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WELCOME

The IEEE Power & Energy Society (PES) is proud to be holding its 2017 General Meeting in Chicago, IL USA. The technical program theme of “Energizing a More Secure, Resilient & Adaptable Grid” will provide a platform to offer new insights, innovative ideas and answers to some of the most intriguing and important questions facing the power industry today.

The Local Organizing Committee, PES Technical Committees and the General Meeting Coordinating Committee welcome colleagues and friends from all facets of the industry and corners of the world to a valuable technical program, productive committee meetings and exciting networking opportunities.

OUR THANKS

PES gratefully acknowledges the support of the 2017 General Meeting’s host utility, ComEd and of all our other generous meeting contributors.

CONFERENCE OVERVIEW

Below is a brief overview of the conference and meeting schedule and a description of each element of the meeting. The descriptions are in approximately the same order as they occur during the meeting.

Note: Attire for the conference is business casual. No denim jeans or shorts in the technical sessions or committee meetings, please.

CONFERENCE LOCATION

The 2017 General Meeting will be held at the Sheraton Grand Chicago Hotel, Chicago, IL USA.

CONFERENCE SCHEDULE AT A GLANCE

A quick overview of the meeting in chronological order. Detailed description of the events listed can be found elsewhere in the program.

Note: A limited number of sessions and events (in particular, some committee meeting) may fall outside this schedule.

*Tutorials, Technical and Leisure/Companion Tours and Evening Events, Student, Industry and Faculty Luncheon, and Awards Dinner are optional activities with limited capacities; they require an additional fee and tickets for admittance. Plain Talk courses are co-located with the General Meeting, and require a separate registration rather than General Meeting registration. See the General Meeting Registration page for more information about the Plain Talk courses http://www.pes-gm.org/2017/

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Event / Sessions</th>
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<tbody>
<tr>
<td>Sunday</td>
<td>All Day</td>
<td>Registration/Information</td>
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<td></td>
<td>Committee Meetings, Tutorials*</td>
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<td>PM</td>
<td>Companion Tour*</td>
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<td>PM</td>
<td>New Attendees Orientation (3:00–4:00 PM)</td>
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<td></td>
<td>4:00 PM</td>
<td>IEEE PES Scholarship Plus Reception</td>
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<td></td>
<td>Evening</td>
<td>Welcome Reception</td>
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<tr>
<td>Monday</td>
<td>All Day</td>
<td>Registration/Information</td>
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<td>Companion Lounge for registered companions and registered children</td>
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<td>AM</td>
<td>Attendee and Presenter Breakfasts; Companion Breakfast</td>
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<td>PES Members Meeting (8:00–9:00 AM)</td>
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<td></td>
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<td>Plenary Session (9:00–11:00 AM)</td>
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<td>Companion Tour*</td>
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<td></td>
<td>11:00 AM</td>
<td>Committee Meetings start</td>
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<td></td>
<td>PM</td>
<td>Committee Meetings, Technical Sessions, Technical Tours*, Companion Tour*, Tutorials*</td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>Committee Poster Sessions, Fellows Reception, Candidates Meet-and-Greet (all co-located) (5:00–8:00 PM)</td>
</tr>
</tbody>
</table>
REGISTRATION AND INFORMATION
Sheraton Grand Hotel – Ballroom Promenade, 4th Floor
Sunday, 16 July 10:00 AM – 8:00 PM
Monday, 17 July – Tuesday, 18 July 6:30 AM – 7:00 PM
Wednesday, 19 July 6:30 AM – 4:00 PM
Thursday, 20 July 6:30 AM – 12:00 PM
All attendees are required to register for the 2017 General Meeting and pay the appropriate fee in order to participate in any aspect of the meeting.

At the registration counters, you may pick up your advance registration packets, register on-site, purchase tickets for luncheons or companion and evening events (depending on availability), ask questions at both the registration and information counters.

Conference Proceedings: All registrants for the technical program will be able to download a copy of the conference proceedings from a secure web site. Or, if when registering you indicated you wanted a copy of the proceedings on a USB stick, you can pick that up at registration. You must indicate you want the proceedings on USB stick when registering for the conference in order to receive it on USB stick. Information on downloading the proceedings will be sent via the registration when the proceedings are available.

INCLUDED WITH REGISTRATION
Attendee registration fees include: Continental breakfasts Monday–Thursday, Welcome Reception Sunday evening, full technical session and committee meeting program (including the Poster Session and Reception on Monday evening, and Student Poster Contest on Tuesday morning), the conference proceedings either via download or USB stick, the opportunity to participate in any of the available optional events open exclusively to registrants at the prevailing registrant rate.

Companion and Children registration fees include: Continental breakfasts Monday–Thursday in the Companion Lounge, welcome reception on Sunday evening, Poster Session and Reception/Fellows Reception on Monday evening, all technical sessions, technical tour, and conference proceedings.

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<tr>
<th>Day</th>
<th>All Day</th>
<th>AM</th>
<th>PM</th>
<th>Evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday</td>
<td>Registration/Information</td>
<td>Student Poster Contest and Attendee Breakfast <em>(co-located with the Student Poster Contest)</em>; Presenter Breakfast; Companion Breakfast; Companion Tour*</td>
<td>Technical Tour*, Companion Tour*</td>
<td>Awards Dinner and Ceremony <em>(7:00–9:30 PM)</em></td>
</tr>
<tr>
<td>Wednesday</td>
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<td>Plain Talk Course <em>(co-located event, separate registration required)</em></td>
<td>Companion Lounge Program for registered companions and registered children</td>
</tr>
<tr>
<td>Thursday</td>
<td>All Day</td>
<td>Committee Meetings, Tutorials*, Technical Sessions</td>
<td>Plain Talk Course <em>(co-located event, separate registration required)</em></td>
<td>Companion Lounge Program for registered companions and registered children <em>(until 12:00 pm)</em></td>
</tr>
</tbody>
</table>

*Indicates an additional registration fee is required for this event / session.
evening, companion lounge Monday–Thursday, the opportunity to participate in companion tours and any of the other available optional events open to registered companions at the prevailing registered companion rate. Companions are not admitted to technical session nor do they receive a copy of the proceedings. Note: Registered children must be accompanied by a registered companion when in the companion lounge or participating in any conference activities, including tours.

The Companion Lounge is located in the Sheraton Grand Hotel.

**Student registration fees include:** Continental breakfasts Monday–Thursday, welcome reception Sunday evening, full technical session and committee meeting program (including the poster session and co-located receptions on Monday evening and the Student Poster Contest on Tuesday morning), the conference proceedings either via download or USB stick, participation in any program elements designed exclusively for students. If you wish to attend the Student/Industry/Faculty Luncheon on Wednesday, you must purchase a ticket for the luncheon. Plus optional events open to registrants at the prevailing registrant rate.

**IN AND AROUND THE REGISTRATION AREA**

**PES-Related Displays:** Tables with literature and with materials about PES and IEEE membership, programs, publications and future meetings.

**Information Booth:** Staffed by local volunteers, you can obtain information about the meeting, the venue and the Chicago area from knowledgeable people.

**NEW ATTENDEES ORIENTATION SESSION**

Sunday, 16 July 4:00 PM – 5:00 PM

A short orientation session will familiarize first-time attendees with PES and the PES General Meeting. Session will provide an understanding of the various types of technical sessions, committee meetings, tutorials, technical tours, and social events. At the end of the session, the newcomer should be able to navigate confidently through the General Meeting and obtain maximum value from the experience. Session will include a question and answer period.

**WELCOME RECEPTION**

Sunday, 16 July 5:00 PM – 8:00 PM Aon Grand Ballroom at Navy Pier

Take this opportunity to renew old acquaintances and meet more members of the power and energy community. You are invited to enjoy a complimentary hors d’oeuvre buffet and a cash bar. Photo ID will be required to purchase alcoholic beverages.

**Name badges are required.** You will not be allowed into the Welcome Reception without your badge.

Shuttle Buses are arranged between the Sheraton Hotel and Navy Pier from 5:00 PM to 8:00 PM, departing from the hotel from the Convention Entrance, Lobby Level 3. Navy Pier is an approximate 20 minute walk from the Hotel.

**ATTENDEE BREAKFASTS**

**Monday, 17 July** 6:30 AM – 7:45 AM Sheraton Grand Chicago Hotel

**Tuesday, 18 July** 7:00 AM – 9:30 AM Sheraton Grand Chicago Hotel

**Wednesday, 19 July** 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel

**Thursday, 20 July** 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel

Complimentary continental breakfasts for all conference registrants will be available Monday through Thursday. Note that a general breakfast is not offered on days other than these.

**PRESENTERS BREAKFASTS**

**Monday, 17 July** 6:30 AM – 7:45 AM Sheraton Grand Chicago Hotel

**Tuesday, 18 July** 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel

**Wednesday, 19 July** 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel

**Thursday, 20 July** 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel

Presenters must attend a special breakfast on the day of their sessions where final plans for the session at which they will present will be made. See additional information in the “Information for Presenters” section of this program.
PES MEMBERS MEETING
Monday, 17 July 8:00 AM – 9:00 AM Sheraton Grand Chicago Hotel

PES President, Damir Novosel, will update the membership on various PES activities. Candidates for the office of PES President Elect, PES Treasurer and PES Secretary will speak. (Meet the candidates face-to-face at a reception that will be co-located with the Monday Night Poster Session, Location to be announced, 5:00 PM-8:00 PM, Monday, 17 July.)

PLENARY SESSION – LOC
Monday, 17 July 9:00 AM – 11:00 AM Sheraton Grand Chicago Hotel

PES President Damir Novosel will moderate the Plenary Session which begins immediately following the PES Members Meeting.

COMMITTEE MEETINGS

Most administrative and technical committee meetings are scheduled from Monday 11:00AM (following the Plenary Session) through Friday morning. Some additional committee meetings are scheduled on Sunday, 16 July. See the Committee Meeting section of the program for details. Last minute updates to the program will be posted on the message board in the Registration area as well as via push notifications for those who will be using mobile app.

TECHNICAL SESSIONS AND OTHER TECHNICAL EVENTS

See the “Technical Session and Other Events” section of the program for a complete listing and description of all technical sessions. Descriptions include an abstract of each event and papers presented during each session. Last minute updates to this program will be posted in the Registration area as well as via push notifications for those who will be using mobile app. Technical meetings are planned for Monday afternoon and evening and all day Tuesday, Wednesday and Thursday. The following types of sessions are scheduled:

Super Sessions: a series of presentations in composite sessions designed to fully explore topics from different perspectives. Experts from several PES technical committees will address subjects that are of significant interest to the profession:
- Late Breaking News
- Extreme Events and Grid Resiliency
- Energy Storage
- Cyber and Physical Security
- Distributed Generation (DG) Regulation, Engineering, Modeling, and Impacts

Panel Sessions: Invited papers on a wide variety of noteworthy subjects.

Transactions Paper Sessions: Presentation of high quality IEEE PES Transactions papers on many issues of significance to energy and power professionals.

Paper Forums: Multiple authors present brief overviews of their quality papers followed by time for a discussion with the individual author(s) of your choice.

Poster Session: A Monday evening special event with hundreds of authors representing all aspects of the industry, each presenting a poster version of his/her paper. Enjoy hot and cold hors d’oeuvres and refreshing beverages as you browse the posters and discuss the papers one-on-one with their authors.

Student Poster Contest: The Student Poster Contest will be held in conjunction with the Tuesday morning attendee breakfast (on 18 July).

Tutorials: Thirteen tutorials will be presented during the meeting. Classes are taught by top professionals in the field. Earn PDHs and CEUs for your attendance (see below for an explanation of PDHs and CEUs). Full or one-day conference registration plus an additional fee is required in order to attend any of these courses. For complete information about the tutorials including pricing, information about the instructors and schedule, see the Tutorial section of the program in the pages that follow, or the GM website. Tickets may be purchased at the Registration desk if seats remain. The tutorials are:
- Surge Protection of Power Systems According to IEEE C62.22
- Shunt Compensation for Transmission – Principles, Planning, Operational Experience & Future Trend
- Smart Inverters for Distributed Generators
- Planning and Integration of Flexible HVDC Into Today’s Grid
- Synchronphasors Estimation and Control of Power System Dynamics
- Smart Grid 308 – Distributed Energy Resources

Introductory Information, continued
Introductory Information, continued

- IEEE 1547 Standard for Interconnecting Distributed Energy Resources with Electric Power Systems
- Design and Implementation of Microgrids in Modern Power Systems
- Managing Uncertainties in the Future Grid: Evolution of EMS Control Centers – Synchronphasor Solution
- Distribution Automation/Management Systems and Integration with DERs and Microgrids
- Cybersecurity of the Electric Power Transmission and Distribution System

Technical Tours: Four half-day inspection trips are offered. Registration is permitted through 11 July only. No on-site technical tour registration is available. Valid photo ID must be presented at the beginning of each tour. See the Technical Tour section of the program for descriptions and details of each tour.

MONDAY NIGHT POSTER SESSION AND RECEPTION
Monday, 17 July 5:00 PM – 8:00 PM Sheraton Grand Chicago Hotel
(co-located with the Fellows’ Reception, the Meet the Candidates Reception and an opportunity to meet the donors who have contributed to the PES Scholarship Plus program)

A popular feature of the PES General Meeting technical program is the Poster Session, where papers from each represented committee and all topics will be presented. A complimentary hors d’oeuvre buffet will be served and cash bar will be available. Attendee or Companion badges are required for entrance to the Poster Session. Photo ID will be required to purchase alcoholic beverages at the bar. (The Student Poster Contest will be held Tuesday morning, 7:30 AM – 9:00 AM, during which an Attendees’ Breakfast will be available.)

CANDIDATES MEET & GREET RECEPTION
Monday, 17 July 5:00 PM – 8:00 PM Sheraton Grand Chicago Hotel
(co-located with the Poster Session and New Fellows Reception)

The PES candidates for the President-Elect, Secretary and Treasurer will each make a short presentation of his/her views for the Society and IEEE so you can make an informed decision when you vote during this year’s election.

NEW FELLOWS RECEPTION
Monday, 17 July 5:00 PM – 8:00 PM Sheraton Grand Chicago Hotel
(co-located with the Poster Session, Candidates Reception)

As part of PES’s recognition of extraordinary achievements in the technical and professional fields of energy and power, during the reception held in their honor you are cordially invited to stop in and congratulate the IEEE Fellows elected to the class of 2017 who are members of PES.

SCHOLARSHIP PLUS RECEPTION
Monday, 17 July 5:00 PM – 8:00 PM Sheraton Grand Chicago Hotel
(co-located with the Poster Session, Candidates Reception and New Fellows Reception)

Meet the individuals who will help shape the future of the Power Industry and congratulate them on being selected as IEEE PES Scholars.

STUDENT POSTER CONTEST
Tuesday, 18 July 7:00 AM – 9:30 AM Sheraton Grand Chicago Hotel
(co-located with Attendee Breakfast)

Take this opportunity to see the work done by hundreds of the top students in our field. Plan to spend some time discussing topics of mutual interest with the participants.

AWARDS CEREMONY AND BANQUET
Tuesday, 18 July 7:00 PM – 9:30 PM Sheraton Grand Chicago Hotel

US$80/$85

Join us for a banquet dinner where IEEE and PES award winners are honored for their outstanding achievements. Vegetarian/vegan meals are available upon request. Seating is limited. This is a ticketed event. You may purchase tickets on-site at the Registration Desk if there are seats remaining. A cash bar serving beer and wine will open at 6:30 PM and be available thru dinner. Photo ID will be required to purchase alcoholic beverages.
STUDENT PROGRAM
An exciting student program for IEEE PES Student Members includes a Poster Contest, and the Student/Industry/Faculty luncheon (ticket required) as well as the Student/Industry/Faculty Job Fair. Student members are invited to participate in all other aspects of the General Meeting as well. After registering for the General Meeting, students may visit http://www.pes-gm.org/2017/ for more information about the program. Students must be prepared to verify their status by providing their ID and IEEE Membership number when picking up their registration packets on-site.

STUDENT / INDUSTRY / FACULTY LUNCHEON
Wednesday, 19 July 12:00 PM – 1:30 PM Sheraton Grand Chicago Hotel
US$40/$45; Students US$20/$25

Student/Industry/Faculty Luncheon: Attend a luncheon designed to bring together students, industry representatives and faculty advisors. The recipients of the IEEE PES Student Prize Paper Award in Honor of T. Burke Hayes and the recipients of the Student Poster Contest will be recognized. This is a ticketed event. All meeting registrants are invited to purchase tickets and join the luncheon as long as there are seats remaining. Seating is limited.

STUDENT / INDUSTRY / FACULTY JOB FAIR
Wednesday, 19 July 1:30 PM – 3:00 PM Sheraton Grand Chicago Hotel
International Job Fair for Students: Employers and university graduates and undergraduates can participate in an International Job Fair for Students following the luncheon. This job fair will provide a forum for employers and students who share a common interest in the power and energy industry to meet and discuss career opportunities. It enables one-to-one conversations between company engineers or recruitment professionals and students who will soon be in the job market. Students will sit with a potential employer during lunch. Students may circulate among recruiting tables for further conversations. Doors will open following the conclusion of the Luncheon.

JOINT RECEPTION HOSTED BY PES WOMEN IN POWER & YOUNG PROFESSIONALS (reception)
Wednesday, 19 July 6:00 PM – 7:30 PM Sheraton Grand Hotel / S – Michigan B
PES’ Women in Power & Young Professionals groups invite you to a reception on Wednesday evening. This is an opportunity for all conference attendees, in particular, women, current students and engineers that have graduated within the last ten years to network, meet officers of IEEE PES, and to make contacts among their peers in the Power & Energy community. Find out how you can contribute to PES and how it can help you.

COMPANION ACTIVITIES
Access to the activities described below is limited to registered companions and registered children in the company of a registered companion.

Registered companions and children are invited to mingle and relax in the Companion Hospitality Lounge, located in the Sheraton Grand Chicago Hotel. The lounge will be open:
- Sunday 12:00 PM – 5:00 PM
- Monday through Wednesday 7:00 AM – 5:00 PM
- Thursday 7:00 AM – 12:00 PM

Complimentary breakfast will be served Monday through Thursday, 7:00AM – 9:30AM.

Many fun activities are being planned for the lounge. Please check on-site in the lounge for more details and activity sign-up.

COMPANION TOURS
A full program of optional tours has been planned for registered companions.
IEEE PES PLAIN TALK courses for the power industry professional will help you to understand technical aspects of the electric power industry, even if you do not have an engineering background. You will gain insights into the concerns of engineers, the demands of regulators and consumer groups, and the factors and trends that impact the operation of today's electric power systems. These courses are also appropriate for new engineers to the industry, or for engineers in other fields who are transitioning to the electric power industry. These courses aim to increase your understanding of the electric power system by providing you with practical knowledge that you can use as you work in or with this important industry.

IEEE PES PLAIN TALK courses are co-located events rather than parts of the General Meeting, and thus, conference registration is not required to attend these courses. The fee to register for the courses on-site is US$2,150 for three courses, US$1,510 for two courses and US$795 for a single course. (If you register on or before 27 June, prices are lower. See the Plain Talk web page noted below for specifics.) The course fee includes continental breakfast, lunch and all course materials. Breakfast and registration: 7:30 AM – 8:00 AM. Courses start promptly at 8:00 AM. You may register on-site if seats are available.


**Power System Basics – Understanding the Electric Utility Operation Inside and Out**

Tuesday 18 July 8:00AM – 5:00PM

The focus of this course is to provide a fundamental foundation in electric power systems, from basic formulas to the planning, operations, and equipment involved in generating, transmitting, and distributing electric power. Basic electrical terminology will be explained in simple to understand language with regard to design, construction, operation and maintenance of power plants, substations and transmission and distribution lines. Topics covered in the course include an introduction to the fundamentals and basic formulas of electricity as well as the equipment involved in the electric power system. An overview of generation, substations, transmission, distribution, and utilization is provided. Protection, reliable operation, and safety are among the topics covered.

Instructor: William J. Ackerman

**Distribution System – Delivering Power to the Customer**

Wednesday, 19 July 8:00 AM – 5:00 PM

(Prerequisite for this course is Power System Basics or a familiarity with basic formulas and power system equipment.)

The focus of this course is to provide attendees with an overview of the issues associated with the planning, engineering, design, operation, and automation of electrical distribution systems. Types of distribution systems and network circuits, as well as engineering issues related to distribution systems will be explored. New concepts in the design, challenges, and operation of smart grid will be addressed. This course is intended for those who are not familiar with the delivery of electricity to the end user.

Topics covered in the course include an introduction to the types of distribution systems, issues associated with distribution planning such as outages and reliability, distribution engineering considerations relating to radial and secondary networks, and distribution automation. The course also provides an overview of electrical distribution operations, including the roles of utility personnel, construction and maintenance considerations, and trends in the industry. Smart grid and its impact on the distribution system will be explored.

Instructors: Joseph L. Koepfinger and Maurice Ney

**Transmission System – The Interconnected Bulk Electric System**

Thursday, 20 July 8:00 AM – 5:00 PM

(Prerequisite for this course is Power System Basics or a familiarity with basic formulas and power system equipment.)

The focus of this course is to provide participants with knowledge of how electric power is transferred from generation sources to distribution systems via the interconnected electric bulk power system known as “the grid.” Basic physical laws governing the grid will be introduced, as well as the regulatory agencies involved in its governance. The great blackouts will be explored. This course is intended to increase participant's understanding of the electric grid and how it functions in the electric power system. Topics covered in the course include an introduction to the fundamental concepts of power, energy, and power system stability as they relate to the grid. The grid is explored in terms of its interconnections, power flow, North American interconnections, and governing bodies such as NERC/ERO, ISOs, and RTOs. Reliability standards and
contingency analysis are addressed. Issues related to the planning and operation of the grid, such as transmission and economic constraints, determining transmission transfer capability, and dealing with congestion are reviewed. The course also discusses the great blackouts, their root causes, and lessons learned.

Instructor: Robert W. Waldele

Technological Program Information

Information for Presenters

Presenter/Chair Breakfasts

All presenters, panelists and session chairs MUST meet at breakfast the day of their session(s) to discuss session arrangements. Attendance is required. All presenters should have received e-mails providing the dates of their sessions and breakfasts.

Presenter Breakfasts

Monday, 17 July 6:30 AM – 7:45 AM Sheraton Grand Chicago Hotel
Tuesday, 18 July 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel
Wednesday, 19 July 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel
Thursday, 20 July 6:30 AM – 8:30 AM Sheraton Grand Chicago Hotel

Audio-Visual Equipment and Presenters Preparation Room

Technical Session rooms will be equipped with an LCD projector and screen, power and extension cords, podium, microphone if appropriate, and a wireless mouse. Speakers who wish to use a computer during their presentations are required to provide their own laptop computers and are responsible for ensuring compatibility with on-site equipment.

Committee meeting rooms will be equipped with a screen, and power and extension cords. No projector or computer will be provided. Arrangements, including payment via credit card, for any additional audio-visual equipment you wish to rent from the meeting's AV provider must be made in advance.

The Presenters Prep Room, located in the Sheraton Grand Chicago Hotel, will be equipped with an LCD projector with the same specifications and compatibility as those in the Technical Session rooms. The equipment is provided to allow presenters to become familiar with, and to ensure that, their laptop computers are compatible with on-site equipment provided. Please check at the Information Booth or Paper Sales area for exact location, hours and access.

PDHs and CEUs for Attendees

Continuing Education Units (CEUs) offered by IEEE

A Continuing Education Unit (CEU) is ten contact hours of participation in an organized continuing education experience under responsible, qualified direction and instruction. A unit generally consists of courses of study that refresh, update and enhance knowledge, skills and experience of professional personnel. Any course that offers CEUs which is presented by an IEEE entity has been reviewed and approved according to standards set by IEEE. All registered students who complete an IEEE course offering CEUs will receive a certificate via email from the IEEE attesting to the CEUs earned by the attendee.

It is up to each student to determine if a specific course or program fills the needs of the discipline or certifying body for which the CEUs are intended.

Professional Development Hours (PDHs)

Continuing professional education for licensed engineers is measured in Professional Development Hours (PDH). A PDH is one contact hour of instruction or presentation. Currently, approximately thirty states mandate Professional Development Hours to maintain P.E. licensure, each with varying requirements. CEUs readily translate into PDHs (1CEU=10 PDHs), though PDHs do not convert automatically to CEUs. The licensee is responsible for maintaining records to be used to support PDH credits claimed. PES does not track this information. Unlike the procedure for CEUs, courses are not pre-approved by the IEEE for PDHs.

At many PES meetings, forms are readily available that can be completed by attendees of any session and signed by the session chair to verify attendance. The completed forms are held by each attendee. They are not submitted to IEEE. It is up to each licensee to provide the forms to the certifying body or employer, and to determine if a specific course or program fills the needs of the discipline or certifying body and/or employer for which the PDHs are intended.
TECHNICAL TOURS

Technical tours are a unique element of the PES General Meeting technical program.

TUTORIALS

Meeting registration plus an additional fee is required to attend any of these courses. Earn CEUs and PDHs for your attendance. You may register on-site if seats are available.

Surge Protection of Power Systems According to IEEE C62.22

Date: Sunday July 16
Time: 8:00 AM – 5:00 PM
Price: Early Bird $295, Regular $395; Student Early Bird $100, Student Regular $150
Instructors: Jonathan Woodworth, ArresterWorks

This tutorial focuses on the application of surge arresters to AC power systems above 1000 volts. It introduces the subject with examples of best practices in Distribution, Transmission, and Substations applications. It also covers the basic AC system fundamentals as they apply to arresters and basic Arrester Fundamentals as they apply to applications. A detailed overview of how to select the proper arrester rating is covered and includes real world examples. The tutorial is targeted toward engineers with some power systems knowledge, but even the novice can understand the selection method.

Energy Storage: An Introduction to Technologies, Applications and Best Practices

Date: Sunday July 16
Time: 8:00 AM – 5:00 PM
Price: Early Bird $295, Regular $395; Student Early Bird $100, Student Regular $150
Instructors: Dr. Hamid Zareipour, University of Calgary
Dr. Sudipta Lahiri, Distributed Energy Resources, DNV GL Energy
Dr. Michael Klinberg, Senior Consultant – Energy Advisory, DNV GL – Energy
Dr. Ramteen Sioshansi, Ohio State University

Energy storage is becoming an attractive solution for today’s smart grid, either being operated independently as asset or interacting with other resources like wind/solar generation or demand response. This tutorial is a full-day course which will provide participants a solid understanding of the basics and the state-of-the-art energy storage application, its implications on the grid’s reliability and the system's economics and how-to on evaluating its performance and cost-benefit. Instructors with diverse backgrounds on this subject will bring the field deployment experience of energy storage applications and real-world examples to demonstrate the analytic tools used in assisting utility planning and operation decisions. The course is suitable for non-technical, as well as technical audiences, including regulatory, legislative, and utility staff members.

Shunt Compensation for Transmission – Principles, Planning, Operational Experience & Future Trend

Date: Sunday July 16
Time: 8:00 AM – 5:00 PM
Price: Early Bird $295, Regular $395; Student Early Bird $100, Student Regular $150
Instructors: Ben Mehraban, AEP
David Langne, Siemen
Geza Joos, McGill
Anders Bostrom, ABB
Paul Marken, GE
Sep Boshoff, PSD Consulting
Joe Warner, ABB
Mikael Halone, ABB

AC transmission systems make use of shunt compensation to maximize transmission capacity and ensure power system stability. The retirement of older generation, changes in configuration of existing transmission and the integration of distributed energy resources pose challenges that require new planning approaches and compensation equipment. This tutorial presents principles of available technology, planning approaches for deployment and a comparative evaluation of existing and newly available solutions. Both steady-state and dynamic operation are presented. Uses and specifications of shunt devices for existing and newer
applications are also illustrated. These include static var compensators, voltage sourced converters, mechanically switched shunts, hybrid solutions of the above, and synchronous condensers.

**Smart Inverters for Distributed Generators**

**Date:** Sunday July 16  
**Time:** 8:00 AM – 5:00 PM  
**Price:** Early Bird $295, Regular $395; Student Early Bird $100, Student Regular $150  
**Instructors:** Babak Enayati, National Grid  
Tom Key, EPRI  
Michael Coddington, NREL  
Richard Bravo, Southern California Edison (SCE)  
John Berdner, Enphase Energy  
Rajiv K. Varma, University of Western Ontario

Different countries are setting up ambitious targets of PV solar based Distributed Generators (DGs) installations. However, the integration of PV based DGs has led to several challenges, mitigation of which typically require expensive compensating and protection equipment, as well as complex network management strategies.

DG inverters primarily produce real power at unity power factor. However, power electronics has now made it possible for inverters to perform multiple functions for grid support, in addition to real power generation. Such inverters are termed Smart Inverters as they are capable of effectively minimizing several grid integration challenges of DGs without additional equipment. Recognizing the significant potential of smart inverter technology, utilities across the globe are actively considering implementation of smart inverters.

The technology of smart inverters is i) new, ii) rapidly evolving, and iii) has outpaced the technical regulations and standards which are needed to allow its implementation. Different PV interconnection and testing standards around the world are being revised to allow the different features of smart inverters to be implemented. US DOE, EPRI, NREL are testing and demonstrating the smart inverter technologies on several pilot projects.

This IEEE Tutorial on Smart Inverters is being proposed to present a comprehensive and structured knowledge on the need, functions, operation and protection, integration and testing standards, system studies of benefits, demonstration projects and actual installations of this new technology. This Tutorial will be very helpful for academics, utilities, practicing engineers, consultants, system operators and planners, DG developers, and inverter manufacturers for understanding the various facets of this technology and to fully exploit its vast capabilities in their T&D grids.

**Planning and Integration of Flexible HVDC Into Today’s Grid**

**Date:** Sunday July 16  
**Time:** 8:00 AM – 5:00 PM  
**Price:** Early Bird $295, Regular $395; Student Early Bird $100, Student Regular $150  
**Instructors:** Michael I. Henderson, NE ISO  
Dr. Simon Teeuwissen, Siemens PTI  
Prof. Dr. Rajiv Varma, UWO  
Prof. Dr. Dirk Van Hertem, KU Leuven  
Dr. Stefanie Kuenzel, Imperial College London  
Dr. Tarek Adel-Gaill, SNC Lavalin  
Dr. Bernd Klöckl, Tennet  
Dale Osborn, MISO  
Prof. Dr. Kyeon Hur, Yonsei University

The evolving planning process requires competitively solicited projects that efficiently and creatively use limited rights-of-way. In addition, renewable resources from remote locations must be successfully integrated with the system. High voltage direct current (HVDC) provides a viable option to transfer large amounts of power across long distances in an environmentally friendly manner.

This tutorial provides system planners with an understanding of how HVDC applications can reliably and economically improve the system. The tutorial reviews the planning process and discusses the studies necessary for considering HVDC technologies. Attendees will understand: the role of HVDC in the grid of the future; a planner’s perspective of basic HVDC technologies; and the technical issues that must be properly considered and addressed to successfully plan, implement, and operate an HVDC project. System interactions of new HVDC assets with the existing AC transmission system are specifically addressed. Case studies of HVDC plans providing reliable and economic service are presented as well as the how and why HVDC overlay networks can be successfully planned. The advantages and disadvantages of state-of-the-art HVDC technologies are discussed.

The focus lies on HVDC for grid development, rather than HVDC technology.
Synchrophasors Estimation and Control of Power System Dynamics

**Date:** Sunday July 16  
**Time:** 8:00 AM – 12:00 PM  
**Price:** Early Bird $195, Regular $240; Student Early Bird $50, Student Regular $75  
**Instructors:** Dr. Esmail Ghahremani, Institut de recherche d’Hydro-Québec (IREQ)  
Prof. Innocent Kamwa, Institut de recherche d’Hydro-Québec (IREQ)  
Prof. Bikash C. Pal, Imperial College London  
Dr. Abhinav Kumar Singh, Imperial College London  

Power system operates under quasi stationary states. Any random disturbance in a power system (such as a fault) triggers dynamic response of the system. Most of the times response settle to a stable equilibrium, sometimes experiences oscillations which are electromechanical in nature. These oscillations in the past grew in magnitude within few seconds when were not controlled in time, resulted in wide-scale blackouts in many instances. These oscillations are global in nature and in order to control them dynamically and adaptively, the operating state of the whole system needs to be estimated in real-time, with estimation update rates which are in time scales of 100 milliseconds or less. This fast estimation of operating state is known as dynamic state estimation (DSE), and the control methods based on dynamic estimation are referred to as estimation-based control methods. In the literature research efforts are appearing employing various techniques such as various approaches of Kalman filtering. In the absence of any books, IEEE report, standard, there is growing need from the community to understand these methods. This tutorial will demonstrate the necessity and applicability of such methods and algorithms of estimation and control, and would explain the theory used in the development of these methods/algorithms.

Smart Grid 308 – Distributed Energy Resources

**Date:** Sunday July 16  
**Time:** 1:00 PM – 5:00 PM  
**Price:** Early Bird $195, Regular $240; Student Early Bird $50, Student Regular $75  
**Instructors:** Doug Houseman, EnerNex  

This tutorial will cover the following topics:

- Overview of DER and its components  
- Understanding variable generation issues  
- Limits to DER implementation in a conventional distribution grid  
- Interconnect and other standards for DER  
- Engineering considerations for DER planning and approval  
- Issues in customer owned DER (e.g. maintenance, overrides, etc)  

Who should attend:

- Anyone who is interested in Distribution level DER, its impact on the grid and limits in the distribution grid today.

IEEE 1547 Standard for Interconnecting Distributed Energy Resources with Electric Power Systems

**Date:** Monday July 17  
**Time:** 1:00 PM – 5:00 PM  
**Price:** Early Bird $195, Regular $240; Student Early Bird $50, Student Regular $75  
**Instructors:** David Narang, NREL  
Babak Enayati, National Grid  
Jens Boerner, EFRI  
Leo Casey, Google  
Mark Sira, Coment  
Sudipta Chakraborty, NREL  
Charlie Varianian, MEPPi  

This tutorial will introduce the IEEE 1547 “Standard for Interconnecting Distributed Energy Resources with Electric Power Systems.”

Due to the increasing amount of Distributed Energy Resources (DERs) interconnections with the Electric Power System, the IEEE 1547 standard is going through a major revision to address some of the technical issues associated with high penetration of DERs i.e. grid support functionalities, etc.
The participants will learn about the major changes to the IEEE 1547 i.e. voltage regulation, response to abnormal system conditions (including voltage and frequency ride through), power quality, islanding, interoperability, etc.

The participants will also learn about the utility concerns/solutions to adopt the revised IEEE 1547 standard.

**Design and Implementation of Microgrids in Modern Power Systems**

**Date:** Wednesday July 19  
**Time:** 8:00 AM – 12:00 PM  
**Price:** Early Bird $195, Regular $240; Student Early Bird $50, Student Regular $75  
**Instructors:** Michael Higginson, P.E., S&C Electric Company  
Saeed Kamalinia, Ph.D., S&C  
Paul Pabst, P.E., S&C

This tutorial introduces the concepts, fundamental theories, practical design process, and applications of various types of microgrids. The course is intended for engineers, researchers, and industry managers who want to learn more about latest developments of microgrid technologies as well as the design and implementation of microgrid systems. Participants will learn several aspects of the engineering design and analytical studies required for successful integration of modern microgrids. Initial discussion will cover the definition and objectives of microgrids, the current market, challenges and barriers of microgrid development, and real world experiences with microgrid projects will be presented. Engineering challenges will be discussed, including selection and integration of Distributed Energy Resources (DERs), microgrid protection, communication systems, and control hierarchy.

The workshop will also include an overview of actual industrial-scale microgrids commissioned by S&C engineers and group exercises for better understanding of the concepts and processes. One project is the recipient of 2015 Smart Grid Project of the Year award from *Power* magazine.


**Date:** Wednesday July 19  
**Time:** 8:00 AM – 12:00 PM  
**Price:** Early Bird $195, Regular $240; Student Early Bird $50, Student Regular $75  
**Instructors:** Emanuel Bernabeu, PJM Interconnection  
Doug Bowman, Southwest Power Pool  
Robert Cummings, NERC  
Charles Lawrence, American Transmission Co.  
Milorad Papic, Idaho Power Company  
Marianna Vaiman; V&R Energy

Security and safety of a power system network are fundamental aspects of electric utility operation. As the security issues related to the power industry become more critical, the challenge of maintaining secure operation of bulk power systems is growing. The utilities and regional organizations should be able to assess quickly an outcome of a larger impact on the transmission network. Major blackouts are frequently caused by cascading outages. Since cascading outages may have such a wide-spread effect, NERC, under its transmission planning standards requires analyses of cascading events. This tutorial developed by the IEEE Cascading Failure Working Group addresses industry best practices in assessment of cascading outages as a part of NERC compliance studies. This half-day tutorial pioneers hands-on training as a part of the tutorial. It includes training on performing cascading studies to comply with NERC TPL-001-4 and CIP-014-2 standards. The attendees are encouraged to bring their laptops with them to run the studies, or they will be able to observe computations performed by instructors. The tutorial covers industry experience in preparing to the NERC audit and NERC perspective on performing cascading analysis under transmission planning standards. This tutorial, taught by a team of experts from industry, is intended for power system engineers, regulators, transmission owners, power engineering students, and academics.
Managing Uncertainties in the Future Grid: Evolution of EMS Control Centers –
Synchrophasor Solution

Date: Wednesday July 19
Time: 1:00 PM – 5:00 PM
Price: Early Bird $195, Regular $240; Student Early Bird $50, Student Regular $75
Instructor: Jay Giri, GE Grid Solutions

Managing the future grid will require creative, innovative solutions. This is because of uncertainties being introduced by the growth of less predictable & reliable renewable generation resources, demand response programs, distributed generation, microgrids, potential cyber-security issues and the aging infrastructure. Energy Management Systems (EMS) have been deployed for decades at utility control centers to manage the electricity grid in real-time. Today these EMS capabilities are poised to be enhanced quite dramatically with growth of synchrophasor PMU measurements. Solutions to decentralize management of the grid are also being introduced – these include Distribution Management Systems, Substation Automation and advances in grid control devices. These new solutions will help us manage the uncertainties and challenges of the future smart grid.

This presentation will describe:
• The history and evolution of the EMS from its digital genesis in the 1970's
• The primary functions of a modern EMS
• Emerging new industry drivers & emerging new technology trends
• Impact of growth of microgrids, renewables and distributed generation on the EMS
• Growth of Phasor Measurement Units (PMUs) and synchrophasor measurements worldwide
• Wide area monitoring (WAMS) and wide area control (WAMPAC) solutions
• Modern advanced fast-acting grid control devices

Concluding thoughts on the challenges and opportunities to manage the future grid.

Distribution Automation/Management Systems and Integration with DERs and Microgrids

Date: Thursday July 20
Time: 8:00 AM – 5:00 PM
Price: Early Bird $295, Regular $395; Student Early Bird $100, Student Regular $150
Instructor: Dr. Jiyuan Fan, Southern States LLC
John D. McDonald, P.E, GE Energy Connections – Grid Solutions

This course introduces the intuitive concepts, fundamental theories, practical technologies on distribution system modeling, automation management, including the core functionalities and real use cases of the Distribution Automation and Management Systems (DA/DMS) and the advanced applications in Smart Distribution, as well as the integration with Distributed Energy Resources (DERs) and Microgrids. The potential audience would include power system planning/operation engineers, project/product managers, business leaders in power utilities, smart grid solution providers, system developers, research institutes, as well as individual researchers, college students and other individuals working on or interested in the Smart Distribution Solutions. The course will cover the following break-down topics: Overall Framework and Architecture of DA/DMS Systems in Smart Distribution, Distribution System Modeling for automation and management, Static and Dynamic Data for DA/DMS, Advanced Real-time and Analytic Applications in DMS, DMS integration with other systems (OMS, AMI, DRM) in Smart Distribution, Advanced DMS in integration with DERs through DERMS (Distributed Energy Resource Management) and integration with Microgrids, including DERs/Microgrids connection and disconnection to/from the Distribution Grid; and New Trends in ADMS Development.

Cybersecurity of the Electric Power Transmission and Distribution System

Date: Thursday July 20
Time: 8:00 AM – 5:00 PM
Price: Early Bird $295, Regular $395; Student Early Bird $100, Student Regular $150
Instructor: Dr. Murty V.V.S. Yalla, Beckwith Electric Co., Inc.
Steven A. Kunsman, ABB
Dr. Nathan Wallace, Ampirical
Scott R. Mix, NERC
J. Matt Cole, Sargent and Lundy

Cyber-attack on an Electric Power T&D communications system can have a devastating impact and cause widespread power outages as evident from the Dec 2015 cyber-attack on a Ukrainian Electric Power
Distribution System. Securing Electric Power System from cyber-attacks is of national importance and in North America NERC is spearheading the effort in developing and enforcing Critical Infrastructure Protection (CIP) Standards for Bulk Electric System (BES). Local and state regulating agencies are also looking at cybersecurity of the Electric Power Distribution Systems.

Substation protection, automation and control systems along with distribution field devices have changed significantly in the past decade. These systems have become more interconnected and provide end users with much more information to allow for higher reliability and greater levels of control. Interoperability between different vendor products and systems has been achieved using open standards. This change in technology has not only brought huge benefits from an operational point of view, it also permits to address cyber security issues similar to other traditional, enterprise systems which have been facing the same industry challenges for years.

The tutorial discusses cybersecurity basics including passwords & access management, authentication, encryption, network security monitoring, techniques in cyber alarming, logging, and auditing. The tutorial also covers NERC CIP requirements applicable to T&D systems along with brief overview of IEEE and IEC standards. Cybersecurity implementation examples of substation protection, automation and controls systems including devices inside as well as outside the substations are also discussed. Utility perspective on Cybersecurity and NERC CIP compliance will be included.
<table>
<thead>
<tr>
<th>DAY / TIME / LOCATION</th>
<th>SESSION NAME AND DESCRIPTION</th>
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</table>
| Tuesday, 18 July 2017 8:00 AM–12:00 PM S – Sheraton II | Late Breaking News – 8:00 AM– 9:45 AM  
Chair: Doug Houseman  
Industry editors will be discussing and answering audience questions on the latest power & energy industry news. The following speakers are currently confirmed:  
Rick Bush, Editorial Director, T&D World  
Jill Feblowitz, Feblowitz Energy Consulting  
Hot Topics Session – Grid Modernization – 10:00 AM – 12:00 PM  
Chair: Mazana Armstrong  
The session will include presentations and Q&A on hot topics around grid modernization. The following speakers are currently confirmed:  
NERC, Premature PV Inverter Trip due to a 500-kV System Fault  
Bob Cummings  
Distribution Automation in Mexico City for System Reconfiguration and Restoration  
Gerardo Urrea, Schweitzer Engineering Laboratories, Southern California Edison, Planning for Grid Modernization  
Erik Takayasu | 116 |
| Tuesday, 18 July, 2017 1:00 PM–5:00 PM S – Sheraton II | Cyber and Physical Security  
- NERC requirements and standards for Cyber and Physical security in the Bulk Electric System.  
- IEEE PES collaboration with DOE, NERC, and FERC in developing reliability standards and policy.  
- Recent changes to cyber and physical security requirements.  
- Best practices for cyber and physical security in electric power systems. | 137 |
| Wednesday, 19 July, 2017 8:00 AM–12:00 PM S–Sheraton II | Distributed Generation (DG) Regulation, Engineering, Modeling, and Impacts  
- Latest on regulations affecting DG, including rate design, community solar, value of solar, and US Assembly Bill 2514.  
- IEEE Standard 1547 and the future of standards for interconnecting distributed resources with electric power systems, including challenges, gaps, and needs.  
- Grid integration challenges and solutions associated with grids incorporating high penetration levels of DG, including modeling, analysis, and technology solutions (energy storage, demand response, etc.).  
- Microgrids, including applications, business cases, challenges, and solutions.  
- Protection and control challenges (and solutions) associated with grids incorporating DG. | 156 |
| Wednesday, 19 July, 2017 1:00 PM–5:00 PM S – Sheraton II | Energy Storage  
- Large-scale utility level energy storage, business cases and applications intentional islanding, and micro-grids.  
- Integration of renewable generation, energy storage, and demand response to achieve competitive energy cost.  
- Energy storage technologies and long-term environmental considerations.  
- Mobile energy storage, such as electric cars, and impact on a dynamic distribution grid.  
- Advancements in energy storage technologies and hybrid storage technologies. | 173 |
| Thursday, 20 July, 2017 8:00 AM–12:00 PM S – Sheraton II | Extreme Events and Grid Resiliency  
- What level of blackout is acceptable under extreme events conditions?  
- How to respond to a disaster situation. | 192 |
**Super Sessions at a Glance, continued**

- Coordination of electric and natural gas infrastructure and interdependence during an extreme event or a natural disaster.
- Substation design for resiliency under storms, earthquake, and other natural disaster conditions.
- Advances in understanding and modeling Geomagnetic Disturbances (GMD) and Electromagnetic Pulse (EMP) phenomena, impact assessments, and mitigation.
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<thead>
<tr>
<th>Administrative Committees</th>
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<th>Location</th>
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<tr>
<td>Regions 1–7 Chapter Chairs Meeting</td>
<td>Su</td>
<td>8:00 A 5:00 P</td>
<td>S – Michigan A</td>
</tr>
<tr>
<td>Smart Village Workshop</td>
<td>Su</td>
<td>8:00 A 5:00 P</td>
<td>S – Huron</td>
</tr>
<tr>
<td>Regions 1–7 Chapter Chairs Meeting <em>(Lunch)</em></td>
<td>Su</td>
<td>12:00 P 1:00 P</td>
<td>S – Michigan B</td>
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<tr>
<td>Women in Power Advisory Board Meeting</td>
<td>Su</td>
<td>12:00 P 4:00 P</td>
<td>S – Bridgeport</td>
</tr>
<tr>
<td>IEEE Smart Grid Strategic Planning Meeting</td>
<td>Su</td>
<td>2:00 P 5:00 P</td>
<td>S – Lincoln Boardroom</td>
</tr>
<tr>
<td>PES Technical Policy Support Task Force Meeting</td>
<td>Su</td>
<td>3:00 P 5:00 P</td>
<td>S – Mayfair</td>
</tr>
<tr>
<td>Smart Village Workshop</td>
<td>M</td>
<td>8:00 A 5:00 P</td>
<td>S – Huron</td>
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<tr>
<td>ISGT Steering Committee</td>
<td>M</td>
<td>11:00 A 12:00 P</td>
<td>G – 608 Boardroom</td>
</tr>
<tr>
<td>IEEE Smart Cities</td>
<td>M</td>
<td>11:30 A 2:30 P</td>
<td>S – Edgewater</td>
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<tr>
<td>Power Africa Steering Committee Meeting</td>
<td>M</td>
<td>2:00 P 3:00 P</td>
<td>G – 608 Boardroom</td>
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<tr>
<td>APPEEC Conference Meeting</td>
<td>M</td>
<td>3:00 P 4:00 P</td>
<td>G – 608 Boardroom</td>
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<tr>
<td>IEEE Smart Village – Finance Committee Meeting</td>
<td>M</td>
<td>4:00 P 5:00 P</td>
<td>S – Tennessee</td>
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<tr>
<td>PES Fellows Committee</td>
<td>M</td>
<td>4:30 P 6:30 P</td>
<td>S – Bridgeport</td>
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<tr>
<td>Technical Council, Operation &amp; Procedures Committee</td>
<td>Tu</td>
<td>8:00 A 10:00 A</td>
<td>S – Ontario</td>
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<tr>
<td>Membership Committee Meeting</td>
<td>Tu</td>
<td>8:00 A 12:30 P</td>
<td>S – Edgewater</td>
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<tr>
<td>Smart Village Workshop</td>
<td>Tu</td>
<td>8:00 A 5:00 P</td>
<td>S – Huron</td>
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<tr>
<td>Meetings Department Executive Committee</td>
<td>Tu</td>
<td>9:00 A 11:00 A</td>
<td>S – Lincoln Boardroom</td>
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<tr>
<td>Task Force Meeting on IEEE PES Membership Expansion in China</td>
<td>Tu</td>
<td>9:00 A 11:00 A</td>
<td>G – Midway Boardroom</td>
</tr>
<tr>
<td>Transactions on Power Systems Editorial Board Meeting</td>
<td>Tu</td>
<td>12:30 P 2:30 P</td>
<td>S – Superior A</td>
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<tr>
<td>Chapters Leadership Meeting</td>
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<td>S – Superior B</td>
</tr>
<tr>
<td>Technical Council, Technical Sessions Committee</td>
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<td>1:00 P 4:30 P</td>
<td>S – Ontario</td>
</tr>
<tr>
<td>PES Technical Co-Sponsored Meetings Steering Committee</td>
<td>Tu</td>
<td>2:00 P 3:00 P</td>
<td>S – Lincoln Boardroom</td>
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<tr>
<td>Transactions on Sustainable Energy Editorial Board Meeting</td>
<td>Tu</td>
<td>2:30 P 4:00 P</td>
<td>S – Superior A</td>
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<tr>
<td>PES High School Students Initiative</td>
<td>Tu</td>
<td>4:00 P 5:00 P</td>
<td>S – Lincoln Boardroom</td>
</tr>
<tr>
<td>IEEE Smart Village Education Committee Meeting</td>
<td>Tu</td>
<td>4:00 P 5:00 P</td>
<td>S – Michigan A</td>
</tr>
<tr>
<td>Electrification Magazine Editorial Board Meeting</td>
<td>Tu</td>
<td>4:00 P 5:30 P</td>
<td>S – Arkansas</td>
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<tr>
<td>Transactions on Smart Grid Editorial Board Meeting</td>
<td>Tu</td>
<td>4:30 P 5:30 P</td>
<td>S – Superior A</td>
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<tr>
<td>Technical Council, Awards Committee</td>
<td>Tu</td>
<td>4:30 P 5:30 P</td>
<td>S – Ontario</td>
</tr>
<tr>
<td>Transactions on Energy Conversion Editorial Board Meeting</td>
<td>W</td>
<td>8:00 A 10:00 A</td>
<td>S – Superior A</td>
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<tr>
<td>IEEE PES Scholarship Plus Initiative</td>
<td>W</td>
<td>8:00 A 11:30 A</td>
<td>S – Old Town</td>
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<tr>
<td>Smart Village Workshop</td>
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<td>8:00 A 5:00 P</td>
<td>S – Huron</td>
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<tr>
<td>PES Major Awards Committee and PES Technical Committee Awards Meeting</td>
<td>W</td>
<td>9:00 A 11:00 A</td>
<td>G – 600 Executive Meeting Room</td>
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<td>Intelect Meeting</td>
<td>W</td>
<td>10:00 A 11:00 A</td>
<td>S – Bridgeport</td>
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<tr>
<td>Technical Council, Standards Coordination Committee</td>
<td>W</td>
<td>10:00 A 12:00 P</td>
<td>S – Sheraton III</td>
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<tr>
<td>Transactions on Power Delivery Editorial Board Meeting</td>
<td>W</td>
<td>10:00 A 12:00 P</td>
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<tr>
<td>Conferences in Regions 7, 8, 9 and 10</td>
<td>W</td>
<td>11:00 A 12:00 P</td>
<td>S – Bridgeport</td>
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<tr>
<td>Power &amp; Energy Magazine Editorial Board</td>
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<tr>
<td>Technical Council/Lunch and Meeting</td>
<td>W</td>
<td>12:00 P 6:00 P</td>
<td>S – Sheraton III</td>
</tr>
<tr>
<td>IEEE Smart Village – Engagement Committee Meeting</td>
<td>W</td>
<td>3:00 P 4:00 P</td>
<td>S – Missouri</td>
</tr>
<tr>
<td>Publications Board Meeting</td>
<td>W</td>
<td>3:00 P 5:00 P</td>
<td>S – Bridgeport</td>
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<tr>
<td>Committee and Other Entity Meetings, continued</td>
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<tr>
<td><strong>IEEE Smart Village – Operations Committee Meeting</strong></td>
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<td>4:00 P</td>
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<tr>
<td><strong>Governing Board Meeting</strong></td>
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<td><strong>Governing Board Meeting</strong></td>
<td>F</td>
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<tr>
<td><strong>Analytic Methods for Power Systems Committee</strong></td>
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<tr>
<td><strong>AMPS WG on Test Case Coordination</strong></td>
<td>M</td>
<td>12:00 P</td>
<td>1:00 P</td>
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<tr>
<td><strong>AMPS WG on Prize Paper Awards Nomination</strong></td>
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<td><strong>AMPS Admin Meeting</strong></td>
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<td><strong>Analytic Methods for Power Systems (AMPS)</strong></td>
<td>W</td>
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<td><strong>Joint Task Force on Definitions and Quantification of Resilience in Power Systems</strong></td>
<td>W</td>
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<tr>
<td><strong>Big Data Analytics Subcommittee</strong></td>
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<tr>
<td><strong>BDA Big Data Applications in Power Distribution Systems TF</strong></td>
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<td><strong>BDA Big Data Webinar Series Task Force</strong></td>
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<td><strong>Computer Analytical Methods Subcommittee</strong></td>
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<td><strong>CAMS TF on Power System Modeling in CIM</strong></td>
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<td><strong>CAMS WG on the Understanding, Prediction, Prevention and Restoration of Cascading Failures</strong></td>
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<td><strong>CAMS TF on Cyber Security in Power Systems</strong></td>
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<td><strong>CAMS Computer and Analytical Methods Subcommittee</strong></td>
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<td><strong>CAMS TF on Open Source Software</strong></td>
<td>W</td>
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<td><strong>CAMS TF on High Performance Computing for Grid Analysis and Operation</strong></td>
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<td><strong>Distribution System Analysis Subcommittee</strong></td>
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<td><strong>DSA WG on Test Feeders</strong></td>
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<td><strong>DSA WG on State Estimations for Distribution Systems</strong></td>
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<td><strong>Intelligent Systems Subcommittee</strong></td>
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<td><strong>ISS WG on Intelligent Data Mining and Analysis</strong></td>
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<td><strong>ISS WG on Multi Agent Systems</strong></td>
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<tr>
<td><strong>ISS WG on Modern Heuristic Optimization</strong></td>
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<td><strong>ISS WG on Intelligent Control Systems</strong></td>
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<td><strong>ISS TF on Open Data Set</strong></td>
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<td><strong>ISS TF on Micro-Grid Control Systems</strong></td>
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<td><strong>ISS TF on Modern Heuristic Optimization Test Beds</strong></td>
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<td><strong>Reliability and Risk Analysis Subcommittee</strong></td>
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<tr>
<td><strong>RRPA TF on Upgrade of IEEE Reliability Test System</strong></td>
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<td><strong>RRPA TF on Reliability Consideration in Emerging Cyber-Physical Electrical Energy Systems</strong></td>
<td>M</td>
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<tr>
<td><strong>RRPA WG on LOLE Best Practices Planning Session</strong></td>
<td>M</td>
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<tr>
<td>WG on Review of IEEE Standard 762</td>
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<td>S – Lakeview</td>
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<td>WG on Review of IEEE Standard 859</td>
<td>M</td>
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<tr>
<td>RRPA TF on Capacity Value of Solar Power</td>
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<td>RRPA WG on Probability Application for Common Mode Events in Electric Power Systems (PACME)</td>
<td>Tu</td>
<td>9:00 A – 10:00 A</td>
<td>S – Michigan A</td>
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<td>Reliability, Risk and Probability Applications Subcommittee</td>
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<td>10:00 A – 12:00 P</td>
<td>S – Colorado</td>
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<tr>
<td>RRPA TF Reliability Impact of Demand Side Resources</td>
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<td>G – 602 Executive Meeting Room</td>
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<td>Practical Aspects of Ferroresonance WG</td>
<td>Tu</td>
<td>4:00 P – 5:00 P</td>
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<tr>
<td><strong>Transient Analysis and Simulation Subcommittee</strong></td>
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<td>Frequency Domain Methods for Transient Studies TF</td>
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<td>11:00 A – 12:00 P</td>
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<tr>
<td>Distributed Resources: Modeling and Analysis WG</td>
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<td>1:00 P – 2:00 P</td>
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<td>Interfacing Techniques for Simulation Tools TF</td>
<td>M</td>
<td>3:00 P – 4:00 P</td>
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<td>Lightning Performance of Overhead Lines WG</td>
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<tr>
<td>Real-Time Simulation of Power &amp; Energy Systems TF</td>
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<td>EMT-type Modeling of Wind Turbine Generators and Parks TF</td>
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<tr>
<td>Field Measured Overvoltages and Their Analysis WG</td>
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<tr>
<td>Dynamic Average Modeling Techniques TF</td>
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<tr>
<td>Dynamic Systems Equivalents TF</td>
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<td>G – 604 Executive Meeting Room</td>
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<td>Portable Data &amp; Modeling for Electromagnetic Transient Analysis Programs</td>
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<td>3:00 P – 4:00 P</td>
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<tr>
<td>Modeling of Induction Machines TF</td>
<td>Tu</td>
<td>4:00 P – 5:00 P</td>
<td>S – Pullman</td>
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<tr>
<td>GIC Modeling and Analysis TF</td>
<td>Tu</td>
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<td>G – 604 Executive Meeting Room</td>
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<tr>
<td>Modeling and Analysis of System Transients Using Digital Programs WG</td>
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<td>5:00 P – 6:00 P</td>
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<td>TASS Subcommittee Meeting</td>
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<td>3:00 P – 4:00 P</td>
<td>S – Lakeview</td>
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<td><strong>Electric Machinery Committee</strong></td>
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<tr>
<td>EMC Grid Task Force</td>
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<td>EMC WG-12, IEEE-1415</td>
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<td>1:00 P – 5:00 P</td>
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<td>EMC WG-7, IEEE 115</td>
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<td>EMC WG 8 Meeting: IEEE Std C50.13</td>
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<td>EMC WG-10, IEEE 1110</td>
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<td>G – 350 Lounge (North)</td>
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<td>EMC WG-3, IEEE Std 1665</td>
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<td>EMC Renewable Energy Machines &amp; Systems Subcommittee Meeting</td>
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<td>EMC Long Range Planning</td>
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## Committee and Other Entity Meetings, continued

### Energy Development and Power Generation Committee

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<td>IPSC Chinese Electricity Infrastructure WG</td>
<td>M</td>
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<tr>
<td>IPSC Distributed Generation WG</td>
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<td>IEEE 665 Working Group</td>
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<td>IEEE 666 Working Group</td>
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<td>RTSC – Electric Vehicles WG</td>
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<td>IEEE 1050 Working Group</td>
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<td>RTSC – Photovoltaics WG</td>
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<td>EDPG Fellows</td>
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<td>IPSC Latin America Infrastructure WG</td>
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<td>IPSC Asian and Australian Infrastructure WG</td>
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<td>EDPG Climate Change Technologies SC, P1595 WG, T&amp;D Energy Efficiency WG</td>
<td>Tu</td>
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<tr>
<td>Solar Plant Collector Design Working Group</td>
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<td>G – 608 Boardroom</td>
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<tr>
<td>Excitation Systems &amp; Controls Subcommittee (ES&amp;CSC)</td>
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<td>HEPSC – Guide for Commissioning of Electrical Systems in Hydroelectric Power Plants (P1248)</td>
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<td>Recommended Practice for Rehabilitation of Hydroelectric Power Plants (P1147)</td>
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<td>ESCSC Equipment WG</td>
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<td>Guide for Control of Hydroelectric Power Plants (1010)</td>
<td>Tu</td>
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<td>WG on Management of Distributed Battery Storage Systems</td>
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<td>EDPGC Distributed Generation and Energy Storage Subcommittee</td>
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<td>5:00 P 6:00 P</td>
<td>S – Michigan A</td>
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<tr>
<td>WG on Microgrid Applications and Implementation</td>
<td>Tu</td>
<td>6:00 P 7:00 P</td>
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<td>IPSC Africa Electricity Infrastructure WG</td>
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<td>W</td>
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<td>S – Lakeview</td>
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<td>Wind and Solar Plant Grounding for Personal Safety Task Force</td>
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<tr>
<td>HEP Governor Task Force / Published 2017! P1827 – Guide for Electrical &amp; Control Design of Hydroelectric Water Conveyance Facilities / Plant Condition Monitoring Task Force</td>
<td>W</td>
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<td>G – 602 Executive Meeting Room</td>
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<td>Integration of Renewable Energy into T&amp;D Grids Subcommittee</td>
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<td>10:00 A 12:00 P</td>
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<td>EDPG Station Design &amp; Control Subcommittee</td>
<td>W</td>
<td>11:00 A 12:00 P</td>
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<tr>
<td>International Practices Subcommittee</td>
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<tr>
<td>ES&amp;C Subcommittee</td>
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<td>Th</td>
<td>8:00 A 11:00 A</td>
<td>S – Huron</td>
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Committee and Other Entity Meetings, continued

IPSC Europe Electricity Infrastructure WG

Grid & Emerging Technologies Coordinating Committee
Emerging Technology White Paper Working Session
ICETCC Liaison Meeting
IGETCC Panel Session and Committee Meeting

Power & Energy Education Committee
PEEC Research Subcommittee
PEEC ADCOM
PEEC Career Promotion and Workforce Development Subcommittee
PEEC Lifelong Learning SC
PEEC University Education Subcommittee
PEEC Fellows Working Group
PEEC Main Committee
PES Student Meetings Subcommittee
PEEC Awards Subcommittee

Power System Dynamic Performance Committee
CIGRE JWG C4/C6.35/CIRED Modeling and Dynamic Performance of Inverter Based Generation in Power System Transmission and Distribution Studies
Task Force on Microgrid Stability
Task Force on Modelling of Large Interconnected Systems for Stability Analysis
Task Force on Measurements Monitoring and Reliability Issues
PSDP Working Group on Dynamic Performance of Renewable Energy Systems
PSDP Working Group on Power System Dynamics Measurements
Power System Stability Controls Subcommittee
Power System Stability Subcommittee
PSDP Working Group on Dynamic Security Assessment
Working Group on Power System Dynamic Modeling
Task Force on Oscillation Source Location
PSDP AdComm Meeting
PSDP Committee Meeting
PSDP Task Force on Adjustable Speed Pumped Storage Modeling
PSDP Working Group on Voltage Stability
Task Force on Power System Restoration with Renewable Energy Sources

Power System Instrumentation and Measurements Committee
WG to Write an IEEE Paper on “Smart Grid Sensor System Uncertainties”
Task Force 1 is to Develop an IEEE Guide on “Guide for Testing Smart Grid Sensor and Intelligent Electronic Device Systems”
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<td><strong>WG on Energy Saving Devices</strong></td>
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<td><strong>Power System Operation, Planning &amp; Economics Committee</strong></td>
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<tr>
<td><strong>PSOPE – Working Group on State Estimation Algorithms</strong></td>
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<tr>
<td><strong>PSOPE – Working Group on Conventional &amp; Renewable Energy Supply</strong></td>
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<tr>
<td><strong>PSOPE – Working Group on Modern &amp; Future Distribution System Planning</strong></td>
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<tr>
<td><strong>PSOPE – Working Group on Test Systems for Economic Analysis</strong></td>
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<tr>
<td><strong>PSOPE – Task Force on Benchmarks for Validation of Emerging Power System Algorithms</strong></td>
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<td><strong>PSOPE AdCom</strong></td>
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<td><strong>PSOPE – Task Force on Advanced Future Bulk Power Systems with Massive Distributed Resources</strong></td>
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<td><strong>PSOPE – Working Group on the Economics of Energy Storage</strong></td>
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<tr>
<td><strong>PSOPE – Working Group on Power System Restoration</strong></td>
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<td><strong>PSOPE – Task Force on Bulk Power System Operations with Variable Generation</strong></td>
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<td><strong>PSOPE – Working Group on Transmission System Planning</strong></td>
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<td><strong>PSOPE – Bulk Power System Operations Subcommittee</strong></td>
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<tr>
<td><strong>PSOPE Task Force on Natural Disaster Preparation and Recovery</strong></td>
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<td><strong>PSOPE – Task Force on Decision Support Tools for Energy Storage Investment and Operations</strong></td>
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<tr>
<td><strong>PSOPE – Bulk Power System Planning Subcommittee</strong></td>
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<td><strong>PSOPE – Working Group on Network Charging</strong></td>
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<tr>
<td><strong>PSOPE – Distribution System Operation &amp; Planning Subcommittee</strong></td>
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<td><strong>PSOPE – Working Group on Asset Management</strong></td>
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<td><strong>PSOPE – Working Group on the Assessment of Power System Flexibility</strong></td>
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<tr>
<td><strong>PSOPE – Task Force on Next-Generation EMS for Advanced Future Bulk Power Systems: Challenge, Architecture and Concept</strong></td>
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<td><strong>PSOPE – Power System Economics</strong></td>
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<td><strong>PSOPE – Task Force on Real-Time Contingency Analysis</strong></td>
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<td><strong>PSOPE – Task Force on Distribution Management Systems</strong></td>
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<td><strong>PSOPE – Working Group on Sustainable Energy Systems for Developing Communities</strong></td>
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<tr>
<td><strong>PSOPE – Technologies &amp; Innovation Subcommittee</strong></td>
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<tr>
<td><strong>PSOPE – Working Group on Demand Response</strong></td>
</tr>
<tr>
<td><strong>PSOPE – Task Force on Electricity and Natural Gas Market Coordination</strong></td>
</tr>
<tr>
<td><strong>PSOPE – Task Force on Voltage Control for Smart Grids</strong></td>
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<tr>
<td><strong>PSOPE – Working Group on Energy Forecasting</strong></td>
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</table>

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### Committee and Other Entity Meetings, continued

<table>
<thead>
<tr>
<th>Committee and Other Entity Meetings</th>
<th>Description</th>
<th>Days</th>
<th>Times</th>
<th>Location</th>
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<tbody>
<tr>
<td><strong>Distribution System Operation and Planning Subcommittee</strong></td>
<td>PSOPE – Task Force on Future TSO-DSO Interaction: Challenges, Business Cases and Solutions</td>
<td>Th</td>
<td>8:00 A 9:00 A</td>
<td>S – Missouri</td>
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<tr>
<td><strong>Smart Buildings, Loads &amp; Customer Systems Committee</strong></td>
<td>Loads Subcommittee and Asia-Pacific WG</td>
<td>M</td>
<td>3:00 P 4:00 P</td>
<td>G – Midway Boardroom</td>
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<td>PES Smart Buildings, Loads and Customer Systems Technical Committee Meeting</td>
<td>Tu</td>
<td>9:00 A 10:00 A</td>
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<tr>
<td><strong>Substations Committee</strong></td>
<td>I0 Subcommittee Meeting</td>
<td>M</td>
<td>1:00 P 2:00 P</td>
<td>S – Lincoln Boardroom</td>
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<td>WG I4 Static VAR Compensator</td>
<td>M</td>
<td>2:00 P 5:00 P</td>
<td>S – Lincoln Boardroom</td>
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<td></td>
<td>WG I5 Voltage Source Converter</td>
<td>Tu</td>
<td>8:00 A 12:00 P</td>
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<td></td>
<td>10 High Voltage Direct Current</td>
<td>Tu</td>
<td>1:00 P 5:00 P</td>
<td>G – 303 Executive Meeting Room</td>
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<td>WG I9 Modern Protection SVC</td>
<td>Tu</td>
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<td>Substations Committee B0 Administrative Meeting</td>
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<td>8:00 A 12:00 P</td>
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<td><strong>Transmission and Distribution Committee</strong></td>
<td>Lightning Performance of Overhead Lines Working Group</td>
<td>Tu</td>
<td>8:00 A 12:00 P</td>
<td>G – 604 Executive Meeting Room</td>
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<td></td>
<td>T&amp;D Administrative Subcommittee</td>
<td>Th</td>
<td>8:00 A 11:00 A</td>
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<tr>
<td><strong>Capacitor Subcommittee</strong></td>
<td>Series Capacitor WG</td>
<td>M</td>
<td>1:30 P 3:00 P</td>
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<td>Capacitor GMD Mitigation TF</td>
<td>M</td>
<td>3:00 P 5:00 P</td>
<td>G – 303 Executive Meeting Room</td>
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<td></td>
<td>Shunt Capacitor WG</td>
<td>Tu</td>
<td>8:00 A 12:00 P</td>
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<td>Shunt Capacitor App Guide P1036 WG</td>
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<td>2:00 P 5:00 P</td>
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<td>Capacitor Discharge Limitation Application Paper TF</td>
<td>W</td>
<td>8:00 A 10:00 A</td>
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<td></td>
<td>Guide for Application &amp; Specification of Harmonic Filter</td>
<td>W</td>
<td>10:00 A 12:00 P</td>
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<td>3:30 P 5:00 P</td>
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<td><strong>Distribution Subcommittee</strong></td>
<td>Smart Distribution WG</td>
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<td>Stray and Contact Voltage WG</td>
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<td>Volt/Var TF</td>
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<td>Distributed Resources Integration WG</td>
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<td>Switching and Overcurrent WG</td>
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<td>10:00 A 12:00 P</td>
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<td>Microgrids TF</td>
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<td>1:00 P 3:00 P</td>
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<td>Distribution Reliability WG Part 2</td>
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<td>Distribution Subcommittee</td>
<td>W</td>
<td>1:30 P 4:30 P</td>
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<tr>
<td><strong>ESMOL Subcommittee</strong></td>
<td>ESMOL Draft Paper – Minimum Approach Distance</td>
<td>Su</td>
<td>1:00 P 2:30 P</td>
<td>S – Missouri</td>
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<td>Committee and Other Entity Meetings, continued</td>
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<tr>
<td><strong>ESMOL 1307 Study Group</strong></td>
<td>Su</td>
<td>2:30 P  3:30 P</td>
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<tr>
<td><strong>ESMOL 935 IEEE Guide on Terminology for Tools</strong></td>
<td>Su</td>
<td>3:30 P  4:30 P</td>
<td>S – Missouri</td>
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<td><strong>ESMOL Steering Committee (Private)</strong></td>
<td>M</td>
<td>11:00 A  1:00 P</td>
<td>S – Colorado</td>
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<td><strong>ESMOL 957 IEEE Guide for Cleaning Insulators</strong></td>
<td>M</td>
<td>1:00 P  2:30 P</td>
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<td><strong>ESMOL 1071 IEEE Draft Application Guide for an Engineered Restoration Program for Failed Transmission Structures</strong></td>
<td>M</td>
<td>2:30 P  3:30 P</td>
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<td><strong>ESMOL 1067 IEEE Guide for In-Service Use, Care, Maintenance, and Testing of Conductive Clothing for Use on Voltages up to 765 kV AC and +/-750 kV DC</strong></td>
<td>M</td>
<td>3:30 P  4:30 P</td>
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<td><strong>ESMOL 1654 IEEE Guide for RF Protection of Personnel Working in the Vicinity of Wireless Communications Antennas Attached to Electric Power Line Structures</strong></td>
<td>Tu</td>
<td>8:00 A  9:00 A</td>
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<td><strong>ESMOL 1882 IEEE Draft Guide for Establishing, Benchmarking, and Maintaining a Working Program for Energized Transmission Lines</strong></td>
<td>Tu</td>
<td>9:00 A  10:00 A</td>
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<tr>
<td><strong>ESMOL Draft Paper – Mechanical Equipment Grounding</strong></td>
<td>Tu</td>
<td>10:00 A  11:00 A</td>
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<td><strong>ESMOL Draft Paper – Helicopter Work and Qualifications</strong></td>
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<td>11:00 A  12:00 P</td>
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<td><strong>ESMOL 1048 IEEE Guide for Protective Grounding of Power Lines</strong></td>
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<td>1:00 P  2:00 P</td>
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<tr>
<td><strong>ESMOL 516 IEEE Guide for Maintenance Methods on Energized Power Lines</strong></td>
<td>Tu</td>
<td>2:00 P  4:00 P</td>
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<td><strong>ESMOL Subcommittee</strong></td>
<td>Tu</td>
<td>4:00 P  5:00 P</td>
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<tr>
<td><strong>ESMOL 1307 IEEE Standard for Fall Protection for Utility Work</strong></td>
<td>W</td>
<td>8:00 A  10:00 A</td>
<td>S – Edgewater</td>
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<tr>
<td><strong>ESMOL Conference Committee (Private)</strong></td>
<td>W</td>
<td>10:00 A  12:00 P</td>
<td>S – Edgewater</td>
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<tr>
<td><strong>HVDC &amp; FACTS Subcommittee</strong></td>
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<tr>
<td><strong>HVDC &amp; FACTS Economics and Operating Strategies WG</strong></td>
<td>M</td>
<td>11:00 A  1:00 P</td>
<td>S – Michigan A</td>
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<td><strong>HVDC &amp; FACTS Dynamic Performance and Modeling WG</strong></td>
<td>M</td>
<td>2:00 P  5:00 P</td>
<td>S – Michigan A</td>
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<td><strong>Studies for Planning of HVDC WG</strong></td>
<td>Tu</td>
<td>8:00 A  10:00 A</td>
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<tr>
<td><strong>Practical Technologies for VSC HVDC Systems WG</strong></td>
<td>Tu</td>
<td>10:00 A  12:00 P</td>
<td>S – Ohio</td>
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<tr>
<td><strong>HVDC &amp; FACTS Education WG and HVDC &amp; FACTS Bibliography WG</strong></td>
<td>W</td>
<td>8:00 A  10:00 A</td>
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<tr>
<td><strong>HVDC &amp; FACTS Subcommittee</strong></td>
<td>W</td>
<td>1:30 P  4:30 P</td>
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<tr>
<td><strong>Overhead Lines Subcommittee</strong></td>
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<td><strong>Fiberglass Components TF</strong></td>
<td>Su</td>
<td>1:00 P  3:00 P</td>
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<tr>
<td><strong>Std 524 Task Force</strong></td>
<td>Su</td>
<td>1:00 P  3:00 P</td>
<td>S – Mayfair</td>
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<tr>
<td><strong>Line Ratings: Risk &amp; Prediction TF</strong></td>
<td>Su</td>
<td>1:00 P  4:00 P</td>
<td>S – Goldcoast</td>
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<tr>
<td><strong>IEEE Std 563 TF – Guide on Conductor Self-Damping Measurements</strong></td>
<td>Su</td>
<td>3:00 P  4:00 P</td>
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<tr>
<td><strong>HVDC Line Design Guide TF</strong></td>
<td>Su</td>
<td>3:00 P  5:00 P</td>
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<tr>
<td><strong>IEEE Std 664 TF – Guide for Laboratory Measurement of the Power Dissipation Characteristics of Aeolian Vibration Dampers for Single Conductors</strong></td>
<td>Su</td>
<td>4:00 P  5:00 P</td>
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<td><strong>IEEE Std 644 TF – IEEE Standard Procedure for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines</strong></td>
<td>M</td>
<td>1:00 P  2:30 P</td>
<td>S – Mayfair</td>
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<tr>
<td><strong>IEEE Std 977 TF – Installation of Foundations TF</strong></td>
<td>M</td>
<td>1:00 P  3:00 P</td>
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<td><strong>IEEE Std P1218 TF – Guide for Maintenance of Wood Poles</strong></td>
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<td>1:00 P  3:00 P</td>
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<td><strong>IEEE Std 656 TF – IEEE Standard for the Measurement of Audible Noise from Overhead Transmission Lines</strong></td>
<td>M</td>
<td>2:30 P  4:00 P</td>
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<td><strong>IEEE Std 751 TF – Guide for Wood Structures Used for Overhead Transmission Lines</strong></td>
<td>M</td>
<td>3:00 P  5:00 P</td>
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<td><strong>IEEE Std 1542 TF – Installation, Maintenance, and Operation of Irrigation Equipment Located Near or Under Power Lines</strong></td>
<td>M</td>
<td>4:00 P  5:00 P</td>
<td>S – Mayfair</td>
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## Committee and Other Entity Meetings, continued

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<tr>
<th>Organization</th>
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<tr>
<td>OHL Special Session</td>
<td>Tu 8:00 A 10:00 A</td>
<td>S – Sheraton IV</td>
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<tr>
<td>NESC WG</td>
<td>Tu 10:00 A 12:00 P</td>
<td>S – Sheraton IV</td>
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<tr>
<td>T&amp;D Corrosion Management WG</td>
<td>Tu 1:00 P 3:00 P</td>
<td>S – Sheraton IV</td>
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<tr>
<td>Management of Existing Overhead Transmission Lines WG</td>
<td>Tu 3:00 P 5:00 P</td>
<td>S – Sheraton IV</td>
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<tr>
<td>HVDC Lines WG</td>
<td>W 8:00 A 10:00 A</td>
<td>S – Chicago IX</td>
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<tr>
<td>T&amp;D Overhead Conductors &amp; Accessories WG</td>
<td>W 10:00 A 12:00 P</td>
<td>S – Chicago IX</td>
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<tr>
<td>OHL Steering WG</td>
<td>W 12:00 P 1:30 P</td>
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<td>W 1:30 P 3:00 P</td>
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<tr>
<td>OHL / ESMOL Joint Meeting</td>
<td>W 3:00 P 5:00 P</td>
<td>S – Chicago IX</td>
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<tr>
<td>Design &amp; Construction of Overhead Lines WG</td>
<td>Th 8:00 A 10:00 A</td>
<td>S – Superior</td>
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<tr>
<td>Development of NCI Line Post Application Curves TF</td>
<td>Th 9:00 A 10:00 A</td>
<td>S – Missouri</td>
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<td>T&amp;D Overhead Line Structural Materials &amp; Hardware WG</td>
<td>Th 10:00 A 12:00 P</td>
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<td>Corona &amp; Field Effects WG</td>
<td>Th 1:00 P 3:00 P</td>
<td>S – Superior</td>
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<tr>
<td>Insulator Performance &amp; Applications WG</td>
<td>Th 3:00 P 5:00 P</td>
<td>S – Superior</td>
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<tr>
<td>TC36 TAG TF</td>
<td>F 8:30 A 9:00 A</td>
<td>S – Chicago IX</td>
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<tr>
<td>ANSI C29 TF</td>
<td>F 9:00 A 2:00 P</td>
<td>S – Chicago IX</td>
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### Power Quality Subcommittee

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<tbody>
<tr>
<td>Transfer of Power Quality Data TF (IEEE Std 1159.3)</td>
<td>M 1:00 P 3:00 P</td>
<td>S – Goldcoast</td>
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<tr>
<td>Power Quality Interest Group</td>
<td>M 3:00 P 4:00 P</td>
<td>S – Goldcoast</td>
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<tr>
<td>SCC22 Power Quality Standards Coordination Committee</td>
<td>M 4:00 P 5:00 P</td>
<td>S – Goldcoast</td>
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<tr>
<td>Monitoring Electric Power Quality WG (IEEE Std 1159)</td>
<td>Tu 8:00 A 9:00 A</td>
<td>G – 246 Multifunction Room</td>
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<tr>
<td>Harmonics WG (IEEE Std 519)</td>
<td>Tu 9:00 A 10:00 A</td>
<td>G – 246 Multifunction Room</td>
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<tr>
<td>Harmonics WG (IEEE Std 519.1)</td>
<td>Tu 10:00 A 11:00 A</td>
<td>G – 246 Multifunction Room</td>
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<tr>
<td>Harmonics WG (Probabilistic Aspects of Harmonics TF)</td>
<td>Tu 11:00 A 12:00 P</td>
<td>G – 246 Multifunction Room</td>
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<tr>
<td>Harmonics WG (Harmonics Modeling &amp; Simulation TF)</td>
<td>Tu 2:00 P 3:00 P</td>
<td>G – 246 Multifunction Room</td>
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<tr>
<td>Power Quality Disturbances Analytics WG</td>
<td>Tu 3:00 P 4:00 P</td>
<td>G – 246 Multifunction Room</td>
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<tr>
<td>International Conference on Harmonics and Quality of Power (ICHQP) Executive Committee</td>
<td>Tu 4:00 P 5:00 P</td>
<td>G – 246 Multifunction Room</td>
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<tr>
<td>Flicker TF (IEEE Std 1453)</td>
<td>W 8:00 A 9:00 A</td>
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<td>Voltage Quality WG (IEEE Std 1250)</td>
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<td>S – Goldcoast</td>
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<tr>
<td>Voltage Sag Indices TF (IEEE Std 1564)</td>
<td>W 10:00 A 11:00 A</td>
<td>S – Goldcoast</td>
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<tr>
<td>Power Quality Subcommittee</td>
<td>W 11:00 A 12:15 P</td>
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<tr>
<td>CIGRE C4.24</td>
<td>W 2:00 P 6:00 P</td>
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### Wind & Solar Power Coordinating Committee

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<tr>
<td>Wind &amp; Solar Power Coordinating Committee</td>
<td>M 1:00 P 4:00 P</td>
<td>G – 246 Multifunction Room</td>
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### Non-Committee

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<tr>
<td>CIGRE Executive Committee Meeting</td>
<td>Tu 2:00 P 5:00 P</td>
<td>S – Missouri</td>
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<tr>
<td>Power Professionals – India Group</td>
<td>W 6:00 P 7:00 P</td>
<td>S – Ontario</td>
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# TECHNICAL AND OTHER SESSIONS

<table>
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<tr>
<th>Event Start</th>
<th>Event End</th>
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<th>Primary Committee</th>
<th>Title</th>
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<tbody>
<tr>
<td>8:00 AM</td>
<td>12:00 PM</td>
<td>T</td>
<td>Admin</td>
<td>Syncophasors Estimation and Control of Power System Dynamics</td>
<td>S – Sheraton III</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>5:00 PM</td>
<td>C</td>
<td>Admin</td>
<td>Regions 1-7 Chapter Chairs Meeting</td>
<td>S – Michigan A</td>
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<tr>
<td>8:00 AM</td>
<td>5:00 PM</td>
<td>C</td>
<td>Admin</td>
<td>Smart Village Steering Committee Meeting</td>
<td>S – Old Town</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>5:00 PM</td>
<td>C</td>
<td>Admin</td>
<td>Smart Village Workshop</td>
<td>S – Huron</td>
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<tr>
<td>8:00 AM</td>
<td>5:00 PM</td>
<td>T</td>
<td>Admin</td>
<td>Surge Protection of Power Systems According to IEEE C62.22</td>
<td>S – Chicago VII</td>
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<tr>
<td>8:00 AM</td>
<td>5:00 PM</td>
<td>T</td>
<td>Admin</td>
<td>Energy Storage: An Introduction to Technologies, Applications and Best Practices</td>
<td>S – Chicago IX</td>
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<td>8:00 AM</td>
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<td>Planning and Integration of Flexible HVDC Into Today's Grid</td>
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### Meeting at a Glance by Day, continued

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<td>PL Admin New Attendees Orientation</td>
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<td>R Admin IEEE Smart Village/PES Scholarship Donor Reception</td>
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<tr>
<td>5:00 PM</td>
<td>R Admin Welcome Reception</td>
<td>Navy Pier</td>
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<td><strong>MONDAY, JULY 17, 2017</strong></td>
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<td>8:00 AM</td>
<td>PL Admin PES Members Meeting</td>
<td>S – Sheraton IV–V + Chicago VI–VII</td>
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<td>PL Admin Plenary Session</td>
<td>S – Sheraton IV–V + Chicago VI–VII</td>
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<td>C AMPS CAM ISS WG on Intelligent Data Mining and Analysis</td>
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<tr>
<td>11:00 AM</td>
<td>C AMPS TAS Frequency Domain Methods for Transient Studies TF</td>
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<td>C Admin ISGT Steering Committee</td>
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<td>C EDPG IPSC Chinese Electricity Infrastructure WG</td>
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<td>C EDPG IPSC Distributed Generation WG</td>
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<td>C PSOPE PSOPE – Working Group on State Estimation Algorithms</td>
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<td>C PSOPE PSOPE – Working Group on Modern &amp; Future Distribution System Planning</td>
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<td>C PSOPE PSOPE – Working Group on Test Systems for Economic Analysis</td>
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<td>C PSOPE PSOPE – Task Force on Benchmarks for Validation of Emerging Power System Algorithms</td>
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<td>C AMPS CAM CAMS WG on the Understanding, Prediction, Prevention and Restoration of Cascading Failures</td>
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<td>C AMPS CAM AMPS WG on Test Case Coordination</td>
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<td>C AMPS CAM CAMS TG on Cyber Security in Power System</td>
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<td>C AMPS RRA RRPA TF on Upgrade of IEEE Reliability Test System</td>
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<td>C AMPS RRA RRPA TF on Reliability Consideration in Emerging Cyber-Physical Electrical Energy Systems</td>
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<td>C EDPG IEEE 665 Working Group</td>
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<td>C PEE PEEC Career Promotion and Workforce Development Subcommittee</td>
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<td>C PSDP Task Force on Microgrid Stability</td>
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<td>AMPS RRA Power System Flexibility: Challenges and Enhancement Solutions</td>
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<td>EDPG Asian and Australasian Experience on Application of Smart Grid Technology</td>
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<td>PL</td>
<td>LCoC Regulating the Future of Microgrids</td>
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Meeting at a Glance by Day, continued
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<td>AMPR RRA WG on Review of IEEE Standard 859</td>
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<td>EDPG IPS Latin America Infrastructure WG</td>
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<td>AMPS CAM AMPS Computer Analytical Methods Poster Session</td>
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<td>5:00 PM</td>
<td>PO</td>
<td>GETCC Grid &amp; Emergint Technologies Poster Session</td>
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<td>5:00 PM</td>
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<td>IC Insulated Conductors Poster Session</td>
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<td>MSC Marine Systems Poster Session</td>
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<td>NPE Nuclear Power Engineering Poster Session</td>
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<td>PEE Power &amp; Energy Education Committee Posters</td>
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<td>PSCCS Power System Communications &amp; Cyber Security Poster Session</td>
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<td>PSRC Power system Relaying and Control Poster Sessions</td>
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<td>PSOPE: BPSOS: Bulk Power System Operations Subcommittee Poster Session</td>
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<td>PSOPE: DSOPS: Distribution System Operations and Planning Subcommittee Poster Session</td>
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<td>PSOPE: PSES: Power System Economics Subcommittee Poster Session</td>
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<td>PSOPE: TIS: PSOPE: Technologies and Innovation Subcommittee Poster Session</td>
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### Meeting at a Glance by Day, continued

#### TUESDAY, JULY 18, 2017

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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>7:00 AM</td>
<td>Admin Student Poster Session</td>
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<tr>
<td>8:00 AM</td>
<td>C EDPG RRPA TF on Capacity Value of Solar Power</td>
<td>S – Bridgeport</td>
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<tr>
<td>8:00 AM</td>
<td>C PSDP Dynamic Performance of Renewable Energy Systems</td>
<td>G – 244 Multifunction Room</td>
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<td>8:00 AM</td>
<td>C TD ESMOL 1654 IEEE Guide for RF Protection of Personnel Working in the</td>
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<tr>
<td></td>
<td>Vicinity of Wireless Communications Antennas Attached to Electric Power</td>
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<td>Line Structures</td>
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<td>8:00 AM</td>
<td>C TD Monitoring Electric Power Quality WG (IEEE Std 1159)</td>
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<td>8:00 AM</td>
<td>C AMPS IS Intelligent Systems Subcommittee</td>
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<td>C Admin Technical Council, Operation &amp; Procedures Committee</td>
<td>S – Ontario</td>
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<td>8:00 AM</td>
<td>C EM C50.12 WG meeting</td>
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<td>C EDPG EDPG Climate Change Technologies SC, P1595 Energy Efficiency WG</td>
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<td>C EDPG Solar Plant Collector Design Working Group</td>
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<td>C PSOPE PSOPE – Bulk Power System Operations Subcommittee</td>
<td>G – 404 Tiered Classroom</td>
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<td>8:00 AM</td>
<td>C TD Distributed Resources Integration WG</td>
<td>G – 406 Tiered Classroom</td>
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<td>8:00 AM</td>
<td>C TD OHL Special Session</td>
<td>S – Sheraton IV</td>
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<td>C TD Studies for Planning of HVDC WG</td>
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<td>8:00 AM</td>
<td>C AMPS Big Data Access and Big Data Research Integration in Power Systems</td>
<td>G – 226 Multifunction Room</td>
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<td>8:00 AM</td>
<td>C AMPS Tools for Managing Electricity Markets and Reliability for Grid</td>
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<tr>
<td></td>
<td>with Very High Renewable Resources</td>
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<td>C EDPG Lessons Learned from Implementing Portable and Reconfigurable</td>
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<td>Microgrids for Resilient Operation</td>
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<td>C LOC Utility Data Analytics</td>
<td>S – Chicago X</td>
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<td>8:00 AM</td>
<td>C PSOPE Decision Support Tools for Economic Valuation of Energy Storage</td>
<td>S – Chicago IX</td>
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<td>8:00 AM</td>
<td>C PSOPE Global Best Practices on Natural Disaster Mitigation, Operation</td>
<td>G – 300 Tiered Classroom</td>
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<td></td>
<td>Technologies, Communication, and New Trends</td>
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<td>C TD Update on DOE/IEEE T&amp;D Initiatives</td>
<td>G – 203 Executive Meeting Room</td>
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<td>TP AMPS Transactions Paper Session 01</td>
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<td>TP PSDP Transactions Paper Session 13</td>
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<td>TP PSSCS Transactions Paper Session 12</td>
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<td>PL TD Protection Design for Microgrids</td>
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<td>PL AMPS Lightning Performance of Overhead Lines WG</td>
<td>G – 602 Executive Meeting Room</td>
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<tr>
<td>Time</td>
<td>Event Description</td>
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<td>EMC WG – 3, IEEE Std 1665</td>
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<td>WG I5 Voltage Source Converter</td>
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<td>Lightning Performance of Overhead Lines Working Group</td>
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<td>Admin Paper Forum 01</td>
<td>Sheraton I</td>
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<td>Admin Paper Forum 02</td>
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<td>AMPS Advances in Accelerated Distribution System Time-Series Analysis</td>
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<td>Advanced Interconnection Features of Transmission-connected Renewable Power Plants</td>
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<td>Advanced Topics in Electrical Machines I</td>
<td>206 Tiered Classroom</td>
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<td>Optimal Integration of Variable Renewable Generation into Power Systems – Coordination of Measures at TSO and DSO Level</td>
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<td>8:00 AM - 12:00 PM</td>
<td>Late Breaking News and Hot Topics</td>
<td>Sheraton II</td>
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<td>Sharing Experiences and Insights Involving the Application of Generic Wind and Photovoltaic Transient Stability Models</td>
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<td>Asset Management – Asset Health Assessment, Ranking and Intervention Prioritization</td>
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<td>Membership Committee Meeting</td>
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<td>Smart Village Workshop</td>
<td>Huron</td>
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<td>Power System Basics – Understanding the Electric Utility Operation Inside and Out</td>
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<td>AMPS BDA BDA Big Data Applications in Power Distribution Systems TF</td>
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<td>AMPS RRA RRPA WG on Probability Application for Common Mode Events in Electric Power Systems (PACME)</td>
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<td>AMPS TAS Real-Time Simulation of Power &amp; Energy Systems TF</td>
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<td>EDPG Excitation Systems &amp; Controls Subcommittee (E&amp;CS)</td>
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<td>SBLCS PES Smart Buildings, Loads and Customer Systems Technical Committee Meeting</td>
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<td>TD ESMOL 1882 IEEE Draft Guide for Establishing, Benchmarking, and Maintaining a Working Program for Energized Transmission Lines</td>
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<td>Admin Meetings Department Executive Committee</td>
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<td>Admin Taskforce Meeting on IEEE PES Membership Expansion in China</td>
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<td>AMPS BDA BDA Big Data Webinar Series Task Force</td>
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<td>AMPS TAS EMT-type Modeling of Wind Turbine Generators and Parks TF</td>
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<td>PSOPE – Task Force on Decision Support Tools for Energy Storage Investment and Operations</td>
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<td>PSOPE Task Force on Natural Disaster Preparation and Recovery</td>
<td>300 Tiered Classroom</td>
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<td>TD ESMOL Draft Paper - Mechanical Equipment Grounding</td>
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<td>AMPs RRA Reliability, Risk and Probability Applications Subcommittee</td>
<td>S – Colorado</td>
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<td>EDPG HEPS– Guide for Commissioning of Electrical Systems in Hydroelectric Power Plants (P1248)</td>
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<td>PEE PEEC Main Committee</td>
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<td>PSOPE – Bulk Power System Planning Subcommittee</td>
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<td>TD NESC WG</td>
<td>S – Sheraton IV</td>
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<td>10:00 AM</td>
<td>TD Practical Technologies for VSC HVDC Systems WG</td>
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<td>TD Switching and Overcurrent WG</td>
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<td>PL Renewable Resources and Demand Response Integration Using the CIM Standard</td>
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<td>PL Multi-agent Field Deployment Platforms</td>
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<td>10:00 AM</td>
<td>PL Sustainability Issues in Grid Modernization</td>
<td>G – 204 Tiered Classroom</td>
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<td>10:00 AM</td>
<td>PL Engineering and Planning – Energy Storage Roadmap</td>
<td>S – Chicago X</td>
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<td>PL Decentralized Architectures for Power System Protection, Estimation and Control</td>
<td>G – 621 Executive Dining Meeting Room</td>
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<td>10:00 AM</td>
<td>PL Grid Modernization Opportunities and Challenges</td>
<td>G – 400 Tiered Classroom</td>
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<td>C Field Measured Overvoltages and Their Analysis</td>
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<td>C BDA Data Access Working Group</td>
<td>S – Arkansas</td>
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<td>C PSOPE Working Group on Network Charging</td>
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<td>C ESMOL Draft Paper - Helicopter Work and Qualifications</td>
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<td>C Harmonics WG (Probabilistic Aspects of Harmonics TF)</td>
<td>G – 246 Multifunction Room</td>
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<td>L CIGRE U.S. National Committee Luncheon</td>
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<td>12:30 PM</td>
<td>C Transactions on Power Systems Editorial Board</td>
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<td>C ESMOL 1048 IEEE Guide for Protective Grounding of Power Lines</td>
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<td>1:00 PM</td>
<td>C DC Grids: Technology Needs, Design Considerations, Operational Challenges, and Case Studies*</td>
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<td>1:00 PM</td>
<td>C HEPSC – Guide for Rehabilitation of Hydroelectric Power Plants (P1147)</td>
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<td>C Recommended Practice for Preparation of Equipment Specifications for Speed-Governing of Hydraulic Turbines Intended to Drive Electric Generators (125)</td>
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<td>C PES Student Meetings Subcommittee</td>
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<td>C PSDP Working Group on Power System Dynamics Measurements</td>
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<td>C PSOPE - Distribution System Operation &amp; Planning Subcommittee</td>
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<td>1:00 PM</td>
<td>C Microgrids TF</td>
<td>S – Edgewater</td>
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<td>1:00 PM</td>
<td>C T&amp;D Corrosion Management WG</td>
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### Meeting at a Glance by Day, continued

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<td>PL</td>
<td>AMPS DSA Distribution System State Estimation: Algorithm, Metering and Data Exchange: Advances and Challenges</td>
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<td>AMPS IS Smart Grid Monitoring and Control</td>
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<td>3:00 PM</td>
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<td>LOC Grid Technology and Innovations</td>
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<td>PSOPE Advanced Data Analytics for EMS</td>
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<td>PSOPE Best Practices on Integration and Operation of Grid-scale Energy Storage Systems</td>
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<td>Admin Technical Council, Technical Sessions Committee</td>
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<td>EDPG HVDC Grids and related activities in Europe</td>
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<td>EDPG Cyber and Physical Security</td>
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<td>PEE E-learning Modules and Resources in Power Engineering</td>
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<td>PSOPE Transmission Planning for Non-Synchronous Variable Resources</td>
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<td>SBLCS Discovering the Value of Transactive Energy</td>
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<td>SUB Challenge in Operation and Control of AC-DC Hybrid Power Systems</td>
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<td>SUB WG I9 Modern Protection SVC</td>
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<td>AMPS TAS Dynamic Systems Equivalents TF</td>
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<td>PES Technical Co-Sponsored Meetings Steering Committee</td>
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<td>EDPG ESCSC Equipment WG</td>
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<td>TD Harmonics WG (Harmonics Modeling &amp; Simulation TF)</td>
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<td>2:00 PM</td>
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<td>EM EMC WG-19, IEEE 112</td>
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**Locations:**
- G – 203 Executive Meeting Room
- G – 100 Tiered Classroom
- G – 206 Tiered Classroom
- G – 200 Tiered Classroom
- G – 204 Tiered Classroom
- S – Arkansas
- S – Superior B
- S – Ontario
- G – 303 Executive Meeting Room
- S – Sheraton I
- S – Sheraton I
- G – 208 Tiered Classroom
- G – 400 Tiered Classroom
- S – Chicago VIII
- S – Ohio
- S – Goldcoast
- G – 620 Executive Boardroom
- S – 602 Executive Meeting Room
- G – 604 Executive Meeting Room
- G – 608 Boardroom
- S – Lincoln Board Room
- S – Columbus B
- G – 246 Multifunction Room
- G – 600 Executive Meeting Room
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>2:00 PM</td>
<td>TD ESMOL 516 IEEE Guide for Maintenance Methods on Energized Power Lines</td>
<td>S - Lakeview</td>
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<td>2:00 PM</td>
<td>C Other CIGRE Executive Committee Meeting</td>
<td>S - Missouri</td>
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<td>2:00 PM</td>
<td>TD Shunt Capacitor App Guide P1036 WG</td>
<td>S - Tennessee</td>
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<tr>
<td>2:30 PM</td>
<td>C Admin Transactions on Sustainable Energy Editorial Board Meeting</td>
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<tr>
<td>3:00 PM</td>
<td>C AMPS TAS Portable Data &amp; Modeling for Electromagnetic Transient Analysis Programs</td>
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<td>3:00 PM</td>
<td>C Admin Meeting between PES &amp; CSEE Leadership</td>
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<td>C PSOPE – Task Force on Next-Generation EMS for Advanced Future Bulk Power Systems: Challenge, Architecture and Concept</td>
<td>G - 200 Tiered Classroom</td>
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<tr>
<td>3:00 PM</td>
<td>C PSOPE – Working Group on the Assessment of Power System Flexibility</td>
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<tr>
<td>3:00 PM</td>
<td>C PSOPE – Working Group on Asset Management</td>
<td>S - Colorado</td>
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<td>3:00 PM</td>
<td>C TD Power Quality Disturbances Analytics WG</td>
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<td>C AMPS BDA Big Data &amp; Analytics (BDA) Subcommittee</td>
<td>G – 406 Tiered Classroom</td>
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<td>3:00 PM</td>
<td>C EDPG Guide for Control of Hydroelectric Power Plants (1010)</td>
<td>G – 602 Executive Meeting Room</td>
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<td>C PSOPE - Power System Economics</td>
<td>G – 408 Tiered Classroom</td>
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<td>3:00 PM</td>
<td>C TD Management of Existing Overhead Transmission Lines WG</td>
<td>S – Sheraton IV</td>
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<td>3:00 PM</td>
<td>PL AMPS CAM Future Trends in Computer Hardware for Power Grid HPC Applications</td>
<td>G – 244 Multifunction Room</td>
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<td>PL AMPS RRA Decision Support Methods for Capital Planning Under Uncertainty</td>
<td>G – 206 Tiered Classroom</td>
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<tr>
<td>3:00 PM</td>
<td>PL EDPG Regulatory and Environmental Impact on Power Grid: Simulation &amp; Implication</td>
<td>G – 100 Tiered Classroom</td>
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<td>3:00 PM</td>
<td>PL LOC Smart Distribution Application: Distribution System Operator (DSO)</td>
<td>S – Chicago IX</td>
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<td>3:00 PM</td>
<td>PL PSOPE Challenges and Technologies in Bulk Power System Outage Management</td>
<td>S – Mississippi</td>
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<td>PL PSOPE Network Restoration Operation Procedure with Renewable Energy Sources</td>
<td>G – 300 Tiered Classroom</td>
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<td>3:00 PM</td>
<td>PL TD Industry Experiences and Trends in Grid Modernization</td>
<td>S – Sheraton III</td>
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<td>3:00 PM</td>
<td>TP AMPS Transactions Paper Session 04</td>
<td>G – 304 Tiered Classroom</td>
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<td>3:00 PM</td>
<td>TP PSOPE Transactions Paper Session 17</td>
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<td>TP TD Transactions Paper Session 25</td>
<td>G – 308 Tiered Classroom</td>
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<td>C AMPS RRA Practical Aspects of Ferroresonance WG</td>
<td>S – Columbus B</td>
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<td>C AMPS TAS GIC Modeling and Analysis TF</td>
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<td>4:00 PM</td>
<td>C AMPS TAS Modeling of Induction Machines TF</td>
<td>S – Pullman</td>
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<td>4:00 PM</td>
<td>C Admin IEEE Smart Village Education Committee Meeting</td>
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<td>4:00 PM</td>
<td>C Admin PES High School Students Initiative</td>
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<td>4:00 PM</td>
<td>C EDPG WG on Management of Distributed Battery Storage Systems</td>
<td>S – Old Town</td>
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<tr>
<td>4:00 PM</td>
<td>C PEE PECE Awards Subcommittee</td>
<td>G – Midway Boardroom</td>
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<tr>
<td>4:00 PM</td>
<td>C PSDP Power System Stability Controls Subcommittee</td>
<td>G – Colorado</td>
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Meeting at a Glance by Day, continued
### Meeting at a Glance by Day, continued

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<th>Time</th>
<th>Time</th>
<th>Location</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>4:00 PM</td>
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<td>C PSOPE</td>
<td>PSOPE – Task Force on Real-Time Contingency Analysis</td>
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<td>4:00 PM</td>
<td>5:00 PM</td>
<td>C PSOPE</td>
<td>PSOPE – Task Force on Distribution Management Systems</td>
<td>G – 608</td>
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<tr>
<td>4:00 PM</td>
<td>5:00 PM</td>
<td>C TD</td>
<td>ESMOL Subcommittee</td>
<td>S – Lakeview</td>
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<td>4:00 PM</td>
<td>5:00 PM</td>
<td>C TD</td>
<td>International Conference on Harmonics and Quality of Power (ICHQP) Executive Committee</td>
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<td>4:00 PM</td>
<td>5:30 PM</td>
<td>C Admin</td>
<td>Electrification Magazine Editorial Board Meeting</td>
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<td>4:00 PM</td>
<td>5:30 PM</td>
<td>C GETCC</td>
<td>Emerging Technology White Paper Working Session</td>
<td>S – Bridgeport</td>
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<tr>
<td>4:30 PM</td>
<td>5:30 PM</td>
<td>C Admin</td>
<td>Technical Council, Awards Committee</td>
<td>S – Ontario</td>
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<tr>
<td>4:30 PM</td>
<td>5:30 PM</td>
<td>C Admin</td>
<td>Transactions on Smart Grid Editorial Board Meeting</td>
<td>S – Superior A</td>
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<tr>
<td>4:00 PM</td>
<td>6:00 PM</td>
<td>C PSIM</td>
<td>WG on Sensors for Smart Grid</td>
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<td>4:00 PM</td>
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<td>C AMPAS</td>
<td>Modeling and Analysis of System Transients Using Digital Programs WG</td>
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<td>6:00 PM</td>
<td>C EDPG</td>
<td>EDPGC Distributed Generation and Energy Storage Subcommittee</td>
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<td>5:00 PM</td>
<td>6:00 PM</td>
<td>C GETCC</td>
<td>ICETCC Liaison Meeting</td>
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<td>5:00 PM</td>
<td>6:00 PM</td>
<td>C Other</td>
<td>Canadian Power Engineering Faculty Members</td>
<td>S – Superior B</td>
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<td>5:00 PM</td>
<td>6:30 PM</td>
<td>PL Admin</td>
<td>Publications Open Forum: Q&amp;A with the Transactions Editors in Chief</td>
<td>S – Chicago VIII</td>
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<tr>
<td>6:00 PM</td>
<td>7:00 PM</td>
<td>C EDPG</td>
<td>WG on Microgrid Applications and Implementation</td>
<td>S – Michigan B</td>
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<tr>
<td>6:00 PM</td>
<td>7:00 PM</td>
<td>R Admin</td>
<td>Pre Awards Dinner General Reception</td>
<td>S – Chicago VI+VII</td>
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<tr>
<td>7:00 PM</td>
<td>9:30 PM</td>
<td>D Admin</td>
<td>PES Awards Dinner</td>
<td>S – Chicago VI+VII</td>
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**WEDNESDAY, JULY 19, 2017**

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<th>Time</th>
<th>Location</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>8:00 AM</td>
<td>9:00 AM</td>
<td>C AMPS</td>
<td>CAMS TF on Open Source Software</td>
<td>G – 600</td>
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<tr>
<td>8:00 AM</td>
<td>9:00 AM</td>
<td>C AMPSS</td>
<td>AMPS Admin Meeting</td>
<td>S – Michigan B</td>
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<tr>
<td>8:00 AM</td>
<td>9:00 AM</td>
<td>C EDPG</td>
<td>IPSC Africa Electricity Infrastructure WG</td>
<td>G – 604</td>
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<tr>
<td>8:00 AM</td>
<td>9:00 AM</td>
<td>C PSDP</td>
<td>Power System Stability Subcommittee</td>
<td>S – Arkansas</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>9:00 AM</td>
<td>C PSOPE</td>
<td>PSOPE – Working Group on Sustainable Energy Systems for Developing Communities</td>
<td>G – 608</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>9:00 AM</td>
<td>C TD</td>
<td>Flicker TF (IEEE Std 1453)</td>
<td>S – Goldcoast</td>
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<tr>
<td>8:00 AM</td>
<td>9:00 AM</td>
<td>PL TD</td>
<td>Understanding and Dealing with High Harmonic Distortions: How Much is Too Much? System and Equipment Immunity &amp; Limits</td>
<td>G – 222</td>
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<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C Admin</td>
<td>Transactions on Energy Conversion Editorial Board</td>
<td>S – Superior A</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C EDPG</td>
<td>EDPG AdCom</td>
<td>S – Lakeview</td>
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<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C EDPG</td>
<td>Wind and Solar Plant Grounding for Personal Safety Task Force</td>
<td>G – 406</td>
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<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C PSOPE</td>
<td>PSOPE – Technologies &amp; Innovation Subcommittee</td>
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<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C TD</td>
<td>Capacitor Discharge Limitation Application Paper TF</td>
<td>S – Superior B</td>
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<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C TD</td>
<td>ESMOL 1307 IEEE Standard for Fall Protection for Utility Work</td>
<td>S – Edgewater</td>
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<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C TD</td>
<td>HVDC &amp; FACTS Education WG and HVDC &amp; FACTS Bibliography WG</td>
<td>S – Ontario</td>
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<td>8:00 AM</td>
<td>10:00 AM</td>
<td>C TD</td>
<td>HVDC Lines WG</td>
<td>S – Chicago IX</td>
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<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>PL PEE</td>
<td>Research and Education for Food Water Energy Nexus</td>
<td>G – 203</td>
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<tr>
<td>8:00 AM</td>
<td>10:00 AM</td>
<td>TP EDPG</td>
<td>Transactions Paper Session 08</td>
<td>G – 304</td>
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<td>8:00 AM</td>
<td>10:00 AM</td>
<td>TP PSOPE</td>
<td>Transactions Paper Session 18</td>
<td>G – 308</td>
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<td>TP SUB</td>
<td>Transactions Paper Session 11</td>
<td>G – 306</td>
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<td>8:00 AM</td>
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<td>C Admin</td>
<td>IEEE PES Scholarship Plus Initiative</td>
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### Meeting at a Glance by Day, continued

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<th>Time</th>
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<tbody>
<tr>
<td>8:00 AM</td>
<td>EDPG HEP Governor Task Force / Published 2017</td>
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<td>12:00 PM</td>
<td>P1827 - Guide For Electrical &amp; Control Design of Hydroelectric Water Conveyance Facilities / Plant Condition Monitoring Task Force</td>
<td>G – Midway Boardroom</td>
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<td>8:00 AM</td>
<td>SUB Substations Committee B0 Administrative Meeting</td>
<td>G – 404 Tiered Classroom</td>
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<td>8:00 AM</td>
<td>TD Distribution Reliability WG Part 2</td>
<td>G – Sheraton I</td>
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<td>8:00 AM</td>
<td>Admin Paper Forum 05</td>
<td>S – Sheraton I</td>
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<tr>
<td>8:00 AM</td>
<td>PL AMPS BDA Big data Analytics for Electricity Markets</td>
<td>G – 226 Multifunction Room</td>
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<tr>
<td>8:00 AM</td>
<td>PL AMPS IS Modern Heuristic Optimization Techniques for Renewable Energy Sources Integration with Energy Storage Devices: Optimization Under Uncertainty</td>
<td>G – 200 Tiered Classroom</td>
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<tr>
<td>8:00 AM</td>
<td>PL EM EMC Grid Task Force</td>
<td>G – 100 Tiered Classroom</td>
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<tr>
<td>8:00 AM</td>
<td>PL Challenges and Advancements for Renewable Power Plants in Weak Grid Applications</td>
<td>G – 206 Tiered Classroom</td>
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<tr>
<td>8:00 AM</td>
<td>PL EDPG A decade of blackout prevention</td>
<td>S – Chicago VIII</td>
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<tr>
<td>8:00 AM</td>
<td>PL EDPG International practices in energy internet</td>
<td>G – 100 Tiered Classroom</td>
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<tr>
<td>8:00 AM</td>
<td>PL PES SS Distributed Generation (DG) Regulation, Engineering, Modeling, and Impacts</td>
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<td>8:00 AM</td>
<td>PL PSOPE Industry Experiences with Advanced Distribution Managements Systems</td>
<td>G – 300 Tiered Classroom</td>
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<td>8:00 AM</td>
<td>PL PSOPE Integrated Resource Planning with Renewable Penetration and Distributed Energy Resources</td>
<td>G – 400 Tiered Classroom</td>
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<tr>
<td>8:00 AM</td>
<td>T Admin Design and Implementation of Microgrids in Modern Power Systems</td>
<td>S – Chicago X</td>
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<tr>
<td>8:00 AM</td>
<td>T Admin Industry Best Practices, Needs, and Challenges in Cascading Analysis: T and Training</td>
<td>S – Michigan A</td>
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<tr>
<td>8:00 AM</td>
<td>C Admin Smart Village Workshop</td>
<td>S – Huron</td>
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<td>8:00 AM</td>
<td>T Admin Distribution System – Delivering Power to the Customer</td>
<td>S – Erie</td>
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<td>9:00 AM</td>
<td>C TD Voltage Quality WG (IEEE Std 1250)</td>
<td>S – Goldcoast</td>
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<td>C Admin PES Major Awards Committee and PES Technical Committee Awards Meeting</td>
<td>G – 600 Executive Meeting Room</td>
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<td>9:00 AM</td>
<td>C AMPS Analytic Methods for Power Systems (AMPS)</td>
<td>S – Michigan B</td>
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<tr>
<td>9:00 AM</td>
<td>PL EDPG Network Cost Allocation: Who Should Pay for Green Network Infrastructure?</td>
<td>S – Arkansas</td>
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<td>9:00 AM</td>
<td>PL PSDP Impact of the Use of Node-Breaker Representation in Power Flow and Transient Stability Analysis Software on Dynamic Performance</td>
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<td>C Admin Intelect Meeting</td>
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<td>C TD Voltage Sag Indices TF (IEEE Std 1564)</td>
<td>S – Goldcoast</td>
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<td>10:00 AM</td>
<td>PL TD Power Quality Issues with Solar Power Plants</td>
<td>G – 222 Multifunction Room</td>
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<td>10:00 AM</td>
<td>C Admin Technical Council, Standards Coordination Committee</td>
<td>S – Sheraton III</td>
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<td>S – Superior A</td>
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<td>C EDPG EDPGC HydroElectric Power Subcommittee</td>
<td>S – Lakeview</td>
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<td>10:00 AM</td>
<td>C EDPG Integration of Renewable Energy into T&amp;D Grids Subcommittee</td>
<td>G – 406 Tiered Classroom</td>
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<td>10:00 AM</td>
<td>C TD ESMO Conference Committee (Private)</td>
<td>S – Edgewater</td>
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38
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<thead>
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<th>Time</th>
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<tr>
<td>10:00 AM</td>
<td>TD</td>
<td>Guide for Application &amp; Specification of Harmonic Filter</td>
<td>S – Superior B</td>
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<tr>
<td>10:00 AM</td>
<td>TD</td>
<td>T&amp;D Overhead Conductors &amp; Accessories WG</td>
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<td>10:00 AM</td>
<td>PL</td>
<td>Reforming the Power Engineering Educational Curriculum amid the Industry Transformation</td>
<td>G – 203 Executive Meeting Room</td>
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<td>PSOPE Transactions Paper Session 19</td>
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<td>PSRC Transactions Paper Session 22</td>
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<td>AMPS CAM CAMS TF on High Performance Computing for Grid Analysis and Operation</td>
<td>S – Ohio</td>
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<tr>
<td>11:00 AM</td>
<td>C</td>
<td>Admin Conferences in Regions 7,8,9 and 10</td>
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<tr>
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<td>C</td>
<td>EDPG EDPG Station Design &amp; Control Subcommittee</td>
<td>G – 600 Executive Meeting Room</td>
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<tr>
<td>11:00 AM</td>
<td>C</td>
<td>TD Power Quality Subcommittee</td>
<td>S – Goldcoast</td>
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<tr>
<td>11:45 AM</td>
<td>L</td>
<td>Admin Student Faculty Industry Luncheon</td>
<td>S – Chicago VI-VII</td>
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<tr>
<td>12:00 PM</td>
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<td>TD OHL Steering WG</td>
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<td>Admin Power &amp; Energy Magazine Editorial Board</td>
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<td>EM EMC Motor Subcommittee Meeting</td>
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<td>Admin Technical Council/Lunch and Meeting</td>
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<td>TD Smart Grid and Sags: Characterization and Need for New Indices</td>
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<td>PSOPE PSOPE Main</td>
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<td>PL</td>
<td>AMPSCAM Power Grid Cascading – Industry Perspectives</td>
<td>G – 300 Tiered Classroom</td>
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<td>PL</td>
<td>PEE Industry Presentations in University Undergraduate and postgraduate programs</td>
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<td>PSOPE Flexible Transmission System Operation with Natural Gas Constraints</td>
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<td>TD Applications of Microgrids to Improve the Reliability, Resiliency, and Efficiency of Distribution Systems</td>
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<td>EDPG Planning 21st-Century's Electricity Infrastructure under Uncertainty: Challenges and Opportunities</td>
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<td>PSIM Smart Grid Data Analytics and Integrations</td>
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<td>AMPSTAS Advances in the Computation of Power System Transients</td>
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<td>AMPS Trusted Monitoring and Intelligent Consumption Data Management for Smart Buildings</td>
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<td>SBLCS VPP for Power System Operation and Electricity Markets</td>
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<td>SUB Operational Reliability of FACTS &amp; HVDC</td>
<td>G – 240 Multifunction Room</td>
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<td>WPC</td>
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<td>Latest Advances in Wind and Solar Power Integration</td>
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<td>T Admin</td>
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<td>Managing Uncertainties in the Future Grid: Evolution of EMS Control Centers – Synchrophasor Solution</td>
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<td>S – Chicago VI+VII</td>
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<td>Low Voltage Shunt Capacitor Application TF</td>
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<td>International Practices Subcommittee</td>
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<td>C PSDP</td>
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<td>Working Group on Power System Dynamic Modeling</td>
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<td>C EDPG</td>
<td>G – 602 Executive Meeting Room</td>
<td>ES&amp;C Subcommittee</td>
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<td>G – 226 Multifunction Room</td>
<td>Industry Experiences in Dynamic-System Operational Monitoring and Control using PMUs</td>
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<td>Integration of Distribution Systems, Data Assimilation, and Advanced Modelling into On-Line DSA</td>
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<td>CIGRE C4.24</td>
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<td>IEEE Smart Village – Engagement Committee Meeting</td>
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<td>Task Force on Oscillation Source Location</td>
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<td>G – 406 Tiered Classroom</td>
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<td>G – 206 Tiered Classroom</td>
<td>Flicker Standards – Applications and Advancements</td>
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<td>G – 408 Tiered Classroom</td>
<td>Integration of (VSC) HVDC in Existing Power Systems</td>
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<td>C Admin</td>
<td>S – Bridgeport</td>
<td>Publications Board Meeting</td>
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<td>C AMPs</td>
<td>G – 604 Executive Meeting Room</td>
<td>Joint Task Force on Definitions and Quantification of Resilience in Power Systems</td>
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<td>G – 208 Tiered Classroom</td>
<td>EMC Renewable Energy Machines &amp; Systems Subcommittee Meeting</td>
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<td>3:00 PM</td>
<td>C GETCC</td>
<td>G – Midway Boardroom</td>
<td>IGETCC Panel Session and Committee Meeting</td>
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<td>C TD</td>
<td>S – Chicago IX</td>
<td>OHL / ESMOL Joint Meeting</td>
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<td>3:00 PM</td>
<td>C PEE</td>
<td>G – 203 Executive Meeting Room</td>
<td>Data Sciences Education and Research in Power Systems</td>
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<td>C PSOPE</td>
<td>G – 300 Tiered Classroom</td>
<td>Challenges, Opportunities, and Approaches for Integrating Demand Response in Markets and Distribution Systems</td>
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<td>G – 400 Tiered Classroom</td>
<td>Flexibility: How Can Systems Ensure the Right Type and Quantity?</td>
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<td>TP AMPS</td>
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<td>G – 308 Tiered Classroom</td>
<td>Transactions Paper Session 9: Energy Storage &amp; Battery Transaction Papers</td>
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<td>S – Superior B</td>
<td>Capacitor Subcommittee</td>
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<td>S – Missouri</td>
<td>IEEE Smart Village – Operations Committee Meeting</td>
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<td>S – Lakeview</td>
<td>PSOPE – Task Force on Voltage Control for Smart Grids</td>
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<td>C PSOPE</td>
<td>S – Edgewater</td>
<td>PSOPE – Task Force on Electricity and Natural Gas Market Coordination</td>
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### Thursday, July 20, 2017

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<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>8:00 AM</td>
<td>PSOPE: DSOPS Interaction: Challenges, Business Cases and Solutions</td>
<td>S - Missouri</td>
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<tr>
<td>8:00 AM</td>
<td>Design &amp; Construction of Overhead Lines WG</td>
<td>S - Superior</td>
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<td>8:00 AM</td>
<td>Advancing Distribution System Modeling Tools for PV Integration</td>
<td>G - 226 Multifunction Room</td>
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<td>8:00 AM</td>
<td>Intelligent Systems for Voltage Control in Smart Grids</td>
<td>G - 204 Tiered Classroom</td>
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<tr>
<td>8:00 AM</td>
<td>Reliability Modeling and Evaluation of Dependent Cyber-Physical Systems</td>
<td>S - Sheraton IV</td>
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<tr>
<td>8:00 AM</td>
<td>Protection Challenges in Modern Power Systems: Trends and Educational Aspects</td>
<td>G - 222 Multifunction Room</td>
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<td>8:00 AM</td>
<td>Facilitating Energy Storage Integration into Electricity Markets</td>
<td>G - 206 Tiered Classroom</td>
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<tr>
<td>8:00 AM</td>
<td>Distribution Planning Under Uncertainties</td>
<td>S - Arkansas</td>
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<tr>
<td>8:00 AM</td>
<td>International Practices in Power System Planning: Processes, Methods and Techniques</td>
<td>S - Ohio</td>
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<tr>
<td>8:00 AM</td>
<td>DER Integration and DER Management Systems</td>
<td>S - Chicago IX</td>
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<td>Transactions Paper Session 07</td>
<td>G - 304 Tiered Classroom</td>
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<td>Transactions Paper Session 20</td>
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<td>Ice-Breaking Projects in Electric Power System Engineering</td>
<td>S - Sheraton III</td>
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<td>Automation, Protection, Reliability and Voltage Engineering of Power Distribution Systems with DER</td>
<td>G - 308 Tiered Classroom</td>
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<td>8:00 AM</td>
<td>Electric Machinery Committee Meeting</td>
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<td>Paper Forum 09</td>
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<td>Paper Forum 10</td>
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<td>8:00 AM</td>
<td>Big Data for Integrated Energy Systems</td>
<td>G - 200 Executive Classroom</td>
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<td>8:00 AM</td>
<td>State-of-the-Art of GMD Modeling and Monitoring</td>
<td>G - 203 Executive Meeting Room</td>
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<tr>
<td>8:00 AM</td>
<td>Extreme Events and Grid Resiliency</td>
<td>S - Sheraton II</td>
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<tr>
<td>8:00 AM</td>
<td>Distribution Automation/Management Systems and Integration with DERs and Microgrids</td>
<td>S - Chicago X</td>
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<td>8:00 AM</td>
<td>Transmission System – The Interconnected Bulk Electric System</td>
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<td>Cybersecurity of the Electric Power Transmission and Distribution System</td>
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<td>Development of NCI Line Post Application Curves TF</td>
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<td>PSDP Committee Meeting</td>
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<td>PSOPE - Working Group on Energy Forecasting</td>
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<td>T&amp;D Overhead Line Structural Materials &amp; Hardware WG</td>
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<td>10:00 AM</td>
<td>Computing in Optimization – Tales from Methodology Developers, Tool Makers and Users</td>
<td>G - 222 Multifunction Room</td>
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### Meeting at a Glance by Committee, continued

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<tr>
<td>3:00 PM</td>
<td>Panel Session: AMPS Power System Transient Overvoltages, Field Measurement and Their Analysis*</td>
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<td>3:00 PM</td>
<td>Panel Session: EDPG Power System Stabilizer Practical Issues in the Modern Grid</td>
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<tr>
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<td>Panel Session: EDPG High Renewable Energy Penetrations within Isolated and Remote Area Power Systems</td>
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<td>Panel Session: PSOPE Tuning the Measurement Weights in Power System State Estimation</td>
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<td>Panel Session: PSOPE Recent Developments in High-Fidelity Large-Scale Power System Datasets</td>
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<td>Panel Session: PSOPE Energy Storage and Conventional Resources: Complementarity, Rivalry and Substitutability</td>
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<td>3:00 PM</td>
<td>Panel Session: EDPG Power System Stabilizer Practical Issues in the Modern Grid</td>
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#### FRIDAY, JULY 21, 2017

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<tr>
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<td>Technical Program: TC36 TAG TF</td>
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<tr>
<td>9:00 AM</td>
<td>Technical Program: ANSI C29 TF</td>
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Surge Protection of Power Systems According to IEEE C62.22 (tutorial)

Sunday, 16 July, 2017, 8:00 AM–5:00 PM S – Chicago VIII
Sponsored by: Power & Energy Society

This tutorial focuses on the application of surge arresters to AC power systems above 1000 volts. It introduces the subject with examples of best practices in Distribution, Transmission, and Substations applications. It also covers the basic AC system fundamentals as they apply to arresters and basic Arrester Fundamentals as they apply to applications.

A detailed overview of how to select the proper arrester rating is covered and includes real world examples. The tutorial is targeted toward engineers with some power systems knowledge, but even the novice can understand the selection method.

Energy Storage: An Introduction to Technologies, Applications and Best Practices (tutorial)

Sunday, 16 July, 2017, 8:00 AM–5:00 PM S – Chicago IX
Sponsored by: Power & Energy Society

Energy storage is becoming an attractive solution for today’s smart grid, either being operated independently as asset or interacting with other resources like wind/solar generation or demand response. This tutorial is a full-day course which will provide participants a solid understanding of the basics and the state-of-the-art energy storage application, its implications on the grid’s reliability and the system’s economics and how-to on evaluating its performance and cost-benefit. Instructors with diverse backgrounds on this subject will bring the field deployment experience of energy storage applications and real-world examples to demonstrate the analytic tools used in assisting utility planning and operation decisions. The course is suitable for non-technical, as well as technical audiences, including regulatory, legislative, and utility staff members.

Shunt Compensation for Transmission – Principles, Planning, Operational Experience & Future Trend (tutorial)

Sunday, 16 July, 2017, 8:00 AM–5:00 PM S – Chicago X
Sponsored By: Power & Energy Society

Energy storage is becoming an attractive solution for today’s smart grid, either being operated independently as asset or interacting with other resources like wind/solar generation or demand response. This tutorial is a full-day course which will provide participants a solid understanding of the basics and the state-of-the-art energy storage application, its implications on the grid’s reliability and the system’s economics and how-to on evaluating its performance and cost-benefit. Instructors with diverse backgrounds on this subject will bring the field deployment experience of energy storage applications and real-world examples to demonstrate the analytic tools used in assisting utility planning and operation decisions. The course is suitable for non-technical, as well as technical audiences, including regulatory, legislative, and utility staff members.

Smart Inverters for Distributed Generators (tutorial)

Sunday, 16 July, 2017, 8:00 AM–5:00 PM S – Sheraton I
Sponsored by: Power & Energy Society

Different countries are setting up ambitious targets of PV solar based Distributed Generators (DGs) installations. However, the integration of PV based DGs has led to several challenges, mitigation of which typically require expensive compensating and protection equipment, as well as complex network management strategies.

DG inverters primarily produce real power at unity power factor. However, power electronics has now made it possible for inverters to perform multiple functions for grid support, in addition to real power generation. Such inverters are termed Smart Inverters as they are capable of effectively minimizing
several grid integration challenges of DGs without additional equipment. Recognizing the significant potential of smart inverter technology, utilities across the globe are actively considering implementation of smart inverters.

The technology of smart inverters is i) new, ii) rapidly evolving, and iii) has outpaced the technical regulations and standards which are needed to allow its implementation. Different PV interconnection and testing standards around the world are being revised to allow the different features of smart inverters to be implemented. US DOE, EPRI, NREL are testing and demonstrating the smart inverter technologies on several pilot projects.

This IEEE Tutorial on Smart Inverters is being proposed to present a comprehensive and structured knowledge on the need, functions, operation and protection, integration and testing standards, system studies of benefits, demonstration projects and actual installations of this new technology. This Tutorial will be very helpful for academics, utilities, practicing engineers, consultants, system operators and planners, DG developers, and inverter manufacturers for understanding the various facets of this technology and to fully exploit its vast capabilities in their T&D grids.

Planning and Integration of Flexible HVDC into Today’s Grid (tutorial)

Sunday, 16 July, 2017, 8:00 AM–5:00 PM          S – Sheraton II
Sponsored by:             Power & Energy Society

The evolving planning process requires competitively solicited projects that efficiently and creatively use limited rights-of-way. In addition, renewable resources from remote locations must be successfully integrated with the system. High voltage direct current (HVDC) provides a viable option to transfer large amounts of power across long distances in an environmentally friendly manner.

This tutorial provides system planners with an understanding of how HVDC applications can reliably and economically improve the system. The tutorial reviews the planning process and discusses the studies necessary for considering HVDC technologies. Attendees will understand: the role of HVDC in the grid of the future; a planner’s perspective of basic HVDC technologies; and the technical issues that must be properly considered and addressed to successfully plan, implement, and operate an HVDC project. System interactions of new HVDC assets with the existing AC transmission system are specifically addressed. Case studies of HVDC plans providing reliable and economic service are presented as well as the how and why HVDC overlay networks can be successfully planned. The advantages and disadvantages of state-of-the-art HVDC technologies are discussed.

The focus lies on HVDC for grid development, rather than HVDC technology.

Synchrophasors Estimation and Control of Power System Dynamics (tutorial)

Sunday, 16 July, 2017, 8:00 AM–12:00 PM            S – Sheraton III
Sponsored by:             Power & Energy Society

Power system operates under quasi stationary states. Any random disturbance in a power system (such as a fault) triggers dynamic response of the system. Most of the times response settle to a stable equilibrium, sometimes experiences oscillations which are electromechanical in nature. These oscillations in the past grew in magnitude within few seconds when were not controlled in time, resulted in wide-scale blackouts in many instances. These oscillations are global in nature and in order to control them dynamically and adaptively, the operating state of the whole system needs to be estimated in real-time, with estimation update rates which are in time scales of 100 milliseconds or less. This fast estimation of operating state is known as dynamic state estimation (DSE), and the control methods based on dynamic estimation are referred to as estimation-based control methods. In the literature research efforts are appearing employing various techniques such as various approaches of Kalman filtering. In the absence of any books, IEEE report, standard, there is growing need from the community to understand these methods. This tutorial will demonstrate the necessity and applicability of such methods and algorithms of estimation and control, and would explain the theory used in the development of these methods/algorithms.
Sunday Afternoon – Sunday Evening – Monday Morning

Sunday Afternoon

Smart Grid 308 – Distributed Energy Resources (tutorial)
Sunday, 16 July, 2017, 1:00 PM–5:00 PM  S – Sheraton III
Sponsored by: Power & Energy Society

This tutorial will cover the following topics:
- Overview of DER and its components
- Understanding variable generation issues
- Limits to DER implementation in a conventional distribution grid
- Interconnect and other standards for DER
- Engineering considerations for DER planning and approval
- Issues in customer owned DER (e.g. maintenance, overrides, etc)

Who should attend:
Anyone who is interested in Distribution level DER, its impact on the grid and limits in the distribution grid today.

New Attendees Orientation (panel)
Sunday, 16 July, 2017, 4:00 PM–5:00 PM  S – Ontario

A short orientation session will familiarize first time attendees with PES and the PES General meeting. The session will provide an understanding of the various types of technical sessions, committee meetings, tutorials, technical tours and social events. At the end of the session, the newcomer should be able to navigate confidently through the General Meeting and obtain maximum value from the experience.

IEEE Smart Village/PES Scholarship Donor Reception (reception)
Sunday, 16 July, 2017, 4:00 PM–6:00 PM  S – Superior A

Sunday Evening

Welcome Reception (reception)
Sunday, 16 July, 2017, 5:00 PM–8:00 PM  Aon Grand Ballroom at Navy Pier
Sponsored by: Power & Energy Society

Monday Morning

Attendee Breakfast (breakfast)
Monday, 17 July, 2017, 6:30 AM–8:00 AM  S – Ballroom Promenade+Chicago X

Presenter Breakfast (breakfast)
Monday, 17 July, 2017, 6:30 AM–7:45 AM  S – Riverwalk A

PES Members Meeting (panel)
Monday, 17 July, 2017, 8:00 AM–9:00 AM  S – Sheraton IV-V+Chicago VI-VII
Sponsored by: Power & Energy Society

PES President, Damir Novosel, will update the membership on various PES activities. Candidates for the offices of PES President Elect, PES Treasurer and PES Secretary will speak.
Plenary Session (panel)
Monday, 17 July, 2017, 9:00 AM–11:00 AM       S – Sheraton IV-V+Chicago VI-VII
Sponsored by:   Power & Energy Society
PES President Damir Novosel will moderate the Plenary Session which begins immediately following the PES Members Meeting.

How to Write an Effective IEEE Fellow Nomination (panel)
Monday, 17 July, 2017, 11:30 AM–1:00 PM       G – 400 Tiered Classroom
Sponsored by:   Power & Energy Society
Chair:   M. CROW, Missouri Institute of Science and Technology

Monday Afternoon

Various Aspects of Water Power Generation (panel)
Monday, 17 July, 2017, 1:00 PM–5:00 PM       G – 204 Tiered Classroom
Sponsored by:   Electric Machinery
Chair:   E. MULJADI, NREL
This panel will discuss various aspects of water power generation in a panel discussion forum, to encourage electrical engineers especially within the Power and Energy Society to participate in research, development, and demonstration of water power generation activities, to open dialog among many different experts and stakeholder organizations working in the area of water power generation for possible future collaborations.

The panelists include engineers and researchers actively involved in research and development efforts in both marine and hydrokinetic and hydropower technologies to improve performance, lower cost and ultimately support our ability to sustainably meet its growing energy demand. Marine and hydrokinetic technologies capture energy from waves, ocean thermal gradients, and tidal, ocean and river currents.

PANELISTS:
• 17PESGM2490, Marine Hydro-Kinetic Operation, Planning and Integration into Electricity Systems
  A. LAMADRID, Lehigh University
• 17PESGM2491, Global Pumped Storage Activities and Trends
  D. ERPENBECK, MWH Global
• 17PESGM2492, Potential of Microhydro and Minihydro Power Plants
  A. SCHNEIDER, Natel Energy, Inc.
• 17PESGM2493, High Flexible Hydro Power Generation Concepts for Future Grids
  M. EGRETZBERGER, Andritz Hydro GmbH
• 17PESGM2494, Hydropower Diagnostics and SCADA
  N. MYERS, Bureau of Reclamation
• 17PESGM2495, Sabella D10 to Tidal Turbine Pilot Power Plant
  D. DIEFFENTHALER, Sabella
• 17PESGM2496, Update on OSU Ocean Energy Research
  T. BREKKEN, Oregon State University

Advanced Topic for Electrical Machine II (panel)
Monday, 17 July, 2017, 1:00 PM–5:00 PM       G – 206 Tiered Classroom
Sponsored By:   Electric Machinery
Chairs:   Y. DUAN, IEEE
           M. OSHIMA, Tokyo University of Science, Suwa
PANELISTS:
• 17PESGM2557, A New Stray-Load Loss Formula for Small and Medium Sized Induction Motors
  M. AL-BADRI, Concordia University
• 17PESGM2558, Stabilized Control Strategy under Loaded Condition at Failure of a Motor Section in a d-q Axis Current Control Bearingless Motor
  M. OSHIMA, SUWA TUS
• 17PESGM2559, Fault Diagnosis of Power Converter for Future High Speed Electric Motor Drive
  S. CHOI, University of Akron
Power System Flexibility: Challenges and Enhancement Solutions (panel)

Monday, 17 July, 2017, 1:00 PM-3:00 PM  G – 300 Tiered Classroom
Sponsored by: (AMPS) Reliability and Risk Analysis
Chairs: M. PARVANIA, University of Utah
         E. VAAHEDI, Open Access Technology International

Increasing penetration of intermittent renewable energy resources is contributing to shortage of flexibility and ramping resources in power systems operation. There has been a recent focus in the technical community on developing new operation models, market mechanisms and services to enhance the flexibility of power systems in order to respond to fast sub-hourly ramping of renewable resources, and reduce the frequency and intensity of ramping scarcity events. This panel session brings together experts from academia and industry practitioners to discuss the challenges of flexibility in power systems operation, as well as to explore solutions that assist in enhancing operational flexibility.

PANELISTS:
• 17PESGM2779, Incentive Compatible Pricing, Payment and Cost Allocation of Flexibility Reserves
  F. RAHIMI, Open Access Technology International, Inc. (OATI)
• 17PESGM2780, Role of Natural Gas Market in Power System Flexibility
  M. SHAHIDEHPOUR, Illinois Institute of Technology
• 17PESGM2778, The Key Role of Power System Control in Enabling Flexible Operations—What Is It Worth?
  M. ILIC, Carnegie Mellon University
• 17PESGM2777, Continuous-Time Flexibility Scheduling in Power Systems
  M. PARVANIA, University of Utah
• 17PESGM2781, Compressed Air Energy Storage for Western Energy Flexibility
  R. WALJE, Magnum CAES

Current R&D in Photovoltaics: Technology and Grid Integration (panel)

Monday, 17 July, 2017, 1:00 PM–4:00 PM  G – 208 Tiered Classroom
Sponsored by: Energy Development and Power Generation
Chair: B. CHOWDHURY, UNC Charlotte

By the end of 2008, the largest PV installation in the United States was the 14MW PV at Nellis Air Force Base in Nevada. The largest installation in the world was just a 60MW plant located in Spain. There is currently over 9 GWac of major solar projects operating in the USA. In addition, there is a substantial amount of capacity in the pipeline, with over 30 GW of PV and CSP projects either under construction or under development. Eight of the ten largest solar plants are installed in the US including a 579 MW PV facility went online in 2015. Driving the unprecedented growth of PV are the aggressive renewable portfolio standards set by many states and the falling solar panel and balance of system costs. Every major utility company is currently faced with growing penetration of solar generation, and this is beginning to create operational and planning challenges.

PANELISTS:
• 17PESGM2759, Voltage Issues on Distribution Systems in the Presence of PV
  B. CHOWDHURY, UNC Charlotte
• 17PESGM2760, Utility Business Models, Rate Design and Regulatory Issues Pertaining to High Penetration of PV
  J. ROMERO AGUERO, Quanta Technology
• 17PESGM2761, Testing and Certification for PV Systems
  B. KROPONSKI, NREL
• 17PESGM2762, Planning for Distributed Generation
  T. KEY, EPRI
• 17PESGM2763, Integration of Grid Operations and Related Standards
  A. ELLIS, Sandia National Lab
• 17PESGM2764, Utility Perspective – Operating the System with 1 GW Solar
  S. ROBERTS, Duke Energy
• 17PESGM2765, Evaluating Potential Impacts of Adding Solar Photovoltaic Resources on System Operations and Costs
  K. LE, Power Costs, Inc.
Asian and Australasian Experience on Application of Smart Grid Technology (panel)

Monday, 17 July, 2017, 1:00 PM–3:00 PM G – 200 Tiered Classroom

Sponsored By: Energy Development and Power Generation
Chairs: M. NEGNEVITSKY, University of Tasmania
S. MUKHOPADHYAY, GTBIT, GGSIP University

With contributions made towards development of Smart Grid Technology as defined in the power sector, this panel session aims at reporting various successful applications in different parts of Asia & Australasia through some presentations in the areas that are covered in this inter-disciplinary subject. Idea behind this is to share experiences gathered so that the same could be further used in the countries of the region or outside.

PANELISTS:
- 17PESGM2994, Development of Smart City Prototype in the Indian Context
  S. CHAKRABARTI, Indian Institute of Technology Kanpur
- 17PESGM2995, Variability Study of a Utility-Scale PV Plant in the Fringe of Grid, Australia
  T. SAHA, University of Queensland
- 17PESGM2996, Smart State Estimation for Smart Grid Applications
  M. NEGNEVITSKY, University of Tasmania
- 17PESGM2997, Northeast Asia Power System Interconnection Operation Strategies and Stabilization by Parameter Identification-State Estimation in South Korea
  S. LEE, Harvard University
- 17PESGM2998, Smart City and Smart Microgrid in Southern State of India
  A. DAS, AECOM
- 17PESGM2999, The Experience of Off-Grid Microgrid Implementation in Korea
  Y. KWON, Hyosung Corporation
- 17PESGM3000, Study on Adaptive Voltage Regulation for Flexible Loads in Active Distribution Networks and the Demonstration Project in China
  W. DAN, Tianjin University

Regulating the Future of Microgrids (panel)

Monday, 17 July, 2017, 1:00 PM–3:00 PM G – 100 Tiered Classroom

Sponsored by: Local Organizing Committee
Chair: M. AVENDANO, ComEd

This panel imagines a future where urban distribution systems include a network of interconnected microgrids. In an environment such as this, what is the role of the regulated utility, the third party energy producer, or the consumer? How does the current regulatory structure need to change to accommodate such a system? Who should be allowed to own critical assets within a Microgrid?

PANELISTS:
- 17PESGM3057, Established and Emerging Ownership and Financing Models for Microgrids
  D. IMMERMAN, AECOM
- 17PESGM3056, Development of Interconnected Network of Multimicrogrids
  M. SHAHIDEHPOUR, Illinois Institute of Technology
- 17PESGM3058, Resilience, Reliability, and Security Through Microgrids
  J. SVACHULA, ComEd
- 17PESGM3059, Microgrids from an International Perspective
  R. GRAG, Delhi Technological University

New Challenges and Issues Related to Interharmonic Distortion Modeling and Simulation (panel)

Monday, 17 July, 2017, 1:00 PM–4:00 PM G – 304 Tiered Classroom

Sponsored By: Transmission and Distribution
Chairs: R. LANGELLA, University of Campania “Luigi Vanvitelli”
A. TESTA, University of Campania “Luigi Vanvitelli”

There is a great interest in academic, industrial and standard communities about fixing limits for interharmonics. Limits can be fixed only if there is a deep knowledge of the interharmonic causes and effects. The panel will discuss different aspects of modeling, simulation and measurement of interharmonics in power systems. After an introduction on definitions, causes and effects, interharmonic generation will be investigated from the classical loads such as arc furnaces and LCI VSDs to new efficient VSI based
Monday Afternoon, continued

VSDs. The possible interharmonic impact of renewable resources will be also addressed both from the theoretical point of view and through the description of incident experiences with wind farms due to interharmonics. The Light Flicker effect will be discussed in terms of impact on new lamp technologies and of propagation within the network. The panelists will present theoretical aspects and practical case studies. Finally, a discussion on Interharmonic limits will be done.

PANELISTS:

• 17PESGM1103, Interharmonics: Definitions, Causes and Effects
  A. TESTA, Second University of Naples

• 17PESGM1105, Interharmonics Produced by Renewables (Wind and PV Systems)
  R. LANGELLA, Second University of Naples

• 17PESGM1106, Incident Experiences with Wind Farms Due to Interharmonics
  D. MUELLER, Enernex

• 17PESGM1104, Interharmonics Produced by LCI VSD
  W. XU, University of Alberta

• 17PESGM1101, Interharmonics Produced by PWM VSD
  F. BLAAJBERG, Aalborg University

• 17PESGM1107, Light Flicker Effects Produced by Interharmonics on Different Lamp Technologies
  J. DRAPELA, Brno University of Technologies

• 17PESGM1100, Interharmonics Produced by EAF
  G. CHANG, National Chung Cheng University

• 17PESGM1102, Interharmonic Propagation Related to Voltage Flicker in HV Networks
  I. PAPIC, University of Ljubljana

• 17PESGM3077, Discussion on Interharmonic Limits
  A. TESTA, Second University of Naples

Economics and Operating Experience of HVDC and FACTS – Recent HVDC and FACTS Refurbishments, Installations, and Special Controls that Are the Economic Choice (panel)

Monday, 17 July, 2017, 1:00 PM–4:00 PM  G – 400 Tiered Classroom

Sponsored by: Transmission and Distribution
Chair: M. HENDERSON, ISO New England

This panel will discuss the thinking behind recent HVDC and FACTS refurbishments, installations, and the opportunities presented by new controls and innovative uses of limited rights-of-way. The panel will address the economic reasons for HVDC and FACTS facilities and controls that can provide practical lessons learned.

PANELISTS:

• 17PESGM2705, Experience with HVDC and FACTS
  W. LITZENBERGER, Consultant

• 17PESGM2706, Recent HVDC and FACTS Installations
  D. SULLIVAN, MEPEI

• 17PESGM2707, Balancing Wind Generation with HVDC Overlays
  D. OSBORN, MISO

• 17PESGM2700, Situational Awareness for Inverter Based Technologies
  B. CUMMINGS, NERC

• 17PESGM2699, New VSC Installations
  N. KIRBY, GE Energy Connections

• 17PESGM2708, Integrating Wind with HVDC
  F. GOMEZ, Electronic

• 17PESGM2709, Interconnecting Across Interconnection
  J. CASPARY, SPP

• 17PESGM2698, VSC Damping of AC System Oscillations
  G. KARADY, Arizona State University

• 17PESGM2710, Structures Sharing HVDC and AC Transmission
  T. ABDIEL-GALIL, SNC Lavalin

• 17PESGM2712, Converting 400 kV AC to One HVDC and One AC Transmission Circuit
  J. RESTREPO, SNC Lavalin

• 17PESGM2713, HVDC and FACTS at ERCOT
  W. LASHER, ERCOT

• 17PESGM2714, 500kV DC Grid: Zhangbei Project
  J. CAI, CEPRI

• 17PESGM2715, West Alberta HVDC and FACTS STATCOM
  J. CHAHWAN, SNC Lavalin
Distributed Generation/Microgrids Implementation—Technologies, Standardization and Experiences (panel)

Monday, 17 July, 2017, 1:00 PM–5:00 PM  
G – 406 Tiered Classroom

This panel session will focus on advancements in technologies, solutions and standardization activities in the field of distributed generation (DG) implementation with participation of experts from around the world. Important issues include the art associated to the key distributed generation integration technologies, the related standardization needs and activities, and the existing application and business model of the DG. Topics will include but not limited to:

- Distributed generation (DG) implementation and integration technologies and solutions
- Application and business models of DG, such as providing solutions for access to electricity in remote or developing areas, virtual power plant (VPP)
- Operation and management methods of DGs, such as coordinated operation and control of multiple energy resources, coordinated operation with main grid when multiple DGs are integrated together as a system
- Standardization, such as standardization needs for the application of DGs, existing standards associated to DGs integration and operation
- Experiences and projects relating to the application of DGs
- New approaches for modeling and simulation of DGs supporting both operations and control

Panelists:
- 17PESGM3096, Powering Microgrids for the 21st-Century Electrical System
  B. MARCHIONINI, NEMA USA
- 17PESGM3095, Distributed Generation Implementation & Integration Technologies and Solution
  G. JOOS, McGill University
- 17PESGM3094, Application and Business Model of Microgrids in China
  H. YU, China Electric Power Research Institute
- 17PESGM3097, Distributed Generation Integration Standards Research in China
- 17PESGM3093, Microgrids Business Model
  N. HATZIARGYRIOU, National Technical University of Athens

IEEE 1547 Standard for Interconnecting Distributed Energy Resources with Electric Power Systems (tutorial)

Monday, 17 July, 2017, 1:00 PM–5:00 PM  
S – Erie

This tutorial will introduce the IEEE 1547 “Standard for Interconnecting Distributed Energy Resources with Electric Power Systems.”

Due to the increasing amount of Distributed Energy Resources (DERs) interconnections with the Electric Power System, the IEEE 1547 standard is going through a major revision to address some of the technical issues associated with high penetration of DERs i.e. grid support functionalities, etc.

The participants will learn about the major changes to the IEEE 1547 i.e. voltage regulation, response to abnormal system conditions (including voltage and frequency ride through), power quality, islanding, interoperability, etc.

The participants will also learn about the utility concerns/solutions to adopt the revised IEEE 1547 standard.
Best Conference Papers Session on Microgrids, Renewables, and Distributed Energy Resources (best paper)

Monday, 17 July, 2017, 1:00 PM–5:00 PM  S – Chicago IX

Sponsored by:  Best Paper Sessions
Chairs:  F. TRINDADE, University of Campinas
         M. BARAN, North Carolina State University

PAPERS AND AUTHORS:

• 17PESGM2128, Agent-Based Distributed Control Scheme for Distributed Energy Storages Based on Forecast Uncertainties
   D. SHARMA, MJP Rohilkhand University, Bareilly (India)
   S. SINGH, Indian Institute of Kanpur
   J. LIN, PJM Interconnection, USA
   E. FORUZAN, University of Nebraska

• 17PESGM1290, A Control Architecture for Optimal Power Sharing Among Interconnected Microgrids
   L. ISURU SAMPATH, Nanyang Technological University, Singapore
   A. KRISHNAN, Nanyang Technological University, Singapore
   K. CHAUDHARI, Nanyang Technological University, Singapore
   H. GOOI, Nanyang Technological University, Singapore
   A. UKIL, Nanyang Technological University, Singapore

• 17PESGM0851, Optimal Energy Management of Microgrid via Distributed Primal-Dual Dynamics for Fast Frequency Recovery
   T. ZHAO, University of Manchester
   Z. DING, University of Manchester

• 17PESGM0567, Systematic Design of Virtual Component Method for Inverter-Based Microgrids
   P. HUANG, Massachusetts Institute of Technology
   P. VOROBEV, Massachusetts Institute of Technology
   J. KIRTLLEY, Massachusetts Institute of Technology
   K. TURITSYN, Massachusetts Institute of Technology

• 17PESGM0279, Community Microgrid Scheduling Considering Building Thermal Dynamics
   G. LIU, Oak Ridge National Laboratory
   M. STARKE, Oak Ridge National Laboratory
   B. XIAO, Oak Ridge National Laboratory
   X. ZHANG, University of Tennessee, Knoxville
   K. TOMSOVIC, University of Tennessee, Knoxville

• 17PESGM1864, Modeling and Optimal Operation of a Combined Heat and Power System in Microgrids
   Z. DING, Binghamton University
   Z. ZHANG, Binghamton University

• 17PESGM1571, Communication-Assisted Impedance-Based Microgrid Protection Scheme
   M. ELKHATIB, Sandia National Laboratories
   A. ELLIS, Sandia National Laboratories

• 17PESGM1095, Integrated Protection and Monitoring System for Safe Operation of Photovoltaic-Based Isolated Microgrids
   O. NUÑEZ-MATA, University of Chile
   R. PALMA-BEHNKE, University of Chile
   F. VALENCIA, University of Chile
   P. MENDOZA-ARAYA, University of Chile
   J. COTOS, Enel Generation

• 17PESGM1883, Microgrid Protection: An Overview of Protection Strategies in North American Microgrid Projects
   J. SHILES, Southern California Edison
   E. WONG, pesgm2017@mirasmart.com
   S. RAO, pesgm2017@mirasmart.com
   M. ZAMANI, Quanta Technology
   M. DAVARI, pesgm2017@mirasmart.com
   F. KATIRAEI, Quanta Technology

• 17PESGM0670, Challenges in High Impedance Fault Detection Due to Increasing Penetration of Photovoltaics in Radial Distribution Feeder
   M. KAVI, Queensland University of Technology, Australia
   Y. MISHRA, Queensland University of Technology, Australia
   M. VILATHGAMUWA, Queensland University of Technology, Australia
• 17PESGM0016, Passive Oscillator Based Protection Scheme for Faults Within Utility-Scale Photovoltaic Arrays
  K. SALEH, University of Waterloo
  E. EL-SAADANY, University of Waterloo
  A. HOOSHYAR, York University

• 17PESGM0977, Voltage Regulation Strategy for Active Distribution Network Coordinating DGs, ESS Units and OLTC
  C. ZHANG, Shandong University
  X. CHU, Shandong University

• 17PESGM1340, Optimal RES Portfolio to Achieve 45% Renewable Electricity in Central Europe by 2030
  P. ESER, ETH Zurich
  N. CHOKANI, ETH Zurich
  R. ABHARI, ETH Zurich

• 17PESGM2200, A Cost-Benefit Study of Sizing Residential PV and ES Systems Based on Synthesized Load Profiles
  X. ZHU, North Carolina State University
  G. HENRI, North Carolina State University
  J. YAN, North Carolina State University
  N. LU, North Carolina State University

• 17PESGM0854, Optimal Battery Energy Storage Sizing for Reducing Wind Generation Curtailment
  A. ALANAZI, University of Denver
  A. KHODAEI, University of Denver

• 17PESGM0761, Capacity-Based Adaptive Droop Control for Battery Energy Storage Operation
  Y. ZHANG, AESO

• 17PESGM0950, Smart Real-Time Multi-Node Congestion Management in Active Distribution Networks
  A. HAQUE, Eindhoven University of Technology
  T. VO, Eindhoven University of Technology
  P. NGUYEN, Eindhoven University of Technology
  J. SLOOTWEG, Eindhoven University of Technology
  F. BLIEK, DNV GL

Best Conference Papers Session on Power System Planning, Operation, and Electricity Markets (best paper)

Monday, 17 July, 2017, 1:00 PM-5:00 PM  S – Sheraton I

Sponsored by:  Best Paper Sessions
  Chairs:  A. DINIZ, CEPEL – Brazilian Electric Energy Research Center

PAPERS AND AUTHORS:

• 17PESGM1457, Chance-Constrained Transmission Expansion Planning with Guaranteed Wind Power Utilization
  Y. ZHANG, Xi’an Jiaotong University
  J. WANG, Xi’an Jiaotong University
  Y. LI, Xi’an Jiaotong University
  X. CAO, Xi’an Jiaotong University

• 17PESGM1546, INTEGRID – Impact of New Grid Codes on the Local Distribution Network of Nuclear Power Plants
  M. RIOUAL, EDF R&D
  F. DUFFEAU, EDF R&D
  I. MARCELLES, TECNATOM
  S. RABANEDO, TECNATOM
  K. KOPSIDAS, University of Manchester
  R. PREECE, University of Manchester
  W. GEISSLER, AREVA GmbH
  J. LORANGE, AREVA GmbH

• 17PESGM1744, Substation Flood Program and Flood Hardening Case Study
  R. COSTA, National Grid
  G. MCALLISTER, GZA

• 17PESGM0914, Short-Term Transmission Line Maintenance Scheduling with Wind Energy Integration
  C. WANG, Iowa State University
  Z. WANG, Iowa State University

• 17PESGM0911, Short-Term Transmission Line Maintenance Scheduling with Wind Energy Integration
  C. WANG, Iowa State University
  Z. WANG, Iowa State University
Monday Afternoon, continued

• 17PESGM1057, Improving Power Flow Robustness via Circuit Simulation Methods
  A. PANDEY, Carnegie Mellon University
  M. JEREMINOV, Carnegie Mellon University
  G. HUG, ETH Zurich
  L. PILEGGI, Carnegie Mellon University

• 17PESGM1018, A Decomposition and Coordination Approach for Large-Scale Security Constrained Unit Commitment Problems with Combined Cycle Units
  X. SUN, University of Connecticut
  P. LUH, University of Connecticut
  M. BRAGIN, University of Connecticut
  Y. CHEN, MISO
  J. WAN, GE Energy Solutions
  F. WANG, MISO

• 17PESGM0597, Robust Operation Strategy of Soft Open Point for Active Distribution Network with Uncertainties
  P. LI, Tianjin University
  H. JI, Tianjin University
  C. WANG, Tianjin University
  G. SONG, Tianjin University
  J. ZHAO, Tianjin University
  Y. SONG, State Grid Corporation of China

• 17PESGM1665, Impact of Demand Side Management in Active Distribution Networks
  P. PONNAGANTI, Aalborg University
  B. BAK-JENSEN, Aalborg University
  J. PILLAI, Aalborg University

• 17PESGM0027, Distributed Two-Stage Network Topology Processor for HVDC Grid Operation
  D. BABAZADEH, KTH – Royal Institute of Technology
  F. HOHN, pesgm2017@mirasmart.com
  Y. WU, pesgm2017@mirasmart.com
  L. NORDSTROM, pesgm2017@mirasmart.com

• 17PESGM1130, A Game-Theoretic Analysis of Wind Power Generator Bidding Strategies in Electricity Markets
  Y. XIA, Rensselaer Polytechnic Institute
  M. MARWALI, NYISO
  J. CHOW, Rensselaer Polytechnic Institute

• 17PESGM1231, Incentive-Based Coordination Mechanism for Backup Renewable Energy Investment
  S. BABAEI, Oklahoma State University
  C. ZHAO, Oklahoma State University
  T. LIU, Oklahoma State University

• 17PESGM0352, Game-Theoretic Approach for Smartgrid Energy Trading with Microgrids during Restoration
  W. KOU, University of Connecticut
  S. PARK, University of Connecticut

• 17PESGM1592, Evaluation of Market-Based Flexibility Provision for Congestion Management in Distribution Grids
  K. GESCHERMANN, RWTH Aachen University
  A. MOSER, RWTH Aachen University

• 17PESGM0114, Limited Energy Resource Optimization in the Electricity Market
  C. NGUYEN, New York Independent System Operator
  C. SANADA, Pacific Gas and Electric Company
  M. MARWALI, New York Independent System Operator
  M. SWIDER, New York Independent System Operator
  C. ROSECRANS, New York Independent System Operator

• 17PESGM0767, Privacy-Preserving Consensus-Based Energy Management in Smart Grid
  C. ZHAO, Zhejiang University
  J. HE, University of Victoria
  P. CHENG, Zhejiang University
  J. JIA, Zhejiang University

• 17PESGM2098, Exploring the Role of Demand Shifting in Oligopolistic Electricity Markets
  D. PAPADASKALOPOULOS, Imperial College London
  Y. YE, Imperial College London
  G. STRBAC, Imperial College London

• 17PESGM1820, Short-Term Global Horizontal Irradiance Forecasting Based on Sky Imaging and Pattern Recognition
  C. FENG, University of Texas at Dallas
  M. CUI, University of Texas at Dallas
  M. LEE, University of Texas at Dallas
Monday Afternoon, continued

J. ZHANG, University of Texas at Dallas
B. HODGE, National Renewable Energy Laboratory
S. LU, IBM TJ Watson Research Center
H. HAMANN, IBM TJ Watson Research Center

Best Conference Papers Session on Power System Modeling and Analysis
(best paper)

Monday, 17 July, 2017, 1:00 PM–5:00 PM              S – Sheraton II
Sponsored by:             Best Paper Sessions
Chairs:                         D. SILVA, Siemens PTI
                                K. CHEUNG, GE

PAPERS AND AUTHORS:

• 17PESGM0256, Parametric Dynamic Phasor Modeling of Synchronous Machine-Rectifier
  Systems for Integrated AC-DC Microgrids
  Y. HUANG, University of British Columbia
  H. CHANG, University of British Columbia
  S. REZAEE, University of British Columbia
  J. JATSKEVICH, University of British Columbia
• 17PESGM0539, Network Reduction Algorithm for Developing Distribution Feeders for Real-Time
  Simulators
  A. NAGARAJAN, National Renewable Energy Laboratory
  A. NELSON, National Renewable Energy Laboratory
  K. PRABHAKAR, National Renewable Energy Laboratory
  A. HOKE, National Renewable Energy Laboratory
  M. ASANO, Hawaiian Electric Company
  R. UEDA, Hawaiian Electric Company
  S. NEPAL, South Dakota State University
• 17PESGM1098, A Statistical Approach to Dynamic Load Modelling and Identification with High
  Frequency Measurements
  D. MALDONADO, Illinois Institute of Technology
  V. PATEL, University of Chicago
  M. ANITESCU, University of Chicago
  A. FLUECK, Illinois Institute of Technology
• 17PESGM1247, On the Development of Power Transformer Failure Models: An Australian Case
  Study
  D. MARTIN, University of Queensland
  J. MARKS, University of Queensland
  T. SAHA, University of Queensland
  O. KRAUSE, University of Queensland
  G. RUSSELL, Powerlink Queensland
  A. ALIBEGOVIC-MEMISEVIC, Powerlink Queensland
• 17PESGM2103, A Modular Phasor Measurement Unit Design Featuring Open Data Exchange
  Methods
  D. LAVERTY, Queen’s University Belfast
  J. HASTINGS, Queen’s University Belfast
  D. MORROW, Queen’s University Belfast
  R. KHAN, Queen’s University Belfast
  K. MCLAUGHLIN, Queen’s University Belfast
  S. SEZER, Queen’s University Belfast
• 17PESGM1651, Comparison of Fault Current Limitation with Saturable Reactor and Dynamic
  Voltage Restorer
  R. KHAN, Washington State University
  A. MEHRIZI SANI, Washington State University
• 17PESGM0817, Identification of Synchronous Machines Parameters Using Genetic Algorithm and
  Load Rejection Test
  P. SILVA, UNIFEI
  E. BORTONI, UNIFEI
  J. ROCHA, GE
• 17PESGM1891, PMU Assisted Power System Parameter Calibration at Jiangsu Electric Power
  Company
  X. LU, State Grid Jiangsu Electric Power Company
  D. SHI, GEIRI North America
  B. ZHU, State Grid Jiangsu Electric Power Company
  Z. WANG, GEIRI North America
Monday Afternoon, continued

J. LUO, State Grid Jiangsu Electric Power Company
D. SU, State Grid Jiangsu Electric Power Company
C. XU, State Grid Jiangsu Electric Power Company
• 17PESGM0745, An Innovative Software Tool Suite for Power Plant Model Validation and Parameter Calibration Using PMU Measurements
  Y. LI, Texas A&M University
  R. DIAO, PNNL
  J. SANCHEZ-GASCA, General Electric
  B. THOMAS, General Electric
  S. KINCIC, PEAK Reliability
  A. NING, PEAK Reliability
  R. HUANG, pesgm2017@mirasmart.com
  P. ETINGOV, pesgm2017@mirasmart.com
  X. LI, pesgm2017@mirasmart.com
  Z. HUANG, pesgm2017@mirasmart.com
  S. WANG, pesgm2017@mirasmart.com
  G. PAI, pesgm2017@mirasmart.com
• 17PESGM1730, Adaptive Adjustment of Noise Covariance in Kalman Filter for Dynamic State Estimation
  S. AKHLAGHI, Binghamton University, State University of New York
  N. ZHOU, Binghamton University, State University of New York
  Z. HUANG, Pacific Northwest National Laboratory
• 17PESGM0988, Optimal Scheduling of Flexibility Resources Incorporating Dynamic Line Rating
  C. SONG, Shandong University
  X. CHU, Shandong University
• 17PESGM0034, Outage Statistics, Reliability and Availability of DC Circuits in North American Bulk Power System
  S. EKISHEVA, North American Electric Reliability Corporation
  M. CLEMONS, TVA
  M. PAKELTIS, CenterPoint Energy
  M. PAPIC, Idaho Power Company
  R. QUEST, Midwest Reliability Organization
  K. WEISMAN, American Transmission Company
• 17PESGM0510, Event Detection and Localization in Distribution Grids with Phasor Measurement Units
  O. ARDAKANIAN, University of British Columbia
  Y. YUAN, Huazhong University of Science and Technology
  R. DOBBE, University of California at Berkeley
  A. VON MEIER, University of California at Berkeley
  S. LOW, California Institute of Technology
  C. TOMLIN, University of California at Berkeley
• 17PESGM1446, Remote Voltage Estimation in LV Feeders with Local Monitoring at Transformer Level
  V. RIGONI, University College Dublin
  A. KEANE, University College Dublin
• 17PESGM2071, Monitoring Harmonic Distortion in Microgrids Using Dynamic Mode Decomposition
  A. SALDAÑA, Universidad de Guadalajara
  E. BAPOCIO, Universidad de Guadalajara
  A. MESSINA, CINVESTAV
  J. RAMOS, CINVESTAV
  J. SEGUNDO, Universidad de San Luis Potosí
  G. TINAJERO, Universidad de San Luis Potosí
• 17PESGM1292, Harmonic Instability Source Identification in Large Wind Farms
  E. EBRAHIMZADEH, Aalborg University
  F. BLAABJERG, Aalborg University
  X. WANG, Aalborg University
  C. LETH BAK, Aalborg University
• 17PESGM0375, Identification of Critical Locations of Power Systems
  A. ONWUACHUMBA, RLC Engineering
  M. MUSAVI, University of Maine
  P. LERLEY, RLC Engineering
Best Conference Papers Session on Power System Stability, Control, and Protection (best paper)

Sponsored By: Best Paper Sessions
Chairs: V. PERIC, TSCNET Services
A. VACCARO, University of Sannio

PAPERS AND AUTHORS:

- 17PESGM0846, Maximizing Transmission Utilization with Online Stability Assessment
  R. THAPPETAOBULA, MISO
  P. BALASUBRAMANIAN, MISO
  C. UMLOR, MISO
  A. ROWAN, MISO
  K. RUUD, MISO
  D. MANJURE, MISO
  M. MCMULLEN, MISO

- 17PESGM2092, Transient Stability Modes of DFIG in Large Disturbance Based on Reduced-Order DAE Models
  Y. YE, Tsinghua University
  J. RUAN, ABB (China) Limited
  Z. LU, Tsinghua University
  Y. QIAO, Tsinghua University

- 17PESGM0377, Inter-Connected Power System Frequency Stability with Wind Penetration by Using Fuzzy-GrHDP
  Y. TANG, Florida Atlantic University
  H. HE, University of Rhode Island

- 17PESGM1312, Enhancing Security and Resilience of Bulk Power Systems via Multisource Big Data Learning
  L. GUAN, South China University of Technology
  J. ZHANG, South China University of Technology
  Y. XU, Nanyang Technological University
  L. ZHONG, South China University of Technology
  X. LI, South China University of Technology

- 17PESGM0967, Modeling the Transient Security Constraints of Natural Gas Network in Day-Ahead Power System Scheduling
  J. YANG, Tsinghua University
  N. ZHANG, Tsinghua University
  C. KANG, Tsinghua University
  P. PINSON, Technical University of Denmark

- 17PESGM1984, A Robust Approach to Restoring Critical Loads in a Resilient Power Distribution System
  A. DUBEY, Washington State University
  S. POUDEL, Washington State University

- 17PESGM0296, Transactive Control of Air Conditioning Loads for Mitigating Microgrid Tie-Line Power Fluctuations
  Y. YAO, Shanghai JiaoTong University
  P. ZHANG, Shanghai JiaoTong University

- 17PESGM0588, Distinguishing Between Natural and Forced Oscillations Using a Cross-Spectrum Index
  R. XIE, Montana Tech
  D. TRUDNOWSKI, Montana Tech

- 17PESGM0652, Locating the Source of Forced Oscillations Using PMU Measurements and System Model Information
  U. AGRAWAL, University of Wyoming
  J. PIERRE, University of Wyoming
  J. POLLUM, Pacific Northwest National Laboratory
  D. DUAN, University of Wyoming
  D. TRUDNOWSKI, Montana Tech of the University of Montana
  M. DONNELLY, Montana Tech of the University of Montana

- 17PESGM1172, Performance Comparison of Three Algorithms for Estimating Oscillation Modes Using Ringdown Data
  X. ZHANG, Tsinghua University
  N. ZHOU, Binghamton University
  X. XIE, Tsinghua University
  Z. XU, Sifang Automation Co. Ltd.
Monday Afternoon, continued

- 17PESGM1979, MIMO Model Reduction of Modern Power Grids with Wind Generation: Some New Findings
  J. KAUR, Penn State
  N. CHAUDHURI, Penn State
- 17PESGM0661, Time Delay Definitions and Characterization in the Pacific DC Intertie Wide Area Damping Controller
  F. WILCHES-BERNAL, Sandia National Laboratories
  B. PIERRE, Sandia National Laboratories
  R. ELLIOTT, Sandia National Laboratories
  D. SCHOENWALD, Sandia National Laboratories
  R. BYRNE, Sandia National Laboratories
  J. NEELY, Sandia National Laboratories
  D. TRUDNOWSKI, Montana Tech
- 17PESGM0727, Control and Derating of a PV Inverter for Harmonic Compensation in a Smart Distribution System
  G. TODESCHINI, Swansea University
- 17PESGM1561, Mitigation of Harmonic Instability in Offshore Wind Farms Using Supplementary Signals in the HVDC Control
  A. KORAI, University of Duisburg-Essen
  I. ERLICH, University of Duisburg-Essen
- 17PESGM0526, Overload Mitigation Control of Droop-Controlled Grid-Forming Sources in a Microgrid
  W. DU, University of Wisconsin-Madison
  R. LASSETER, University of Wisconsin-Madison
- 17PESGM1921, Hardware-in-the-Loop Relay Testing in Dominon’s Blackstart Plan
  R. LIU, Washington State University
  R. SUN, Dominion Virginia Power
  M. TANIA, Dominion Integrated Resource Planning
- 17PESGM1166, Improved Current Order Control Strategy for Effective Mitigation of Commutation Failure in HVDC System
  D. SHU, Tsinghua University
  Q. JIANG, Tsinghua University
  C. ZHANG, Tsinghua University
  Z. LIU, Tsinghua University
  C. LI, EPRI CSG

PES Young Professional Panel Session (panel)

Monday, 17 July, 2017, 2:00 PM–4:00 PM G – 203 Executive Meeting Room
Sponsored by: Power & Energy Society
Chair: J. HOFMAN, IET

This panel session will highlight technical contributions in the Power and Energy field from the PES YP community. Invited YP members will provide presentations on their career progress since graduation, and current projects and research efforts.

Awards Workshop (panel)

Monday, 17 July, 2017, 2:00 PM–3:30 PM G – 306 Tiered Classroom
Sponsored by: Power & Energy Society
Chair: Vahid Madani, PGE

Power & Energy Society (PES) is transitioning to an on-line nomination process for submission and processing of the PES Awards. The on-line submission starts in mid-September 2017, for the class of 2018, and will be aligned closely with the IEEE process. At this Workshop, attendees will have opportunity for hands on step-by-step (using personal computers) learning or listen to the presenters and participate in the Q & A. Bring your computer of choice if you like to follow during the workshop. There will be ample opportunity to review timeline updates for nominating a colleague, ask some of the administrative questions related to the entire Awards nomination such as qualifications, references, endorsements, or to provide feedback as the instructors step through the new nomination process. Your participation also helps PES staff to make it easier for recognizing colleagues.

Outline:
1. Introduction and Overview
   a. Awards history
   b. Number and types of Awards
   c. Categories and participation / qualification classification
2. Newly released Awards enhancement Website
   a. Why new look?
   b. Where do I find information?
   c. Q & A
   d. Attendee feedback

3. Nomination timelines
   a. Open Applications window
   b. References and endorsements submission process
   c. Process after nomination window is closed
   d. How does PES Awards process work for best WG and Prize Paper Awards
   e. Q & A

4. On-line nomination review
   a. Q & A

Evaluating the Performance of Modern Heuristic Optimizers on Smart Grid Operation Problems (panel)

Monday, 17 July, 2017, 3:00 PM–5:00 PM  G – 300 Tiered Classroom

Sponsored by:  (AMPS) Intelligent Systems
Chair:  J. RUEDA TORRES, Delft University of Technology, Netherlands

The increasing penetration of renewable energy sources and the new and adaptive patterns of demand side response entail a higher level of variability of the operation of electrical sustainable power systems. In this context, operational problems possess highly complex mathematical properties (e.g. non-convexity, discontinuity, multi-modality, high-dimensionality) and high computational burden, which emphasizes the need of advanced optimization solvers in order to find optimal solutions that guarantee efficient and flexible operations.

This panel introduces two benchmark problems, namely, Stochastic OPF Based Active-Reactive Power Dispatch, and the Optimal Scheduling of Distributed Energy Resources. Besides, the panel will present the results and a comparative evaluation concerning the performance of different modern heuristic optimization algorithms, which are developed by different researchers worldwide. These researchers are challenged to solve the benchmarks, which are treated as black-box problems. They are only allowed to improve the methodological framework of their algorithms.

PANELISTS:
• 17PESGM2617, Test Bed 1: Stochastic OPF Based Active-Reactive Power Dispatch  S. RIVERA, Universidad Nacional de Colombia
• 17PESGM2611, Test bed 2: Optimal Scheduling of Distributed Energy Resources  Z. VALE, Polytechnic of Porto
• 17PESGM2612, Solving Smart Grid Operation Problems with MVMO: Reference Results for Comparison  I. ERLICH, University of Duisburg-Essen
• 17PESGM3062, Solving Smart Grid Operation Problems Through Variable Neighborhood Search  L. MACEDO, São Paulo State University-Illa Solteira
• 17PESGM3063, Levy Differential Evolutionary Particle Swarm Optimization (LEVY DEEPSO)  K. PANDYA, CPSIT CHARUSAT-Gujarat
• 17PESGM3075, Modified Chaotic Biogeography-Based Optimisation (CBBO) with Random Sinusoidal Migration  S. RIVERA, Universidad Nacional de Colombia
• 17PESGM3079, Cooperative Combination of the Cross-Entropy Method and the Evolutionary Particle Swarm Optimization to Improve Search Domain Exploration and Exploitation  L. CARVALHO, INESC TEC
• 17PESGM2613, Comparative Evaluation of the Performance of Modern Heuristic Optimizers on Smart Grid Operation Problems  J. RUEDA TORRES, Delft University of Technology, Netherlands

Developments in Energy Storage Technology with Renewable Generation Sources (panel)

Monday, 17 July, 2017, 3:00 PM–5:00 PM  G – 200 Tiered Classroom

Sponsored by:  Electric Machinery
Chair:  M. RICHWINE, GE

Energy Storage has multiple technical and economic facets that are rapidly evolving. This panel will focus on recent developments, with examples of technology actually in use or under active development that include rotating machine technology.
Monday Afternoon, continued

**Integrating Wind and Solar with Your Hydro (panel)**

**Monday, 17 July, 2017, 3:00 PM–5:00 PM**

**S – Michigan B**

**Sponsored by:** Energy Development and Power Generation

**Chair:** E. VAUGHN, Bureau of Reclamation Technical Service Center, Denver, Colorado

Presentation by utilities, consultants, and manufacturers on the challenges and impacts of wind and solar integration on a hydrogenating power plant. The impact to controls, operations, speed governors, and other challenges will be explored.

**PANELISTS:**
- 17PESGM3006, Andritz Wind and Solar Integration Effects on Speed Governors
  W. HOFBRAUER, Andritz Hydro
- 17PESGM3007, TBD
  P. SEN, Colorado School of Mines
- 17PESGM3008, Integrating Hydroelectric Resources into Isolated Microgrid Systems
  R. POSTIAK, Fostiak Engineering, LLC
- 17PESGM3009, Integrating Hydroelectric Resources into Isolated Microgrid Systems
  B. SADDEN, Stantec
- 17PESGM3010, Coupling Hydropower, PV and Flexible Loads in Carbon Free Microgrid
  K. ZHANG, Cornell University

**Addressing Grid Changes and Challenges through IEEE Global Collaborative Initiatives (panel)**

**Monday, 17 July, 2017, 3:00 PM–5:00 PM**

**G – 100 Tiered Classroom**

**Sponsored by:** Local Organizing Committee

**Chair:** M. VAIMAN, V&R Energy

The energy industry worldwide is experiencing significant changes caused by rapid technology transformation, security and environmental concerns, and evolving consumer needs. The initiatives we undertake today affect the way in which the grid is operated and maintained in the future. To help address opportunities and challenges, IEEE has recently initiated cooperation with the U.S. Department of Energy (DOE), the U.S. Federal Energy Regulatory Commission (FERC), the North-American Energy Reliability Corporation (NERC), European Union (EU), and California Public Utility Commission (CPUC). This panel discusses how government and regulatory agencies address opportunities and challenges and initiatives with IEEE to bring together communities and agencies for a helpful impact on the global energy directions through grid modernization.

**PANELISTS:**
- 17PESGM3043, IEEE Policy Technical Support Initiative
  J. NELSON, TVA
- 17PESGM2542, DOE Initiatives
  M. PESIN, DOE
- 17PESGM2541, An Overview of the Federal Energy Regulatory Commission
  M. TABA, FERC
- 17PESGM3045, ENTSO-E Overview and Initiatives
  R. SCHROEDER, ENTSO-E
- 17PESGM3044, Initiatives Led by North American Transmission Forum
  T. GALLOWAY, NATF (North American Transmission Forum)
- 17PESGM2540, Reliability and the Future of the Electricity Grid: A North American Bulk Power System Perspective
  J. MOURA, NERC
Monday Evening

Technical Committee and Working Groups  (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM  S – Riverwalk AB
Technical Committees and Working Groups will have posters to discuss their work.

Analytic Methods for Power Systems Poster Session  (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM  S – Riverwalk AB
Sponsored by: Analytic Methods for Power Systems

PAPERS AND AUTHORS:
• 17PESGM1612, Challenges for Probabilistic Generation Adequacy Assessment in Sub-Saharan Africa
  G. EDWARDS, University of Edinburgh
  C. DENT, University of Edinburgh
  N. WADE, Newcastle University

AMPS Computer Analytical Methods Poster Session  (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM  S-Riverwalk AB
Sponsored by: (AMPS) Computer Analytical Methods
Chair: Z. HUANG, PNNL

PAPERS AND AUTHORS:
• 17PESGM0069, Harmonic Resonance Analysis Method Based on Singular Value Decomposition Theory
  Y. LI, Hunan University
  Z. SHUAI, Hunan University
  J. SHEN, Illinois Institute of Technology
  Y. HONG, Hunan University

• 17PESGM0152, Smart Inverter Impacts on California Distribution Feeders with Increasing PV Penetration: A Case Study
  Z. PECENAK, UC San Diego
  J. KLEISSL, UC San Diego
  V. DISFANI, UC San Diego

• 17PESGM0219, Impact of Network Splitting on Cascading Failure Blackouts
  F. SLOOTHAAK, Eindhoven University of Technology
  B. ZWART, Eindhoven University of Technology

• 17PESGM0368, Implementation of a Novel Unified Power Flow Controller into Newton-Raphson Load Flow
  J. YANG, Zhejiang University
  Z. XU, pesgm2017@mirasmart.com
  W. WANG, State Grid Jiangsu Electric Power Company
  H. CAI, State Grid Jiangsu Electric Power Company

• 17PESGM0475, Application of High Performance Computing in California ISO’s On-Line DSA System
  K. ABDUL-RAHMAN, California ISO
  J. WU, California ISO
  E. HAQ, California ISO
  F. HOWELL, Powertech Labs Inc.
  X. LIN, Powertech Labs Inc.
  L. WANG, Powertech Labs Inc.

• 17PESGM0497, Optimal Controller Design for AGC with Battery Energy Storage Using Bacteria Foraging Algorithm
  P. XIE, Electric Power Research Institute, China Southern Power Grid
  Z. ZHU, Electric Power Research Institute, China Southern Power Grid
  P. XUAN, Electric Power Research Institute, China Southern Power Grid

• 17PESGM0500, A Multivariate Ensemble Framework for Short Term Solar Photovoltaic Output Power Forecast
  M. RAZA, University of Queensland, Australia
  M. NADARAJAH, University of Queensland
  C. EKANAYAKE, Griffith University
Monday Evening, continued

- 17PESGM0576, Robust State Estimator Based on Hyperbolic Cosine Function
  Y. CHEN, North China Electric Power University
  J. MA, University of Sydney
  J. ZHANG, SGCC

- 17PESGM0635, Deep Learning in Photovoltaic Penetration Classification
  Y. TAO, Sentient Energy, Inc.
  M. ZHANG, Sentient Energy, Inc.
  M. PARSONS, Sentient Energy, Inc.

- 17PESGM0637, Idaho Power Experience of Implementing Cascade Analysis Study Using the Node/Breaker Model
  R. RAMANATHAN, Maxisys Inc.
  A. POPAT, Maxisys Inc.
  M. PAPIC, Idaho Power
  O. CINIGLIO, Idaho Power

- 17PESGM0808, Identification of Power Grid Critical Lines Based on Comprehensive Transmission Betweenness
  Y. CAO, ZheJiang University
  Y. ZHANG, ZheJiang University
  C. GUO, ZheJiang University
  B. ZHU, State Grid Zhejiang Electric Power Company
  L. XU, State Grid Zhejiang Electric Power Company

- 17PESGM0868, Solving the Natural Gas Flow Problem Using Semidefinite Program Relaxation
  A. OJHA, Virginia Tech
  V. KEKATOS, Virginia Tech
  R. BALDICK, University of Texas at Austin

- 17PESGM0957, Power System Bad Load Data Detection Based on an Improved Fuzzy C-Means Clustering Algorithm
  Z. WU, China Southern Power Grid
  X. KONG, Tianjin University
  X. DONG, China Southern Power Grid
  Q. HU, Tianjin University
  Z. LIU, China Southern Power Grid
  Y. CHEN, Tianjin University
  Y. ZENG, Tianjin University

- 17PESGM1020, Exploration of Power Flow Distribution to Reveal Scale-Free Characteristics in Power Grids
  A. NASIRUZZAMAN, Nanyang Technological University
  M. AKTER, Deakin University
  M. MAHMUD, Deakin University
  H. POTA, University of New South Wales

- 17PESGM1044, Wide Area Static Security Assessment of Power Systems Using Wavelet Support Vector Machine
  V. T, Indian Institute of Technology Indore
  R. BUJETHIYA, Indian Institute of Technology Indore
  R. MEENA, Indian Institute of Technology Indore
  T. JAIN, Indian Institute of Technology Indore

- 17PESGM1206, Allocating Distributed Generators for Resilient Distribution System Under Uncertain Probability Distribution of Natural Disasters
  S. BABAEI, Oklahoma State University
  C. ZHAO, Oklahoma State University
  T. DING, Xi'an Jiaotong University

- 17PESGM1421, A Combined Transmission and Distribution System Co-Simulation Framework for Assessing the Impact of Volt/VAR Control on Transmission System
  K. BALASUBRAMANIAM, Argonne National Lab
  S. ABHYANKAR, Argonne National Lab

- 17PESGM1451, Distributed Contingency Analysis over Wide Area Network among Dispatch Centers
  Z. REN, Tsinghua University
  Y. CHEN, Tsinghua University
  S. HUANG, Tsinghua University
  S. SHENG, Dept. NARI Technology Development Limited Company
  H. ZHENG, Shanxi Electric Power Grid
  X. LIU, Shanxi Electric Power Grid

- 17PESGM1524, Recommendation of Geographic Distributed Charging Stations for Electric Vehicles: A Game Theoretical Approach
  T. GUO, Zhejiang University
  P. YOU, Zhejiang University
  Z. YANG, Zhejiang University
• 17PESGM1608, Faster than Real-Time Dynamic Simulation for Large-Size Power System with Detailed Dynamic Models Using High-Performance Computing Platform
  R. HUANG, Pacific Northwest National Lab
  S. JIN, Pacific Northwest National Lab
  Y. CHEN, Pacific Northwest National Lab
  R. DIAO, Pacific Northwest National Lab
  B. PALMER, Pacific Northwest National Lab
  Q. HUANG, Pacific Northwest National Lab
  Z. HUANG, Pacific Northwest National Lab

• 17PESGM1750, Graph-Based Multiple-Line Outage Identification in Power Transmission Systems
  B. WANG, Pennsylvania State University
  C. GAN, Pennsylvania State University
  J. YANG, Pennsylvania State University
  C. HEDGE, Iowa State University
  J. WU, University of Arkansas

• 17PESGM1794, Periodic Steady State of Power Networks Using the Numerical Differentiation Method and Spline Interpolation
  M. DÍAZ ARAUJO, Universidad Michoacana de San Nicolas de Hidalgo
  J. MEDINA RIOS, Universidad Michoacana de San Nicolas de Hidalgo

• 17PESGM2072, Faster-Than-Real-Time Power System Transient Stability Simulation Using Parallel General Norton with Multiport Equivalent (PGNME)
  B. SULLIVAN, Mississippi State University
  J. SHI, Mississippi State University
  M. MAZZOLA, Mississippi State University
  B. SARAVI, Mississippi State University

• 17PESGM2093, Optimization Based Real-Time Frequency Dependent Reduced Order Modeling of Power Grid
  A. THAKALLAPELLI, UNC Charlotte
  S. KAMALASADAN, UNC Charlotte

• 17PESGM2131, A Study of the Impact of Peak Demand on Increasing Vulnerability of Cascading Failures to Extreme Contingency Events
  B. VYAKARANAM, PNNL
  M. VALLEM, PNNL
  T. NGUYEN, pesgm2017@mirasmart.com
  N. SAMAAN, PNNL
  A. BERSCHEID, pesgm2017@mirasmart.com
  Y. MAKAROV, pesgm2017@mirasmart.com
  R. DIAO, pesgm2017@mirasmart.com

AMPS Distribution System Analysis Poster Session (poster)

Monday, 17 July, 2017, 5:00 PM–8:00 PM              S – Riverwalk AB
Sponsored by:             (AMPS) Distribution System Analysis
Chair:                           J. FULLER, Pacific Northwest National Laboratory

PAPERS AND AUTHORS:
• 17PESGM0196, A Method to Evaluate Maximum Available Capability of Accommodating Plug-In Electric Vehicles in Residential Distribution Networks
  Y. HUANG, Guangzhou Power Supply Bureau Co., Ltd.
  S. CHEN, Guangzhou Power Supply Bureau Co., Ltd.
  K. WANG, Guangzhou Power Supply Bureau Co., Ltd.
  F. WEN, Zhejiang University
  W. LIU, Guangzhou Power Supply Bureau Co., Ltd.
  Y. XU, Guangzhou Power Supply Bureau Co., Ltd.

• 17PESGM0325, Interactions between Gas Networks and Microgrids through Microturbines
  X. XU, Queen's University Belfast
  K. LI, Queen's University Belfast
  H. JIA, Tianjin University
  Y. GUO, Chinese Academy of Sciences

• 17PESGM0436, Agent-Based Voltage Control in Competitive Electricity Markets: A Game-Theoretic Approach
  X. WANG, Tianjin University
  T. XU, Tianjin University
  C. WANG, Tianjin University
  R. XU, Tianjin University
  Z. E, State Grid Tianjin Electric Power Co.
Monday Evening, continued

- **17PESGM0445**, Toward Optimal Multi-Period Network Reconfiguration for Increasing the Hosting Capacity of Distribution Networks
  Y. FU, Tianjin University
  H. CHIANG, Cornell University

- **17PESGM0557**, Location and Time Domain Analysis of DER in Distribution Load Flow
  B. MURUGANANTHAM, Pondicherry Engineering College
  R. GNANADASS, Pondicherry Engineering College
  P. N. P., Indian Institute of Technology, Roorkee

- **17PESGM0574**, Two Kinds of Security Distance for Distribution Network
  J. XIAO, Tianjin University
  B. ZHANG, Tianjin University
  G. ZU, Tianjin University
  G. ZHEN, Tianjin University
  J. XIAO, Tianjin University
  Q. LIN, Tianjin University

- **17PESGM0710**, Adaptive Reactive Power Control of PV Power Plants for Improved Power Transfer Capability under Ultra-Weak Grid Conditions
  D. YANG, Aalborg University
  X. WANG, Aalborg University
  F. LIU, Central Research Institute of Huawei Technologies Co., Ltd.
  K. XIN, Central Research Institute of Huawei Technologies Co., Ltd.
  F. BLAABJERG, Aalborg University

- **17PESGM0791**, Distributed Energy Management for the Multi-Microgrid System Based on ADMM
  Y. LIU, Nanyang Technological University
  H. GOOI, Nanyang Technological University
  H. XIN, Zhejiang University

- **17PESGM0972**, An Operational Planning Framework for Prosumers Participating in Electricity Markets
  R. HEJEEJO, University of Newcastle
  J. QIU, Commonwealth Scientific and Industrial Research Organization (CSIRO)

- **17PESGM0973**, Verified Load Flow Modelling and Scenario Simulation of a Three-Phase Four-Wire Low Voltage Residential Distribution Network in Australia
  J. VARENDORFF, Queensland University of Technology
  G. WALKER, Queensland University of Technology
  H. PEZESHKI, Queensland University of Technology

- **17PESGM1022**, A Novel Demand Transition Procedure for Outage Risk Reduction in Distribution Networks
  Y. SU, Sichuan University
  J. LIU, Sichuan University
  Y. LIU, Sichuan University
  G. TAYLOR, Brunel University London

- **17PESGM1060**, Voltage Regulation with Autonomous Distributed Smart Inverters in a Low Voltage Network
  M. GHAPANDAR KASHANI, North Carolina State University
  S. BHATTACHARYA, North Carolina State University
  J. MATAMOROS, Enphase Energy
  D. KAISER, Enphase Energy
  M. CESPEDES, Enphase Energy

- **17PESGM1127**, Motivation and Requirements for Quasi-Static Time Series (QSTS) for Distribution System Analysis
  M. RENO, Sandia National Laboratories
  J. DEBOEVER, Georgia Institute of Technology
  B. MATHER, National Renewable Energy Laboratory

- **17PESGM1156**, A Historical Data-Driven Unscented Kalman Filter for Distribution System State Estimation
  M. HUANG, Hohai University
  Z. WEI, Hohai University
  G. SUN, Hohai University
  K. CHEUNG, GE Grid Solutions
  Y. SUN, Hohai University
  H. ZANG, Hohai University
Monday Evening, continued

• 17PESGM1244, Comparison of Voltage Control Methods in Distribution Systems Using Q-V Based PI and Droop Controls of Solar Inverters
  S. NOWAK, University of British Columbia, Okanagan
  M. METCALFE, University of British Columbia, Okanagan
  W. EBERLE, University of British Columbia, Okanagan
  L. WANG, University of British Columbia, Okanagan

• 17PESGM1306, Fault Analysis of Successive Faults on Multi-Feeders in Resonant Grounding Distribution Network
  Z. WU, Electric Power Research Institute of China Southern Power Grid
  Y. CAI, South China University of Technology
  X. DONG, Electric Power Research Institute of China Southern Power Grid
  Z. LIU, Electric Power Research Institute of China Southern Power Grid
  L. CHEN, Electric Power Research Institute of China Southern Power Grid

• 17PESGM1479, Simulation Analysis of Arc Grounding Fault in Non-Solidly Earthed Network
  S. LI, China University of Petroleum
  Y. XUE, China University of Petroleum
  B. XI, Shandong University of Technology

• 17PESGM1495, Power Distribution System Equipment Failure Identification Using Machine Learning Algorithms
  M. DOOSTAN, University of North Carolina at Charlotte
  B. CHOWDHURY, University of North Carolina at Charlotte

• 17PESGM1565, Distributed Generators Allocation in Distribution System
  P. BABU, IIT (BHU) Varanasi
  S. SINGH, IIT (BHU) Varanasi
  S. SINGH, IIT (BHU) Varanasi

• 17PESGM1572, Smart Meter Data to Identify Customer Voltage Fluctuations Caused by Solar PV
  M. VARIANI, Nexant Inc.
  E. LIU, Nexant Inc.
  L. DOW, Nexant Inc.
  J. DIRKMAN, Nexant Inc.
  T. MARTIN, Pacific Gas and Electric Company
  W. WHITLOCK CORNISH, Pacific Gas and Electric Company
  P. BAKER, Pacific Gas and Electric Company
  O. TRINKO, Pacific Gas and Electric Company

• 17PESGM1580, Multi-Agent System Architecture for Enhanced Resiliency in Autonomous Microgrids
  V. LAKSHMINARAYANAN, University of Houston
  K. RAJASHEKARA, University of Houston
  B. ZHU, University of Texas at Dallas

• 17PESGM1616, On the Use of pPMU for State Estimation in Distribution Systems
  R. SILVA, University of Campinas
  F. LABURU, University of Campinas
  M. DE ALMEIDA, University of Campinas

• 17PESGM1637, Data-Driven Joint Topology and Line Parameter Estimation for Renewable Integration
  J. YU, Stanford University
  Y. WENG, Stanford University
  R. RAJAGOPAL, Stanford University

• 17PESGM1670, Renewable Energy Sources Operational Performance Evaluation with Hybrid Model
  R. PANDEY, Indian Institute of Technology (BHU)
  H. KUMAR, IIT (BHU)

• 17PESGM1813, Short-Term Load Forecasting Based Automatic Distribution Network Reconfiguration
  H. LIANG, National Renewable Energy Laboratory
  F. DING, National Renewable Energy Laboratory
  Y. ZHANG, National Renewable Energy Laboratory

• 17PESGM1822, Towards the Improvement of Multi-Objective Evolutionary Algorithms for Service Restoration
  L. MARQUES, University of Sao Paulo
  M. CAMILLO, Paranaense Company of Energy
  A. DELBEM, University of Sao Paulo
  J. LONDON JR., University of Sao Paulo

• 17PESGM1910, A New Accurate Locating Strategy for Switched Capacitors in Smart Distribution Network
  R. CHEN, Wuhan University
  T. LIN, Wuhan University
  R. BI, Wuhan University
  X. XU, Central China Electric Power
• 17PESGM0195, Interdependent Strategic Cyber Defense and Robust Switching Control Design for Wind Energy Systems
  J. CHEN, New York University
  Q. ZHU, New York University

• 17PESGM0351, Optimal Dynamic Dispatch of Pareto Frontier for Microgrid Based on MOIBBO Algorithm
  Z. LYU, Guangxi University
  X. WANG, Guangxi University
  Z. YANG, Guangxi University

• 17PESGM0604, Bad Data Detection and Estimation in High Dimensional Measurement Data
  J. LIM, Burns & McDonnell
  C. DEMARCO, University of Wisconsin – Madison

• 17PESGM1031, Two-Stage Energy Management of Residential Microgrid Community Using Pairing Strategy
  C. JU, Nanyang Technological University
  P. WANG, Nanyang Technological University
  Y. XU, Nanyang Technological University

• 17PESGM1198, Emergency Voltage and Reactive Power Control Using Reduction of Variables Considering Effectiveness Against Voltage Stability
  N. KAWAMOTO, Osaka Prefecture University
  S. TAKAYAMA, Osaka Prefecture University
  A. ISHIGAME, Osaka Prefecture University

• 17PESGM1249, A Wavelet-Based Universal Data Compression Method for Different Types of Signals in Power Systems
  X. JI, Tsinghua University
  F. ZHANG, Tsinghua University
  L. CHENG, Tsinghua University
  C. LIANG, China Electric Power Research Institute
  H. HE, China Electric Power Research Institute

• 17PESGM1315, Multistage Optimal PMU Placement for Hybrid State Estimation
  J. HAZRA, IBM Research
  K. DAS, DTU Denmark
  B. ROY, NIT Agartala
  M. PADMANABAN, IBM Research
  A. SINHA, IIT Kharagpur

• 17PESGM1396, An Advanced Fireworks Algorithm for Distribution Network Reconfigurations
  H. MORI, Meiji University
  H. IKEGAMI, Meiji University

• 17PESGM1482, A Frequency Based Real-time Electricity Rate for Residential Prosumers
  S. HAMBRIDGE, North Carolina State University
  N. LU, North Carolina State University
  A. HUANG, North Carolina State University
  R. YU, North Carolina State University

• 17PESGM1664, Resiliency and Transient Stability of AC/DC Systems
  W. KUEHN, Frankfurt UAS

• 17PESGM1674, Forecasting Wind Power Generation by a New Type of Radial Basis Function-Based Neural Network
  G. CHANG, National Chung Cheng University
  H. LU, National Chung Cheng University
  Y. CHEN, National Chung Cheng University
  Y. CHANG, Institute of Nuclear Energy Research

• 17PESGM1761, Online Analysis of Voltage Security in a Microgrid Using Convolutional Neural Networks
  Y. WANG, University of Tennessee, Knoxville
  H. PULGAR-PAINEMAL, University of Tennessee, Knoxville
  K. SUN, University of Tennessee, Knoxville

• 17PESGM1810, TOOCC: Enabling Heterogeneous Systems Interoperability in the Study of Energy Systems
  B. TEIXEIRA, Polytechnic of Porto
  F. SILVA, Polytechnic of Porto
  T. PINTO, Polytechnic of Porto
  G. SANTOS, Polytechnic of Porto
  I. PRAÇA, Polytechnic of Porto
  Z. VALE, Polytechnic of Porto

• 17PESGM2298, Demand Response in Presence of Multiple Suppliers
  S. SIDDIQI, Jubail University College
  R. KOWALCZYK, Swinburne University of Technology
  B. VO, Swinburne University of Technology
Monday Evening, continued

EMC poster session *(poster)*

Monday, 17 July, 2017, 5:00 PM–8:00 PM  
S – Riverwalk AB

Sponsored by: Electric Machinery

PAPERS AND AUTHORS:

- **17PESGM0816**, The Conductor as the Cornerstone of Winding Manetomotive Force  
  J. ROCHA, GE  
  P. SILVA, UNIFEI  
  E. BORTONI, UNIFEI

- **17PESGM0840**, A Sensorless Vector-Control Strategy for MPPT of a Wind-Driven BDFRG System  
  M. MOUSA, Tanta University  
  S. ALLAM, Tanta University  
  E. RASHAD, Tanta University

- **17PESGM1223**, Dynamic State Estimation Based Synchronous Generator Model Calibration Using PMU Data  
  L. SUN, Georgia Institute of Technology  
  A. MELIOPOULOS, Georgia Institute of Technology  
  Y. LIU, Georgia Institute of Technology  
  B. XIE, Georgia Institute of Technology

- **17PESGM1857**, Physical Rotor Inertia of DFIG Wind Turbines for Short-Term Frequency Regulation in Low-Inertia Grids  
  N. DAVID, Iowa State University  
  Z. WANG, Iowa State University

  J. FONSECA, UNIFEI  
  C. COELHO, UNIFEI  
  E. BORTONI, UNIFEI

- **17PESGM2222**, Modeling and Analysis of Stator Interturn Faults in Permanent Magnet Synchronous Machine  
  C. BARROS, Federal University of Paraíba  
  L. BARROS, Federal University of Rio Grande do Norte

- **17PESGM2294**, Performance Evaluation of DTC IM Drive for an EV Application  
  C. REDDY, Indian Institute of Technology Guwahati  
  K. PRABHAKAR, Indian Institute of Technology Guwahati  
  A. SINGH, Indian Institute of Technology Guwahati  
  P. KUMAR, Indian Institute of Technology Guwahati

AMPS Reliability and Risk Analysis Poster Session *(poster)*

Monday, 17 July, 2017, 5:00 PM–8:00 PM  
S – Riverwalk AB

Sponsored by: (AMPS) Reliability and Risk Analysis  
Chair: C. DENT, University of Edinburgh

PAPERS AND AUTHORS:

- **17PESGM0071**, A Cross-Entropy-Based Control Variate Method for Power System Reliability Assessment  
  Y. TANG, Chongqing University  
  W. LI, Chongqing University  
  Y. ZHAO, Chongqing University

- **17PESGM0104**, Reliability Comparison of Fault-Tolerant HVDC Based Modular Multilevel Converters  
  M. ALHARBI, North Carolina State University  
  N. YOUSEFPOOR, Quanta Technology  
  S. BHATTACHARYYA, North Carolina State University

- **17PESGM0118**, Determining an Optimal Number of Spares for Hydro One 230/115 kv Auto-Transformers  
  G. HAMOUD, Hydro One  
  P. ZHAO, Hydro One

- **17PESGM0147**, Optimal Dispatch of Electrified Autonomous Mobility on Demand Vehicles during Power Outages  
  C. SHEPPARD, University of California, Berkeley  
  L. DUNN, University of California, Berkeley  
  S. BAE, University of California, Berkeley  
  M. GARDNER, University of California, Berkeley
Monday Evening, continued

• 17PESGM0176, Power System Transmission Line Fault Diagnosis Based on Combined Data Analytics
  H. WU, Sichuan University
  J. LIU, Sichuan University
  G. TAYLOR, Brunel University London
  Y. LIU, Sichuan University
  G. QIU, Sichuan University

• 17PESGM0223, Deducing Historical Correlations for Realistic Stochastic Forecasting of Intermittent Energy Sources
  W. WADMAN, IBM Research
  Y. KIM, IBM Research
  M. LAVIN, IBM Research
  S. SHUKLA, IBM Research
  F. HENG, IBM Research

• 17PESGM0692, Method for Reliability Analysis of Distribution Grid Communications Using PRMs-Monte Carlo Methods
  M. ARMENDARIZ, KTH – Royal Institute of Technology
  R. GONZALEZ, KTH – Royal Institute of Technology
  M. KORMAN, KTH – Royal Institute of Technology
  L. NORDSTRÖM, KTH – Royal Institute of Technology

• 17PESGM0725, Outage Prediction Using Radar Measurement for Facilitating Distribution System Restoration
  M. YUE, BNL
  M. JENSEN, pesgm2017@mirasmart.com
  M. JENSEN, pesgm2017@mirasmart.com
  S. GIANGRADE, pesgm2017@mirasmart.com

• 17PESGM0742, Power Grid State Estimation after a Cyber-Physical Attack Under the AC Power Flow Model
  S. SOLTAN, Columbia University
  G. ZUSSMAN, Columbia University

• 17PESGM1298, Investigation of Fault Ride-Through Capability of AC-DC Hybrid Microgrids During AC Network Faults
  L. MEEGAHAPOLA, RMIT University
  I. NUTKANI, RMIT University
  B. MCGRATH, RMIT University

• 17PESGM1534, Credible Capacity Evaluation of a PV Plant with Energy Storages Governed by MDP Control Strategy
  Z. ZHANG, Tsinghua University
  Y. CHEN, Tsinghua University
  X. ZHANG, Tsinghua University

• 17PESGM1663, Stochastic Dynamic Economic Dispatch with Multiple Wind Farms Based on Wind Power Conditional Distribution Models
  C. TANG, Wuhan University
  J. XU, Wuhan University
  J. LIU, Wuhan University
  X. MA, State Grid Tianjin Electric Power Company, China
  H. JIANG, Wuhan University

• 17PESGM1850, Variable Energy Resource Capacity Contributions Consistent with Reserve Margin and Reliability
  N. ABDEL-KARIM, NERC
  E. PRESTON, Transmission Adequacy Consulting
  J. MOURA, NERC
  T. COLEMAN, NERC

• 17PESGM2055, User-Aware Reliability Assessment and Compensation Method in Distribution System
  S. IWANG, Tianjin University
  L. LIU, Tianjin University

• 17PESGM2091, Economic Sizing of Distributed Energy Resources for Reliable Community Microgrids
  C. YUAN, Ohio State University
  M. ILLINDALA, Ohio State University

• 17PESGM2108, Replacement of Aging Power Transformers Considering System Risks under Multi-Level Load
  Z. YE, Xi’an Jiaotong University
  K. WU, Xi’an Jiaotong University
Monday Evening, continued

C. CHENG, Xi’an Jiaotong University
W. SONG, Xi’an Jiaotong University
• 17PESGM2133, Evaluating the Contribution of Demand Response to Supply Adequacy in Smart Distribution System with Consideration the Impact of Human Factor
  G. WU, North China Electric Power University
  B. ZENG, North China Electric Power University
  Y. LI, North China Electric Power University
  M. ZENG, North China Electric Power University

• 17PESGM2162, Discrete Optimization via Simulation to Determine Reliable Network Investments
  T. LAGOS, University of Chile
  R. SACAAAN, Pontificia Universidad Católica de Chile
  A. NAVARRO-ESPINOSA, University of Chile
  F. ORDÓÑEZ, University of Chile
  H. RUDNICK, Pontificia Universidad Católica de Chile
  R. MORENO, University of Chile/Imperial College

Energy Development and Power Generation – Poster Session  (poster)

Monday, 17 July, 2017, 5:00 PM–8:00 PM          S – Riverwalk AB
Sponsored by:  Energy Development and Power Generation
Chair: B. WOJSZCZYK, DP Global

PAPERS AND AUTHORS:
• 17PESGM0419, Operation and Regulation Scheme and the Application for Microgrids
  J. LIU, Shanghai Jiao Tong University
  W. HUANG, Shanghai Jiao Tong University
  N. TAI, Shanghai Jiao Tong University

• 17PESGM0463, On Sizing the Required Energy of HVDC Based Inertia Emulation for Frequency Control
  E. RAKHSHANI, Technical University of Catalonia, UPC
  H. MEHRJERDI, pesgm2017@mirasmart.com
  N. AL-EMADI, pesgm2017@mirasmart.com
  K. ROUZBEHI, Technical University of Catalonia, UPC

• 17PESGM0485, A New Wind Power Integrated System Based on a Controllably Inductive Filtering and Compensating Method
  Y. PENG, Hunan University
  Y. LI, Hunan University
  K. LEE, Baylor University
  F. LUI, Central South University
  F. YANG, Grid State Energy Research Institute
  B. HU, Grid State Energy Research Institute

• 17PESGM0529, Optimal Placement of Photo-Voltaic Array and Electric Vehicles in Distribution System under Load Uncertainty
  M. DIXIT, S. V. National Institute of Technology
  P. KUNDU, pesgm2017@mirasmart.com
  H. JARIWALA, pesgm2017@mirasmart.com

• 17PESGM0559, Coordinated Control of Multiple Voltage Balancers in a Bipolar DC Microgrid
  X. LI, Tianjin University
  L. GUO, Tianjin University
  Z. GUO, Tianjin University
  C. WANG, Tianjin University
  C. HONG, China Southern Power Grid (CSG)
  Y. ZHANG, China Southern Power Grid (CSG)
  Y. LI, University of Alberta

• 17PESGM0649, The Varied Impacts of Energy Storage and Photovoltaics on Fossil Fuel Emissions
  E. BARRETT, Pacific Northwest National Laboratory
  B. THAYER, Pacific Northwest National Laboratory
  K. STUDARUS, Pacific Northwest National Laboratory
  S. PAL, Pacific Northwest National Laboratory

• 17PESGM0714, Database Simulation Model of the Photovoltaic Array Based on Nelder-Mead Method
  Y. XU, North China Electric Power University
  W. JIN, North China Electric Power University

• 17PESGM0715, Study of Variability Metrics for Solar Irradiance and Photovoltaic Output
  Y. CUI, University of Tennessee
  Y. SU, University of Tennessee
Y. LIU, University of Tennessee
Y. LIU, University of Tennessee
D. SMITH, Tennessee Valley Authority

- 17PESGM0738, A Framework for Intelligent Control of SIRES for Rural Communities
  Z. MAHESHWARI, Oklahoma State University
  R. RAMAKUMAR, Oklahoma State University

- 17PESGM0768, 24-Hour Photovoltaic Generation Forecasting Using Combined Very Short-Term and Short-Term Multivariate Time Series Model
  M. LEE, Sungkyunkwan University
  W. LEE, Ajou University

- 17PESGM0785, Performance Evaluation of Autonomous Single-Phase Self-Excited Induction Generators
  L. WANG, National Cheng Kung University
  T. CHEN, National Cheng Kung University
  A. PROKHOROV, Tomsk Polytechnic University

- 17PESGM0793, An Optimal Regional Time-of-Use Charging Price Model for Electric Vehicles
  J. CHEN, Wuhan University
  J. YANG, Wuhan University
  J. ZHU, China Electric Power Research Institute
  X. LI, China Electric Power Research Institute
  S. ZENG, China Electric Power Research Institute

- 17PESGM0834, A Cascaded High Frequency AC Link System with Reduced Switch Count and Low-Voltage Ride-Through Capability for Large-Scale PV Systems
  N. ELSAYAD, Florida International University
  O. MOHAMMED, Florida International University

- 17PESGM0842, Implementation of SHE Based Genetic Algorithm in Cascaded Half-Bridge Based Multilevel DC Link Inverter Fed from PV Modules
  K. KOTB, University of Tanta
  A. HASSAN, University of Tanta
  E. M. RASHAD, University of Tanta

- 17PESGM1019, Optimum Power Quality Service in Multi-Bus Microgrid Systems
  L. MENG, Aalborg University
  J. GUERRERO, Aalborg University

- 17PESGM1120, Cross-Characterization of PV and Sunshine Profiles Based on Hierarchical Classification
  Z. ZHANG, University of Bath
  R. LI, University of Bath

- 17PESGM1149, Short-Term Photovoltaic Generation Forecasting Based on Similar Day Selection and Extreme Learning Machine
  P. LUO, Hangzhou Dianzhi University
  S. ZHU, pesgm2017@mirasmart.com
  L. HAN, pesgm2017@mirasmart.com
  Q. CHEN, pesgm2017@mirasmart.com

- 17PESGM1154, A Semi-Supervised Anomaly Detection Method for Wind Farm Power Data Preprocessing
  Y. ZHOU, Tsinghua University
  W. HU, Tsinghua University
  Y. MIN, Tsinghua University
  L. ZHENG, Tsinghua University
  B. LIU, State Grid Corporation of China Southwest Branch
  R. YU, State Grid Corporation of China Southwest Branch

- 17PESGM1162, Dynamic Equivalent Modeling Approach of Wind Power Plant with PMSG-WTGs
  L. YE, China Agricultural University
  R. RAO, China Agricultural University
  Y. ZHANG, China Agricultural University
  W. ZHONG, China Electric Power Research Institute

- 17PESGM1243, Battery Energy Storage Sizing for Commercial Customers
  I. ALSAIDAN, University of Denver
  W. GAO, University of Denver
  A. KHODAEI, University of Denver
Monday Evening, continued

- 17PESGM1329, Impact of Active Front End Topology on Wind Farm Resonance
  C. ALMEIDA, Universidade Federal de Minas Gerais
- 17PESGM1350, A New DC Series Arc Fault Detector for Household Photovoltaic Systems
  J. GU, National Taiwan University of Science and Technology
  D. LAI, National Taiwan University of Science and Technology
  M. YANG, St. John's University
- 17PESGM1467, Unified Controller for Overvoltage Prevention, Islanding Detection and LVRT at High Penetration of PV Systems Connected to a LV Grid
  H. KHAN, Indian Institute of Technology, Bombay
  B. FERNANDES, Indian Institute of Technology, Bombay
  A. KULKARNI, Indian Institute of Technology, Bombay
- 17PESGM1496, An Adaptive Droop Based Cooperative Control Framework in DC Microgrids
  S. SAHOO, Indian Institute of Technology Delhi
  D. PULLAGURAM, Indian Institute of Technology Delhi
  M. MISHRA, Indian Institute of Technology Delhi
- 17PESGM1696, Frequency Components Analysis of an Induction Machine under Different Fault Conditions
  T. HU, Wayne State University
  C. WANG, Wayne State University
- 17PESGM1705, The Importance of Dynamic Pricing to the Business Case for Microgrids and Distributed Energy Resources
  B. BUNTE, Green Business Certification Inc.
  J. KELLY, Green Business Certification Inc.
- 17PESGM1728, Circulating Current Reduction Strategy for Three-Phase Parallel Inverters in a Microgrid
  D. SANKARAN, Wayne State University
  C. WANG, Wayne State University
- 17PESGM1796, Control of Modular Multilevel Converters as Virtual Synchronous Machines
  Z. LV, Illinois Institute of Technology
  Q. ZHONG, Illinois Institute of Technology
- 17PESGM1816, The Impact of Seasonal ARMA Wind Speed Modeling on the Reliability of Power Distribution Systems
  A. BIZRAH, King Fahd University of Petroleum and Minerals
  M. AL-MUHAINI, King Fahd University of Petroleum and Minerals
- 17PESGM1899, A Robust Decentralized Control Framework for Enhancing Smart Grid Transient Stability
  M. AYAR, University of Florida
  R. TREVIZAN, University of Florida
  S. OBUZ, University of Florida
  A. BRETAS, University of Florida
  H. LATCHMAN, University of Florida
- 17PESGM1989, Evaluation of the Inertial Response of Variable-Speed Wind Turbines Using Advanced Simulation
  X. WANG, Northeastern University
  W. GAO, University of Denver
  W. YAN, University of Denver
  J. WANG, Northeastern University
  E. MULJADI, National Renewable Energy Lab
  V. GEVORGIAN, National Renewable Energy Lab
  A. SCHOLBROCK, National Renewable Energy Lab
- 17PESGM2036, Grid Impacts of Utility-Scale Solar PV Systems Installed at both Subtransmission and Distribution Levels Simultaneously
  X. WANG, Brookhaven National Laboratory
  M. YUE, Brookhaven National Laboratory
  M. VILLARAN, Brookhaven National Laboratory
  R. LOFARO, Brookhaven National Laboratory
  H. LI, Electric Power Research Institute
  U. SMITH, Electric Power Research Institute
- 17PESGM2141, Development of Control-Sim: Control Strategies for Power Take-Off Integrated Wave Energy Converter
  R. SO, Oregon State University
  M. STARRETT, Northwest Power and Conservation Council
  K. RUEHL, Sandia National Laboratories
  T. BREKKEN, Oregon State University
- 17PESGM2151, An Advanced Architecture of Multiple Microgrids Interfacing with UCC
  P. WU, Shanghai Jiao Tong University
Poster Session for Energy Storage & Battery (poster)

Monday, 17 July, 2017, 5:00 PM–8:00 PM
S – Riverwalk AB

Sponsored by: Energy Storage & Stationary Battery Committee and Stationary Battery Committee

Chairs: C. ASHTON, Centurylink
C. SEARLES, BAE Batteries USA

PAPERS AND AUTHORS:

• 17PESGM0076, A High-Fidelity Hybrid Lithium-Ion Battery Model for State of Energy and Circuit Characteristics Prediction
  K. LI, Nanyang Technological University
  B. SOONG, Nanyang Technological University
  K. TSENG, Singapore Institute of Technology

• 17PESGM0135, Charge Equalization for Series-Connected Battery Cells Using SIMO DC-DC Converter
  B. WANG, Nanyang Technological University
  L. XIAN, Nanyang Technological University
  A. UKIL, Nanyang Technological University
  H. GOOI, Nanyang Technological University

• 17PESGM0252, Effects of Battery Degradation on Economic Viability of Energy Storage Systems Participating in Regulation Markets
  Y. DU, North Carolina State University
  R. JAIN, North Carolina State University
  S. M. LUKIC, North Carolina State University

• 17PESGM0255, The Importance of Temporal Resolution in Evaluating Residential Energy Storage
  K. ABDULLA, University of Melbourne
  J. DE HOOG, University of Melbourne
  K. STEER, University of Melbourne
  A. WIRTH, University of Melbourne
  S. HALGAMUGE, Australian National University

• 17PESGM0284, A Low Complexity Control and Energy Management for DC-Coupled Hybrid Microgrid with Hybrid Energy Storage System
  U. MANANDHAR, Nanyang Technological University
  A. UKIL, Nanyang Technological University
  H. GOOI, Nanyang Technological University
  N. TUMMURU, Nanyang Technological University
  S. KOLLIMALLA, Nanyang Technological University

• 17PESGM0530, Considerations When Using Utility-Scale Battery Storage to Black Start a Gas Turbine Generator
  I. BEIL, Sargent & Lundy, LLC
  A. ALLEN, Sargent & Lundy, LLC
  A. TOKOMBAYEV, Sargent & Lundy, LLC
  M. HACK, Sargent & Lundy, LLC

• 17PESGM0603, Frequency and Voltage Index Control of EV's Intelligent Integrated Station
  S. YU, Shanghai Jiao Tong University
  W. WU, Shanghai Jiao Tong University
  D. XIE, Shanghai Jiao Tong University
  C. GU, University of Bath

• 17PESGM0607, Linear Autonomous Control of Electric Vehicles Charging in Distribution Systems
  S. FADEL, Florida International University
  A. MOHAMED, Florida International University
  O. MOHAMMED, Florida International University
Monday Evening, continued

- **17PESGM0627**, A Two-Layer Incentive-Based Controller for Aggregating BTM Storage Devices Based on Transactive Energy Concept
  M. PARANDEHGHEIBI, NEXTEV
  S. POURMOUSAVI KANI, NEC Laboratories America Inc.
  K. NAKAYAMA, NEC Laboratories America Inc.
  R. SHARMA, NEC Laboratories America Inc.

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  H. YANG, California State University, Long Beach

- **17PESGM0792**, Modeling the Dynamic Electrical Behavior of High Temperature Electrolysis for Hydrogen Production
  X. XING, Tsinghua University
  J. LIN, Tsinghua University
  C. WAN, Tsinghua University
  Y. SONG, Tsinghua University

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  W. LEE, Ajou University
  M. LEE, Sungkyunkwan University
  J. JUNG, Ajou University

- **17PESGM0863**, Investigation of Ontario’s Electricity Market Behaviour and Energy Storage Scheduling in the Market Based on Model Predictive Control
  H. KHANI, Western University
  R. VARMA, Western University
  M. DADASH ZADEH, ETAP Operation Technology Inc.

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  L. GUO, Tianjin University Key Laboratory of Smart Grid of Ministry of Education
  Z. GUO, Tianjin University Key Laboratory of Smart Grid of Ministry of Education
  X. LI, Tianjin University Key Laboratory of Smart Grid of Ministry of Education
  C. WANG, Tianjin University Key Laboratory of Smart Grid of Ministry of Education
  C. HONG, China Southern Power Grid Company
  Y. ZHANG, China Southern Power Grid Company

- **17PESGM0961**, Charging Station Selection Optimization Based on Electric and Traffic Information
  Z. ZHOU, Tsinghua University
  Q. GUO, Tsinghua University
  H. SUN, Tsinghua University
  K. ZHANG, Graduate School at Shenzhen of Tsinghua University

- **17PESGM1153**, Customer Benefit Optimization for Residential PV with Energy Storage Systems
  P. ETHA, Arizona State University
  G. KARADY, Arizona State University
  A. JANJUA, Arizona State University
  A. CHELLADURAI, Arizona State University

- **17PESGM1189**, A Study on Super Capacitor Wayside Connection for Energy Recuperation in Electric Rail Systems
  M. KHODAPARASTAN, City University of New York City College
  A. MOHAMED, City University of New York City College

  D. ROSEWATER, Sandia National Laboratories
  P. SCOTT, TransPower USA
  S. SANTOSO, University of Texas at Austin

- **17PESGM1333**, Characterization of Charging Load for a Large Number of EV Units in Distribution Grids
  M. ISLAM, University of Queensland
  M. NADARAJAH, University of Queensland
  K. LEE, Baylor University

- **17PESGM1357**, State of Charge Estimation Based on Sliding Mode Observer for Vanadium Redox Flow Battery
  B. XIONG, Wuhan University of Technology
  H. ZHANG, Wuhan University of Technology
  X. DENG, Wuhan University of Technology
  J. TANG, Wuhan University of Technology

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  J. PEPPANEN, Electric Power Research Institute
  M. RYLANDER, Electric Power Research Institute
  A. MAITRA, Electric Power Research Institute
  J. ARAIZA JR., Southern California Edison
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  - M. KEDIS, Southern California Edison
  - I. SANCHEZ, Southern California Edison

- **17PESGM1558, Battery Energy Storage Sizing with Respect to PV-Induced Power Ramping Concerns in Distribution Networks**
  - T. NGUYEN, Sandia National Laboratories
  - R. BYRNE, Sandia National Laboratories
  - R. CONCEPCION, Sandia National Laboratories
  - I. GYUK, U.S. Department of Energy

- **17PESGM1615, Real-Time Centralized Control Scheme for Energy Management in Smart Microgrids**
  - W. ELAMIN, American University of Sharjah
  - M. SHAABAN, American University of Sharjah

- **17PESGM1679, Energy Storage Control Based on User Clustering and Battery Capacity Allocation**
  - H. RYU, Korea Advanced Institute of Science and Technology (KAIST)
  - Y. JUNG, Korea Advanced Institute of Science and Technology (KAIST)
  - J. PARK, Korea Advanced Institute of Science and Technology (KAIST)

- **17PESGM1693, Robust Unit Commitment with Large-Scale Battery Storage**
  - K. JURKOVIC, University of Zagreb
  - H. PANDZIC, University of Zagreb
  - I. KUZLE, University of Zagreb

- **17PESGM1752, BESS Control on an Microgrid with Significant Wind Generation**
  - M. SUCH, IEM Power Systems
  - G. MASADA, University of Texas

- **17PESGM1881, Development and Analysis of an Energy Storage Sizing Tool for Residential Deployment**
  - M. STARKE, ORNL
  - N. SAWYER, ORNL
  - B. DEAN, ORNL
  - M. SMITH, ORNL
  - G. LIU, ORNL
  - D. SPIERS, Spiers New Technology
  - B. SCHULTZ, Spiers New Technology
  - H. HARMAN, Habitat for Humanity

- **17PESGM1889, Performance and Health Test Procedure for Grid Energy Storage Systems**
  - K. SMITH, National Renewable Energy Laboratory
  - M. BAGGU, National Renewable Energy Laboratory
  - A. FRIEDL, San Diego Gas & Electric
  - T. BIALEK, San Diego Gas & Electric
  - M. SCHIMPE, Technical University of Munich

- **17PESGM1924, Energy Storage Sharing Strategy in Distribution Networks Using Bi-Level Optimization Approach**
  - H. CHEN, Tsinghua University
  - Y. YU, Stanford University
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  - H. LUO, Tsinghua University
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  - R. RAJAGOPAL, Stanford University

- **17PESGM2030, Effective Control and Energy Management of Isolated DC Microgrid**
  - P. SANJEEV, IIT Roorkee
  - N. PADHY, IIT Roorkee
  - P. AGARWAL, IIT Roorkee

- **17PESGM2037, A Sizing Method for Economic Assessment of II-Life Batteries for Power System Applications**
  - V. CALDERARO, University of Salerno
  - V. GALDI, University of Salerno
  - G. GRABER, University of Salerno
  - F. LAMBERTI, University of Salerno
  - A. PICCOLO, University of Salerno
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- **17PESGM2088**, Load Power Smoothing Control of Distribution Network Including Photovoltaic Generation with Energy Storage from Electric Vehicles
  M. WANG, Tianjin University
  Y. MU, Tianjin University
  X. XU, Queen's University Belfast
  H. JIA, Tianjin University
  T. WANG, NARI Group
  X. JIN, Tianjin University
  Q. JIANG, Tianjin University

  H. KHANI, Western University
  H. FARAG, York University

Grid & Emerging Technologies Poster Session (poster)

Monday, 17 July, 2017, 5:00 PM–8:00 PM S – Riverwalk AB
Sponsored by: Grid & Emerging Technologies Coordinating Committee

PAPERS AND AUTHORS:

- **17PESGM0484**, Grid Incremental Capacity Evaluation with an Optimally Deployed Photovoltaic System in Distribution Network
  M. EMMANUEL, Victoria University of Wellington, New Zealand
  R. RAYUDU, Victoria University of Wellington, New Zealand
  I. WELCH, Victoria University of Wellington, New Zealand

- **17PESGM1023**, Parallel Interlinking PWM Current Source Converter for Hybrid AC/DC Microgrids
  H. WANG, Tianjin University
  H. JIA, Tianjin University
  J. HE, Tianjin University

- **17PESGM1719**, Gas Network for Mitigating Wind Uncertainty by Using Combined Heat and Power (CHP)
  H. WANG, University of Bath
  C. GU, University of Bath
  F. LI, University of Bath

- **17PESGM1894**, Experimental Test on Intentional Islanding of Diesel Generator – PV Microgrid (# 1894)
  C. HICKS, UNLV
  B. BLACKSTONE, UNLV
  O. GONZALEZ, UNLV
  Y. BAGHZOUZ, UNLV

Insulated Conductors Poster Session (poster)

Monday, 17 July, 2017, 5:00 PM–8:00 PM S – Riverwalk AB
Sponsored by: Insulated Conductors

PAPERS AND AUTHORS:

- **17PESGM0173**, Condition Assessment of Installed Shielded Cable Systems
  W. HIGINBOTHAM, EA Technology LLC
  N. DAVIES, EA Technology Pty
  V. CHAN, EA Technology Pty

- **17PESGM1330**, Electric Field Analysis of XLPE Covered Aerial Line and Insulator Lashing
  J. GU, National Taiwan University of Science and Technology
  D. TSAI, National Taiwan University of Science and Technology
  M. YANG, St. John's University

- **17PESGM1072**, Thermal Modelling and Experimental Validation for Research on Medium Voltage DC Cables
  A. SHEKHAR, University of Texas at Austin
  X. FENG, University of Texas at Austin
  R. HEBNER, University of Texas at Austin
  A. GAITOZZI, University of Texas at Austin
  S. STRANK, University of Texas at Austin
  A. MOR, Delft University of Technology
  L. RAMIREZ-ELIZONDO, Delft University of Technology
  P. BAUER, Delft University of Technology
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PAPERS AND AUTHORS:
• 17PESGM1033, A Novel Decomposition-Based Localized Short-Term Tidal Current Speed and Direction Prediction Model
  N. SAFARI, University of Saskatchewan
  O. ASLAM ANSARI, University of Saskatchewan
  A. ZARE, University of Saskatchewan
  C. CHUNG, University of Saskatchewan
• 17PESGM1050, A Linear Quadratic Tracking Based Voltage Controller for VSI; MVDC Shipboard Power System Application
  M. BABAEI, Mississippi State University
  T. QUNAIS, Mississippi State University
  S. ABDELWAHED, Mississippi State University

Nuclear Power Engineering Poster Session (poster)
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  F. THIAM, Sargent and Lundy
  M. URBINA, Sargent and Lundy
  J. WISNIEWSKI, Sargent and Lundy
• 17PESGM1639, Nuclear Plant Auxiliary System Modeling and Analysis for Open Phase Conditions
  M. URBINA, Sargent & Lundy
  J. KRVAVAC, Sargent & Lundy
  A. ALLEN, Sargent & Lundy
  E. HOPE, Sargent & Lundy
  J. WISNIEWSKI, Sargent & Lundy

Power & Energy Education Committee Posters (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM  S – Riverwalk AB
Sponsored by:  Power & Energy Education
Chair:  S. SURYANARAYANAN, Colorado State University

PAPERS AND AUTHORS:
• 17PESGM1562, Hardware Setup of a Solar Microgrid Laboratory
  N. COLEMAN, Drexel University
  J. HILL, Drexel University
  J. BERARDINO, Drexel University
  K. OGAWA, Drexel University
  R. MALLGRAVE, Drexel University
  Y. QIAN, Drexel University
  L. ZHU, Drexel University
  K. MIU, Drexel University
  C. NWANKPA, Drexel University
• 17PESGM1657, Application of Modulation Techniques for Power System Transient Response Studies
  D. DOTTA, UNICAMP
  J. CHOW, RPI
  F. WILCHES-BERNAL, Sandia
• 17PESGM1798, Development of a Power System Protection Laboratory/Test-Bed at Clarkson University
  A. ENAYATI, Clarkson University
  T. ORTMeyer, Clarkson University
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Sponsored by: Power System Dynamic Performance

PAPERS AND AUTHORS:

• 17PESGM0041, Frequency Control Capability of VSC-HVDC for Large Power Systems
  Z. YUAN, University of Tennessee, Knoxville
  S. YOU, University of Tennessee, Knoxville
  Y. LIU, University of Tennessee, Knoxville
  Y. LIU, University of Tennessee, Knoxville
  D. OSBORN, Midcontinent ISO
  J. PAN, ABB Inc.

• 17PESGM0288, Measurement and Modeling of Voltage and Frequency Dependences of Low-Voltage Loads
  S. PALM, Technische Universität Dresden
  P. SCHEGNER, Technische Universität Dresden
  T. SCHNELL, Mitteldeutsche Netzgesellschaft Strom mbH

• 17PESGM0316, Formal LPV Control for Transient Stability of Power Systems
  A. EL-GUINDY, Technische Universität München
  K. SCHAA, University of Kassel
  B. SCHUERMANN, Technische Universität München
  O. STURSBERG, University of Kassel
  M. ALTBOFF, Technische Universität München

• 17PESGM0440, Two-Time Scale Integrated Simulation with Automatic Transition via Dot Products
  R. FERNANDES, CEPEL
  G. TARANTO, COPPE-UFRJ
  T. ASSIS, COPPE-UFRJ
  D. FALCÃO, COPPE-UFRJ
  D. PARRINI, COPPE-UFRJ

• 17PESGM0491, Cascading Contingencies in Low Inertia Power Systems: Frequency Response Challenges and a Potential Solution
  N. MASOOD, University of Queensland
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  T. SAHA, University of Queensland

• 17PESGM0511, Investigation of the Factors Influencing Wide Area Control
  L. ZACHARIA, University of Cyprus
  M. ASPROU, University of Cyprus
  E. KYRIAKIDES, University of Cyprus

• 17PESGM0516, Steady-State Inertia Estimation Using a Neural Network Approach with Modal Information
  A. SCHMITT, Virginia Tech
  B. LEE, Korea University

• 17PESGM0532, Sensitivity Analysis of a PMU-Fed Steady State Model Synthesis Method for Active Distribution Networks
  F. MAHMOOD, KTH Royal Institute of Technology
  H. HOOSHYAR, KTH Royal Institute of Technology
  L. VANFRETTI, KTH Royal Institute of Technology

• 17PESGM0549, Impedance Characteristics of DFIGs Considering the Impacts of DFIG Numbers and Locations and Its Application on SSR Analysis
  H. JIANG, State Grid Jibei Electric Power Research Institute
  J. YOU, State Grid Jibei Electric Power Research Institute
  H. LIU, State Grid Jibei Electric Power Research Institute
  W. WU, State Grid Jibei Electric Power Research Institute

• 17PESGM0551, A Static Voltage Stability Assessment Scheme of Power Systems Considering Charging State of Electric Vehicles and Load Fluctuation Limits
  F. TANG, Wuhan University
  S. ZHOU, Wuhan University
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  D. LIU, Wuhan University
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  Q. YIN, Wuhan University

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  H. KHALILI NIA, DNV GL
  F. SALEHI, DNV GL
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- **17PESGM1095**, Simulating Sustained Oscillations and Ambient Data in a Large Nonlinear Power System Model  
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- **17PESGM1194**, Feeder Flow Control Method with Improved Power Sharing Performance in Microgrids  
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- **17PESGM1359**, Electric Vehicles in Automatic Generation Control for Systems with Large Integration of Renewables  
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  F. CONTE, University of Genoa
  M. CROSA DI VERGAGNI, University of Genoa
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• 17PESGM1437, Damping Control Design for Pulse Width Modulation Series Compensator Using GrHDP
  L. ZENG, Huazhong University of Science & Technology
  W. YAO, Huazhong University of Science & Technology
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  H. HE, University of Rhode Island
  C. LUO, Northern Indiana Public Service Company (NIPSCO)

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  H. TANG, China Electric Power Research Institute

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  I. ERLICH, University of Duisburg-Essen

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  T. WOLF, FAU Erlangen-Nuremberg
  S. WELLHÖFER, FAU Erlangen-Nuremberg
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• 17PESGM1614, Fast Online Identification of Power System Dynamic Behavior
  P. PAPADOPOULOS, University of Manchester
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  N. SENROY, Indian Institute of Technology Delhi

• 17PESGM1668, Semi-Analytical Fault-on Trajectory Simulation and Its Application in Direct Methods
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  W. JU, University of Tennessee Knoxville
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  S. ZARRABIAN, State University of New York

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- **17PESGM1753**, Model Order Sensitivity in ARMA-Based Electromechanical Mode Estimation Algorithms Under Ambient Power System Conditions
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  D. TRUDNOWSKI, Montana Tech of the University of Montana
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  R. VENKATRAMAN, Iowa State University
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- **17PESGM1818**, Power Plant Model Verification at ISO New England
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  E. LITVINOV, ISO New England

- **17PESGM1825**, HVDC Connection to Large Nuclear Power Plants: A Case Study on Moorside in Great Britain
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  B. CHAUDHURI, Imperial College London
  R. MAJUMDER, Mitsubishi Electric Power Products, Inc.

- **17PESGM1863**, On the Dynamics and Transient Stability of Power Systems Post-Transmission Switching
  R. OWUSU-MIREKU, Cornell University
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- **17PESGM1869**, Analyzing Subsynchronous Control Interactions in Large-Scale Power Systems in Frequency Domain
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  J. XIE, Shandong University
  W. ZHANG, Shandong University
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  K. MAHAPATRA, Penn State
  N. CHAUDHURI, Penn State
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- **17PESGM2002**, A Two-Level Voltage Stability Monitoring Method Based on P-V Sensitivity Assessment
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M. ZHANG, Tsinghua University
B. WANG, Tsinghua University
•  17PESGM2059, An Advanced Small-Signal Model of Multi-Terminal MMC-HVDC for Power Systems Stability Analysis Based on Dynamic Phasors
  H. CHEN, Wuhan University
  P. HU, Wuhan University
  Y. YU, Wuhan University
  X. ZHU, Wuhan University
•  17PESGM2106, Derivation of WECC Distributed PV System Model Parameters from Quasi-Static Time-Series Distribution System Simulations
  J. BOEMER, Electric Power Research Institute (EPRI)
  E. VITTAL, Electric Power Research Institute (EPRI)
  M. RYLANDER, Electric Power Research Institute (EPRI)
  B. MATHER, National Renewable Energy Laboratory (NREL)
•  17PESGM2153, Adaptive Wide-Area Primary Frequency Controller for Improving Power Grid Dynamic Performance
  B. ANSARI, New York Power Authority
  S. BABAEI, New York Power Authority
  B. FARDANESH, New York Power Authority
  D. RIMOROV, Hydro-Quebec Research Institute
  A. HENICHE, Hydro-Quebec Research Institute
  I. KAMWA, Hydro-Quebec Research Institute
•  17PESGM2155, The Role of Electric Vehicles for Frequency Regulation during Grid Restoration
  T. RAHMAN, University of Central Florida
  Z. OU, University of Central Florida
•  17PESGM2233, Analytical Estimation of the Magnitude of Loss of Generation in Power Systems
  R. AZIZIPANAH-ABARGHOOEE, University of Manchester
  M. MALEKPOUR, University of Isfahan
  A. KIYOUMARSI, University of Isfahan
  V. TERZIJA, University of Manchester
•  17PESGM2235, Real-Time Monitoring of Long-Term Voltage Stability via Convolutional Neural Network
  S. LI, Iowa State University
  V. AJJARAPU, Iowa State University
•  17PESGM2299, Power System Damping Analysis on Large Power System Networks: An Entergy Case Study
  M. TABRIZI, DNV GL
  N. PRAKASH, DNV GL
  M. SAHNI, DNV GL
  H. KHALILINIA, DNV GL
  P. SARAF, DNV GL
  S. KOLLURI, Entergy Service Inc.
•  17PESGM0803, Design and Engineering Practice of HVDC SSDC for Suppressing Sub-Synchronous Oscillations
  W. LI, NCEPU, China
  X. XIAO, NCEPU
  S. TAO, State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources

PSIM Poster session PESGM2017 (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM  S – Riverwalk AB
Sponsored by:  Power System Instrumentation and Measurements
Chair:  J. MCBRIDE, JMX Services, Inc.
PAPERS AND AUTHORS:
•  17PESGM0726, Optimum PMU Placement for Power System State Estimation
  I. AKINGENYE, University of Arkansas
  J. WU, University of Arkansas
  J. YANG, Penn State University
•  17PESGM1180, An Interval Arithmetic-Based State Estimation for Unbalanced Active Distribution Networks
  J. XU, Southeast University
  Z. WU, Southeast University
Monday Evening, continued

X. DOU, Southeast University
Q. HU, Harvard University
• 17PESGM1472, PMU Applications Prioritization Methodology Using Wide-Area Disturbances Events and Its Implementation in the Colombian Electric Power System
  L. ZORA, Quanta Technology
  D. ELIZONDO, Quanta Technology
  S. JARAMILLO, Quanta Technology
  J. CASTRO, Quanta Technology
  R. LEON, Quanta Technology
  J. DE LA REE, pesgm2017@mirasmart.com
• 17PESGM1501, Spectral Grid Impedance Identification on Different Voltage Levels – Challenges and Realization
  H. LANGKOWSKI, Helmut-Schmidt-University
  M. JORDAN, Helmut-Schmidt-University
  T. DO, Helmut-Schmidt-University
  D. SCHULZ, Helmut-Schmidt-University
• 17PESGM1698, The Impact of Instrumentation Errors on Dynamic State Estimation-Based Protection
  S. VEJDAN, Georgia Institute of Technology
  A. MELIOPoulos, Georgia Institute of Technology
• 17PESGM2084, Estimation of Goodness of Fit of Synchrophasors during Transient Faults
  D. LAVERY, Queen's University Belfast
  H. KIRKHAM, Pacific Northwest National Laboratory
  D. MORROW, Queen's University Belfast
  X. LIU, Queen's University Belfast
• 17PESGM2097, Optimal Placement of Fault Indicators Using Adaptive Genetic Algorithm
  H. ORELLANA CRUZ, UNESP
  F. LEÃO, UNESP
• 17PESGM2121, Phase Jumps in PMU Signal Generators
  A. RIEPNIEKS, Riga Technical University
  H. KIRKHAM, Pacific Northwest National Laboratory
  A. FARIS, Bonneville Power Administration
  M. ENGELS, PNNL

Power System Communications & Cyber Security Poster Session (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM S – Riverwalk AB
Sponsored by: Power Systems Communications & Cyber Security

PAPERS AND AUTHORS:
• 17PESGM0227, Data Integrity Attack on Consensus-Based Distributed Energy Management Algorithm
  J. DUAN, North Carolina State University
  M. CHOW, North Carolina State University
• 17PESGM0261, A Time Synchronization Method of Power Grid Based on TD–LTE Frame Synchronization
  Z. HAI-LONG, Power Control Center of China Southern Power Grid
  Z. GUO-YI, Power Control Center of China Southern Power Grid
• 17PESGM0290, Direct Cyber-Power Interdependency Study on Microgrid Control
  B. FALAHATI, Schweitzer Engineering Laboratories, Inc.
  R. COSTA, Schweitzer Engineering Laboratories, Inc.
  A. KARGARIAN, Louisiana State University
• 17PESGM0312, iPaCS: An Integrative Power and Cyber Systems Co-Simulation Framework for Smart Grid
  G. RAVIKUMAR, IIT Bombay
  G. RAMYA, IIT Bombay
  S. MISRA, NMSU
  S. BRAWMA, NMSU
  S. KHAPARDE, IIT Bombay
• 17PESGM0347, Realistic Measurement Protection Schemes Against False Data Injection Attacks on State Estimators
  J. WANG, Huazhong University of Science and Technology
  D. SHI, Huazhong University of Science and Technology
  Y. LI, Huazhong University of Science and Technology
  J. CHEN, Huazhong University of Science and Technology
  X. DUAN, Huazhong University of Science and Technology
• 17PESGM0560, False Data Injection Attacks Targeting DC Model-Based State Estimation
  G. LIANG, University of Newcastle
  S. WELLER, University of Newcastle
  J. ZHAO, Chinese University of Hong Kong (Shenzhen)
  F. LUO, University of Sydney
  Z. DONG, Electric Power Research Institute

• 17PESGM0565, Composite FDIA and Topology Attack on the Electricity Market
  G. LIANG, University of Newcastle
  S. WELLER, University of Newcastle
  J. ZHAO, Chinese University of Hong Kong (Shenzhen)
  F. LUO, University of Sydney
  Z. DONG, Electric Power Research Institute

• 17PESGM0592, An Active Security Defense Strategy for Wind Farm Based on Automated Decision
  J. LAI, XiangTan University
  B. DUAN, XiangTan University
  Y. SU, XiangTan University
  L. LI, Collaborative Innovation Center of Wind Power Equipment and Energy Conversion
  Q. YIN, Collaborative Innovation Center of Wind Power Equipment and Energy Conversion

• 17PESGM0609, Ontology-Based Approach for Malicious Behaviour Detection in Synchrophasor Networks
  A. ALBALUSHI, Queens University, Belfast
  R. KHAN, Queens University, Belfast
  K. MCLAUGHLIN, Queens University, Belfast
  S. SEZER, Queens University, Belfast

• 17PESGM0735, False Data Injection Attack in Smart Grid Topology Control: Vulnerability and Countermeasure
  T. LAN, Texas A&M University
  W. WANG, Texas A&M University
  G. HUANG, Texas A&M University

• 17PESGM0757, Simulation of a RTU Cyber Attack on a Transformer Bank
  P. TOP, Lawrence Livermore National Lab
  E. BANKS, Lawrence Livermore National Lab
  P. BARNES JR., Lawrence Livermore National Lab
  S. BROMBERGER, Lawrence Livermore National Lab
  M. FREUND, Pacific Gas & Electric Co
  B. KELLEY, Lawrence Livermore National Lab
  R. RIVERA SOTO, Lawrence Livermore National Lab
  B. SALAZAR, Lawrence Livermore National Lab
  S. SMITH, Lawrence Livermore National Lab
  N. YEE, Lawrence Livermore National Lab

• 17PESGM1021, On Detecting False Data Injection with Limited Network Information Using Transformation Based Statistical Techniques
  K. KHANNA, Indian Institute of Technology Delhi
  S. SINGH, Indian Institute of Technology Delhi
  B. PANIGRAHI, Indian Institute of Technology Delhi
  R. BOSE, Indian Institute of Technology Delhi
  A. JOSHI, University of Maryland Baltimore County

• 17PESGM1215, OPNET Based Simulation Modeling and Analysis of DoS Attack for Digital Substation
  J. ZHANG, Hangzhou Dianzi University
  Y. CHEN, Hangzhou Dianzi University
  N. JIN, Shaoxing Power Supply Company
  L. HOU, Hangzhou Dianzi University
  Q. ZHANG, University of Utah

• 17PESGM1407, IEC 61850 Substation Configuration Language as a Basis for Automated Security and SDN Configuration
  J. O’RAW, Queens University, Belfast
  D. LAVERTY, Queens University, Belfast
  D. MORROW, Queens University, Belfast

• 17PESGM1410, Preventive Defensive Strategies for Power Systems under Persistent Malicious Cyberattacks
  C. WANG, University of Hong Kong
  Y. HOU, University of Hong Kong

• 17PESGM1440, A Recursive State Estimation Approach to Mitigate False Data Injection Attacks in Power Systems
  J. SREENATH, Indian Institute of Technology, Kanpur
  A. MEGHWANI, Indian Institute of Technology, Kanpur
Monday Evening, continued

S. CHAKRABARTI, Indian Institute of Technology, Kanpur
K. RAJAWAT, Indian Institute of Technology, Kanpur
S. SRIVASTAVA, Indian Institute of Technology, Kanpur

17PESGM1586, Modernizing Wide-Area Grid Communications for Distributed Energy Resource Applications Using MQTT Publish-Subscribe Protocol
J. HASTINGS, Queen's University, Belfast
D. LAVERTY, Queen's University, Belfast

17PESGM1710, Model Based Intrusion Detection System for Synchrophasor Applications in Smart Grid
R. KHAN, Queen's University, Belfast
A. ALBALUSHI, Queen's University, Belfast
K. MCLAUGHLIN, Queen's University, Belfast
D. LAVERTY, Queen's University, Belfast
S. SEZER, Queen's University, Belfast

17PESGM1870, An Integrated Anomaly Detection Method for Load Forecasting Data under Cyberattacks
M. YUE, BNL

17PESGM1915, A Framework for Modeling Load Redistribution Attacks Coordinating with Switching Attacks
Y. XIANG, University of Wisconsin-Milwaukee
L. WANG, University of Wisconsin-Milwaukee
N. LIU, North China Electric Power University

17PESGM2209, Towards Attack-Resilient Communications for Smart Grids with Software-Defined Networking
Y. WU, University of Akron
J. WEI, University of Akron

Power System Relaying and Control Poster Sessions (poster)

Monday, 17 July, 2017, 5:00 PM-8:00 PM  S – Riverwalk AB
Sponsored by: Power Systems Relaying & Control

PAPERS AND AUTHORS:

17PESGM0063, Mathematical Morphology-Based Fault Detection Technique for Power Distribution Systems Subjected to Resonant Grounding
M. BARIK, Deakin University
A. GARGOOM, Deakin University
M. MAHMUD, Deakin University
M. HAQUE, Deakin University
A. OO, Deakin University
H. AL-KHALIDI, AusNet Services

17PESGM0220, Protection Studies of Geographically Dispersed Type 3 Wind Energy Systems
A. ANUJAN, SEL
B. JOHNSON, University of Idaho
E. WILLIAM, Solved Engineering LLC

17PESGM0249, Design of Networked Protection Systems for Smart Distribution Grids: A Data-Driven Approach
Y. SEYEDI, Polytechnique Montreal
H. KARIMI, Polytechnique Montreal

17PESGM0308, Non-Unit Full Selective Protection Algorithm for MTDC Grids
G. AURIAN, RTE France
B. RAISON, Université Grenoble Alpes
J. DESCLOUX, RTE France
S. NGUEFEU, RTE France

17PESGM0318, Impacts of Substation Transformer Backfeed at High PV Penetrations
R. MACK, ICF
M. SAKIB, ICF
S. SUCCAR, ICF

17PESGM0416, 12kV High Impedance Fault Testing
R. BRAVO, Southern California Edison
E. PHAM, Southern California Edison

17PESGM0671, Information Association Methodology and Application for Integrated Wide Area Protection and Control
Y. ZHAO, XUJI Group Co.
M. LI, Accenture
K. MA, XUJI Group Co.
Monday Evening, continued

- Q. WANG, XUJI Group Co.
  X. MA, XUJI Group Co.
  Z. BO, XUJI Group Co.
  • 17PESGM0680, A Current Transformer Saturation Identification Method of Transmission Line Based on Current Sample Date
    X. WANG, China Electric Power Research Institute
    H. LIU, China Electric Power Research Institute
    Z. ZHOU, China Electric Power Research Institute
    Y. GUO, China Electric Power Research Institute
    D. DU, China Electric Power Research Institute

- X. WANG, China Electric Power Research Institute
  H. LIU, China Electric Power Research Institute
  Z. ZHOU, China Electric Power Research Institute
  Y. GUO, China Electric Power Research Institute
  D. DU, China Electric Power Research Institute
  • 17PESGM0696, A New Integrated Protection Scheme for Power Transmission Lines
    L. WANG, XJ
    Z. BO, XJ
    X. MA, XJ
    Y. ZHAO, XJ
    F. ZHOU, XJ
    X. FENG, XJ

- Y. TIAN, Shanghai Jiao Tong University
  Y. HU, Shanghai Jiao Tong University
  J. LIU, Shanghai Jiao Tong University
  • 17PESGM0810, Solution and Optimal Solution Discrimination of Analytic Model for Hidden Failure Detection
    R. QUINT, NERC
    R. BAUER, NERC
    R. CUMMINGS, NERC
    S. CHANOSKI, NERC
    E. RUCK, NERC
    W. WU, NERC
    J. MERLO, NERC

- L. WANG, XJ
  Z. BO, XJ
  X. MA, XJ
  Y. ZHAO, XJ
  • 17PESGM0879, Event Analysis for the 7 April 2015 Washington, D.C., Area Low Voltage Disturbance
    R. QUINT, NERC
    R. BAUER, NERC
    R. CUMMINGS, NERC
    S. CHANOSKI, NERC
    E. RUCK, NERC
    W. WU, NERC
    J. MERLO, NERC

- R. QUINT, NERC
  R. BAUER, NERC
  R. CUMMINGS, NERC
  S. CHANOSKI, NERC
  E. RUCK, NERC
  W. WU, NERC
  J. MERLO, NERC
  • 17PESGM0885, Accurate Location of Inter-Circuit Faults on Double-Circuit Transmission Lines Based on Sparse Wide-Area Voltage Measurements
    X. JIAO, University of Kentucky
    Y. LIAO, University of Kentucky

- Y. TIAN, Shanghai Jiao Tong University
  Y. HU, Shanghai Jiao Tong University
  J. LIU, Shanghai Jiao Tong University
  • 17PESGM0899, Detection and Classification of MMC-HVDC Transmission Line Faults Based on One-Terminal Transient Current Signal
    N. TAI, Shanghai Jiao Tong University
    X. ZHENG, Shanghai Jiao Tong University
    W. HUANG, Shanghai Jiao Tong University
    M. NADEEM, Shanghai Jiao Tong University

- N. TAI, Shanghai Jiao Tong University
  X. ZHENG, Shanghai Jiao Tong University
  W. HUANG, Shanghai Jiao Tong University
  M. NADEEM, Shanghai Jiao Tong University
  • 17PESGM1168, Temporal-Spatial Collaborated Protection and Control: The Next Generation Security Defence System for Hybrid AC/DC Bulk Power Systems
    J. ZHANG, South China University of Technology
    X. LI, South China University of Technology
    L. GUAN, South China University of Technology
    H. XU, University of Illinois at Urbana-Champaign
    Z. WU, South China University of Technology

- J. ZHANG, South China University of Technology
  X. LI, South China University of Technology
  L. GUAN, South China University of Technology
  H. XU, University of Illinois at Urbana-Champaign
  Z. WU, South China University of Technology
  • 17PESGM1296, Fault Current Characterisation of Single Phase Inverter Systems
    A. MISHRA, University of Auckland
    N. NAIR, University of Auckland
    N. PATEL, University of Auckland

- A. MISHRA, University of Auckland
  N. NAIR, University of Auckland
  N. PATEL, University of Auckland
  • 17PESGM1326, Supervisory Framework for Event Detection and Classification Using Wavelet Transform
    A. SINGH, Malaviya National Institute of Technology, Jaipur India
    M. FOZDAR, Malaviya National Institute of Technology, Jaipur India

- A. SINGH, Malaviya National Institute of Technology, Jaipur India
  M. FOZDAR, Malaviya National Institute of Technology, Jaipur India
  • 17PESGM1847, Ground Distance Relaying with Remote End Infeed Compensation
    J. NÚÑEZ DE NUNES, Southern Federal Institute of Education and Technology
    A. SUMAN BRETAS, University of Florida

- J. NÚÑEZ DE NUNES, Southern Federal Institute of Education and Technology
  A. SUMAN BRETAS, University of Florida
  • 17PESGM2056, Novel Transient Current-Based Protection Scheme for DC Line Faults in UHVDC System
    Y. YANG, Shanghai Jiao Tong University
    N. TAI, Shanghai Jiao Tong University
    C. FAN, Shanghai Jiao Tong University
    X. ZHENG, Shanghai Jiao Tong University
    J. LIU, Shanghai Jiao Tong University
    B. LV, Shanghai Futong Business Management Consulting Co., Ltd.
Monday Evening, continued

- 17PESGM2107, The Impact of Solar Storms on Protective Relays for Saturable-Core Transformers
  R. FAN, Georgia Institute of Technology
  Y. LIU, Georgia Institute of Technology
  A. UMANA, Georgia Institute of Technology
  Z. TAN, Georgia Institute of Technology
  L. SUN, Georgia Institute of Technology
  Y. AN, State Grid Shanghai Pudong Electric Power Supply Company

- 17PESGM2223, A Novel Short Circuit Analysis Method on Mixed-Voltage Quadruple-Circuit Lines
  T. ZHENG, North China Electric Power University
  J. ZHANG, North China Electric Power University
  D. WU, NARI Technology Department Co. Ltd.
  H. SHAOFENG, North China Electric Power University

- 17PESGM2288, Enhancing Distance Relay Security during Power System Stresses: An Apparent Power Approach
  P. GAWANDE, College of Engineering, Pune
  T. HINGE, College of Engineering, Pune
  S. DAMBHARE, College of Engineering, Pune

PSOPE: Bulk Power System Operations Subcommittee Poster Session (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM S – Riverwalk AB
Sponsored By: PSOPE: Bulk Power System Operations Subcommittee
Chairs: E. VAAHEDI, Open Access Technology International
        L. WANG, Powertech Labs, Surrey, BC, Canada

PAPERS AND AUTHORS:
- 17PESGM0012, Introduction of Slack Load and Its Application to Area-Interchange Control in Power Flow Studies
  Y. FENG, Siemens PTI
  C. DUBOSE, Siemens PTI

- 17PESGM0216, Maximizing the Feed-In of Renewable Energy into High-Voltage Grids by Seasonal Topology Measures – A German Case Study
  J. SCHEEL, THM-Technische Hochschule Mittelhessen
  R. DIB, THM-Technische Hochschule Mittelhessen
  D. WESTERMANN, Technische Universität Ilmenau
  F. WIRTZ, Bayernwerk AG

- 17PESGM0305, Global Polynomial Approximation of Static Voltage Stability Region Boundaries Considering Inequality Constraints
  Y. QIU, Zhejiang University
  H. WU, Zhejiang University
  B. XIA, Zhejiang University
  Y. ZHOU, Zhejiang University
  Y. SONG, Zhejiang University

- 17PESGM0310, Design of a Hybrid Fuzzy/Markov Chain-Based Hierarchal Demand-Side Frequency Control
  Z. OBAID, Cardiff University
  L. CIPCIGAN, Cardiff University
  M. MUHSSIN, Cardiff University

- 17PESGM0371, A Local State Vector Augmentation Technique for Processing Network Parameters Errors
  B. CARVALHO, University of Sao Paulo
  N. BRETAG, University of Sao Paulo
  A. BRETAS, University of Florida

- 17PESGM0402, Effective Modeling and Resolution of Generation-Dependent Ramp Rates for Unit Commitment
  B. YAN, University of Connecticut
  P. LUH, University of Connecticut
  E. LITVINOV, ISO New England
  T. ZHENG, ISO New England
  D. SCHIRO, ISO New England
  M. BRAGIN, University of Connecticut
  F. ZHAO, ISO New England
  J. ZHAO, ISO New England
  I. LELIC, ISO New England
Monday Evening, continued

- **17PESGM0482, Lessons Learned from Implementing Path Operating Limit Computation Using the State Estimator Node/Breaker Model**
  R. RAMANATHAN, Maxisyms Inc.
  A. POPAT, Maxisyms Inc.
  M. PAPIC, Idaho Power
  O. CINIGLIO, Idaho Power

- **17PESGM0584, Generation and Transmission Equipment Maintenance Scheduling with Load Transfer**
  J. ZHU, China Southern Power Grid
  P. XUAN, China Southern Power Grid
  P. XIE, China Southern Power Grid
  C. HONG, China Southern Power Grid
  W. YAN, Chongqing University

- **17PESGM0615, Autoregressive Moving Average Modeling of Area Control Error**
  S. PULENDRAN, University of Toronto
  J. TATE, University of Toronto

- **17PESGM0658, A Method of Detecting Commutation Failure in Multiinfeed HVDC Systems Based on Critical Failure Impedance Boundary**
  G. LI, Northeast Electric Power University
  S. ZHANG, Northeast Electric Power University
  T. JIANG, Northeast Electric Power University
  H. CHEN, Northeast Electric Power University
  X. LI, Northeast Electric Power University

- **17PESGM0796, Power System Flexibility Scheduling Model for Wind Power Integration Considering Heating System**
  W. WEI, Tianjin University
  X. YAN, Tianjin University
  Y. NI, Tianjin University
  F. LUO, Tianjin University
  Y. ZENG, Tianjin University
  R. XU, Tianjin University

- **17PESGM0888, A Decentralized Dispatch Approach on AC/DC Hybrid Power Systems with Wind Power**
  M. ZHOU, North China Electric Power University
  J. ZHAI, North China Electric Power University
  G. LI, North China Electric Power University
  J. ZHANG, North China Electric Power University
  Y. WANG, North China Electric Power University

- **17PESGM0914, Robust Optimization of Generating Unit Restoration Sequence Following Massive Outage**
  Y. LIU, North China Electric Power University
  J. JIAO, North China Electric Power University

- **17PESGM0958, On the Load Margins and Bifurcations of Power System Using Quasi-Steady State Model**
  X. ZHAO, Tianjin University
  H. CHIANG, Cornell University

- **17PESGM1075, Modularity Clustering Based Detection of Coherent Groups of Generators with Generator Integrity Indices**
  F. ZNIDI, UALR
  H. DAVARIKIA, UALR
  K. IQBAL, UALR

- **17PESGM1112, Available Capacity Based AGC Signal Distribution Strategy with Energy Storage System**
  Y. GONG, University of Saskatchewan
  C. CHUNG, University of Saskatchewan

- **17PESGM1216, Data-Driven Chance-Constrained Stochastic Unit Commitment Under Wind Power Uncertainty**
  A. BASHIRI, Oklahoma State University
  C. ZHAO, Oklahoma State University
  Y. GUO, Oklahoma State University

- **17PESGM1449, Control and Limit Enforcements for VSC Multi-Terminal HVDC in Newton Power Flow**
  H. CUI, University of Tennessee, Knoxville
  F. LI, University of Tennessee, Knoxville
  H. YUAN, Peak Reliability

- **17PESGM1600, Convex Modeling of the Steady State Domain of Power Generators**
  P. SAIKALY, RTE
  N. OMONTE, RTE
Monday Evening, continued

- **17PESGM1738**, Security-Constrained Unit Commitment with Optimal Robust Confidence Levels
  - C. FENG, Zhejiang University
  - L. NI, Zhejiang University
  - Z. LI, Illinois Institute of Technology
  - F. WEN, Zhejiang University
  - M. SHAHIDEHPOUR, Illinois Institute of Technology
  - Y. XUE, State Grid Electric Power Research Institute

- **17PESGM1740**, Day-Ahead Reserve Scheduling Approaches under Wind Uncertainty
  - E. GIL, Universidad Técnica Federico Santa María
  - J. TORO, Universidad Técnica Federico Santa María
  - G. GUTIÉRREZ-ALCARAZ, Instituto Tecnológico de Morelia

- **17PESGM1764**, Comparison of Methods for Locating and Quantifying Turbine-Induced Forced-Oscillations
  - R. XIE, Montana Tech
  - D. TRUDNOWSKI, Montana Tech

- **17PESGM1934**, Parallel Co-Optimization of Unit Commitment and Transmission Switching
  - C. WANG, Mississippi State University
  - L. GONG, Mississippi State University
  - Y. FU, Mississippi State University

- **17PESGM1962**, Stochastic Unit Commitment for Wind Power Interconnected System Reserve Requirement Estimation
  - R. DAI, GE
  - Q. QI, Puget Sound Energy
  - J. MCCALLEY, Iowa State University

- **17PESGM1970**, Robust Tie-Line Scheduling for Multi-Area Power Systems with Finite-Step Convergence
  - Y. GUO, Cornell University
  - L. TONG, Cornell University

- **17PESGM2064**, The Impacts of Correlation of Multi-Wind Farms in Day-Ahead Economic Dispatching
  - J. LIU, Wuhan University
  - J. XU, Wuhan University
  - Y. SUN, Tsinghua University
  - C. TANG, Wuhan University
  - Y. BAO, Wuhan University
  - H. CAO, Wuhan University
  - J. WANG, Wuhan University
  - Z. ZHANG, Wuhan University
  - G. ZHOU, Wuhan University

- **17PESGM2248**, Day-Ahead Preventive Scheduling of Power Systems During Natural Hazards via Stochastic Optimization
  - M. SAHRAEI-ARDAKANI, University of Utah
  - G. OU, University of Utah

- **17PESGM2251**, Adaptive Automatic Generation Control Based on Gain Scheduling and Neural Networks
  - D. CHEN, Siemens
  - L. WANG, Accenture

**PSOPE: Bulk Power System Planning Subcommittee Poster Session (poster)**

*Monday, 17 July, 2017, 5:00 PM–8:00 PM*  
*S – Riverwalk AB*

*Sponsored by:*  
PSOPE: Bulk Power System Planning Subcommittee

*Chair:*  
P. DU, ERCOT

**PAPERS AND AUTHORS:**

- **17PESGM0143**, A Hypothesis of VSC-HVDC Ring-Network and Its Control Strategy for China's Power Grid
  - J. XU, Wuhan University, Wuhan, China
  - M. ZHOU, Wuhan Power Supply Company
  - T. LAN, Wuhan University, Wuhan, China
  - Y. SUN, Wuhan Power Supply Company

- **17PESGM0218**, Grid Adequacy and Cooperation in Central America: A Data-Driven Analysis
  - S. SUFFIAN, Villanova University
  - D. PONCE DE LEON BARIDO, University of California Berkeley
  - M. KABALAN, Villanova University
  - P. SINGH, Villanova University
• 17PESGM0231, An Optimal Reduction Method for Generating Time Series Scenarios of Wind Power
  J. LI, Guangxi University
  W. SAI, Guangxi University
  H. LIU, Guangxi University
  F. LAN, Guangxi University

• 17PESGM0250, Application of New Generic Models for PV and Battery Storage in System Planning Studies
  X. XU, S&C Electric Company
  E. CASALE, S&C Electric Company
  M. BISHOP, S&C Electric Company
  D. OKARINEN, S&C Electric Company

• 17PESGM0293, Planning in Fragile and Conflict States: Case Study for West Bank and Gaza
  S. OGUHA, The World Bank
  D. CHATTOPADHYAY, The World Bank

• 17PESGM0306, NERC TPL-001-4 System Oscillation Damping Performance Compliance Study – Criteria Development, Study Methodology and Case Studies
  M. WU, ITC Holdings Corp.
  C. CAPRA, ITC Holdings Corp.
  D. SILVA, SIEMENS
  J. FELTES, SIEMENS

• 17PESGM0339, Power System Reliability Assessment with Full Topology Model
  F. DONG, General Electric
  L. FAN, pesgm2017@mirasmart.com

• 17PESGM0624, Studying Cascading Overload Failures under High Penetration of Wind Generation
  M. ATHARI, Virginia Commonwealth University
  Z. WANG, Virginia Commonwealth University

• 17PESGM0697, Application of Unified Power Flow Controller (UPFC) in Jiangsu Power System
  H. CAI, State Grid Jiangsu Economic Research Institute
  L. YANG, State Grid Jiangsu Electric Power Company
  W. HANG, State Grid Jiangsu Economic Research Institute
  P. SONG, Zhejiang University
  Z. XU, Zhejiang University

• 17PESGM0987, Evaluation of Transmission Grid Reinforcements for Multiple Future Scenarios
  T. BONGERS, RWTH Aachen University
  A. MOSER, RWTH Aachen University

• 17PESGM1074, Online Decomposed Optimal Outage Management after Natural Disasters
  A. ARIF, Iowa State University
  S. MA, Iowa State University
  Z. WANG, Iowa State University

• 17PESGM1137, Impact of Distributed PV on Peak Demand in the Australian National Electricity Market
  N. HAGHDADI, University of New South Wales Australia
  A. BRUCE, University of New South Wales Australia
  I. MACGILL, University of New South Wales Australia

• 17PESGM1182, Combined Approach of Firefly Algorithm with Travelling Salesmen Problem for Optimal Design of Offshore Wind Farm
  R. SRIKAKULAPU, National Institute of Information Technology Karnataka
  U. VINATHA, pesgm2017@mirasmart.com

• 17PESGM1398, A Study on Influence of Ramp-Up of Aggregated Power Output of Photovoltaic Power Generation on Electric Power System Frequency
  T. KATO, Nagoya University
  Y. MANAGE, Nagoya University
  T. FUNABASHI, Nagoya University
  T. MURASE, Nagoya University
  M. KURIMOTO, Nagoya University

• 17PESGM1400, Researchs on Asynchronous Interconnection of West Part of China Southern Power Grid
  C. HE, China Southern Power Grid Co., Ltd.
  L. DONGZU, Tianjin University
  B. HONG, China Electric Power Research Institute
  L. PENG, China Southern Power Grid Co., Ltd.
  Z. YUAN, Tianjin University

• 17PESGM1509, The Impact of Electric Vehicle Uncertainties on Load Levelling in the UK
  B. ZHOU, Northeastern University
  D. YANG, Northeastern University
Monday Evening, continued

S. BU, Hong Kong Polytechnic University
G. DU, Aston University
T. LITTLE, Queen's University, Belfast
- 17PESGM1526, Weather Variation and Climate Change Impacts on Power System
  P. CHEN, Texas A&M University
  M. KEZUNOVIC, Texas A&M University
- 17PESGM1715, California's Clean Energy; Now, Future Goals, and Challenges
  H. DANESHI, Southern California Edison
- 17PESGM1772, Integrated AC/DC Transmission Expansion Planning Model Considering VSC-MTDC Systems
  R. DE ARAUJO, UNICAMP
  S. TORRES, University of Cuenca
  J. PISSOLATO, UNICAMP
  C. CASTRO, UNICAMP
- 17PESGM1807, Integrated Planning of Electricity and Natural Gas Systems under Uncertain Hydro Inflows: A Multi-Objective Approach
  C. SALDARRIAGA-CORTES, Universidad Tecnológica de Pereira
  H. SALAZAR, Universidad Tecnológica de Pereira
  R. MORENO, Universidad de Chile
  G. JIMÉNEZ-ESTÉVEZ,
- 17PESGM1831, Reliability Evaluation of Offshore Wind Power Plants Considering Environmental Effect
  B. WANG, Xi'an Jiaotong University
  X. WANG, Xi'an Jiaotong University
  W. WANG, Xi'an Jiaotong University
  C. SHAO, Xi'an Jiaotong University
- 17PESGM1872, Optimal Allocation of Static Var Compensator via Mixed Integer Conic Programming
  X. ZHANG, University of Tennessee, Knoxville
  D. SHI, GEIRI North America
  Z. WANG, GEIRI North America
  H. HUANG, State Grid Jiangsu Electric Power Company
  W. XANG, State Grid Jiangsu Electric Power Company
  G. LIU, Oak Ridge National Laboratory
  K. TOMSOVIC, University of Tennessee, Knoxville
- 17PESGM1897, Impact of Residential Customer Classification on Demand Response Results under High Renewable Penetration
  A. ASADINEJAD, University of Tennessee
  K. TOMSOVIC, University of Tennessee
  C. CHEN, University of Tennessee
- 17PESGM2045, Power Transmission Expansion Planning Based on Voltage Stability Indexes
  T. NGO, University of Texas at Austin
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  S. SANTOSO, pesgm2017@mirasmart.com
  A. COFFMAN, University of California, San Diego
  C. ELLIS, University of California, San Diego
  S. ELSOURI, University of California, San Diego
  H. KHAN, University of California, San Diego
- 17PESGM2231, Statistical Analysis of ERCOT Procured Regulation-Up and Regulation Down Operational Reserves
  J. ANDRADE, UT Austin
  R. BALDICK, UT Austin
  Y. DONG, UT Austin
- 17PESGM2306, Probabilistic Quantification of Wind Power Curtailment Based on Intra-Seasonal Wind Forecasting Approach
  T. MASAUD, Texas A&M University -Kingsville
  S. PATIL, Texas A&M University-Kingsville
  K. HAGAN, Texas A&M University-Kingsville
  P. SEN, Colorado School of Mines
PSOPE: Distribution System Operations and Planning Subcommittee Poster Session

Monday, 17 July, 2017, 5:00 PM–8:00 PM  S – Riverwalk AB
Sponsored by:  PSOPE: Distribution System Operation and Planning Subcommittee
Chair:  M. HONG, Case Western Reserve University

PAPERS AND AUTHORS:

• 17PESGM0054, Distributed Multi-Step Power Scheduling and Cost Allocation for Cooperative Microgrids
  L. AN, North Carolina State University
  D. JIE, North Carolina State University
  Y. ZHANG, North Carolina State University
  M. CHOW, North Carolina State University
  A. DUEL-HALLEN, North Carolina State University

• 17PESGM0129, Optimal Capacitor Bank Capacity and Placement in Distribution Systems with High Distributed Solar Power Penetration
  G. CHO, Sungkyunkwan University
  Y. OH, Sungkyunkwan University
  M. KIM, Sungkyunkwan University
  J. KIM, Sungkyunkwan University
  C. KIM, Sungkyunkwan University
  B. MATHER, National Renewable Energy Laboratory
  B. HODGE, National Renewable Energy Laboratory

• 17PESGM0148, Coordinating Multi-Microgrid Operation within Distribution System: A Cooperative Game Approach
  Y. DU, University of Tennessee
  F. LI, University of Tennessee
  X. KOU, University of Tennessee
  W. PEI, Chinese Academy of Sciences

• 17PESGM0533, Joint PEV Charging Station and Distributed PV Generation Planning
  H. ZHANG, Tsinghua University
  S. MOURA, University of California, Berkeley
  Z. HU, Tsinghua University
  W. QI, Tsinghua University
  Y. SONG, Tsinghua University

• 17PESGM0668, Adaptive Robust Optimal Reactive Power Dispatch in Distribution Networks
  P. LI, Southeast University
  Z. WU, Southeast University
  Y. WANG, State Grid Jiangsu Economic Research Institute
  M. HU, Southeast University
  X. DOU, Southeast University

• 17PESGM0788, Theoretical Framework for Integrating Distributed Energy Resources into Distribution Systems
  J. LIAN, Pacific Northwest National Laboratory
  D. WU, Pacific Northwest National Laboratory
  H. CHEN, Ohio State University
  K. KALSI, Pacific Northwest National Laboratory

• 17PESGM0970, Local Voltage Control Strategy of Active Distribution Network with PV Reactive Power Optimization
  J. ZHAO, Tianjin University
  Y. LI, Tianjin University
  P. LI, Tianjin University
  C. WANG, Tianjin University
  H. JI, Tianjin University
  L. GE, Institute of Energy, School of Engineering
  Y. SONG, State Grid Corporation of China

• 17PESGM1136, Analysis of Integrated CVR Control Performance with High EV Penetrations
  Y. SHEN, University of Manchester
  H. LI, University of Manchester
  K. HOBAN, Electricity North West Limited
  B. INGHAM, Electricity North West Limited

• 17PESGM1192, A Path-Based Method for Feeder Partition Available Capability Evaluation under N-1 Security Criterion
  M. SUN, Zhejiang University
  S. DONG, Zhejiang University
  S. XIA, State Grid Fujian Electric Power Company
Monday Evening, continued

Z. CAO, Zhejiang University
H. WU, Zhejiang University

• 17PESGM1320, Probabilistic Forecasts of Service Outage Counts from Severe Weather in a Distribution Grid
  A. SINGHEE, IBM
  H. WANG, IBM

• 17PESGM1613, Probabilistic Models for Daily Peak Loads at Distribution Feeders
  H. SANGRODY, SUNY at Binghamton
  N. ZHOU, SUNY at Binghamton
  Q. XINGYE, SUNY at Binghamton

• 17PESGM1787, Optimization of a Distribution Network with Distributed Generations Using Demand Response
  Y. HE, CentraleSupélec
  M. PETIT, CentraleSupélec

PSOPE: Power System Economics Subcommittee Poster Session (poster)

Monday, 17 July, 2017, 5:00 PM–8:00 PM S – Riverwalk AB

Sponsored by: PSOPE: Power System Economics Subcommittee
Chair: N. LU, North Carolina State University

PAPERS AND AUTHORS:

• 17PESGM0151, Optimal Online Adaptive Electric Vehicle Charging
  L. GUO, California Institute of Technology
  K. ERLIKSSON, Lund University
  S. LOW, California Institute of Technology

• 17PESGM0411, A New Allocation Methodology for Recovering Transmission Investment Cost
  J. CERVANTES, University of Nebraska-Lincoln
  F. CHOOBINEH, University of Nebraska-Lincoln

• 17PESGM0506, Strategic Bidding Optimization of Microgrids in Electricity Distribution Market
  Y. LIU, TianJin University
  L. GUO, TianJin University
  C. WANG, TianJin University
  X. LI, TianJin University

• 17PESGM0518, A Power Generation Allocation Method for Region-Dispatched Plants during Over-Generation Period in Partly Deregulated Environment
  X. XU, Shanghai Jiao Tong University
  Y. SONG, Shanghai Jiao Tong University

• 17PESGM0521, Optimal Real-Time Congestion Management in Power Markets Based on Particle Swarm Optimization
  M. MAHMOUDIAN ESFAHANI, Florida International University
  M. CINTUGLU, Florida International University
  O. MOHAMMED, Florida International University

• 17PESGM0577, A Genetic Algorithm Approach for Clearing Aggregator Offers in a Demand Response Exchange
  V. DURVASULU, South Dakota State University
  H. SYAHRIL, South Dakota State University
  T. HANSEN, South Dakota State University

• 17PESGM0648, Improving Short-Term Electricity Price Forecasting Using Day-Ahead LMP with ARIMA Models
  Z. ZHAO, Wayne State University
  C. WANG, Wayne State University
  M. NOKLEBY, Wayne State University
  C. MILLER, Wayne State University

• 17PESGM0748, Address Power Swing Issue under Market to Market Flow Control Coordination
  Y. CHEN, MISO
  Y. JIANG, MISO
  T. MALLINGER, MISO

• 17PESGM0866, Bit-Energy: An Innovative Bitcoin-Style Distributed Transactional Model for a Competitive Electricity Market
  J. LUO, University of Michigan-Dearborn
  W. SU, University of Michigan-Dearborn
  A. HUANG, North Carolina State University

• 17PESGM0955, Impact of Carbon Market on China’s Electricity Market: An Equilibrium Analysis
  Y. LIU, Tsinghua University
  N. ZHANG, Tsinghua University
Monday Evening, continued

C. KANG, Tsinghua University
Q. XIA, Tsinghua University
H. WU, CSG
Z. CHEN, CSG

- 17PESGM0984, An Optimal Microgrid Dispatch Algorithm for Scheduling Multiple CHPs in Islanding Operations
  J. LU, North Carolina State University
  D. LUBKEMAN, North Carolina State University
  N. LU, North Carolina State University
  T. SUN, Harbin Institute of Technology
  Z. LI, Harbin Institute of Technology

- 17PESGM1054, Distributed Consensus-Based Economic Dispatch Considering Grid Operation
  P. VERGARA, University of Southern Denmark
  H. SHAKER, University of Southern Denmark
  B. NORREGAARD, University of Southern Denmark
  L. DA SILVA, University of Campinas

- 17PESGM1055, Energy Management of Isolated Microgrids Using Mixed-Integer Second-Order Cone Programming
  J. GIRAUDO, University of Campinas
  J. CASTRILLON, University of Campinas
  C. CASTRO, University of Campinas

- 17PESGM1087, A Decentralized Real-Time Electricity Market Mechanism for Autonomous Microgrids
  M. SABOUNCHI, University of Akron
  J. WEI, University of Akron

- 17PESGM1117, Cost-Benefit Assessment Challenges for a Smart Distribution System: A Case Study
  L. SUN, North Carolina State University
  J. THOMAS, North Carolina State University
  S. SINGH, North Carolina State University
  D. LI, North Carolina State University
  M. BARAN, North Carolina State University
  D. LUBKEMAN, North Carolina State University
  J. DECAROLIS, North Carolina State University
  A. DE QUEIROZ, North Carolina State University
  L. WHITE, North Carolina State University
  S. WATTS, STEAM Ventures, LLC

- 17PESGM1245, Decentralized Economic Dispatch for Transmission and Distribution Networks via Modified Generalized Benders Decomposition
  C. LIN, Tsinghua University
  W. WU, Tsinghua University
  Z. LI, South China University of Technology
  B. ZHANG, Tsinghua University

- 17PESGM1271, Prioritizing Customers for Neighborhood Energy Sharing in Residential Microgrids with a Transactive Energy Market
  F. OPADKUN, Deakin University
  T. ROY, Deakin University
  M. AKTER, Deakin University
  M. MAHMUD, pesgm2017@mirasmart.com

- 17PESGM1284, Dynamic Dispatch of Multi-Energy Microgrids Considering Opportunity Profit
  Z. LI, Nanyang Technological University
  Y. XU, Nanyang Technological University

- 17PESGM1377, Trading Small Prosumers Flexibility in the Day-Ahead Energy Market
  J. IRIA, INESC TEC
  F. SOARES, INESC TEC
  M. MATOS, INESC TEC

- 17PESGM1384, Renewable Energy Forecasting Optimization for System Operator and Trader
  A. RICHTER, Otto-von-Guericke University Magdeburg
  C. KLADUNDE, Otto-von-Guericke University Magdeburg
  M. WOLTER, Otto-von-Guericke University Magdeburg
  J. GRONAU, 50Hertz Transmission GmbH

- 17PESGM1394, Peer-to-Peer Energy Trading in a Community Microgrid
  C. LONG, Cardiff University
  J. WU, Cardiff University
  C. ZHANG, Cardiff University
  L. THOMAS, Cardiff University
  M. CHENG, Cardiff University
  N. JENKINS, Cardiff University
Monday Evening, continued

- **17PESGM1403**, Coalition-Based Bidding Strategies for Integrating Renewable Energy Sources in Electricity Market  
  S. BAE, Sogang University  
  S. RYU, Sogang University  
  H. KIM, Sogang University

- **17PESGM1469**, A Distributed Newton Method for Optimal Operation of Microgrid Clusters  
  Z. WANG, Tsinghua University  
  W. WU, Tsinghua University  
  B. ZHANG, Tsinghua University

- **17PESGM1538**, The Value Proposition for Energy Storage at the Sterling Municipal Light Department  
  R. BYRNE, Sandia National Labs  
  S. HAMILTON, Sterling Municipal Light Department  
  D. BORNEO, Sandia National Labs  
  T. OLINSKY-PAUL, Clean Energy States Alliance

- **17PESGM1567**, Energy Storage: Market Power and Social Welfare  
  J. CONTRERAS-OCANA, University of Washington  
  Y. WANG, University of Washington  
  M. ORTEGA-VAZQUEZ, University of Washington  
  B. ZHANG, University of Washington

- **17PESGM1579**, Distributed and Asynchronous Unit Commitment and Economic Dispatch  
  M. BRAGIN, University of Connecticut  
  P. LUI, University of Connecticut

- **17PESGM1594**, Stochastic Operation of Interconnected Microgrids  
  B. PAPARI, Florida State University  
  C. EDRINGTON, Florida State University  
  T. VU, Florida State University

- **17PESGM1632**, Mixed Integer Linear Programming Formulation for Chance Constrained Mathematical Programs with Equilibrium Constraints  
  S. SADAT, University of South Florida  
  L. FAN, University of South Florida

- **17PESGM1653**, On Centrally Coordinated Voltage Support in a Self-Dispatch System  
  A. ZIKIRI, Swissgrid Ltd.  
  M. SCHERER, Swissgrid Ltd.  
  J. GALLMANN, Swissgrid Ltd.  
  C. RODUNER, Swissgrid Ltd.  
  L. CUDERMAN, Swissgrid Ltd.

- **17PESGM1749**, Pricing for Integrated Electricity and Gas Systems Based on Long-Run Incremental Cost  
  X. YAN, University of Bath  
  X. YANG, University of Bath  
  H. WANG, University of Bath  
  C. GU, University of Bath  
  F. LI, University of Bath

- **17PESGM1836**, Quantifying the Effect of Natural Gas Price Uncertainty on Economic Dispatch Cost Uncertainty  
  D. HU, Iowa State University  
  S. RYAN, Iowa State University

- **17PESGM1887**, Financial Storage Rights for Load Shifting  
  A. RAMACHANDRAN, Arizona State University  
  T. IBRAHIM, Arizona State University  
  T. CHAKRABORTY, Arizona State University

- **17PESGM1882**, Robust Bidding Strategy for Microgrids in Joint Energy, Reserve and Regulation Markets  
  J. WANG, Tsinghua University  
  H. ZHONG, Tsinghua University  
  Q. XIA, Tsinghua University  
  Z. MA, Tsinghua University  
  Z. WANG, State Grid Anhui Power Grid Corporation  
  X. WU, State Grid Anhui Power Grid Corporation

- **17PESGM1888**, A New Multi-Objective Economic-Emission Dispatch in Microgrids  
  V. SAPPI, University of Nevada Reno  
  H. LIVANI, University of Nevada Reno  
  L. YLINIEMI, University of Nevada Reno
• **17PESGM1944**, Evaluating the Impacts of VPPs on the Joint Energy and Ancillary Service Markets Equilibrium
  H. GUO, Tsinghua University
  Q. CHEN, Tsinghua University
  Q. XIA, Tsinghua University
  J. ZHANG, Shanxi Electric Power Company of SGCC
  M. LI, Shanxi Electric Power Company of SGCC
  P. ZOU, Shanxi Electric Power Company of SGCC

• **17PESGM1980**, Transportation Model for Short-Term Natural Gas Purchase for Power Plants
  D. SHARMA, University of Oklahoma
  A. MALYSCHEFF, University of Oklahoma
  J. JIANG, University of Oklahoma

• **17PESGM1983**, Market-to-Market Day-Ahead Scheduling Considering Information Privacy
  M. KHANABADI, Mississippi State University
  Y. FU, Mississippi State University
  L. GONG, Mississippi State University

• **17PESGM2190**, Day-Ahead Schedule of a Multi-Energy System with Power-to-Gas Technology
  Y. LI, Zhejiang University
  F. WEN, Zhejiang University
  F. TIAN, Zhejiang University
  Y. XUE, State Grid Corporation of China
  Z. DONG, China Southern Power Grid
  Y. ZHENG, China Southern Power Grid
  R. ZHANG, China Southern Power Grid

• **17PESGM2260**, Net-Zero Settlement in Distribution Markets
  S. PARHIZI, University of Denver
  A. MAJZOOBI, University of Denver
  A. KHODAEI, University of Denver

**PSOPE: Technologies and Innovation Subcommittee Poster Session** *(poster)*

**Monday, 17 July, 2017, 5:00 PM–8:00 PM**
**S – Riverwalk AB**

**PAPERS AND AUTHORS:**

• **17PESGM0080**, Challenges, Solutions and Lessons Learned for Centralized Model Management at California ISO
  V. PERUMALLA, California ISO
  B. JACOBSSEN, California ISO
  S. ZULKADER, California ISO

• **17PESGM0540**, Benefits of Using Linear State Estimation for Synchrophasor Applications
  L. ZHANG, Electric Power Group
  H. CHEN, Electric Power Group
  N. NAYAK, Electric Power Group
  M. VUTSINAS, Duke Energy
  T. BRADBERRY, Duke Energy
  E. PHILLIPS, Duke Energy
  A. FARIS, Bonneville Power Administration

• **17PESGM0552**, Global Status Event-Based Iterative Co-Simulation Framework for Power and Communication
  H. TONG, NARI Group Corporation
  J. LUO, NARI Group Corporation
  Y. WEI, Sunshine Energy Property Management Group Inc.
  M. NI, NARI Group Corporation
  Y. LI, NARI Group Corporation
  Y. XUE, NARI Group Corporation

• **17PESGM0561**, Planning Hydrogen Refueling Stations with Coordinated On-Site Electrolytic Production
  H. ZHANG, Tsinghua University
  W. QI, Tsinghua University
  Z. HU, Tsinghua University
  Y. SONG, Tsinghua University

• **17PESGM0568**, Smart Sampling and HPC-Based Probabilistic Look-Ahead Contingency Analysis Implementation and Its Evaluation with Real-World Data
  Y. CHEN, Pacific Northwest National Laboratory
  H. REN, Pacific Northwest National Laboratory
Monday Evening, continued

- **17PESGM1034, Synchronized Transmission System Anti-Islanding Scheme**
  - Y. TANG, Center for Power Electronics System
  - R. SUN, Dominion Virginia Power
  - K. THOMAS, Dominion Virginia Power
  - R. BURGOS, Center for Power Electronics System

- **17PESGM1173, Transmission Line Ampacity Improvements of AltaLink Wind Plant Overhead Tie-Lines Using Weather-Based Dynamic Line Rating**
  - B. BHATTARAI, Idaho National Laboratory
  - J. GENTLE, Idaho National Laboratory
  - P. HILL, Idaho National Laboratory
  - T. MCJUNKIN, Idaho National Laboratory
  - R. RENWICK, AltaLink

- **17PESGM1208, Optimal Operation of Battery Swapping-Charging Systems Considering Quality-of-Service Constraints**
  - Q. XU, Nanyang Technological University
  - Z. TIANYANG, North China Electric Power University
  - P. WANG, Nanyang Technological University

- **17PESGM1221, Hierarchical Power Flow Algorithm for Standalone Hybrid AC/Multi-DC Microgrids**
  - E. APRILIA, University of Sydney
  - K. MENG, University of Sydney
  - Z. DONG, University of Sydney
  - Y. JIA, Hong Kong Polytechnic University
  - Z. XU, Hong Kong Polytechnic University

- **17PESGM1236, Solar Power Forecast with Weather Classification Using Self-Organized Map**
  - S. NITISANON, Chulalongkorn University
  - N. HOONCHAREON, Chulalongkorn University

- **17PESGM1308, Uncertainty Analysis of Power System Time-Domain Simulation Based on Generalized Polynomial Chaos Method**
  - L. LI, Zhejiang University
  - L. XIAO, State Grid Corporation of China
  - Y. QIU, Zhejiang University
  - H. WU, Zhejiang University
  - Y. SONG, Zhejiang University

- **17PESGM1476, Parameter Estimation of External Network Equivalents**
  - E. ANGELOS, Sao Carlos School of Engineering – University of Sao Paulo
  - A. ABUR, Northeastern University
  - E. ASADA, Sao Carlos School of Engineering – University of Sao Paulo

- **17PESGM1518, Operation Pattern Recognition via Mass Data in Bulk Transmission Grid**
  - X. LIU, Tsinghua University
  - W. HU, Tsinghua University
  - L. ZHENG, Tsinghua University
  - Y. MIN, Tsinghua University
  - Y. LI, Center China Grid Co. Ltd.
  - R. YU, State Grid Corporation of China Southwest Branch

- **17PESGM1563, Improving Wind Power Prediction Intervals Using Vendor-Supplied Probabilistic Forecast Information**
  - S. NITSCHE, University of Duisburg-Essen
  - C. SILVA-MONROY, Sandia National Laboratories
  - A. STAID, Sandia National Laboratories
  - J. WATSON, Sandia National Laboratories
  - D. WOODRUFF, University of California Davis
  - S. WINNER, Bonneville Power Administration

- **17PESGM1583, An Interval Mathematically Based Methodology for Reliable Estimation of Transmission Line Temperature**
  - G. COLETTA, University of Sannio
  - A. VACCARO, University of Sannio
  - D. VILLACCI, University of Sannio

- **17PESGM1604, Calibrating Physical Parameters in House Models Using Aggregate AC Power Demand**
  - Y. SUN, Pacific Northwest National Laboratory
  - A. STEVENS, Pacific Northwest National Laboratory
Monday Evening, continued

J. LIAN, Pacific Northwest National Laboratory
S. LU, Pacific Northwest National Laboratory

- 17PESGM1609, Reliable Adaptive Optimization Demonstration Using Big Data
  S. CVUIC, NETSS Inc.
  J. LANG, NETSS Inc.
  M. ILIC, NETSS Inc.
  S. BABAEI, NYPA
  G. STEFOPoulos, NYPA

- 17PESGM1671, A Novel Control Strategy for Microgrid Voltage and Frequency Regulation with Electronic Converters
  H. ZHAO, Case Western Reserve University
  M. HONG, Case Western Reserve University
  W. LIN, Case Western Reserve University
  K. LOPARO, Case Western Reserve University

- 17PESGM1776, A Multivariate Time Series Forecast Model for Wind and Storage Integrated System Operation
  W. BAI, Baylor University
  D. LEE, University of Texas at Austin
  K. LEE, Baylor University

- 17PESGM1785, Combining Multi-Objective Evolutionary Algorithm and H&Δ Matrix for SCADA and PMU Placement
  M. VIGLIASSI, Universidade de São Paulo
  J. LONDON JR., Universidade de São Paulo
  A. DELBEM, Universidade de São Paulo
  S. PIERETI, IFMT

- 17PESGM1801, Residential Solar Panel Performance Improvement Based on Optimal Intervals and Optimal Tilt Angle
  M. SARAILOO, Binghamton University, State University of New York
  S. AKHLAGHI, Binghamton University, State University of New York
  M. REZAEIAHARI, Binghamton University
  H. SANGRODY, Binghamton University, State University of New York

- 17PESGM1920, A Method Using PSO to Optimize and Identify Error Parameter Based on Local State Estimation
  H. ZHANG, North China Electric Power University
  J. HAO, North China Electric Power University

- 17PESGM1931, Comparative Studies on Frequency Responses of Type 3 Wind Turbines and Synchronous Generators
  L. SUN, University of Hong Kong
  Y. HOU, University of Hong Kong
  C. PENG, University of Hong Kong
  J. JU, Huazhong University of Science and Technology

- 17PESGM1957, A Two-Stage Multi-Objective Optimal Power Flow Algorithm for Hybrid AC/DC Grids with VSC-HVDC
  Y. LI, Northeast Electric Power University
  Y. LI, Northeast Electric Power University
  G. LI, Northeast Electric Power University

- 17PESGM2034, Performance Analysis of MMF-Based Transmission Network Fault Diagnosis via Randomized Hybrid Simulations
  M. SALMAN, Binghamton University
  M. SARAILOO, Binghamton University
  N. WU, Binghamton University

- 17PESGM2109, Optimal Linear-Quadratic-Integral Controller Design for Doubly-Fed Induction Generator
  N. GURUNG, UNC Charlotte
  R. BHATTARAI, UNC Charlotte
  S. KAMALASADAN, UNC Charlotte

- 17PESGM2169, Integrating Water Distribution Energy Flexibility in Power Systems Operation
  K. OIKONOMOU, University of Utah
  M. PARVANIA, University of Utah
  S. BURIAN, University of Utah

- 17PESGM2284, Inductive Perturbation Tolerance Improvement of Hybrid Networks Using an Integrated Expert System
  B. ABEGAZ, TTU
  S. MAHAJAN, TTU
Monday Evening, continued

Smart Buildings, Loads & Customer Systems Poster Session (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM    S – Riverwalk AB
Sponsored by:    Smart Buildings, Loads & Customer Systems

PAPERS AND AUTHORS:
• 17PESGM0030, Autonomous Coordination of Smart Buildings in Microgrids Based on a Double-Sided Auction
  W. EL-BAZ, Technical University of Munich
  P. TZSCHUEUTSCHLER, Technical University of Munich
• 17PESGM0127, Stochastic Demand Charge Management for Commercial and Industrial Buildings
  Z. WANG, University of Washington
  B. ASGHARI, NEC Labs America
  R. SHARMA, NEC Labs America
• 17PESGM0230, Stochastic Residential Energy Resource Scheduling by Multi-Objective Natural Aggregation Algorithm
  F. LUO, University of Sydney, Australia
  G. RANZI, University of Sydney, Australia
  G. LIANG, University of Newcastle, Australia
  Z. DONG, University of Sydney, Australia
• 17PESGM0403, Coupling a Small Battery with a Datacenter for Frequency Regulation
  R. GURUPRASAD, IBM
  P. MURALI, IBM
  D. KRISHNASWAMY, IBM
  S. KALYANARAMAN, IBM
• 17PESGM0453, Optimal Sizing of Energy Storage for Community Microgrids Considering Building Thermal Dynamics
  G. LIU, Oak Ridge National Laboratory
  Z. LI, Oak Ridge National Laboratory
  M. STARKE, Oak Ridge National Laboratory
  T. OLLIS, Oak Ridge National Laboratory
  K. TOMSOVIC, University of Tennessee, Knoxville
• 17PESGM0617, Sensitivity Analysis on Modeling Heterogeneous Thermostatically Controlled Loads Using Markov Chain Abstraction
  A. RADAIDEH, Iowa State University
  U. VAIDYA, Iowa State University
  V. AJJARAPU, Iowa State University
• 17PESGM0941, Data-Driven Residential Customer Aggregation Based on Seasonal Behavioral Patterns
  K. CHEN, Tsinghua University
  Z. HE, Columbia University
  J. HU, Tsinghua University
• 17PESGM0959, An Unsupervised Electrical Appliance Modeling Framework for Non-Intrusive Load Monitoring
  B. LIU, Tianjin University
  W. LUAN, China Electric Power Research Institute
  Y. YU, Tianjin University
  B. ZENG, Guangxi Power Grid Co. Ltd
• 17PESGM0980, Dynamic Programming Based Home Energy Management Unit Incorporating PVs and Batteries
  B. JEDDI, Queensland University of Technology, Australia
  Y. MISHRA, Queensland University of Technology, Australia
  G. LEDWICH, Queensland University of Technology, Australia
• 17PESGM1011, Model Predictive Control Based Scheduling Method for a Building Microgrid
  F. QI, Tianjin University
  X. JIN, Tianjin University
  Y. MU, Tianjin University
  H. JIA, Tianjin University
  X. XU, Queen’s University, Belfast
  T. JIANG, Northeast Dianli University
  X. YU, Tianjin University
  X. LI, Northeast Dianli University
• 17PESGM1015, Building Energy Management Based on Demand Response Strategy Considering Dynamic Thermal Characteristic
  F. YANG, Tsinghua University
  Q. GUO, Tsinghua University
  Z. PAN, Tsinghua University
  H. SUN, Tsinghua University
Monday Evening, continued

• 17PESGM1327, Optimal Online Charging of Plug In Electrical Vehicles Considering Voltage Unbalance Factor
  N. JABALAMELI, Curtin University
  M. MASOUM, S. DEILAMI, Curtin University
• 17PESGM1528, Improvement of Voltage Magnitude and Unbalance in LV Network by Implementing Residential Demand Response
  M. RAHMAN, Murdoch University, Australia
  G. SHAHJUH, Murdoch University, Australia
  A. AREFI, Murdoch University, Australia
  H. PEZESHKI, Queensland University of Technology Brisbane, Australia
  S. HETTITIHE, National School of Business Management
• 17PESGM1733, An Investigation of the Randomized Controlled Trial (RCT) Method as a Customer Baseline Load (CBL) Calculation for Residential Customers
  S. MOHAJERYAMI, University of North Carolina at Charlotte
  V. CECCHI, University of North Carolina at Charlotte
• 17PESGM1977, Transformer for Contactless Electric Vehicle Charging with Bidirectional Power Flow
  O. AWORO, University of Pittsburgh
  J. SHEK, University of Edinburgh
• 17PESGM2270, On Aggregating Thermostatically Controlled Loads Based on Energy Losses
  K. HREINSSON, Arizona State University
  A. SCAGLIONE, Arizona State University

Poster Session – Substations (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM S – Riverwalk AB
Sponsored by: Substations

PAPERS AND AUTHORS:
• 17PESGM0349, Control Strategy for Multi-Infeed MMC-Based HVDC System Connected to Weak Grid
  H. XIAO, Zhejiang University
  Z. XU, Zhejiang University
  S. WANG, Zhejiang University
  S. LIU, Zhejiang University
  W. JIANG, State Grid Corporation of China
• 17PESGM1784, Automated Low Voltage Intelligent Network (ALVIN)
  C. LOWSLEY, EA Technology Ltd.
  B. HIGGINBOTHAM, EA Technology LLC
• 17PESGM1971, A Practical Preset Position Calibration Technique for Unattended Smart Substation Security Improvement
  D. CAI, University of Electronic Science and Technology of China
  Q. HUANG, University of Electronic Science and Technology of China
  J. LI, University of Electronic Science and Technology of China
  Z. CHANG, University of Electronic Science and Technology of China
• 17PESGM2096, Modeling Power System Buses Using Performance Based Earthquake Engineering Methods
  V. CHALISHAZAR, Oregon State University
  C. HUO, Oregon State University
  I. FOX, Oregon State University
  T. HAGAN, Oregon State University
  E. COTILLA-SANCHEZ, Oregon State University
  A. VON JOUANNE, Oregon State University
  J. ZHANG, Oregon State University
  T. BREKKEN, Oregon State University
  R. BASS, Portland State University

Transformers Poster Session (poster)
Monday, 17 July, 2017, 5:00 PM–8:00 PM S – Riverwalk AB
Sponsored by: Transformers
Chair: S. MCNELLY, Xcel Energy

PAPERS AND AUTHORS:
• 17PESGM0207, PDTools: A Toolbox of Partial Discharge (PD) Signal Analysis for Transformer Condition Assessment
  H. MA, University of Queensland
Monday Evening, continued

T. SAHA, University of Queensland
J. SEO, University of Queensland
J. CHAN, University of Queensland
Y. CUI, University of Queensland

• 17PESGM0390, A Two-Stage Overload Strategy of Oil-Immersed Transformers Considering Operation Risk
Y. ZHANG, Zhejiang University
Y. CAO, Zhejiang University
D. HE, Zhejiang University
C. GUO, Zhejiang University
X. DU, State Grid Shandong Electric Power Company
D. BAI, State Grid Shandong Electric Power Company

• 17PESGM1037, An Estimation of Remaining Life Expectancy of Generator Step-Up Transformer Based on Strength Analysis of Insulating Paper
S. SERMSUKROONGSAKUL, Chiang Mai University
S. PREMRUDEEPRREECHACHARN, Chiang Mai University

• 17PESGM1121, A New Inrush Current Identification Algorithm Based on Transformer Core Saturation
M. JIN, GE Grid Software Solutions
Y. LIU, Shandong Electric Power Co.

• 17PESGM1145, Finite Element Analysis to Understand the Mechanical Defects in Power Transformer Winding Clamping Structure
L. NARANPANAWE, University of Queensland, Australia
T. SAHA, University of Queensland, Australia
C. EKANAYAKE, Griffith University

• 17PESGM1165, Machine Learning Applications in Estimating Transformer Loss of Life
A. MAJZOABI, University of Denver
M. MAHOOR, University of Denver
A. KHODAEI, University of Denver

• 17PESGM1182, Thermal Monitoring and Reliability Analysis System for Underground Substation
T. WANG, Nanyang Technological University
Q. WANG, Nanyang Technological University
P. WANG, Nanyang Technological University
Y. ZHANG, Nanyang Technological University

• 17PESGM1860, Application of Multi-Port Solid State Transformer for Volt-VAR Control in Distribution System
M. RASHIDI, UWMilwaukee-n
A. BANI-AHMED, UWMilwaukee-n
A. NASIRI, UWMilwaukee-n

• 17PESGM2038, A Magnetization Hysteresis-Based Power Transformer Fault Detection Algorithm
Z. LI, Xi'an Jiaotong University
Z. JIAO, Xi'an Jiaotong University
Y. WANG, Xi'an Jiaotong University
F. MA, Xi'an Jiaotong University

• 17PESGM2198, Design and Experimental Verification of DC-DC Autotransformer Prototype
M. LI, Huazhong University of Science and Technology
M. ZHOU, Huazhong University of Science and Technology
W. ZUO, Huazhong University of Science and Technology
W. LIN, Huazhong University of Science and Technology
J. WEN, Huazhong University of Science and Technology
C. LUO, Northern Indiana Public Service Company

T&D Committee Poster Session (poster)
Monday, 17 July, 2017, 5:00 PM-8:00 PM  S – Riverwalk AB
Sponsored by: Transmission and Distribution
Chairs: G. TODESCHINI, Swansea University
S. SANTOSO, University of Texas

PAPERS AND AUTHORS:
• 17PESGM0014, Passive Filter Installation for Harmonic Mitigation in Residential Distribution Systems
Q. SHI, University of Tennessee
H. LIANG, North China Electric Power Research Institute Co. Ltd
T. HOU, University of Alberta
L. BAI, University of Tennessee
W. XU, University of Alberta
F. LI, University of Tennessee
• 17PESGM0035, A Probabilistic Formulation for Cost / Benefit Analysis in Power Distribution Engineering
  G. HEYDT, ASU
  A. DINAKAR, ASU

• 17PESGM0244, Fifth Harmonic Voltages in EHV Transmission Systems
  G. HEYDT, ASU
  P. JACKOVICH, Salt River Project

• 17PESGM0247, Geomagnetic Disturbance Storm System Impact – A Transmission Facility Owner Case Study
  A. HAQUE, Teshmont Consultants LP
  J. VAILE, Teshmont Consultants LP
  T. RUTKUNAS, AltaLink Management Limited
  S. KODSI, Teshmont Consultants LP
  R. BAKER, Teshmont Consultants LP

• 17PESGM0336, Analysis and Mitigation of Interaction between Transformer Inrush Current and HVDC Operation
  Y. ZHANG, AESO
  C. BUSH, pesgm2017@mirasmart.com

• 17PESGM0412, Feedback Reduction “Circulating Current” in MMC-HVDC without Electronic/Digital Filter
  H. JIANG, McGill University
  B. OOI, McGill University

• 17PESGM0783, Control Strategy for Hybrid High-Voltage DC (HVDC) Systems Connecting Voltage-Weak Grid
  G. LEE, Seoul National University
  D. KWON, Seoul National University
  S. MOON, Seoul National University
  C. KIM, KEPCO Research Institute (KEPRI)

• 17PESGM0858, Elevating Prosumers to Provisional Microgrids
  A. ALBAKER, University of Denver
  A. KHODAEI, University of Denver

• 17PESGM1170, Investigating Effects of Weather Parameter Uncertainty on Transmission Line Power Handling Capabilities Using Affine Arithmetic
  M. RAHMAN, University of North Carolina at Charlotte
  V. CECCHI, University of North Carolina Charlotte
  B. WATKINS, Bobby.Watkins@southwire.com

• 17PESGM1434, The Analysis of DC Fault Mode Effects on MMC-HVDC System
  J. CHEN, Northeast Electric Power University
  C. SUN, Northeast Electric Power University
  Y. LI, Northeast Electric Power University
  B. LI, Northeast Electric Power University
  G. LI, Northeast Electric Power University

• 17PESGM1506, Assessing Energy Storage Potential to Facilitate the Increased Penetration of Photovoltaic Generators and Electric Vehicles in Distribution Networks
  V. CUNHA, University of Campinas
  T. RICCIARDI, University of Campinas
  W. FREITAS, University of Campinas
  B. VENKATESH, Ryerson University

• 17PESGM1559, Four-Channel Control of Hybrid MMC with Pole-to-Ground DC Fault Ride Through Capability
  W. XUAN, Huazhong University of Science and Technology
  W. LIN, Huazhong University of Science and Technology
  J. WEN, Huazhong University of Science and Technology
  C. LUO, Northern Indiana Public Service Company

• 17PESGM1564, Capturing Distribution Grid-Integrated Solar Variability and Uncertainty Using Microgrids
  A. MAJZOobi, University of Denver
  A. KHODAEI, University of Denver
  S. BAHRAMIRAD, Commonwealth Edison Company

• 17PESGM1576, Event-Driven State Estimation for Monitoring the Voltage Quality of Distribution Systems
  L. RAGGI, University of Campinas (Unicamp)
  F. TRINDADE, University of Campinas (Unicamp)
  W. FREITAS, University of Campinas (Unicamp)
• 17PESGM1652, Protection of Full Bridge MMC DC Grid Employing Mechanical DC Circuit Breakers
  W. LIN, University of Aberdeen
  D. JOVICIC, University of Aberdeen
  S. NGUEFEU, RTE France
  H. SAAD, RTE France

• 17PESGM1688, Modelling of Hybrid DC Circuit Breaker Based on Phase-Control Thyristors
  A. JAMSHIDI FAR, University of Aberdeen
  D. JOVICIC, University of Aberdeen

• 17PESGM1708, Component Outage Estimation Based on Support Vector Machine
  R. ESKANDARPOUR, University of Denver
  A. KHODAEI, University of Denver

• 17PESGM1741, Digital Image Expert System for Corrosion Analysis of Steel Transmission Structures
  I. HATHROUT, Hydro One Networks Inc.
  K. CALLERY, Hydro One Networks Inc.
  T. HATHROUT, McMaster University
  U. SIVAGNANENTHIRARAJAH, University of Waterloo

• 17PESGM1751, Effects of Pre-Insertion Resistor on Energization of MMC-HVDC Stations
  L. HE, Siemens AG

• 17PESGM2099, Status of Revision of IEEE Std 1547 and 1547.1
  J. BOEMER, Electric Power Research Institute (EPRI)
  M. HUQUE, Electric Power Research Institute (EPRI)
  B. SEAL, Electric Power Research Institute (EPRI)
  T. KEY, Electric Power Research Institute (EPRI)
  D. BROOKS, Electric Power Research Institute (EPRI)
  C. VARTANIAN, Mitsubishi Electric Power Products, Inc.

• 17PESGM2140, Literature Survey on Operational Voltage Control and Reactive Power Management on Transmission and Sub-Transmission Networks
  M. ELIZONDO, Pacific Northwest National Laboratory
  N. SAMAAN, Pacific Northwest National Laboratory
  Y. MAKAROV, Pacific Northwest National Laboratory
  J. HOLZER, Pacific Northwest National Laboratory
  M. VALLEM, Pacific Northwest National Laboratory
  R. HUANG, Pacific Northwest National Laboratory
  X. KE, Pacific Northwest National Laboratory
  F. PAN, Pacific Northwest National Laboratory

• 17PESGM2185, Condition Assessment and Failure Probability of Existing Transmission Lines
  I. HATHROUT, Hydro One Networks Inc.
  K. CALLERY, Hydro One Networks Inc.
  T. HATHROUT, McMaster University
  Y. XU, McGill University

• 17PESGM2257, Generalized Short Circuit Ratio for Multi-Infeed LCC-HVDC Systems
  F. ZHANG, Zhejiang University
  H. XIN, Zhejiang University
  Z. WANG, Zhejiang University
  D. GAN, Zhejiang University
  Q. XU, State Grid
  P. DAI, State Grid
  F. LIU, Tsinghua University

• 17PESGM0432, Stacked Benefit Applications of Energy Storage Systems in Distribution Circuits
  P. CHIRAPONGSANANURAK, Chulalongkorn University
  A. DUBEY, Washington State University
  S. JOTHIBASU, University of Texas at Austin
  S. SANTOSO, University of Texas at Austin
  A. MAITRA, EPRI

• 17PESGM1129, Distributed Demand Response Considering Line Loss for Distributed Renewable Energy Systems
  T. VU, Florida State University
  C. EDRINGTON, Florida State University
  R. HOVSAPIAN, Idaho National Laboratory

• 17PESGM1521, Simulation-Based Validation for Voltage Optimization with Distributed Generation
  M. HERNANDEZ, Universidad de los Andes
  G. RAMOS, Universidad de los Andes
  H. PADULLAPARTI, University of Texas at Austin
  S. SANTOSO, University of Texas at Austin
Tuesday Morning

- 16TD0168 Non-Frequency Sensitive All-Pass Filter Based Single-Phase PLLs (This paper was accepted for the 2016 IEEE PES T&D conference but was not presented, it is being presented at the 2017 GM)
  M. RAMEZANI, Electrical Engineering, Islamic Azad University-Abadan Branch
  S. GOLESTAN, Electrical Engineering, Islamic Azad University-Abadan Branch
  S. LI, Electrical and Computer Engineering, University of Alabama

Tuesday Morning

Presenter Breakfast (breakfast)

Tuesday, 18 July, 2017, 6:30 AM–8:30 AM       S – Chicago VI+VII

Student Poster Session and Attendee Breakfast (breakfast)

Tuesday, 18 July, 2017, 7:00 AM–9:30 AM       S – Riverwalk AB
Sponsored By:       Power & Energy Society
Chair:             J. SOLANKI, West Virginia University

Poster Categories:
- Advanced Computational Methods for Power System Planning, Operation, and Control
- Asset Management
- Cyber and Physical Security of the Smart Grid
- Dynamic Performance and Control of Power Systems
- Electric Machines and Drives
- Emerging Software Needs for the Restructured Grid
- Flexible AC Transmission Systems
- Integrating Renewable Energy into the Grid
- Intelligent Monitoring and Outage Management
- Market Interactions in Power Systems
- Power Electronics
- Power System Modeling and Simulation
- Smart Cities
- Smart Grid Technology
- Smart Sensors, Communication and Control in Energy Systems
- Substation and Distribution Automation
- System-Wide Events and Analysis Methods

IEEE PES Student Activities Subcommittee

DR. J. SOLANKI
DR. A. ST. LEGER
DR. V. CECCHI

Transactions Paper Session 01 (transactions paper)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM       G – 304 Tiered Classroom
Sponsored by:       Analytic Methods for Power Systems
Chair:             J. WEN, Southern California Edison (SCE)

PAPERS AND AUTHORS:
- 17PESGM0107, Scenario Reduction with Submodular Optimization [Transaction Number: 10.1109/TPWRS.2016.2603448]
  Y. WANG, University of Washington
  Y. LIU, University of Washington
  D. KIRSCHEN, University of Washington

- 17PESGM0986, Multiscale Simulation of Power System Transients Based on the Matrix Exponential Function [Transaction Number: TPWRS-01813-2015]
  C. WANG, Tianjin University
  X. FU, Tianjin University
  P. LI, Tianjin University
  J. WU, Cardiff University
  L. WANG, University of British Columbia

- 17PESGM0869, Dynamic Phasor Modeling of Line-Commutated Rectifiers with Harmonics Using Analytical and Parametric Approaches [Transaction Number: TEC-00508-2016]
  Y. HUANG, University of British Columbia
Tuesday Morning, continued

L. DONG, Northwestern Polytechnical University
S. EBRAHIMI, University of British Columbia
N. AMRI, University of British Columbia
J. JATSKEVICH, University of British Columbia
• 17PESGM1029, A New Framework for Detection and Identification of Network Parameter Errors
   [Transaction Number: 2597286]
   A. ABUR, Northeastern University
   Y. LIN, Northeastern University

A. ABUR, Northeastern University
Y. LIN, Northeastern University
• 17PESGM1405, Computation of Dominant Poles and Residue Matrices for Multivariable Transfer Functions of Infinite Power System Models
   [Transaction Number: TPWRS-01011-2013]
   S. VARRICCHIO, CEPEL
   F. FREITAS, University of Brasilia
   N. MARTINS, CEPEL
   F. VELIZ, CEPEL

S. VARRICCHIO, CEPEL
F. FREITAS, University of Brasilia
N. MARTINS, CEPEL
F. VELIZ, CEPEL
• 17PESGM1635, A Novel Multi-Agent Decision Making Architecture Based on Dual’s Dual Problem Formulation
   [Transaction Number: TSG-00755-2015]
   Z. MIAO, University of South Florida
   L. FAN, University of South Florida

Z. MIAO, University of South Florida
L. FAN, University of South Florida
• 17PESGM1995, Online Detection of Stealthy False Data Injection Attacks in Power System State Estimation
   [Transaction Number: TSG.2016.2596298]
   A. ASHOK, Pacific Northwest National Laboratory
   M. GOVINDARASU, Iowa State University
   V. AJJARAPU, Iowa State University

A. ASHOK, Pacific Northwest National Laboratory
M. GOVINDARASU, Iowa State University
V. AJJARAPU, Iowa State University

Tools for Managing Electricity Markets and Reliability for Grid with Very High Renewable Resources (panel)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM           G – 222 Multifunction Room
Sponsored by: (AMPS) Computer Analytical Methods
Chairs: I. KOCKAR, University of Cambridge
        E. HAQ, California ISO

The increasing penetration (50% or more) of renewable energy sources in the coming years in the electrical grid and the advances in smart grid technologies require new efficient algorithms and tools to reliably & economically manage the power grid and electricity markets. The variability and uncertainty associated with the renewable resources will require more efficient monitoring, situational awareness tools, advanced market applications and fast and sophisticated controls of the power grid. The uncertainty and variability associated with renewable resources may cause renewable forecasting error and this may cause over or under generation. The fast and effective tools for both electricity markets and grid control are needed to minimize the variability and uncertainty associated with renewable resources. There will also be a need for more advanced modeling and optimization techniques for the market applications.

Panelists:
• 17PESGM2743, “Tools for Market and Grid”
  A. KHALED, CAISO
• 17PESGM2744, EIM Markets at California ISO
  A. GEORGE, CAISO
• 17PESGM2745, Toward a Flexible Scenario Generation Tool for Stochastic Renewable Energy Analysis
  H. CHIANG, Cornell University
• 17PESGM2742, Toward Dynamic Standards for Supporting Large Penetration of Renewable Resources and Responsive Demand
  M. ILIC, Carnegie Mellon University

Advances in Accelerated Distribution System Time-Series Analysis (panel)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM           G – 240 Multifunction Room
Sponsored by: (AMPS) Distribution System Analysis
Chair: B. MATHER, National Renewable Energy Laboratory

Quasi-static time-series (QSTS) analysis has received increasing interest from the power system analysis community as it promises refined insight into power system operating and planning concerns. This is particularly true for distribution system analysis on circuits with many time dependent and potentially time-variable components as is the case for deployments of large numbers of distributed energy resources (DERs). Unfortunately, detailed QSTS analysis is also currently computationally intensive as yearlong simulations may take days to complete using standard computing platforms available to typical
utilities. This panel present multifaceted research focused on dramatically decreasing the amount of time required to complete accurate QSTS analyses. Time-series approximation techniques, methods to speed the power flow solution, and parallelization techniques appropriate for standard computing platforms will be discussed and the latest results presented. Additionally, the data requirements for QSTS analysis, and newly developed models to meet this need, will be discussed.

PANELISTS:
• 17PESGM2562, Introduction to Advanced Distribution Time-Series Analysis: Research Motivations, Challenges and Applications
  R. BRODERICK, Sandia National Laboratories
• 17PESGM2563, Fast Time-Series Approximations Using Vector Quantization and an Event-Based Algorithm
  J. DEBOEVER, Georgia Institute of Technology
• 17PESGM2564, New Methods for Rapid Time-Series Analysis
  M. REINO, Sandia National Laboratories
• 17PESGM2565, Improvements to a Commercial-Grade Distribution System Power Flow Engine to Support Rapid QSTS Simulations
  F. THERRIEN, CYME International
• 17PESGM2420, Temporal Decomposition of Distribution System-Level Time-Series Analysis
  B. MATHER, NREL
• 17PESGM2566, Distribution Power Flow Computational Parallelization Using Diakoptics (Circuit Tearing)
  D. MONTENEGRO, Electric Power Research Institute
• 17PESGM2567, Solar and Load Data for Accurate QSTS Simulations
  M. LAVE, Sandia National Laboratories

Big Data Access and Big Data Research Integration in Power Systems (panel)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM    G – 226 Multifunction Room
Sponsored by: (AMPS) Big Data Analytics
Chair: H. MOHSENIAN-RAD, University of California Riverside

The electric power industry, interacting with one of the largest customer-serving critical networks and going through drastic rapid changes in both business and technical paradigms, is presenting limitless opportunities for big data studies. However, research and development on big data is meaningful only if one has access to big data. Accordingly, this panel will discuss: 1) the type, resolution, and volume of the power system data that is needed to support different types of big data research and development activities in power systems; 2) the challenges and practical obstacles in sharing real data in power systems; 3) tools and techniques, such as sensitive data masking methods, which can overcome these obstacles.

PANELISTS:
• 17PESGM2880, Efforts on Big Data Analytics Subcommittee – Data Access and Data Research Integration
  H. MOHSENIAN-RAD, University of California Riverside
• 17PESGM2881, Open Micro-PMU: A Real World Reference Distribution Micro-Phasor Measurement Unit Data Set for Research and Application Development
  E. STEWART, LBNL
• 17PESGM2877, Big Data Access and Big Data Research Integration in Power Systems
  Z. HUANG, PNNL
• 17PESGM2878, System Identification of Reduced-Order Models of Power Systems from PMU Data
  A. CHAKRABORTTY, NC State University
• 17PESGM2882, Predictive Analytics for Energy Systems State Estimation
  Y. ZHANG, National Renewable Energy Laboratory
• 17PESGM3084, Advanced Analytics and Data for PMU Applications
  B. BLEVINS, ERCOT

Advanced Interconnection Features of Transmission-Connected Renewable Power Plants (panel)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM    S – Sheraton III
Sponsored by: Electric Machinery
Chair: R. NELSON, SIEMENS

As interconnection requirements imposed on renewable facilities have continued to increase, vendors have introduced or reviewed the introduction of new capabilities, including features like black start, island operation, synthetic inertial response, operation at low short circuit ratio, turbine-based energy storage,
Tuesday Morning, continued

advanced voltage or frequency controls, and advanced modeling capabilities. Many of these capabilities may not be well known in the power industry. This panel would include representatives from major vendors (invitees will include major Americas-base vendors like GE, Siemens, Vestas, Senvion, Gamesa, and Electrocon, as well as academics) who will describe a new advanced feature that is or may be of interest to the transmission community. The selection of the specific feature or control will be left to the discretion of the invitee.

PANELISTS:

• 17PESGM2459, High Performance Ancillary Services from Utility-Scale PV Plants
  M. MORJARIA, First Solar

• 17PESGM2457, Multi-Plant Coordination for Volt/VAR Response of Wind Plants
  M. RICHWINE, GE

• 17PESGM2463, Reactive Current Control for Mitigating Overvoltages and Interharmonic Voltage Oscillations in Wind Farms
  S. EL ITANI, Senvion

• 17PESGM2458, Experience with Lab Testing and Emulation of Turbine Harmonic Susceptibility, Including SSR
  S. SAYLORS, Vestas

• 17PESGM2460, Improved Inertial Response Functionalities in Response to Operational Experiences in Quebec
  M. FISCHER, Enercon

• 17PESGM2462, Advanced Controls to Accommodate Weak System Interconnections
  H. MA, Siemens

• 17PESGM2461, Evolving North American Interconnection Requirements
  J. SMITH, UVIG

Advanced Topics in Electrical Machines I (panel)
Tuesday, 18 July, 2017, 8:00 AM–12:00 PM  G – 206 Tiered Classroom

Sponsored by: Electric Machinery
Chair: M. OSHIMA, Tokyo University of Science, Suwa

PANELISTS:

• 17PESGM2601, Review of Current Waveforms for Noise Reduction of Switched Reluctance Motor for Transportation
  A. CHIBA, Tokyo Institute of Technology

• 17PESGM2602, Novel Flux-Switching PM Machines
  B. SARLIOGLU, Wisconsin University

• 17PESGM2603, Sensorless IPM Electric Submersible Pump Drive System for Offshore Oil Production
  M. RAHMAN, Memorial University of Newfoundland

• 17PESGM2604, Consideration of the Ratio of Outer Diameter and Axial Length for Torque Improvement in Switched Reluctance Motors
  K. KIYOTA, University of Toyama

• 17PESGM2605, Verification of Synchronous Generator Transient Stability Using Power System Simulator
  S. MUKOYAMA, Toshiba Corporation

Lessons Learned from Implementing Portable and Reconfigurable Microgrids for Resilient Operation (panel)
Tuesday, 18 July, 2017, 8:00 AM–10:00 AM  G – 204 Tiered Classroom

Sponsored by: Energy Development and Power Generation
Chair: A. SRIVASTAVA, Washington State University

This panel will explore the lessons learned in implementing microgrid technology for small, portable, and reconfigurable power system for reliable and resilient energy delivery. This style of microgrid targets applications such as small military base camps, disaster relief operations, and other temporary encampments. Networking generators in these environments offers the potential for fuel savings, renewable resource integration, and system flexibility. Panel speakers will offer perspectives that span both the military communities’ efforts and civilian efforts and applications.

PANELISTS:

• 17PESGM2767, Lessons Learned from Rural Microgrids in Sub-Saharan Africa
  H. LOUIE, Seattle University
Optimal Integration of Variable Renewable Generation into Power Systems – Coordination of Measures at TSO and DSO Level (panel)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM           S – Chicago VIII
Sponsored by:             Energy Development and Power Generation
Chairs:                         K. RUDION, University of Stuttgart
                                A. ORTHS, Energinet.dk

The integration of variable renewable energy resources (RES) impacts the electricity system in various ways, as system loading, voltage profiles, stability levels, etc. Since different RES technologies are connected with the grid at the different voltage levels, the grid integration issues concern both, the transmission and the distribution grids. Thus, in order to keep the system operation stable as whole, it is necessary to consider the system characteristics at particular levels and coordinate activities, especially, regarding the application of flexibility options at different voltage levels. This session will give an overview of the approaches used in the European countries regarding the grid planning and grid operation tasks within the power system with high penetration of RES. The issues regarding optimal application of flexibilities at the TSO and DSO level and the possible synergies between these levels will be focused. The results of some European and national projects will be presented.

PANELISTS:
• 17PESGM2853, Integrating Renewables into the Irish Power System – Towards 2020 and Beyond
  D. FLYNN, University College Dublin
• 17PESGM2854, Optimal Grid Operation Applying Flexibility Options for Maximum Renewable Energy Exploitation
  B. ARENDARSKI, Fraunhofer Institute for Factory Operation and Automation IFF
• 17PESGM2855, Optimal Reactive Power Control of Distributed Wind Power Plants for Loss Minimization in Medium Voltage Network
  K. DAS, Technical University of Denmark
• 17PESGM2944, Power System Operation Support by Active Distribution Grids Using a Dynamic-Quota-Based Grid Traffic-Light Approach
  D. GROSS, University of Stuttgart
• 17PESGM2851, Wind Power Forecasting Error Patterns during Curtailment and Event Periods
  E. GOMEZ-LAZARO, Universidad de Castilla-La Mancha
• 17PESGM2852, A Local Flexibility Market for Scheduling Flexibility at the Demand Side: The View of the Distributed Intelligence for Smart Power Routing and mATCHing (DISPATCH) project
  M. GIBESCU, Eindhoven University of Technology
• 17PESGM2856, TSO-DSO Coordination for Enabling Distribution Systems to Provide Ancillary Services for the Electrical System: The View of the Project SmartNet
  G. MIGLIAVACCA, Ricerca sul Sistema Energetico – RSE S.p.A.

Utility Data Analytics (panel)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM           S – Chicago X
Sponsored by:             Local Organizing Committee
Chair:                           T. MAHAR, ComEd

With AMI meters, PMU’s and other connected devices becoming more commonplace at utilities, the amount of data that utilities have access to has increased. This panel will discuss different ways that this data can be utilized to deliver value to customers and deliver insight to utilities. What are leading companies currently doing with this data, and which ambitious uses are yet to be tested? Which decisions can be improved by utilizing this data?

PANELISTS:
• 17PESGM3028, Industry Case Studies and Trends
  J. MCCLANAHAN, West Monroe Partners
• 17PESGM3025, Leveraging Data for Enhanced Utility Cybersecurity
  T. HEIDEL, National Rural Electric Cooperative Association
Tuesday Morning, continued

- 17PESGM3026, The Next DA – Computing to the Edge
  M. GEHRS, Silver Spring Networks
- 17PESGM3027, Leveraging Data to Address Common Utility Problems
  N. MATEVOSYAN, ComEd

Sharing Experiences and Insights Involving the Application of Generic Wind and Photovoltaic Transient Stability Models (panel)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM        G – 244 Multifunction Room
Sponsored by:           Power System Dynamic Performance
Chair:                           J. SANCHEZ-GASCA, GE Energy Consulting

Recognizing the need for transient stability models suitable for representing different types of wind and photovoltaic power plants in planning studies, the Western Electricity Coordinating Council (WECC), through its Renewable Energy Modeling Task Force (REMTF), has been leading a concerted effort to develop such generic models. The objective of the panel session is to disseminate and document the experiences and insights acquired by experienced users of these models. Issues related to the verification, implementation and application of generic models in system studies will be addressed by the panelists.

PANELISTS:
- 17PESGM2470, Experience with 2nd Generation Generic Renewable Energy System Models: Model Validation, Use in Large Scale Simulations and Latest Developments
  P. POURBEIK, Power and Energy, Analysis Consulting and Education, PLLC (PEACE)
- 17PESGM2471, Validation Experience in Modeling GE Wind Plants Using Second Generation Generic Models
  M. RICHWINE, GE
- 17PESGM2476, ENERCON Experiences and Considerations Regarding the Use Generic Models
  A. SCHWANKA TREVISAN, ENERCON
- 17PESGM2472, PV Modeling – Lessons Learned from Real Event
  J. WEN, Southern California Edison (SCE)
- 17PESGM2477, BPA Experience with Wind Power Plant Model Validation Using PMU Data
  S. YANG, Bonneville Power Administration (BPA)

Transactions Paper Session 13 (transactions paper)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM        G – 308 Tiered Classroom
Sponsored by:           Power System Dynamic Performance

PAPERS AND AUTHORS:
- 17PESGM0113, Assessing the Applicability of Uncertainty Importance Measures for Power System Studies [Transaction Number: TPRWS-01564-2014]
  R. PREECE, University of Manchester
  J. MILANOVIC, University of Manchester
- 17PESGM0275, Power System Simulation Using the Multi-Stage Adomian Decomposition Method [Transaction Number: DOI 10.1109/TPWRS.2016.2551688]
  N. DUAN, University of Tennessee, Knoxville
  K. SUN, University of Tennessee, Knoxville
- 17PESGM0315, Semi-Implicit Formulation of Differential-Algebraic Equations for Transient Stability Analysis [Transaction Number: 10.1109/TPWRS.2016.2516646]
  F. MILANO, University College Dublin
  K. KAUR, Thapar University
  R. RANA, Thapar University
  N. KUMAR, Thapar University
  M. SINGH, Thapar University
  S. MISHRA, IIT Delhi
- 17PESGM0498, Wavelet-Based Event Detection Method Using PMU Data [Transaction Number: 7293207]
  D. KIM, Yonsei University
  T. CHUN, Yonsei University
  S. YOON, Yonsei University
  G. LEE, Yonsei University
  Y. SHIN, Yonsei University
Decision Support Tools for Economic Valuation of Energy Storage (panel)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM       S – Chicago IX
Sponsored by: Power System Operation, Planning & Economics
Chairs: R. SIOSHANSI, Ohio State University
H. ZAREIPOUR, University of Calgary

The academic research is rife with storage-valuation studies. At the same time, the electricity industry suffers from a shortage of robust modeling tools that can be used for their own in-house storage studies. This panel seeks to address this issue by discussing how some off-the-shelf and publicly available models can be used for storage valuation. It also discusses some of the realities of how energy storage participates in energy markets, and the implications of those market realities on how storage should be modeled.

PANELISTS:
• 17PESGM2380, The Ins and Outs of Using Production-Cost Models for Storage Valuation Modeling
P. DENHOLM, National Renewable Energy Laboratory
• 17PESGM2382, An Introduction to the StorageVET Model
A. CORTES, Electric Power Research Institute
• 17PESGM2381, What Are the Real Market Rules that Energy Storage Has to Contend With?
U. HELMAN, Helman Analytics

Global Best Practices on Natural Disaster Mitigation: Operation Technologies, Communication, and New Trends (panel)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM       G – 300 Tiered Classroom
Sponsored by: Power System Operation, Planning & Economics
Chair: J. LIU, PJM Interconnection LLC

In responding to natural disasters, electric utilities have developed comprehensive plans for emergency preparation, incident response structure and procedures, service restoration process, and evaluation matrices during and after events. Response plans are gradually developed based on field experience starting from the emerging of modern power grids. New technologies in smart grid and asset management have shown great advantages on natural disaster mitigation. Communication plays the key role throughout the mitigation efforts, ranging from internal information flow on disaster evaluation, asset allocation, and decision making, to awareness in publicity domain. Pre- and post-event scenario analysis presents the nature of best practices and discover knowledge and lessons-learned from real world events. In this panel, best practices of natural disaster mitigation around the world will be discussed, with the focus on the evolution of Operation Technology, Data and Communication, and role of new technologies.

PANELISTS:
• 17PESGM2807, Review of Regulation Issues on Risk-Preparedness in EU
A. MARIEN, CREG
• 17PESGM2803, Best Practices of Natural Disaster Mitigation in India
S. MUKHOPADHYAY, GTBIT, GGSIP University

Tuesday Morning, continued
Tuesday Morning, continued

- 17PESGM2802, Lessons Learned from Great East Japan Earthquake in 2011 and Demand Side Resiliency Improvement  
  H. AKI, National Institute of Advanced Industrial Science and Technology (AIST)
- 17PESGM2806, System Restoration in Brazil  
  R. FERREIRA, PSR
- 17PESGM2809, Planning Resilient Power System Infrastructure Against Large Earthquakes: Case on the Chilean Transmission Network  
  R. MORENO, Universidad de Chile & Imperial College London
- 17PESGM3061, Natural Disasters Downunder  
  S. BARTLETT, University of Queensland
- 17PESGM2804, Challenges and Opportunities in Natural Disaster Mitigation: A Task Force Review  
  J. LIU, PJM

Asset Management – Asset Health Assessment, Ranking and Intervention Prioritization  (panel)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM  G – 208 Tiered Classroom
Sponsored by:  Power System Operation, Planning & Economics
Chairs:  T. MCGRAIL, Doble Engineering  
K. ELKINSON, Doble Engineering

With the growth of asset management, and organizational cultural changes which require both tactical response to condition and strategic response to industry trends, asset condition assessment and analysis is becoming a key factor in many industries. The need to identify anomalous performance or variations in fleet capability require data, analyses and interpretation. Subsequent ranking and intervention prioritization cover a huge range of opportunities. The approach requires clear thinking, an understanding of both the data and decision context. This session will look at aspects of condition assessment, ranking and intervention for different asset classes, in different applications and will provide an opportunity to learn from, and share experience with, practitioners.

PANELISTS:
- 17PESGM2908, Asset Management and Smart Grid: From AHI to Reliability Improvement  
  T. MCGRAIL, Doble Engineering

Transactions Paper Session 12  (transactions paper)

Tuesday, 18 July, 2017, 8:00 AM–10:00 AM  G – 306 Tiered Classroom
Sponsored By:  Power Systems Communications & Cyber Security Committee and Power System Instrumentation and Measurements Committee

PAPERS AND AUTHORS:
- 17PESGM0282, Dependency Analysis and Improved Parameter Estimation for Dynamic Composite Load Modeling  [Transaction Number: TPWRS-01003-2016.R1]  
  K. ZHANG, University of Illinois at Urbana-Champaign (UIUC)  
H. ZHU, University of Illinois at Urbana-Champaign (UIUC)  
S. GUO, University of Illinois at Urbana-Champaign (UIUC)
- 17PESGM0297, Vulnerability Analysis and Consequences of False Data Injection Attack on Power System State Estimation  [Transaction Number: 10.1109/TPWRS.2015.2504950]  
  J. LIANG, Arizona State University  
L. SANKAR, Arizona State University  
O. KOSUT, Arizona State University
- 17PESGM0334, Multidimensional Intrusion Detection System for IEC 61850 Based SCADA Networks  [Transaction Number: TPWRD-00133-2016]  
  Y. YANG, State Grid Jiangsu Electric Power Research Institute  
H. XU, State Grid Jiangsu Electric Power Research Institute  
L. GAO, State Grid Jiangsu Electric Power Research Institute  
Y. YUAN, State Grid Jiangsu Electric Power Research Institute  
K. MCLAUGHLIN, Queen’s University, Belfast  
S. SEZER, Queen’s University, Belfast
- 17PESGM0406, Physical System Consequences of Unobservable State-and-Topology Cyber-Physical Attacks  [Transaction Number: 10.1109/TSG.2016.2552178]  
  J. ZHANG, Arizona State University  
L. SANKAR, Arizona State University
The Department of Energy (DOE) is working to ensure America’s security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions. DOE and IEEE entered into a Memorandum of Understanding (MOU) to address grid modernization challenges including a focus on the distribution level. The MOU concentrates on both planning and operational challenges that include integrated resource planning and schemes for coordination, control, and information management. IEEE USA, the IEEE Standards Association (IEEE-SA), IEEE Smart Grid, and other IEEE societies will join IEEE PES in collaboration on the MOU, which includes four cooperative areas with the DOE: standards, technology, conferences, and education. This panel will provide an update on ongoing joint activities between DOE and IEEE.

**Panelists:**
- 17PESGM1804, Chair – Update on DOE/IEEE T&D Initiatives  
  T. PIERPOINT, Exelon
- 17PESGM1792, Co-Chair – Update on DOE/IEEE T&D Initiatives  
  M. AVENDANO, Exelon / ComEd
- 17PESGM1790, Update on DOE/IEEE T&D Initiatives  
  K. LYNN, Department of Energy
Protection Design for Microgrids (panel)

Tuesday, 18 July, 2017, 8:00 AM–11:00 AM
G – 200 Tiered Classroom

Sponsored By: Transmission and Distribution
Chair 1: G. SIMARD, S.I.M.A.R.D. SG
N. HADJSIAID, grenoble-inp

This panel will discuss protection design needs for microgrids. Traditionally, distribution protection design is based on conventional grid configuration having a single source, typically a substation, with several distribution feeders for the downstream customers. For more than a decade generation is being directly connected to the actual distribution grid at medium voltage. DER generation is also being installed at the residential low voltage level. These distribution generation systems bring new challenges to the protection design. Not only can this generation create reverse power flow, but the different type of generation have an impact on the short circuit level. The transformer connections between each generation station can influence the grounding mode of the distribution system. The transition between the complete distribution system with all the interconnected generation to the several pockets of microgrids (and vice versa) also means some kind of adaptive protection schemes and settings is needed.

PANELISTS:
- 17PESGM2526, Microgrid Protection Challenges and Solutions
  M. HIGGINSON, S&C Electric Company
- 17PESGM2527, New Protection Schemes for Microgrid with a High Integration Rate of Renewable Energy
  J. WILD, Schneider Electric – France
- 17PESGM2528, Protection of Bipolar DC Microgrid
  J. DRIESEN, KUL, Belgium
- 17PESGM2529, New Perspectives on Protection with Distributed Generation
  T. KEY, EPRI
- 17PESGM2942, Design and Real-World Operating Experience of Protection and Switching Considerations of SSEN Microgrids
  C. ABBEY, Smarter Grid Solutions
- 17PESGM2953, Active Probing, and Micro-Synchrophasors: New Measurement Technologies for Microgrid Stability and Control
  A. MCEACHERN, Power Standards Lab

Paper Forum 01 (paper forum)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM
S – Sheraton I

Sponsored by: Admin
Chairs: S. CHANDLER, Navigant
J. MATHIEU, University of Michigan

PAPERS AND AUTHORS:
- 17PESGM0184, Short-Term Wind Power Data Forecasting by Particle Swarm Optimization Dynamic GM(1,1) Model
  D. WU, Jiangnan University
  C. GAO, Jiangnan University
  Z. JI, pesgm2017@mirasmart.com
  T. PAN, pesgm2017@mirasmart.com
  Y. SHEN, pesgm2017@mirasmart.com
- 17PESGM0241, Integration of Space Heating Demand Flexibility in a Home Energy Management System using a Market-Based Multi Agent System
  B. FERON, RWTH Aachen University
  A. MONTI, RWTH Aachen University
- 17PESGM0542, Validation of the Sensitivity Based Thevenin Index on Large Systems
  A. RAMAPURAM MATAVALAM, Iowa State University
  V. AJJARAPU, Iowa State University
- 17PESGM0587, Optimal Coordinated EV Charging with Reactive Power Support in Constrained Distribution Grids
  S. PAUDYAL, Michigan Technological University
  O. CEYLAN, Istanbul Kemerburgaz University
  B. BHATTARAI, Idaho National Laboratory
  K. MYERS, Idaho National Laboratory
- 17PESGM0628, Insights on the Use of SVD for Evaluating and Reinforcing Measurement Systems
  F. SCHMIDT, University of Campinas
  M. CORTES DE ALMEIDA, University of Campinas
Tuesday Morning, continued

• 17PESGM0681, Optimal Measurement Locations Based on Uncertainty Intervals for State Identification in Distribution Grids
  M. SCHMIDT, TU Dresden
  T. HESS, TU Dresden
  P. SCHEGNER, TU Dresden

• 17PESGM0683, The Effect of PMU Measurement Delays on a Linear State Estimator: Centralized vs Decentralized
  M. ASPROU, University of Cyprus
  E. KYRIAKIDES, University of Cyprus

• 17PESGM0737, Hardware-in-the-Loop Simulation of a Distribution System with Air Conditioners under Model Predictive Control
  A. PRATT, National Renewable Energy Laboratory (NREL)
  R. RUTH, National Renewable Energy Laboratory (NREL)
  D. KRISHNAMURTHY, National Renewable Energy Laboratory (NREL)
  B. SPARN, National Renewable Energy Laboratory (NREL)
  M. LUNACEK, National Renewable Energy Laboratory (NREL)
  W. JONES, National Renewable Energy Laboratory (NREL)
  S. MITAL, MITRE Corporation
  H. WU, Kansas State University
  J. MARKS, Missouri University of Science and Technology

• 17PESGM1225, Optimal Residential Demand Response Considering the Operational Constraints of Unbalanced Distribution Networks
  W. ZHENG, Tsinghua University
  W. WU, Tsinghua University
  W. SHENG, China Electric Power Research Institute
  B. ZHANG, Tsinghua University

• 17PESGM1240, A Robust Frequency Estimator for Single-Phase MicroGrid Applications
  M. VENKATESWARA REDDY, IIT Ropar
  R. SODHI, IIT Ropar

• 17PESGM1335, Distributed Optimal Vehicle Grid Integration Strategy with User Behavior Prediction
  Y. XIONG, University of California, Los Angeles
  B. WANG, Lawrence Berkeley National Laboratory
  C. CHU, University of California, Los Angeles
  R. GADH, University of California, Los Angeles

• 17PESGM1375, A New Development Platform for the Next Generation of Power System Control Center Functionalities for Hybrid AC-HVDC Transmission Systems
  C. BROSINSKY, Technische Universität Ilmenau
  A. KUMMEROW, Fraunhofer
  A. NAUMANN, Fraunhofer
  A. KROENIG, Siemens AG
  S. BALISCHIEWSKI, Otto-von-Guericke-Universität Magdeburg
  D. WESTERMANN, Technische Universität Ilmenau

• 17PESGM1531, Model Predictive Control of Flexible Demand for Voltage Support in Unbalanced Distribution Systems
  J. JOO, Lawrence Berkeley National Laboratory
  M. CHAVA, Black & Veatch
  M. SANKUR, Lawrence Berkeley National Laboratory
  D. ARNOLD, Lawrence Berkeley National Laboratory
  E. STEWART, Lawrence Berkeley National Laboratory

• 17PESGM1596, A Steady-State Equivalent Model of Solid State Transformers for Voltage Regulation Studies
  M. MAHARJAN, South Dakota State University
  U. TAMRAKAR, South Dakota State University
  S. BAJAGAIN, South Dakota State University
  T. HANSEN, South Dakota State University
  R. TONKOSKI, South Dakota State University

• 17PESGM1610, Gain Tuning Control Strategy for DFIG-Based Wind Farms
  Y. XU, Purdue University Northwest
  C. HUANG, The University of Tennessee
  F. LI, The University of Tennessee
  X. LI, Northeast Electrical Power University
  Q. HU, Harvard University

• 17PESGM1714, Adaptive Building Load Control to Enable High Penetration of Solar Photovoltaic Generation
  J. DONG, Oak Ridge National Laboratory
  M. OLAMA, Oak Ridge National Laboratory

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Late Breaking News and Hot Topics (super session)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM   S – Sheraton II

Sponsored By: PES Super Session

Chairs: M. ARMSTRONG, BC Hydro
D. HOUSEMAN, EnerNex

Late Breaking News – 8:00 AM–9:45 AM

Chair: D. HOUSEMAN

Industry Editors will be discussing and answering audience questions on the latest power & energy industry news. The following speakers are currently confirmed:

R. BUSH, Editorial Director, T&D World
J. FEBLOWITZ, Feblowitz Energy Consulting

Hot Topics Session – Grid Modernization – 10:00 AM–12:00 PM

Chair: M. ARMSTRONG

The session will include presentations and Q&A on hot topics around grid modernization. The following speakers are currently confirmed:

Premature PV Inverter Trip due to a 500-kV System Fault
B. CUMMINGS, NERC

Distribution Automation in Mexico City for System Reconfiguration and Restoration
G. URRÉA, Schweitzer Engineering Laboratories

Planning for Grid Modernization
E. TAKAYESU, Southern California Edison

Paper Forum 02 (paper forum)

Tuesday, 18 July, 2017, 8:00 AM–12:00 PM   S – Sheraton V

Sponsored by: Admin
Chair: A. DINIZ, CEPEL – Brazilian Electric Energy Research Center

PAPERS AND AUTHORS:

• 17PESGM0036, On-Line Loss Minimization by HVDC Dispatch Using OPF in EMS
  X. LIU, Alberta Electric System Operator
  Y. XIA, Albert Electric System Operator
  R. DAI, GE Grid Solutions
  W. QIU, GE Grid Solutions

• 17PESGM0128, Validation of Real-Time System Model in Western Interconnection
  Y. LU, University of Tennessee
  S. KINCIC, Peak Reliability
  H. ZHANG, Peak Reliability
  K. TOMSOVIC, University of Tennessee

• 17PESGM0236, Interturn Fault and Condition Identification in BLSG Using Multiple Indicator Approach
  D. WANG, Nanyang Technological University, Singapore
  J. SESHADRINATH, Nanyang Technological University, Singapore
Tuesday Morning, continued

V. NGUYEN, Nanyang Technological University, Singapore
A. UKIL, Nanyang Technological University, Singapore
V. JAISWAL, Nanyang Technological University, Singapore
V. VAIPAPURI, Rolls Royce, Singapore
S. NADARAJAN, Rolls Royce, Singapore

17PESGM0364, A Modified Parallel Evolutionary Algorithm to Economic Scheduling of Three Gorges Project Considering the Influence of Passing Through the Vibration Area
W. YAN, chongqing university
C. ZHANG, chongqing university
X. ZHAO, chongqing university
J. YU, chongqing university

17PESGM0515, A New Strategy of HVDC Operation for Maximizing Renewable Energy Accommodation
H. ZHANG, North China Electric Power University
S. ZHANG, North China Electric Power University

17PESGM0538, Frequency Stability Enhancement for Low Inertia Systems Using Synthetic Inertia of Wind Power
H. NGUYEN, Technical University of Denmark
G. YANG, Technical University of Denmark
A. NIELSEN, Technical University of Denmark
P. JENSEN, Siemens A/S

17PESGM0844, Experimental Verification of a Grid-Synchronization Strategy for a Wind-Driven Brushless Doubly-Fed Reluctance Generator
S. ALLAM, Tanta University
M. MOUSA, Tanta University
E. RASHAD, Tanta University

17PESGM0883, Impacts of Droop and Deadband on Generator Performance and Frequency Control
R. QUINT, NERC
D. RAMASUBRAMANIAN, Arizona State University

17PESGM1039, Statistical Analysis of the FN/GRIDeye-detected Inter-Area Oscillations in Eastern Interconnection (EI)

17PESGM1138, Linear-quadratic-Gaussian Control of Line Active-Power Flow
A. AL-DIGS, The University of British Columbia
S. DHOPLE, University of Minnesota (Twin Cities)
Y. CHEN, The University of British Columbia

17PESGM1222, A Minimum-Regret-Based Optimization Approach for Power System Restoration in EHV Grids
M. OSTERMANN, University of Kaiserslautern
P. HINKEL, University of Kaiserslautern
D. RAOOFSHIBANI, University of Kaiserslautern
W. WELLS, University of Kaiserslautern
C. SCHNEIDER, Amprion GmbH

17PESGM1459, PJM Static and Dynamic Model Validation Efforts and Experiences for MOD-033
W. QIU, PJM Interconnection L.L.C.
B. CHOI, PJM Interconnection L.L.C.
Y. MAO, PJM Interconnection L.L.C.
T. HE, PJM Interconnection L.L.C.

17PESGM1487, Modeling Imperfect Generator Behavior in Power System Operation Models
I. KRAD, National Renewable Energy Laboratory

17PESGM1581, Primary Frequency Response with Stochastic Scheduling Under Uncertain Photovoltaic Generation
V. PRAKASH, Malaviya National Institute of Technology Jaipur
K. SHARMA, Global Institute of Technology, Jaipur
R. BHAKAR, Malaviya National Institute of Technology Jaipur
H. TIWARI, Malaviya National Institute of Technology Jaipur
S. SREEKUMAR, Malaviya National Institute of Technology Jaipur
S. CHAWDA, Malaviya National Institute of Technology Jaipur
F. TEOTIA, Malaviya National Institute of Technology Jaipur

17PESGM1917, Unscented Transformation-Based Fast Scheduling Optimization for Large-Scale Unit Commitment Considering Uncertainties of Wind and Solar Power
J. ZHENG, South China University of Technology
Tuesday Morning, continued

Y. KOU, South China University of Technology
Z. LI, South China University of Technology
Q. WU, South China University of Technology

• 17PESGM1927, Current Sensor Fault-Tolerant Control of DFIGs Using Stator Current Regulators and Kalman Filters
  K. XIAHOU, South China University of Technology
  X. LIN, South China University of Technology
  Q. WU, South China University of Technology

• 17PESGM1932, Implementation and Testing of Remedial Action Schemes for Real-Time Transient Stability Studies
  M. MAHMOUDI, University of Tennessee-Knoxville
  S. KINCIC, Peak Reliability
  H. ZHANG, Peak Reliability
  K. TOMSOVIC, University of Tennessee-Knoxville

  M. LIU, University of Wisconsin-Madison
  Y. LI, University of Wisconsin-Madison
  B. SARLIOGLU, University of Wisconsin-Madison

• 17PESGM2076, Root Cause Analysis for Harmonic Resonance Tripping in Wind Power Plants: An ERCOT Case Study
  H. YIN, DNVGL
  M. SAHNI, DNVGL
  KHALILI NIA, DNVGL

• 17PESGM2266, Inverter Switching Frequency Prediction in DTC of Induction Motor Drive for an EV Drivetrain
  K. PRABHAKAR, Indian Institute of Technology Guwahati
  C. REDDY, Indian Institute of Technology Guwahati
  A. SINGH, Indian Institute of Technology Guwahati
  P. KUMAR, Indian Institute of Technology Guwahati

Power System Basics – Understanding the Electric Utility Operation Inside and Out

Tuesday, 18 July, 2017, 8:00 AM–5:00 PM             S – Erie
Sponsored by:             Plaintalk

Transactions Paper Session 02 (transactions paper)

Tuesday, 18 July, 2017, 10:00 AM–12:00 PM         G – 304 Tiered Classroom
Sponsored by:             Analytic Methods for Power Systems
Chair:                           S. MISHRA, IIT Delhi

PAPERS AND AUTHORS:

• 17PESGM0037, Multiagent-Based Optimal Microgrid Control Using Fully Distributed Diffusion Strategy [Transaction Number: 10.1109/TSG.2016.2587741]
  R. DE AZEVEDO, Florida International University
  M. CINTUGLU, Florida International University
  T. MA, Florida International University
  O. MOHAMMED, Florida International University

• 17PESGM0160, Expansion of Autonomous Microgrids in Active Distribution Networks [Transaction Number: TSG-01474-2015]
  S. DEHGHAN MANSHADI, Southern Methodist University
  M. KHODAYAR, Southern Methodist University

  D. ISSICABA, Technological University of Paraná – UTFPR
  A. SIMOES COSTA, Federal University of Santa Catarina – UFSC
  J. COLOMBO, Federal University of Santa Catarina – UFSC

• 17PESGM0245, A Short-Term and High-Resolution Distribution System Load Forecasting Approach Using Support Vector Regression with Hybrid Parameters Optimization [Transaction Number: TSG-01466-2015.R3]
  H. JIANG, National Renewable Energy Laboratory
  Y. ZHANG, National Renewable Energy Laboratory
  E. MULJADI, National Renewable Energy Laboratory
The electric power system is changing to accommodate the growing deployment of distributed energy resources (DERs) and demand response (DR) systems as well as a shift from a central supply model to a distributed supply model. These changes are increasing the complexity of operating both the transmission and distribution systems that deliver power to electricity end-users. The utilities face new challenges in coordinating the new DERs that may be owned by the utility, third-parties or utility customers. To effectively address these challenges, new DER and DR management systems are under development and these will need to be fully integrated into the utility space. The Common Information Model exchange and Interoperability standards are moving quickly to aid in the integration of these new needs in the utility industry.

**PANELISTS:**
- **17PESGM2836**, DER != DER, Diversity = Complexity, The Challenges in Modeling DER's
  D. BOGEN, Oncor
- **17PESGM2837**, The Current State of DER/DR Modeling in the CIM
  B. IVERSON, Omnetric Group
- **17PESGM2838**, Leveraging Standards for Control of DR and DER
  J. SIMMINS, EPRI
- **17PESGM2835**, CIM Messaging Across Enterprise at California ISO
  V. PERUMALLA, California ISO

**Multi-agent Field Deployment Platforms (panel)**

Automation is increasing at the edges of the electric power system and multi-agent systems are being applied to coordinate the operation of these automated electricity resources. The deployment of intelligent power devices and systems are relying on information and messaging platform technologies to simplify the integration of agent-based logic into devices that interact to optimize local and systemic objectives. This panel explores some of these platforms to explain not only their operating performance requirements, but the capabilities that they offer to streamline the integration of agent-based automation, as well as their ability to scale and manage the multi-agent system.

**PANELISTS:**
- **17PESGM2548**, EF-pi MAS Platform for Transactive Energy Systems
  K. KOK, Center for Electric Power and Energy (CEE)
Tuesday Morning, continued

- 17PESGM2549, VOLTRON MAS Platform for Buildings Flexibility and Other DER Integration
  S. KATIPAMULA, Pacific Northwest National Laboratory
- 17PESGM2550, MAS Platform for Shipboard Systems
  S. SRIVASTAVA, Siemens
- 17PESGM2552, Open Autonomy Kernel (OAK) a Platform for Resilient, Autonomous Systems
  D. SCHEIDT, John Hopkins University
- 17PESGM2850, The Energy Flexibility Interface (EFI): Ensuring Interoperability
  W. WIJBRANDI, TNO

Sustainability Issues in Grid Modernization (panel)

Tuesday, 18 July, 2017, 10:00 AM–12:00 PM   G – 204 Tiered Classroom
Sponsored by: Energy Development and Power Generation
Chairs: J. LIU, PJM Interconnection LLC
P. RIBEIRO, UNIFEI

Power grid modernization is a global process of integrating new technologies, market and economical advances, and regulatory strategic development. Environmental Sustainability issues play key roles in these efforts, in terms of renewable energy integration, empowering energy service and efficiency, and reduction of use of land (ROW) etc. Competitive system planning could bridge long-term capital gains into transmission service market, cops with energy spot markets, and calls economical sustainability through “smart” and “sustainable” designs. Regulatory impacts on sustainable power grid developments are also evident globally. Pollution reduction and control has become a denominate trend around the world to integrate clean energy resources. Long distance energy delivery and intermittent have been a long-time challenge for power system planners and regulators. This panel will discuss the current best practices and challenges on these topics and address the outmost challenges to utilize sustainability issues with new grid technologies.

PANELISTS:
- 17PESGM2078, Ethical Responsibility in Engineering Design for Sustainability in Electric Grids
  P. RIBEIRO, UNIFEI
- 17PESGM2082, Environment and Economic Figures in Power Grid Planning in Brazil
  B. BONATTON, UNIFEI
- 17PESGM2079, Environmental and Economic Influences and Advantages in FACTS, HVDC and Storage Technologies in Grid Modernization
  J. PAN, ABB
- 17PESGM2077, Challenges Posed by Renewables and Superconducting Power Apparatus for Modernized Power Grid
  B. JOHNSON, University of Idaho
- 17PESGM2080, Integrating Massive Renewable Energy into Chinese Power Grids: Regulatory Strategy Evolution
  M. NI, NARI Technology
- 17PESGM2081, Implementation of Transmission Projects with Competitive Planning Tariff
  J. LIU, PJM

Transactions Paper Session 10 (transactions paper)

Tuesday, 18 July, 2017, 10:00 AM–12:00 PM   G – 306 Tiered Classroom
Sponsored by: Grid & Emerging Technologies Coordinating Committee
Chair: L. KOTWEA, Elevate Energy

PAPERS AND AUTHORS:
- 17PESGM0278, Assessing Benefits of Volt-Var Control Schemes Using AMI Data Analytics
  [Transaction Number: TSG.2016.2603421]
  P. BAGHERI, University of Alberta
  W. XU, University of Alberta
- 17PESGM0496, Optimal Cooperative Charging Strategy for a Smart Charging Station of Electric Vehicles
  [Transaction Number: TPWRS-00172-2015]
  P. YOU, Zhejiang University
  Z. YANG, Zhejiang University
  M. CHOW, North Carolina State University
  Y. SUN, Zhejiang University
- 17PESGM0704, Optimal Charging of Electric Vehicles Taking Distribution Network Constraints into Account
  [Transaction Number: TPWRS-01408-2013]
  J. DE HOOG, IBM Research Australia
  T. ALPCAN, University of Melbourne
Tuesday Morning, continued

M. BRAZIL, University of Melbourne
D. THOMAS, University of Melbourne
I. MAREELS, University of Melbourne

• 17PESGM0932, On-Line Load Sensitivity Identification in LV Distribution Grids  [Transaction Number: 10.1109/TPWRS.2016.2581979]
  G. DE CARNE, Kiel University
  M. LISERRE, Kiel University
  C. VOURNAS, National Technical University of Athens

• 17PESGM0933, Load Control Using Sensitivity Identification by Means of Smart Transformer  [Transaction Number: 10.1109/TSG.2016.2614846]
  G. DE CARNE, Kiel University
  G. BUTICCHI, Kiel University
  M. LISERRE, Kiel University
  C. VOURNAS, National Technical University of Athens

• 17PESGM1056, Online Determination of External Network Models Using Synchronized Phasor Data  [Transaction Number: TSG-01136-2015]
  M. MOGHIMI HAJI, University of Alberta
  W. XU, University of Alberta

• 17PESGM1854, A Resilient Plug-and-Play Decentralized Control for DC Parking Lots  [Transaction Number: 10.1109/TSG.2016.2602759]
  A. GHANAFARI, University of Alberta
  M. HAMZEH, Shahid Beheshti University
  Y. ABDEL-RADY I. MOHAMED, University of Alberta

• 17PESGM1219, Analytical Expressions for Multi-Objective Optimization of DGs Operation during Unbalanced Grid Conditions  [Transaction Number: 1]
  M. SHABESTARY, UofA
  Y. MOHAMED, UofA

Engineering and Planning – Energy Storage Roadmap  (panel)
Tuesday, 18 July, 2017, 10:00 AM–12:00 PM  S – Chicago X
Sponsored by:  Local Organizing Committee
Chair:  P. TYSCHENKO, ComEd

This panel discusses a roadmap for application of energy storage in Transmission and Distribution systems and associated cost benefits analysis. Business benefits and penetration levels of energy storage for several combined applications such as capacity deferral and integration of distributed generation will be assessed by panelists from a utility, consultant and vendor perspectives.

PANELISTS:
• 17PESGM3033, ComEd Energy Storage Roadmap
  P. TYSCHENKO, ComEd

• 17PESGM3032, Applications of Energy Storage in Power Distribution Systems – Trends, Challenges, and Solutions
  J. ROMERO AGUERO, Quanta Technology

• 17PESGM3034, Southern California Edison’s Energy Storage Journey
  L. GAILLAC, Southern California Edison

• 17PESGM3035, A Case Study: Unlocking the Multi-Faceted Potential of Energy Storage
  T. MILLER, S&C Electric Company

• 17PESGM3036, Design and Installation Considerations for Solar-Plus-Storage System
  L. KOU, New York Power Authority

Transactions Paper Session 14  (transactions)
Tuesday, 18 July, 2017, 10:00 AM–12:00 PM  G – 308 Tiered Classroom
Sponsored by:  Power System Dynamic Performance

PAPERS AND AUTHORS:
  S. DATTA, Arizona State University
  V. VITTAL, Arizona State University

• 17PESGM0353, Analysis and Mitigation of Undesirable Impacts of Implementing Frequency Support Controllers in Wind Power Generation  [Transaction Number: TEC-00020-2015]
  M. FAKHARI MOGHADDAM ARANI, University of Alberta
  Y. MOHAMED, University of Alberta
The modernization of existing Energy Management Systems is one of the main technological challenges to face in future power systems. To solve this problem, the designers of high performance computing...
systems are revisiting the architectural requirements, design criteria and assumptions related to scalability, adaptability, flexibility, and technological evolution. Data heterogeneity represents a major problem, and massive data management represents another relevant issue to address. Even if sophisticated mathematical models for measured data streaming analysis are available, many problems need to be fixed. Moreover, the conceptualization of a decentralized, self-organizing, proactive, and holistic computing framework for decision support in a massive-data, but information-sparse domain, represents one of the most relevant research directions. The adoption of these paradigms allows improving the grid operation procedures with a set of information services for knowledge discovery and data mining, delivering the most useful information, in useful time, to the correct operators.

PANELISTS:
- 17PESGM2358, Centralized and Decentralized Applications in WAMPACs
  D. NOVOSEL, Quanta Technology
- 17PESGM2359, A Distributed Two-Level PMU-Only Linear State Estimator
  A. BOSE, Washington State University
- 17PESGM2360, Distributed Methods for Online Stability Monitoring of the Power System Using Synchronphasors
  V. VENKATASUBRAMANIAN, Washington State University
- 17PESGM2361, Lessons Learned on Fast, Deterministic, and Reliable De-Centralized (and Mostly Autonomous) Grid Controls and Protection
  S. MANSON, Schweitzer Engineering Laboratories, Inc.
- 17PESGM2362, Synchronized Measurement Technology Supported Frequency Control Schemes
  V. TERZIJA, University of Manchester

Grid Modernization Opportunities and Challenges (panel)
Tuesday, 18 July, 2017, 10:00 AM–12:00 PM  G – 400 Tiered Classroom

This panel will focus on:
- Operational challenges and opportunities offered by DERs and Microgrids
- Providing energy, capacity and ancillary services from DERs and Microgrids
- Modeling the flexibility of energy storage devices for healing ramping scarcity events
- Creating visibility and control end to end (Devices to Distribution and Transmission)

PANELISTS:
- 17PESGM2425, Distribution Grid of the Future: Technical and Operational Requirements
  A. IPAKCHI, OATI
- 17PESGM2421, Wide-Area Transmission System Data Analysis and Visualization
  T. OVERBYE, Texas A&M University
- 17PESGM2423, Role of Cyber Security in Grid Modernization
  M. SHAHIDEHPOUR, Illinois Institute of Technology
- 17PESGM2424, Microgrid Controller Innovation Challenge at NREL
  S. TRUITT, NREL
- 17PESGM2422, Grid Modernization Challenges
  D. SUN, The Glarus Group

Electric Distribution Reliability Best Practices (panel)
Tuesday, 18 July, 2017, 10:00 AM–11:00 AM  G – 222 Multifunction Room

The panel will focus on utility practices that provide the best possible reliability for their customers. Although we use SAIFI and SAIDI as metrics to grade our systems, this does not mean that a rural company that has limitation and cost restrictions cannot have better practices than an urban company with multiple ties in their system. The intent is to share some of the programs and practices that are working in the industry, and to share these practices with other utility companies in the same region and other areas of the U.S. The panel will consist of industry leaders that have proven track records to continue to improve the reliability of their systems. Emphasis will be on identifying the restrictions and limitations that are unique to each company and how they are continuing to improve reliability, and where they see programs and practices moving to in the future.
Tuesday Morning, continued – Tuesday Afternoon

PANELISTS:
- 17PESGM2820, Electric Distribution Reliability Best Practices Panel
  B. CLARK, Pepco Holdings Inc.
- 17PESGM2821, Outage Follow Up: What is the Real Cause of an Outage?
  L. TAYLOR, Duke Energy
- 17PESGM2822, BIL, A Reliability Strategy to Improve More than Lightning Performance
  J. TAYLOR, Entergy
- 17PESGM2831, Moving from Performance Indicator to Customer Focus
  J. AINSCOUGH, XCELEnergy

Tuesday Afternoon

Transactions Paper Session 03  (transactions paper)
Tuesday, 18 July, 2017, 1:00 PM–3:00 PM             G – 304 Tiered Classroom
Sponsored by:             Analytic Methods for Power Systems Committee and
Energy Development and Power Generation Committee
Chair:                           M. VALLEM, PNNL

PAPERS AND AUTHORS:
- 17PESGM0117, HPC-Based Probabilistic Analysis of LV Networks with EVs: Impacts and Control
  [Transaction Number: TSG2604245]
  A. PROCOPIOU, University of Manchester
  J. QUIRÓS-TORTÓS, University of Costa Rica
  L. OCHOA, University of Melbourne
- 17PESGM0346, A Novel MPPT Algorithm Based on Particle Swarm Optimisation for Photovoltaic Systems
  [Transaction Number: TSTE-00976-2015.R2]
  R. KOAD, Brunel University London
  A. ZOBAA, Brunel University London
  A. EL-SHAHAT, Georgia Southern University
- 17PESGM0665, Distributed MPC-Based Secondary Voltage Control Scheme for Autonomous Droop-Controlled Microgrids
  [Transaction Number: TSTE-00096-2016]
  G. LOU, Southeast University
  W. GU, Southeast University
  Y. XIU, Sun Yat-sen University
  M. CHENG, Southeast University
  W. LIU, Southeast University
- 17PESGM0750, Agent-Based Modeling in Electrical Energy Markets Using Dynamic Bayesian Networks
  [Transaction Number: TPWRS-00937-2015.R2]
  K. DEHGHANPOUR, Montana State University
  H. NEHRIR, Montana State University
  J. SHEPPARD, Montana State University
  N. KELLY, Montana State University
- 17PESGM1088, Design and Hardware Implementation of FLMPPT Control of PV Systems Based on GA and Small-Signal Analysis
  [Transaction Number: TSTE-00949-2015]
  A. MOHAMED, FIU University
  A. BERZOY, FIU University
  Q. MOHAMMED, FIU University
- 17PESGM1343, New Problem Formulation for Optimal Demand Side Response in Hybrid AC/DC Systems
  [Transaction Number: TSG-00099-2016]
  C. ZHAO, University of Bath
  S. DONG, Zhejiang University
  C. GU, University of Bath
  F. LI, University of Bath
- 17PESGM1361, Wide Area Phase Angle Measurements for Islanding Detection – An Adaptive Nonlinear Approach
  [Transaction Number: TPWRD-00847-2015]
  X. LIU, Queen's University, Belfast
  J. KENNEDY, SONI Ltd.
  D. LAVERTY, Queen's University, Belfast
  D. MORROW, Queen's University, Belfast
  S. MCLOONE, Queen's University, Belfast
- 17PESGM1535, Residential Demand Management Using Individualised Demand Aware Price Policies
  [Transaction Number: TSG-01450-2015]
  B. HAYES, National University of Ireland Galway
Distribution System State Estimation: Algorithm, Metering and Data Exchange: Advances and Challenges (panel)

Tuesday, 18 July, 2017, 1:00 PM–3:00 PM             G – 203 Executive Meeting Room

Sponsored by:             (AMPS) Distribution System Analysis
Chairs:                         R. SINGH, Argonne National Laboratory
                                J. FULLER, Pacific Northwest National Laboratory

With significant rolling out of smart meters for facilitating smooth uptake of distributed generation, fast computation of network state is very vital. The absence of reliable and high speed communication is a major bottle necks in taking advantage of the development in the network. Faster computation in the presence various discrete control is very much vital for active control of the network. Quality, adequacy and accuracy of measurements have significant impact on the effectiveness of active network control.

PANELISTS:
• 17PESGM2546, 1) Distribution State Estimation to Enhance Grid Awareness of Low Voltage Secondary Networks
  F. THERRIEN, University of British Columbia
• 17PESGM3098, 2) State Estimation Based Evaluation of Distribution Network Losses: Challenges and Limitations
  S. CARILLO, Endesa, Spain
• 17PESGM3100, 3) Three Phase State Estimation with Discrete Variables
  B. PAL, Imperial College London
• 17PESGM3099, 4) Measurement Redundancy and Observability in Multiphase Distribution State Estimation
  L. ZHANG, ComEd
• 17PESGM2544, 5) Getting Data for State Estimation for Distribution Systems
  M. BARAN, North Carolina State University

Smart Grid Monitoring and Control (panel)

Tuesday, 18 July, 2017, 1:00 PM–3:00 PM             G – 100 Tiered Classroom

Sponsored by:             (AMPS) Intelligent Systems
Chair:                           Z. VALE, Polytechnic of Porto

Rollout of smart metering and increasing automation and PMUs use in the electric grids enable a new wide range of opportunities for improved monitoring and control. This panel addresses the current and envisioned smart grid monitoring and control, with contributions from industry and academia. Presentations will address applications regarding consumers, aggregators, generation, and the electric grids focusing real applications and new solutions under development. These and related topics will be discussed covering technical and economic aspects as well as their impact in different regions in the world.

PANELISTS:
• 17PESGM2639, Semantic Interoperability for Enabling Sustainable Business in Distributed Energy
  P. BOURGUIGNON, ENGIE
• 17PESGM2637, Advanced Intelligent Synchrophasor Systems
  V. MADANI, PGE
• 17PESGM2638, Smart Transmission System Monitoring with Synchrophasor Data Intelligence
  G. KUMAR VENAYAGAMOORTHY, unknown
• 17PESGM2640, Use of IEC 61850 Standard in Smart Grid and Microgrids Control and Monitoring Systems
  H. MORAIS, EDF
• 17PESGM2636, Building Management Model Considering Demand Response and Locational Data
  P. FARIA, Polytechnic of Porto
Design of Electromagnetic Synchronous Compensators and Converter Synchronous Controls for Renewable Applications (panel)

Tuesday, 18 July, 2017, 1:00 PM–5:00 PM G – 208 Tiered Classroom
Sponsored by: Electric Machinery
Chair: R. NELSON, SIEMENS

As the penetration of renewable resources using phase-locked-loop controls increases, the need for either synchronous compensators (also called "synchronous condensers" in North America) to provide synchronizing power has increased, resulting in the application of synchronous compensators for several large renewable projects. In contrast to typical applications of synchronous compensators, which are often retired steam turbines kept in service to provide local voltage support for areas with otherwise poor voltage regulation (necessitating a wide dynamic reactive range), synchronous compensators for renewable applications have somewhat different design emphases, including maximal subtransient and transient short circuit contributions and rapid response to system conditions. This panel will feature representatives from major synchronous compensator vendors, including Siemens, ABB, and GE, who will describe design features of synchronous compensators for renewable applications, as well as designers of converter synchronous controls, who will describe the design of converter controls for synchronization of renewable resources.

PANELISTS:
• 17PESGM2467, Needs for Synchronous Condensers to Accommodate High Renewable Penetrations
  F. HUANG, ERCOT
• 17PESGM2464, Synchronous Condensers in Combination with FACTS Devices for Improved Power System Performance
  M. HALONEN, ABB
• 17PESGM2465, Design and Optimization of Synchronous Condensers to Integrate Renewable Generation into Utility Networks
  S. KYNEV, Siemens
• 17PESGM2466, Sizing and Specification of Synchronous Condensers for Power Systems with High Penetration of Inverter-Based Generation
  N. MILLER, GE
• 17PESGM2468, Synchronous Control of Power Converters for Renewable Applications and Beyond
  Q. ZHONG, Illinois Institute of Technology
• 17PESGM2469, Operation and Control of Cascaded H-Bridge STATCOMs under Unbalanced Conditions
  M. BONGIORNO

Unlocking Grid Flexibility – Energy Systems Integration (panel)

Tuesday, 18 July, 2017, 1:00 PM–5:00 PM G – 400 Tiered Classroom
Sponsored by: Energy Development and Power Generation
Chairs: B. KROPOSKI, National Renewable Energy Laboratory
         M. O’MALLEY, University College Dublin

Flexibility of operation—the ability of a power system to respond to changes in demand and supply—is critical to enable higher levels of variable generation. One way to unlock this potential flexibility is tap into other energy domains such as thermal and fuels systems as well as other services such as water and transportation systems. Energy systems integration is the process of coordinating the operation and planning of energy systems across multiple pathways and/or geographical scales to deliver reliable, cost-effective energy services with minimal impact on the environment. This panel will examine the role of energy systems integration in unlocking the flexibility of the electrical power system.

PANELISTS:
• 17PESGM2916, Grid Flexibility by Distributed Energy Resources and the Development of Integrated-Distributed Energy Management System (IDEMS)
  H. AKI, National Institute of Advanced Industrial Science and Technology (AIST)
• 17PESGM2917, Unlocking Flexibility: Integrated Optimization and Control of Multienergy Systems
  E. DALL’ANESI, National Renewable Energy Laboratory
• 17PESGM2918, Integrating Gas and Electricity Distribution Networks in Search of Flexibility
  P. TAYLOR, University of Newcastle
• 17PESGM2919, Multi-Energy Systems and Next Generation Grids for a Tropical Megacity
  X. YAN, Nanyang Technological University
• 17PESGM2920, Water-Energy Nexus: Opportunities and Challenges for Systems Integration
  E. CASEY, University College Dublin
HVDC Grids and Related Activities in Europe (panel)

Tuesday, 18 July, 2017, 1:00 PM–5:00 PM S – Chicago VIII

Sponsored By: Energy Development and Power Generation
Chair 1: D. WESTERMANN, Technische Universität Ilmenau
Department of Power Systems
A.-K. MARTEN, 50Hertz Transmission GmbH

The energy revolution in Europe places new requirements on the transmission grid. If it comes to large scale wind power integration in the north of Europe, as well as bulk solar power production in south, long distance bulk power transmission becomes integral part of an entirely new power system where new controllable devices will operate to make transmission smarter. In the last consequence a new network layer based on HVDC technology will be built which is referred to as an overlay grid in Europe. This session is about activities carried out in Europe and focusing on the meshed HVDC grids.

PANELISTS:
• 17PESGM2924, HVDC Operation
  D. VAN HERTEM, KU Leuven
• 17PESGM2925, HVDC Grid Controller – Realization Aspects
  A. MARTEN, 50Hertz Transmission GmbH
• 17PESGM2927, INELFE – First Experiences
  G. BAREUX, RTE France
• 17PESGM3042, Alegro Project
  S. TEEUWSEN, Siemens
• 17PESGM2926, Diverse Redundancy in AC/HVDC Systems
  F. SASS, Technische Universität Ilmenau
• 17PESGM2929, Advances in HVDC Station Control
  M. WOLTER, OvGU
• 17PESGM2930, OVANET – The HVDC Overlay Grid Option
  K. STRUNZ, TU Berlin
• 17PESGM2928, HVDC Tramssmission Technology
  H. KOCH, SIEMENS


Tuesday, 18 July, 2017, 1:00 PM–4:00 PM G – 222 Multifunction Room

Sponsored by: Energy Storage & Stationary Battery Committee and Stationary Battery Committee
Chair: D. ELIZONDO, Quanta Technology, USA

This panel provides an international perspective of energy storage. The material partly results from a high-level feasibility study for battery-based energy storage in Latin America. The presentation summarizes market potential for energy storage to address the renewable integration issues faced by major utilities in selected countries. A summary of the US energy storage regulatory landscape is provided, along with a vision of the opportunities, barriers (including regulatory and economic) and recommendations for successful introduction into the selected countries' power systems and energy markets.

The speakers will present an overview of different BESS technologies, compare them, and show the key applications of energy storage. The presentation will address how a larger list is narrowed down to the top 3-5 applications currently existing in the selected countries.

The presentation concludes with a summary of the technical and financial feasibility of large-scale BESS implementations in the presented countries.

PANELISTS:
• 17PESGM3001, A Roadmap for Integration of Energy Storage in Distribution Systems
  S. BAHRAMIRAD, ComEd
• 17PESGM3002, Energy Storage Experience at San Diego Gas and Electric Company
  F. GOODMAN, San Diego Gas & Electric

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Tuesday Afternoon, continued

- 17PESGM3003, Perspectives and Plans for Large Scale Battery Energy Storage Systems in Colombia and Brazil
  R. LEÓN CANDELA, Interconexión Eléctrica S.A.
- 17PESGM3107, Southern California Edison’s Energy Storage Journey
  L. GAILLAC, Southern California Edison
- 17PESGM3108, Energy Storage Development in the UK: Issues and Challenges
  X. ZHANG, University of Birmingham

Grid Technology and Innovations (panel)
Tuesday, 18 July, 2017, 1:00 PM–3:00 PM G – 206 Tiered Classroom

Sponsored by: Local Organizing Committee
Chair: S. HENDABADI, COMED

Technology case studies for utility companies will be discussed on this panel.

PANELISTS:
- 17PESGM3029, Detecting Faulty Distribution Components with Drone Technology
  A. DENNISON, Uplift Data Partners
- 17PESGM3030, Energy Storage as a Planning Tool in Distribution System
  D. CHIESA, S & C Electric
- 17PESGM3046, Smart Line Sensor Technology at ComEd
  B. KREGEL, ComEd
- 17PESGM3055, Jordan’s Electrical System
  A. ZUBI, National Electric Power Company (NEPCO)

E-Learning Modules and Resources in Power Engineering (panel)
Tuesday, 18 July, 2017, 1:00 PM–5:00 PM G – 226 Multifunction Room

Sponsored by: Power & Energy Education
Chair: D. NIEBUR, Drexel University

In the last two decades there a number of e-learning resources and modules were created by various universities and professional organizations. Examples include the IEEE PES Resource Center, CUSP, Powerlearn, NPTEL and others. Some of these resources are freely available in the public domain and some are available through institutional licensing arrangements. This panel aims to summarize, document and share what is available with the Power and Energy community. The eventual goal will be to document and catalog these modules, and create a library to benefit all.

PANELISTS:
- 17PESGM1083, PowerLearn Concepts: Community Development of Educational Materials
  J. MCCALLEY, Iowa State University
- 17PESGM1080, Graduate Degree through “Power/Energy” Courses Taught by Web-Based Instructors
  N. MOHAN, University of Minnesota
- 17PESGM1081, Smart Power Distribution System Curriculum – Multi-Institution Demonstration and Deployment
  V. CECCHI, University of North Carolina Charlotte
- 17PESGM1082, Survey of Australian e-Learning Resources
  S. ISLAM, Curtin University
- 17PESGM1079, National Programme on Technology Enhanced Learning (NPTEL)
  S. SINGH, Indian Institute of Technology Kanpur
- 17PESGM1084, IEEE PES Resources
  P. SAUER, University of Illinois, Urbana-Champaign
- 17PESGM1085, The Next GenEEI Initiative
  M. VAIMAN, V&R Energy

Transactions Paper Session 15 (transactions paper)
Tuesday, 18 July, 2017, 1:00 PM–3:00 PM G-306 Tiered Classroom

Sponsored by: Power System Dynamic Performance Committee

PAPERS AND AUTHORS:
- 17PESGM0013, Coordinated Voltage Control in Offshore HVDC Connected Cluster of Wind Power Plants [Transaction Number: 10.1109/TSTE.2016.2569430]
  J. SAKAMURI, Technical University of Denmark
  Z. RATHER, Indian Institute of Technology Mumbai
J. RIMEZ, Elia System Operator
M. ALTIN, Technical University of Denmark
O. GOKSU, Technical University of Denmark
N. CUTULULIS, Technical University of Denmark

• 17PESGM0047, Fast Grid Security Assessment with N-k Contingencies [Transaction Number: TPWRS-00245-2016]
  Y. YANG, Xi’an Jiaotong University
  X. GUAN, Xi’an Jiaotong University
  Q. ZHAI, Xi’an Jiaotong University

• 17PESGM0048, Multistage Generation and Network Expansion Planning in Distribution Systems Considering Uncertainty and Reliability [Transaction Number: 07353222]
  G. MUÑOZ-DELGADÓ, University of Castilla – La Mancha
  J. CONTRERAS, University of Castilla – La Mancha
  J. ARROYO, University of Castilla – La Mancha

• 17PESGM0578, Optimal Reactive Power Dispatch with Accurately Modeled Discrete Control Devices: A Successive Linear Approximation Approach [Transaction Number: TPWRS-00697-2016]
  Z. YANG, Tsinghua University
  A. BOSE, Washington State University
  H. ZHONG, Tsinghua University
  N. ZHANG, Tsinghua University
  Q. XIA, Tsinghua University
  C. KANG, Tsinghua University

• 17PESGM0903, Parameter Estimation of Resonant Fault Current Limiter for Protection and Stability Analysis [Transaction Number: TPWRS.2016.2608904]
  S. AMMANAMANCHI, IIT Kharagpur
  A. PRADHAN, IIT Kharagpur

• 17PESGM1071, Photovoltaic Inverter Controllers Seeking AC Optimal Power Flow Solutions [Transaction Number: TPWRS-01758-2014]
  E. DALL’ANESE, National Renewable Energy Laboratory
  S. DHOPLE, University of Minnesota
  G. GIANNAKIS, University of Minnesota

• 17PESGM1183, Predictive Set Point Modulation to Mitigate Transients in Lightly Damped Balanced and Unbalanced Systems [Transaction Number: 07467529]
  H. GHAFFARZADEH, Washington State University
  C. STONE, Washington State University
  A. MEHRIZI-SANI, Washington State University

• 17PESGM1474, Bayesian Approach in the Modal Analysis of Electromechanical Oscillations [Transaction Number: TPWRS-01072-2015.R2]
  J. SEPPÄNEN, Fingrid
  S. AU, University of Liverpool
  J. TURUNEN, Fingrid
  L. HAARLA, Fingrid

• 17PESGM1778, Energy Storage System Control for Prevention of Transient Under-Frequency Load Shedding [Transaction Number: virtual inertia]
  S. PULENDRAN, University of Toronto
  J. TATE, University of Toronto

Innovative Monitoring Issues of Smart Grid: Looking Back—Lessons and Learn (panel)

Tuesday, 18 July, 2017, 1:00 PM–4:00 PM S – Arkansas
Sponsored by: Power System Instrumentation and Measurements
Chairs: G. FITZPATRICK, NIST
        E. SO, NRC

PANELISTS:
• 17PESGM2746, Electricity Utility and Grid of the Future: Implementation, Technology, Regulations and Policy
  T. LIE, Auckland University of Technology

• 17PESGM2747, Application of Distributed Temperature Sensing Technology to High Voltage Transmission Cables
  S. CHERUKUPALLI, BC Hydro

• 17PESGM2748, Applications of PMU for Quality of Power
  R. CARRANZA, CENAM
Tuesday Afternoon, continued

- 17PESGM2749, Practice and Research of High Voltage Energy Meter in China
  Z. DING, Dongfang
- 17PESGM2750, Monitoring the Distribution Network in China: Challenges and Solutions
  P. WANG, EPRI
- 17PESGM2751, Practice and Research of High Voltage Energy Meter in China
  W. DENG, Dongfang Electric
- 17PESGM2752, Applications of Smart Grid Voltage and Current Sensors and Impact of Applications Requirements on Sensor Performance Requirements
  F. RAHMATIAN, NuGrid Power Corp., BC
- 17PESGM2753, Applications of PMU for Quality of Power
  M. RODRIGUEZ, CENAM Mexico

Advanced Data Analytics for EMS (panel)

Tuesday, 18 July, 2017, 1:00 PM–3:00 PM  G – 200 Tiered Classroom
Sponsored By: Power System Operation, Planning & Economics
Chairs: P. DU, ERCOT  M. PATEL, EPRI

The nation's grid faces significant transformation in supply, demand, consumer expectations, and markets. While unprecedented large amount of data set has been integrated into energy management systems (EMS), technical barriers still exist today to bring more value associated with data management and communication systems to enable full visibility of grid system state and to handle uncertainties originating from renewable resources or load. New breakthrough technologies should be developed and incorporated into EMS so as to transform the future power grid into a fully integrated, highly resilient, suitable paradigm. This panel will discuss how to improve situation awareness in the control room and to improve the grid's capabilities to analyze Big Data by looking at both traditional and non-traditional data or advanced analytics developed for new applications.

Panelists:
- 17PESGM2338, Big Data Processing for Fast Real-Time Online Dynamic Security Assessment System
  M. ZHOU, State Grid Electric Power Research Institute of China
- 17PESGM2339, Operation Knowledge Discovery Based on Big Data from EMS System
  Q. GUO, Tsinghua University
- 17PESGM2340, Data Integration for Asset Management and Operations
  P. MYRDA, EPRI
- 17PESGM2341, Augmenting EMS Functions with Big Data
  K. CHEUNG, GE

Best Practices on Integration and Operation of Grid-scale Energy Storage Systems (panel)

Tuesday, 18 July, 2017, 1:00 PM–3:00 PM  S – Chicago IX
Sponsored By: Power System Operation, Planning & Economics
Chairs: H. ZAREIPOUR, University of Calgary  F. F. LI, University of Tennessee

The recently accelerated trend in deployment of energy storage at a large scale is a great testimony to the values that energy storage can bring to several sectors in electricity industry, including generation, transmission and distribution, while providing services to support real-time balancing of demand and supply, network congestion management and reduce the need for investment in system reinforcement. As the pilot projects have been developed globally to gain more experiences with energy storage, there is a great need to share these experiences among investors, system operators and end-users and to inspire more discussion on the future development. This panel will assemble expertise from industry, academia and national laboratory to assimilate the best practices on integration and operation of energy storage.

Panelists:
- 17PESGM2383, Challenges and Opportunities for Storage Integration at MISO Market
  Y. CHEN, MISO
- 17PESGM2384, Operation, Planning and Market Regulation of Energy Storage in Europe
  J. CONTRERAS, University of Castilla – La Mancha
- 17PESGM2385, Co-Operation of Energy Storage, Wind, Solar, and Transmission Systems – China's Best Practice
  X. WANG, State Grid of China Corporation
• 17PESGM2386, Energy Storage Operations and Role in Grid Operations. How to Maximize the Value of Storage?
  M. KINTNER-MEYER, Pacific Northwest National Laboratory
• 17PESGM2387, Policy and Regulatory Dimensions in the Integration into the Grid of Energy Storage Resources
  G. GROSS, University of Illinois at Urbana-Champaign

**Paper Forum 03 (paper forum)**

*Tuesday, 18 July, 2017, 1:00 PM–5:00 PM  
S – Sheraton I*  
Sponsored by:  
Chair:  TBD

**PAPERS AND AUTHORS:**

- **17PESGM0116, Power System Inertia Estimation by Approaching Load Power Change After a Disturbance**
  D. ZOGRAFOS, Royal Institute of Technology (KTH) Sweden
  M. GHANDHARI, Royal Institute of Technology (KTH) Sweden

- **17PESGM0277, A Novel Control Strategy for the Interlinking Converter in Hybrid Microgrid**
  H. ALRAJHI ALSIRAJI, university of waterloo
  R. ELSHATSHAT, University of Waterloo
  A. RADWAN, University of Alberta

- **17PESGM0311, Calibrating a VSC-HVDC Model for Dynamic Simulations using RaPId and EMTP Simulation Data**
  L. VANFRETTI, KTH Royal Institute of Technology
  M. ADIB MURAD, KTH Royal Institute of Technology
  F. GÓMEZ LÓPEZ, KTH Royal Institute of Technology

- **17PESGM0357, Dynamic Behavior of Transformerless PV System on the Short-Term Voltage Stability of Distribution Network**
  M. ISLAM, University of Queensland
  M. NADARAJAH, University of Queensland
  M. HOSSAIN, Macquarie University

- **17PESGM0370, A Robust Prony Method for Power System Electromechanical Modes Identification**
  M. NETTO, Virginia Polytechnic Institute and State University
  L. MILI, Virginia Polytechnic Institute and State University

- **17PESGM0534, Estimating Dynamic Load Parameters from Ambient PMU Measurements**
  X. WANG, McGill University

- **17PESGM0585, MPC Based AGC for AC/DC Grids with Delays and Voltage Constraints**
  P. MC NAMARA, University College Dublin
  F. MILANO, University College Dublin

- **17PESGM0611, Role of Sensitivity Analysis in Load Model Parameter Estimation**
  P. MITRA, Electric Power Research Institute
  V. VITTAL, Arizona State University

- **17PESGM0618, A Comparison of HVDC Damping Controllers in the Western North American Power System**
  D. ROBERSON, University of Wyoming
  J. O’BRIEN, University of Wyoming

- **17PESGM0656, Impact of Prosumers on Frequency Stability of the Australian Future Grid**
  A. AHMADYAR, The university of Sydney
  H. MARZOOGH, The university of Sydney
  G. VERBIC, The university of Sydney
  D. J. HILL, The university of Sydney

- **17PESGM0664, Effect of Time Delay Asymmetries in Power System Damping Control**
  F. WILCHES-BERNAL, Sandia National Laboratories
  R. CONCEPCION, Sandia National Laboratories
  J. NEELY, Sandia National Laboratories
  D. SCHENWALD, Sandia National Laboratories
  R. BYRNE, Sandia National Laboratories
  B. PIERRE, Sandia National Laboratories
  R. ELLIOTT, Sandia National Laboratories

- **17PESGM0747, Field Experience and Recommendations with Parameter Re-Tuning of the Load Sharing Control Loops at the Itaipu Power Plant**
  R. OLIVEIRA, Itaipu Binacional
  J. PESENTE, Itaipu Binacional
  R. DA SILVA, Itaipu Binacional
Tuesday Afternoon, continued

- **17PESGM0881, Initial Closed-Loop Testing Results for the Pacific DC Intertie Wide Area Damping Controller**
  D. TRUDNOWSKI, Montana Tech
  D. KOSTEREV, Bonneville Power Administration
  B. PIERRE, Sandia National Lab
  F. WILCHES-BERNAL, Sandia National Lab
  D. SCHOENWALD, Sandia National Lab
  J. NEELY, Sandia National Lab
  B. PIERRE, Sandia National Lab
  Y. LIU, South-Central University for Nationalities

- **17PESGM0913, Study on the Migration of Out-of-step Oscillation Center in Power System considering the Virtual Inertial Control**
  F. TANG, Wuhan University
  G. XIAO, Wuhan University
  Q. LIAO, Wuhan University
  D. LIU, Wuhan University
  Y. LIU, South-Central University for Nationalities
  Z. HE, Wuhan University

- **17PESGM0921, Best Modeling Practices for Optimal Estimation of Balanced and Symmetric Three-Phase Signals**
  L. BARTOCCI LIBONI, University of São Paulo
  M. DE OLIVEIRA, University of California, San Diego
  I. NUNES DA SILVA, University of São Paulo

- **17PESGM0965, Analysis of the Interactions Between Close HVDC Links Inserted in an AC Grid**
  I. MUNTEANU, Ecole Centrale Nantes
  B. MARINESCU, Ecole Centrale Nantes
  F. XAVIER, Réseau de transport d’électricité de France

- **17PESGM1045, Sub-synchronous Oscillation Analysis of Transmission System with Multiple Wind Farms**
  F. YANG, Tsinghua University
  L. SHI, Tsinghua University
  Y. NI, Tsinghua University
  L. YAO, China Electric Power Research Institute

- **17PESGM1147, Energy Shaping Control of a Back-to-Back Converter for Microgrid Applications**
  N. SMITH, The University of Arkansas
  R. MCCANN, pesgm2017@mirasmart.com

- **17PESGM1195, Robust Dynamic State Estimator to Outliers and Cyber Attacks**
  J. ZHAO, Virginia Tech
  L. MILI, Virginia Tech
  A. ABDELHADI, Virginia Tech

- **17PESGM1282, Resilient Wide-Area Damping Control for Interarea Oscillation Considering Communication Failure**
  Y. SHEN, Huazhong University of Science & Technology
  W. YAO, Huazhong University of Science and Technology
  J. WEN, Huazhong University of Science & Technology
  H. HE, University of Rhode Island
  C. LUO, Northern Indiana Public Service Company (NIPSCO)

**Paper Forum 04 (paper forum)**

**Tuesday, 18 July, 2017, 1:00 PM–5:00 PM S – Sheraton V**

Sponsored by: Admin
Chair: D. ZHAO, Argonne National Lab

PAPERS AND AUTHORS:

- **17PESGM0083, A Study of Linked Virtual Transactions in New York Electricity Market**
  G. ZHANG, New York ISO
  M. SWIDER, New York ISO
  P. GANESAN, New York ISO
  M. MARWALI, New York ISO

- **17PESGM0096, Optimal Linear Hedge Under Volumetric and Price Uncertainties in both Retail and Wholesale Electricity Markets**
  Y. DU, Seattle City Light
  R. VISHWANATHAN, Seattle City Light
• 17PESGM0108, Impact of Local Transmission Congestion on Energy Storage Arbitrage Opportunities
  Y. WANG, University of Washington
  Y. DVORKIN, New York University
  R. FERNANDEZ-BLANCO, University of Washington
  B. XU, University of Washington
  D. KIRSCHEN, University of Washington

• 17PESGM0120, Distributed Control Algorithm for Optimal Power Allocation of EV Parking Lots
  H. POURBABAK, University of Michigan-Dearborn
  S. XU, University of Michigan-Dearborn
  T. CHEN, University of Michigan-Dearborn
  W. SU, University of Michigan-Dearborn

• 17PESGM0133, Demand Response Aggregator Stackelberg Competition for Selling Stored Energy
  M. MOTALLEB, University of Hawaii at Manoa
  R. GHORBANI, University of Hawaii at Manoa

• 17PESGM0225, Energy Storage Dispatch under Different Ownership and Control Models
  J. DEBOEVER, Georgia Institute of Technology
  S. GRIJALVA, Georgia Institute of Technology

• 7PESGM0253, A Mathematical Model for Electricity Scarcity Pricing in ERCOT Real-Time Energy-Only Market
  C. LIU, Electric Reliability Council of Texas
  H. CHEN, Northeast Electric Power University
  T. JIANG, Northeast Electric Power University
  X. LI, Northeast Electric Power University
  G. LI, Northeast Electric Power University
  X. HE, Northeast Electric Power University
  X. KOU, University of Tennessee
  L. BAI, University of Tennessee
  F. LI, University of Tennessee
  X. FANG, University of Tennessee

• 17PESGM0447, Available Transfer Capability Calculations Considering Demand Response
  H. CHEN, Northeast Electric Power University
  T. JIANG, Northeast Electric Power University
  X. LI, Northeast Electric Power University
  G. LI, Northeast Electric Power University
  X. HE, Northeast Electric Power University
  X. KOU, University of Tennessee
  L. BAI, University of Tennessee
  F. LI, University of Tennessee
  X. FANG, University of Tennessee

• 17PESGM0638, Low-carbon Economic Dispatch Model with Combined Wind-storage System and Carbon Capture Power Plants
  R. ZHANG, Northeast Electric Power University
  H. CHEN, Northeast Electric Power University
  X. LI, Northeast Electric Power University
  T. JIANG, Northeast Electric Power University
  G. LI, Northeast Electric Power University
  R. NING, State Grid Jilin Power Supply Company

• 17PESGM0784, Challenges, Opportunities, and Approaches for Integrating Demand Response in Markets
  J. PRICE, California ISO

• 17PESGM0833, An Optimal Distributed Transactive Energy Sharing Approach for Residential Microgrids
  M. AKTER, Deakin University
  M. MAHMUD, Deakin University
  A. O. Deakin University

• 17PESGM1179, Distributed Microgrid Energy Optimization Using Transactive Control and Heuristic Strategy
  M. JI, Shanghai Jiao Tong University
  P. ZHANG, Shanghai Jiao Tong University
  Y. CHENG, Shanghai Jiao Tong University

• 17PESGM1238, Real-time Economic Dispatch Based on Equivalent Consumption Characteristic of Energy Storage in Hybrid AC-DC Microgrid
  P. LI, State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources
  P. HAN, State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources
Tuesday Afternoon, continued

B. ZHANG, State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources
S. HE, State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources
J. ZHOU, State Grid Zhejiang Electrical Power Company

• 17PESGM1483, A Flow Direction Enforcing Approach for Economic Dispatch with Adjustable Line Impedance
  J. JIN, Singapore University of Technology and Design
  Y. XU, Singapore University of Technology and Design

• 17PESGM1731, Coordinated Operation of Distributed Energy Storage in Low Carbon Networks
  T. RODRIGUES, Imperial College London
  R. MOREIRA, Imperial College London
  G. STRBAC, Imperial College London

• 17PESGM1859, Multi-Agent Collaborative Model in Electrical Energy Market: A Distributed-Based Approach
  M. ALMOUSA, Louisiana State University
  A. KARGARIAN, Louisiana State University

• 17PESGM1958, Energy and Ancillary Services Value of CSP with Thermal Energy Storage in the Australian National Electricity Market
  A. NARIMANI, QUT
  A. ABEGUNAWARDANA, QUT
  B. KHOO, QUT
  L. MAISTRY, QUT
  G. LEDWICH, QUT
  G. WALKER, QUT
  G. NOURBAKHSH, QUT

• 17PESGM2035, Customer Load Profile-Based Pricing Strategy of Retailers with Generation Assets in Retail Markets
  Z. MA, Tsinghua University
  H. ZHONG, Tsinghua University
  Q. XIA, Tsinghua University
  J. WANG, Tsinghua University
  X. LAI, Tsinghua University
  X. ZHANG, Beijing TsIntergy Technology Co., Ltd.
  Y. WANG, Tsinghua University

• 17PESGM2165, Incorporating Interface Bids in the Economic Dispatch for Multi-Area Power Systems
  Y. GUO, Cornell University
  L. TONG, Cornell University

• 17PESGM2262, Non-Critical Transmission Constraints Identification and Removal for Long-Range Production Cost Simulation Performance Improvement
  R. BO, MISO
  Z. ZHOU, MISO
  F. WANG, MISO
  S. SALEM, University of Michigan

• 17PESGM2275, Incorporating Price Responsive Load into Generation Schedule via Non-Iterative Method
  C. SHAO, Xi'an Jiaotong University
  X. WANG, Xi'an Jiaotong University
  X. WANG, Xi'an Jiaotong University
  B. WANG, Xi'an Jiaotong University
  M. SHAHIDEHPOUR, Illinois Institute of Technology

Transmission Planning for Non-Synchronous Variable Resources (panel)

Tuesday, 18 July, 2017, 1:00 PM–5:00 PM
G – 204 Tiered Classroom

Sponsored By: Power System Operation, Planning & Economics
Chairs: J. FELTES, Siemens
S. VENKATARAMAN, GE

This panel addresses how transmission expansion planning is adapting to the increasing penetration of non-synchronous resources with high short-term variability in the grid – notably inverter-connected wind/solar generation and storage devices. Practical solutions employed in the USA, Europe and Latin America are approached.

PANELISTS:
• 17PESGM2839, HVDC Overlay Grids for Sharing Energy Resources
  V. PATHIRANA, Teshmont
Tuesday Afternoon, continued

- 17PESGM2840, Overview of Voltage Control Requirements for Renewable Generation from a System Planning Perspective
  J. FELTES, Siemens
- 17PESGM2841, Transmission Design for High Wind and Solar Penetraions
  J. MCCALLEY, Iowa State University
- 17PESGM2842, Decision-Making Under Uncertainty Using Different Multistage Stochastic Optimization Approaches
  R. PEREZ, PSR
- 17PESGM2843, Overview of Large Scale Battery Energy Storage and Its Impact on Transmission Planning Standards in Latin America
  D. ELIZONDO, Quanta Technology, USA
- 17PESGM2844, System Planning Incorporating Low or No Inertia Resources
  B. FERNANDES, Siemens
- 17PESGM2845, Concurrent Cooling R&D Portfolio: Overhead Transmission Line Planning, Design, and Optimization to Enhance Wind Integration
  K. MYERS, Idaho National Laboratory
- 17PESGM2846, Transmission Planning with Increasing Uncertainties
  D. BROOKS, EPRI
- 17PESGM2847, Regulatory Issues in the United States
  J. BUECHLER, NYISO
- 17PESGM2848, Regulatory Framework for Transmission Expansion in South America – Opportunities and Challenges
  R. FERREIRA, Empresa de Pesquisa Energética

Transactions Paper Session 16 (transactions paper)
Tuesday, 18 July, 2017, 1:00 PM–3:00 PM             G – 308 Tiered Classroom
Sponsored by:             Power System Operation, Planning & Economics
Chair:                           J. YAN, SCE

PAPERS AND AUTHORS:
- 17PESGM0082, Energy Management in Multi-Microgrid Systems – Development and Assessment
  [Transaction Number: TPWRS-00921-2015]
  S. AREFIFAR, Oakland University
  M. ORDONEZ, University of British Columbia
  Y. MOHAMED, University of Alberta
- 17PESGM0237, A Two-Level Approach to AC Optimal Transmission Switching with an Accelerating Technique
  [Transaction Number: TPWRS-01433-2015]
  Y. BAI, Guangdong Power Grid Co., Ltd.
  H. ZHONG, Tsinghua University
  Q. XIA, Tsinghua University
  C. KANG, Tsinghua University
- 17PESGM0488, Iterative Distributed Algorithms for Real-Time Available Transfer Capability Assessment of Multiarea Power Systems
  [Transaction Number: TSG-00422-2014]
  J. LIU, National Tsing Hua University
  C. CHU, National Tsing Hua University
- 17PESGM0519, OPF Techniques for Real-Time Active Management of Distribution Networks
  [Transaction Number: TPWRS-00228-2016]
  J. ROBERTSON, University of Edinburgh
  G. HARRISON, University of Edinburgh
  R. WALLACE, University of Edinburgh
- 17PESGM0612, Reliability Assessment for Distribution Optimization Models: A Non-Simulation-Based Linear Programming Approach
  [Transaction Number: TSG-00349-2016.R2]
  G. MUÑOZ-DELGADO, University of Castilla – La Mancha
  J. CONTRERAS, University of Castilla – La Mancha
  J. ARROYO, University of Castilla – La Mancha
  [Transaction Number: TPWRD-00610-2013]
  S. GANGULY, Indian Institute of Technology, Guwahati, India
- 17PESGM0856, Corrective Transmission Switching for N-1-1 Contingency Analysis
  [Transaction Number: TPWRS.2016.2614520]
  M. ABDI-KHORSAND, Arizona State University
  M. SAHRAEI-ARDAKANI, Arizona State University
  Y. AL-ABDULLAH, Arizona State University
Tuesday Afternoon, continued

- **17PESGM1266, On the Loadability Sets of Power Systems—Part I: Characterization**  
  **[Transaction Number: TPWRS.2016.2547945]**  
  A. ABRJAHROMI, McGill University  
  F. BOUFFARD, McGill University

- **17PESGM1267, On the Loadability Sets of Power Systems—Part II: Minimal Representations**  
  **[Transaction Number: TPWRS.2016.2547938]**  
  A. ABRJAHROMI, McGill University  
  F. BOUFFARD, McGill University

- **17PESGM2220, Hierarchical EMS for Aggregated BESSs in Energy and Performance-Based Regulation Markets**  
  **[Transaction Number: TPWRS.2016.2598186]**  
  T. ZHANG, Nanyang Technological University  
  S. CHEN, DNV GL, Singapore  
  H. GOOI, Nanyang Technological University  
  J. MACIEJOWSKI, Cambridge University

**Discovering the Value of Transactive Energy (panel)**

*Tuesday, 18 July, 2017, 1:00 PM–5:00 PM  
S – Ohio*

*Sponsored by: Smart Buildings, Loads & Customer Systems  
Chair: S. CHANDLER, Navigant*

This panel seeks to explore approaches to value transactive energy for addressing future electric system goals and the challenges to achieve these goals. Panelists are encouraged to consider the specification of scenarios (use cases) that may emphasize future system objectives, as well as requirements for modeling and simulation of these use cases to represent non-coordinated growth of distributed energy resources (DER) and transactive energy mechanisms for coordination of such DER assets. Methods for assessing the value of transactive energy should be explored at a minimum.

**PANELISTS:**
- **17PESGM3018, A Framework of Valuing Transactive Energy**  
  D. HAMMERSTROM, PNNL
- **17PESGM3019, NIST Transactive Energy Challenge Perspective**  
  M. BURNS, National Institute of Standards and Technology
- **17PESGM3020, Value and Optimization: Transactive Energy with Battery Storage and Smart Solar Inverters**  
  B. RECTOR, Portland State University
- **17PESGM3021, Transactive Energy and Blockchain Potential**  
  R. SHANDROSS, Navigant Consulting
- **17PESGM3022, Value of Transactive Energy**  
  J. SHERWOOD, Rocky Mountain Institute

**Challenge in Operation and Control of AC-DC Hybrid Power Systems (panel)**

*Tuesday, 18 July, 2017, 1:00 PM–5:00 PM  
S – Goldcoast*

*Sponsored By: PES Technical Council  
Chairs: F. Xue, Power System Stability Control Company of NARI Technology Inc. CN  
D. OSBORN, Midcontinent ISO*

Driven by the distribution characteristics of energy sources and the growth of load demand, the UHVAC/DC hybrid structure and the large-scale electric power transmission between different regions have become the typical features of power systems in many countries. These features have brought great challenges to the operation and control of the AC-DC hybrid power systems. For example, with the complicated power grid structure, static, transient, dynamic, voltage, frequency and other stability forms may co-exist; and with the grid integration of large scale intermittent renewable energy source and the random characteristics of load demand, the variability of power flow has exacerbated the difficulty of power flow controls and adjustments. With the couplings of AC-DC power grids, large scale applications of power electronic equipment, and the interactions of electromagnetic transients and electromechanical transients, the risk for the occurrence of multi-infeed HVDC simultaneous commutation failures has increased. Therefore, this topic aims to analyze the huge challenges in operation and control of AC-DC hybrid power systems, and to discuss the stable and secure operation of AC-DC hybrid power systems in terms of theories, methods and technical solutions.

**PANELISTS:**
- **17PESGM3112, Develop Ultra High Voltage Power Grid to Promote Energy Power Transformation**  
  Q. ZHANG, State Grid Corporation of China
- **17PESGM3110, Challenge in Operation and Control of AC-DC Hybrid Power System in USA**  
  D. OSBORN, Midcontinent ISO
DC Grids: Technology Needs, Design Considerations, Operational Challenges, and Case Studies (panel)

Tuesday, 18 July, 2017, 1:00 PM–2:00 PM
G – 300 Tiered Classroom
Sponsored By: Transmission and Distribution
Chairs: R. ADAPA, EPRI
J. PAN, ABB

The interest in DC grids is growing due to a change in generation patterns as large amounts of renewable energy sources are replacing conventional generation. This trend will continue into the future, and it is expected that large offshore wind farms will also supply increasing load. An off-shore DC grid or a DC grid overlay on the existing AC grid is being researched for transmitting large amounts of power over long distances. However, there are several major technical challenges that must be overcome, which will be addressed in this panel: DC voltage and power flow control within the DC grid, DC voltage transformation and fast protection for isolation within the DC grid. In addition, other issues such as planning, design, and operational reliability and security, as well as the need for standardization and grid codes for DC grids shall be considered along with some real-world case studies.

PANELISTS:

- 17PESGM2368, Economically Justified HVDC Overlays
  D. OSBORN, Midcontinent ISO
- 17PESGM2369, The DC Grid and the AC system
  D. WOODFORD, Electranix
- 17PESGM2370, Advancing Converter Technologies into DC Grids
  N. KIRBY, GE Energy Connections
- 17PESGM2371, DC Transformers, A Necessity for DC Grids
  M. MOHADDES, Trans Grid Solutions Inc
- 17PESGM2372, Development of Multiterminal HVDC System and High Power HVDC Links as the First Step towards an HVDC Grid
  M. CALLAVIK, ABB

Cyber and Physical Security (super session)

Tuesday, 18 July, 2017, 1:00 PM–5:00 PM
S-Sheraton II
Sponsored by: PES Super Session
Chair: M. DOOD, SEL

CYPHER AND PHYSICAL SECURITY
NERC requirements and standards for cyber and physical security in the bulk electric system.
IEEE PES collaboration with DOE, NERC, and FERC in developing reliability standards and policy.
Recent changes to cyber and physical security requirements.
Best practices for cyber and physical security in electric power systems.

PAPERS AND AUTHORS

- 17PESGM3121, Perspectives from the Field – Practical Approaches to Security Operations in the Utility
  M. MEASON, Western Farmers
- 17PESGM3122, Developing a Culture of Cyber Security
  C. HSU, NRECA
- 17PESGM3123, Understanding Design, Installation, and Testing Methods that Promote Substation IED Resiliency for High-Altitude Electromagnetic Pulse Events
  T. MOONEY, Schweitzer Engineering Labs
- 17PESGM3124, Differences between “Hardware Defined Networks” (HDN) and “Software Defined Networks” (SDN) and the Impacts to Securing SCADA Networks
  R. HILL, Veracity
Tuesday Afternoon, continued

- **17PESGM3125**, Research Initiatives in Progress in the Cyber Resilient Energy Delivery Consortium (CREDC)
  A. VALDES, University of Illinois at Urbana-Champaign

  C. WALCUTT, Black & Veatch

**Transactions Paper Session 04 (transactions paper)**

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM G – 304 Tiered Classroom
Sponsored by: Analytic Methods for Power Systems
Chairs: M. KABALAN, Villanova

**PAPERS AND AUTHORS:**

- **17PESGM0112**, One Markov Model for Spare Analysis of Distribution Power Transformers
  [Transaction Number: TPWRS-00163-2015]
  G. HAMOUD, Hydro One
  C. YIU, Hydro One

- **17PESGM0274**, An Iterative Method for Determining the Most Probable Bifurcation in Large Scale Power Systems
  [Transaction Number: TPWRS-00467-2016]
  M. MITTELSTAEDT, RWTH Aachen University
  S. BAUER, RWTH Aachen University
  A. SCHNITTLER, RWTH Aachen University

- **17PESGM0469**, A Multi-timescale Quasi-Dynamic Model for Simulation of Cascading Outages
  [Transaction Number: TPWRS-00529-2015]
  R. YAO, University of Tennessee
  S. HUANG, Tsinghua University
  K. SUN, University of Tennessee
  F. LIU, Tsinghua University
  X. ZHANG, Tsinghua University
  S. MEI, Tsinghua University

- **17PESGM0555**, A Reliability Assessment Approach for Integrated Transportation and Electrical Power Systems Incorporating Electric Vehicles
  [Transaction Number: TSG-00639-2015]
  K. HOU, Tianjin University
  X. XU, Queen's University Belfast
  H. JIA, Tianjin University
  X. YU, Tianjin University
  T. JIANG, Northeast Dianli University

- **17PESGM0605**, Probabilistic Risk-Based Security Assessment of Power Systems Considering Incumbent Threats and Uncertainties
  [Transaction Number: 07432051]
  E. CIAPESSONI, Ricerca Sul Sistema Energetico – RSE S.p.A.
  D. CIRIO, Ricerca Sul Sistema Energetico – RSE S.p.A.
  G. KJØLLE, SINTEF Energy Research
  S. MASSUCCO, University of Genoa
  A. PITTO, Ricerca Sul Sistema Energetico – RSE S.p.A.
  M. SFORNA, TERNNA

- **17PESGM0762**, Risk Assessment of Multi-Timescale Cascading Outages Based on Markovian Tree Search
  [Transaction Number: TPWRS-00396-2016]
  R. YAO, University of Tennessee
  S. HUANG, Tsinghua University
  K. SUN, University of Tennessee
  F. LIU, Tsinghua University
  X. ZHANG, Tsinghua University
  S. MEI, Tsinghua University
  W. WEI, State Grid Sichuan Electric Power Company
  L. DING, State Grid Sichuan Electric Power Company

- **17PESGM0870**, A Wind Farm Reliability Model Considering Both Wind Variability and Turbine Forced Outages
  [Transaction Number: 99]
  S. SULAEMAN, Michigan State University
  M. BENIDRIS, University of Nevada, Reno
  J. MITRA, Michigan State University
  C. SINGH, Texas A&M University

- **17PESGM1510**, Fuzzy Logic Approach to Predictive Risk Analysis in Distribution Outage Management
  [Transaction Number: TSG2576282]
  P. CHEN, Texas A&M University
  M. KEZUNOVIC, Texas A&M University
Future Trends in Computer Hardware for Power Grid HPC Applications (panel)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM G – 244 Multifunction Room

Sponsored by: (AMPS) Computer Analytical Methods
Chairs: S. ABHYANKAR, Argonne National Laboratory
       J. GROSH, Lawrence Livermore National Laboratory

The advent of digital computer in the 1950s transformed the power industry facilitating the shift from analysis on miniature scale models of the power grid networks, using AC network analyzers or calculating boards, to a faster and flexible solution of the actual grid. The rapid growth of the computing industry since then, from mainframe computers to multicore/many-core CPU architectures and general purpose graphical processing units (GPGPUs) available today, has resulted in the development of a myriad of power grid applications that can solve much larger and complex problems. In this panel session, leading experts from computer hardware will present the recent and future trends in computing hardware and deliberate its implications on power system HPC applications with power grid experts.

PANELISTS:

• 17PESGM2791, Hardware Requirements for Future Grid from Utility’s Perspective
  D. SCHOOLEY, Manitoba HVDC Research Centre

• 17PESGM2792, Introduction to Quantum Computing
  D. DAHL, D-Wave Systems

• 17PESGM2789, Computational Requirements for Future Grid: ISO’s Perspective
  E. LITVINOV, ISO New England

• 17PESGM2814, Developments in HPC Hardware: Multi-Core, Many-Core, GPUs, and More
  R. BAIR, Argonne National Laboratory

Decision Support Methods for Capital Planning Under Uncertainty (panel)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM G – 206 Tiered Classroom

Sponsored by: (AMPS) Reliability and Risk Analysis
Chairs: C. DENT, University of Edinburgh
       B. HOBBS, Johns Hopkins University

It is widely appreciated that when making capital planning decisions, or designing markets, best practice is to consider what plan or policy will hedge against different possible future system backgrounds – in particular the best plan for hedging against uncertainty may well not be optimal with respect to any single possible future. This panel will explore a range of quantitative methods in uncertainty quantification, expert elicitation, and computation for optimization under uncertainty. The aim is to bring together researchers and analysts active in this area to exchange ideas, and to disseminate more broadly the current state of the art.

PANELISTS:

• 17PESGM2413, Co-Optimized Transmission and Generation Expansion Planning Under Uncertainty: Formulations, Data Requirements, and Application
  J. MCCALLEY, Iowa State University

• 17PESGM2414, Efficient Computation Methods for Large-Scale Stochastic Planning Problems
  I. KONSTANTELOS, Imperial College London

• 17PESGM2415, Forward-Looking Integration Planning of Distribution Upgrades for Uncertain DER Futures
  B. PALMINTIER, National Renewable Energy Laboratory

• 17PESGM2412, Decision-Making Under Uncertainty for Complex Computer Models
  A. WILSON, University of Edinburgh
Regulatory and Environmental Impact on Power Grid: Simulation & Implication (panel)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM              G – 100 Tiered Classroom
Sponsored By:     Energy Development and Power Generation
Chairs:           Z. FAN, PJM
                    R. BO, MISO

The transition to clean power is happening faster than expected around the world. The impacts of the policy each country/region will be reflected in energy prices, system operation and reliability, and the broader economy.

This panel will review some (PJM and MISO) of the past studies done at ISO/RTO level in the United States and NREL will present its study. China's effort to clean energy is tremendous, SGGC will show its road map.

PANELISTS:
• 17PESGM2963, The Development of Renewable Energy in China
  Y. REN, Stage Grid of China
• 17PESGM2964, California Clean Energy Policies and the ISO’s Planning Studies
  X. WANG, CA ISO
• 17PESGM2965, Impact of Environmental Policy on UK’s Energy Supply System
  X. ZHANG, University of Birmingham
• 17PESGM2967, Electric System Evolution: Regulatory and Environmental Policy in Capacity Expansion Models
  C. BARROWS, NREL
• 17PESGM2962, Review of PJM’s Study on Environmental Issues
  Z. FAN, PJM
• 17PESGM3047, Lessons Learned from Analysis of State Regulatory and Policy Drivers at MISO
  J. BAKKE, MISO

Smart Distribution Application: Distribution System Operator (DSO) (panel)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM              S – Chicago IX
Sponsored by:     Local Organizing Committee
Chair:            A. PAASO, ComEd

As the utility business model changes to become more transaction focused, the applications used to manage the distribution system must also change. This panel discusses the benefits that utilities, customers, and 3rd party energy producers will realize through the implementation of DSO software, as well as the challenges in implementing such solutions. What steps should utilities be taking today to prepare for DSO implementation?

PANELISTS:
• 17PESGM3037, Approaches to Distribution System Operator – ComEd’s Perspective
  S. BAHRAMIRAD, ComEd
• 17PESGM3038, Approaches to Distribution System Operator
  R. MASIELLO, Quanta Technology
• 17PESGM3039, Approached to Distribution System Operator – ConEd perspective
  M. JOLLY, Con Edison

Challenges and Technologies in Bulk Power System Outage Management (panel)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM              S – Mississippi
Sponsored by:     Power System Operation, Planning & Economics
Chair:            X. LUO, ISO New England

Scheduling and coordination of outages is an important function that transmission owners and grid operators perform which has direct reliability and economic impacts to the grid operations and market participants. There are many challenges today in bulk power system outage management, including the assessment and management of the operational and economic risks, the interdependencies of both generation and transmission outages, the integration of renewable energy resources, gas-electric power system coordination, generation retirements, etc. This panel serves as a forum for the grid operators and researchers to share the challenges in outage management, discuss metrics and tools being used today, and identify new technologies needed to further improve the accuracy and efficiency of outage scheduling and coordination.
Network Restoration Operation Procedure with Renewable Energy Sources (panel)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM             G – 300 Tiered Classroom
Sponsored by:             Power System Operation, Planning & Economics
Chair:                           M. BRAUN, Fraunhofer IWES and University of Kassel

After a blackout of the power system the transmission system operator has to coordinate the power system restoration. Due to the increasing number of variable renewable energy sources in the system (esp. solar and wind) they have an impact on the restoration procedure. The panel session has two focus areas: how the transmission system operator can include renewable energy sources in the network restoration procedure and how distribution systems coordinate distributed energy resources and supports power system restoration.

Transactions Paper Session 17 (transactions paper)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM             G – 306 Tiered Classroom
Sponsored by:             Power System Operation, Planning & Economics
Chair:                           A. VACCARO, University of Sannio

PAPERS AND AUTHORS:

- 17PESGM0019, Global Parametric Polynomial Approximation of Static Voltage Stability Region Boundaries [Transaction Number: 10]
  Y. QIU, Zhejiang University
  H. WU, Zhejiang University
  Y. ZHOU, Zhejiang University
  Y. SONG, Zhejiang University

- 17PESGM0045, Transmission Constrained UC with Wind Power: An All-Scenario-Feasible MILP Formulation with Strong Nonanticipativity [Transaction Number: TPWRS.2016.2592507]
  Q. ZHAI, Xi’an Jiaotong University
  X. LI, Xi’an Jiaotong University
  X. LEI, Xi’an Jiaotong University
  X. GUAN, Xi’an Jiaotong University

  M. HOTZ, Technische Universität München
  W. UTSCHICK, Technische Universität München

- 17PESGM0064, Novel Cost Model for Balancing Wind Power Forecasting Uncertainty [Transaction Number: TEC-00415-2016.R2]
  J. YAN, North China Electric Power University
  Y. LIU, North China Electric Power University
  E. LI, University of Bath
  C. GU, University of Bath
Modern society has reached a point where virtually every crucial economic and social function depends on the secure and reliable operation of the electrical power and energy infrastructures. The electric power systems around the world are undergoing an unprecedented transformation prompted by the need to comply with new technology deployment trends, environmental concerns, new weather patterns, changing consumer needs, and regulatory requirements. In the US, this evolution has been clustered and described under various terms, including smart grid, grid of the future, grid modernization, and utility of the future. Despite slight differences among these terms, all of them recognize that the status quo is no longer able to fulfill the changing needs and growing expectations of end users, while providing electric utilities and other industries with the opportunity to thrive in a dynamic and modern market; therefore, they have encouraged the introduction of new paradigms. The terms “smart grid,” “grid of the future,” and “grid modernization” emphasize the need to build an intelligent grid that can be monitored and controlled in real-time to allow for providing a reliable, safe, and secure service and empower customers to actively participate and benefit from greater and more diverse market opportunities and services. Building this intelligent grid is a monumental task (particularly on the distribution and grid-edge sides which are vast and heterogeneous) that has led to the emergence of new concepts, technologies, and paradigms. This panel session will discuss recent trends, challenges, solutions and developments pertaining to grid modernization initiatives being implemented by the US electric utility industry.

PANELISTS:
- 17PESGM2589, TBD
  B. AMUNDSON, XCEL Energy
- 17PESGM2860, TBD
  E. TAKAYESU, Southern California Edison
- 17PESGM2861, TBD
  E. ZIMMERER, Entergy
- 17PESGM2858, TBD
  M. AVENDANO, Exelon / ComEd
- 17PESGM3078, TBD
  J. OLIVER, Duke Energy
Transactions Paper Session 25 (transactions paper)

Tuesday, 18 July, 2017, 3:00 PM–5:00 PM             G – 308 Tiered Classroom
Sponsored By: Transmission and Distribution
Chair: M. SINGH, ComEd

PAPERS AND AUTHORS:

• 17PESGM0226, Protection Coordination Index Enhancement Considering Multiple DG Locations Using FCL [Transaction Number: 10.1109/TPWRD.2016.2533565]
  H. ZEINELDIN, Masdar Institute
  E. EL-SAADANY, University of Waterloo
  L. HUCHEL, Masdar Institute

• 17PESGM0596, An Equivalent Circuit Method for Modelling and Simulation of Modular Multilevel Converter in Real-time HIL Test Bench [Transaction Number: DOI: 10.1109/TPWRD.2016.2541461]
  W. LI, OPAL-RT Technologies
  B. JEAN, OPAL-RT Technologies

• 17PESGM0685, Cooperative Control of Multi-Master-Slave Islanded Microgrid with Power Quality Enhancement Based on Conservative Power Theory [Transaction Number: TSG-01664-2015]
  A. MORTEZAEI, Colorado School of Mines
  M. SIMÕES, Colorado School of Mines
  M. SAVAGHEBI, Aalborg University
  J. GUERRERO, Aalborg University
  A. AL DURRA, The Petroleum Institute

• 17PESGM0848, Interaction of Droop Control Structures and its Inherent Effect on the Power Transfer Limits in Multi-terminal VSC-HVDC [Transaction Number: TPWRD2600028]
  F. THAMS, Technical University of Denmark (DTU)
  R. ERIKSSON, Svenska Kraftnät
  M. MOLINAS, Norwegian University of Science and Technology (NTNU)

• 17PESGM0999, Offshore Wind Farm Modeling Accuracy and Efficiency in MMC-Based Multi-Terminal HVDC Connection [Transaction Number: TPWRD-00801-2015.R2]
  U. KARAAGAC, Polytechnique Montreal
  L. CAI, Smart Grid Research Institute
  H. SAAD, RTE-France

  U. KARAAGAC, Polytechnique Montreal
  J. MAHEREDJIAN, Polytechnique Montreal
  I. KOCAR, Polytechnique Montreal
  G. SOYKAN, Polytechnique Montreal
  O. SAAD, Hydro-Quebec

• 17PESGM1009, Simulation of Startup Sequence of an Offshore Wind Farm with MMC-HVDC Grid Connection [Transaction Number: TPWRD-00840-2015.R1]
  U. KARAAGAC, Polytechnique Montreal
  L. CAI, Smart Grid Research Institute
  J. MAHEREDJIAN, Polytechnique Montreal

  B. PEREIRA JUNIOR, University of São Paulo – São Carlos
  G. MARTINS DA COSTA, University of São Paulo – São Carlos
  J. CONTRERAS, UCLM
  J. SANCHES MANTOVANI, São Paulo State University

• 17PESGM1229, An Accurate Type III Wind Turbine Generator Short Circuit Model for Protection Applications [Transaction Number: TPWRD-00732-2016.R1]
  T. KAUFFMANN, Polytechnique Montreal
  U. KARAAGAC, Polytechnique Montreal
  I. KOCAR, Polytechnique Montreal
  S. JENSEN, Senvion
  E. FARANTATOS, EPRI

• 17PESGM1677, Design and Transient Operation Assessment of Resonant FCLs in Bulk Power Systems [Transaction Number: TPWRD-00490-2015]
  O. ALIZADEH, Ryerson University
  A. YAZDANI, Ryerson University
  B. VENKATESH, Ryerson University
  B. SINGH, Ryerson University
Tuesday Evening – Wednesday Morning

Tuesday Evening

Publications Open Forum: Q&A with the Transactions Editors in Chief (panel)
Tuesday, 18 July, 2017, 5:00 PM–6:30 PM  S – Chicago VIII
Sponsored by: Power & Energy Society
Chair: M. CROW, Missouri Institute of Science and Technology
This is a PES Publications open forum, the Editors in Chief will be available to answer questions.

Pre Awards Dinner General Reception (reception)
Tuesday, 18 July, 2017, 6:00 PM–7:00 PM  S – Chicago VI+VII

PES Awards Dinner (dinner)
Tuesday, 18 July, 2017, 7:00 PM–9:30 PM  S – Chicago VI+VII

Wednesday Morning

Attendee Breakfast (breakfast)
Wednesday, 19 July, 2017, 6:30 AM–8:30 AM  S – Riverwalk AB

Presenter Breakfast (breakfast)
Wednesday, 19 July, 2017, 6:30 AM–8:30 AM  S – Chicago VI+VII

Paper Forum 05 (paper forum)
Wednesday, 19 July, 2017, 8:00 AM–12:00 PM  S – Sheraton I
Sponsored by: Admin
Chair: TBD

PAPERS AND AUTHORS:

- 17PESGM0105, Understanding the Effect of Non-Uniform Ageing on Dielectric Response of Transformer Insulation
  Y. CUI, University of Queensland
  H. MA, University of Queensland
  T. SAHA, University of Queensland
  Y. LIU, University of Tennessee
- 17PESGM0273, GIC Simulation Study for Part of UK Transmission System by ATP/EMTP
  Y. NI, University of Manchester
  Z. WANG, University of Manchester
  P. JARMAN, National Grid
- 17PESGM1323, Online Detection of Partial Discharge inside Power Transformer Winding Through IFRA
  B. MOHSENI, Curtin University
  N. HASHEMNIA, Curtin University
  S. ISLAM, Curtin University
- 17PESGM1493, Converter–Connected Power Plant Generic Model for Frequency Stability Studies
  F. DE MARCO, GE Gas Power Systems
  A. SWALOV, GE Gas Power Systems
  K. CHAN, GE Gas Power Systems
- 17PESGM1520, Synchrophasor Applications for Distribution Networks, Supporting The IDE4L Use Case
  L. VANFRETTI, KTH Royal Institute of Technology
  H. HOOSHYAR, KTH Royal Institute of Technology
  R. SINGH, KTH Royal Institute of Technology
  A. BIDADFAR, KTH Royal Institute of Technology
  F. MAHMOOD, KTH Royal Institute of Technology
Wednesday Morning, continued

• 17PESGM1673, Modeling Zone-3 Protection with Generic Relay Models for Dynamic Contingency Analysis
  Q. HUANG, Pacific Northwest National Laboratory
  B. VYAKARANAM, Pacific Northwest National Laboratory
  R. DIAO, Pacific Northwest National Laboratory
  Y. MAKAROV, Pacific Northwest National Laboratory
  N. SAMAAN, Pacific Northwest National Laboratory
  M. VALLEM, Pacific Northwest National Laboratory
  E. PAJUELO, Pajuelo Electric Inc

• 17PESGM1699, Study on Auto-transformer Coupling Bridge-Type Solid-State FCL and Its Improvement of Topology
  D. LAO, Zhejiang University
  D. JIANG, Zhejiang University
  Z. WU, Zhejiang University
  Y. FAN, Central Southern China Electric Power Design Institute

• 17PESGM1777, Applications of a New Nonparametric Estimator of Ambient Power System Spectra for Measurements Containing Forced Oscillations
  J. FOLLUM, PNNL
  F. TUFFNER, PNNL
  U. AGRAWAL, University of Wyoming

• 17PESGM1786, Continuously Updated AGC Loading Rates for a Smoother Operation Under Islanded Conditions
  F. DE MARCO, GE Gas Power Systems
  P. PELLANDA, Military Institute of Engineering
  S. TEMTEM, GE Gas Power Systems

• 17PESGM1808, Impact of Synchronous Generator Model GENTPJ on System Dynamics
  A. BIRCHFIELD, University of Illinois at Urbana-Champaign
  Z. MAO, University of Illinois at Urbana-Champaign
  K. SHETYE, University of Illinois at Urbana-Champaign
  J. WEBER, PowerWorld Corporation
  T. OVERBYE, University of Illinois at Urbana-Champaign

• 17PESGM1846, Impact of Measurement Errors on Synchronphasor Applications
  J. ZHAO, University of Tennessee, Knoxville
  J. TAN, University of Tennessee, Knoxville
  L. WU, University of Tennessee, Knoxville
  L. ZHAN, University of Tennessee, Knoxville
  W. YAO, University of Tennessee, Knoxville
  Y. LIU, University of Tennessee, Knoxville
  J. GRACIA, Oak Ridge National Laboratory
  P. EWING, Oak Ridge National Laboratory

• 17PESGM1937, Control Allocation for Wide Area Coordinated Damping
  M. RAOUFAT, University of Tennessee Knoxville
  K. TOMSOVIC, University of Tennessee Knoxville
  S. DJOUADI, University of Tennessee Knoxville

• 17PESGM2017, Impact of Inertia Control on the Structural Loads of DFIG-Based Wind Turbine connected to Weak Grid
  J. YING, Huazhong University of Science and Technology
  L. HUANG, Huazhong University of Science and Technology

• 17PESGM2174, An Evaluation of Critical Impact Factors for SSCI Analysis for Wind Power Plants: A Utility Perspective
  N. KAPNIK, DNV GL
  D. NOVOSAD, DNV GL
  H. KHALILI NIA, DNV GL
  M. SAHNI, DNV GL
  M. GHAVAMI, DNV GL
  H. YIN, DNV GL

• 17PESGM2237, Impacts of DFIG Reactive Power/Voltage Control on Power System Oscillations through Mode Coupling
  W. WANG, Texas A&M University
  G. HUANG, Texas A&M University

• 17PESGM2243, A Comparative Study on Wide-Area Damping Controllers Using Multiple DFIG-Based Wind Farms under Intermittent Observations
  A. YOGARATHINAM, Penn State
  N. CHAUDHURI, Penn State

• 17PESGM0062, Regional Photovoltaic Installed Capacity Forecasting Based on Granger Causality Test and Grey Support Vector Machine
  T. ZHAO, Shanghai Jiao Tong University
Wednesday Morning, continued

J. ZHU, Shanghai Jiao Tong University
Y. ZHANG, Shanghai Jiao Tong University

• 17PESGM0381, Piezoelectric Energy-Scavenging Possibilities in Vehicular Systems for Powering ULPT
U. CHUKWU, South Carolina State University
S. MAHAJAN, Tennessee Technological University

• 17PESGM1003, Comparison Between FE Model and Transfer Function for Short-Term Borehole Charging Optimization
W. WEI, University of Bath
D. HUO, University of Bath
S. LE BLOND, University of Bath

• 17PESGM1092, Improved Reactive Power Sharing Among Photovoltaic Inverters Using Thévenin’s Impedance Based Approach
A. RAGHAMI, Queensland University of Technology
G. LEDWICH, Queensland University of Technology
Y. MISHRA, Queensland University of Technology

Paper Forum 06 (paper forum)

Wednesday, 19 July, 2017, 8:00 AM–12:00 PM  S – Sheraton V
Sponsored by: Admin
Chair: W. WEI, Tsinghua University

PAPERS AND AUTHORS:

• 17PESGM0086, Network Reinforcement for Grid Resiliency under Extreme Events
J. QIU, the Commonwealth Scientific and Industrial Research Organization (CSIRO)
L. REEDMAN, the Commonwealth Scientific and Industrial Research Organization (CSIRO)
Z. DONG, The University of Sydney
K. MENG, The University of Sydney
H. TIAN, University of Newcastle
J. ZHAO, Chinese University of Hong Kong (Shenzhen), Shenzhen

• 17PESGM0095, Distribution System Security Region for Real-Time Monitoring: Model and Topological Characteristics
J. XIAO, TIANJIN UNIVERSITY
G. ZU, TIANJIN UNIVERSITY
B. ZHANG, TIANJIN UNIVERSITY
F. LI, The University of Tennessee

• 17PESGM0401, Evaluation of Ensured Active Power Provision from Highly Flexible Thermo-Electric Supply Portfolios Integrated by District Heating Systems
J. HINKER, TU Dortmund University
J. MYRZIK, TU Dortmund University

• 17PESGM0703, Distributed Newton Method for Primary Voltage Control in Islanded DC Microgrid
Z. WANG, Tsinghua University
W. WU, Tsinghua University
B. ZHANG, Tsinghua University

• 17PESGM0744, Flexibility Studies in System Planning at ERCOT
C. ANDERSON, Electric Reliability Council of Texas
J. MATEVOSYAN, Electric Reliability Council of Texas

• 17PESGM0847, A Generalized Stochastic N-m Security-Constrained Generation Expansion Planning Methodology Using Partial Transmission Distribution Factors
V. HINOJOSA, Universidad Tecnica Federico Santa Maria

• 17PESGM0849, Reactive Power Sharing in Islanded Microgrids Using Distributed Constraint Satisfaction
N. EL-TAWEEL, York University
H. FARAG, York University

• 17PESGM0918, Two-Level Prediction-Based Reactive Power Coordination and Voltage Restoration Strategy for Microgrid
S. WANG, the University of Tennessee
F. GUO, NEC Laboratories America, Inc
R. SHARMA, NEC Laboratories America, Inc

• 17PESGM0927, Flexibility Resource and Demand Balance Mechanism in Power System Planning Considering High Penetration of Renewable Energy
H. LI, Tsinghua University
Z. LU, Tsinghua University
Y. QIAO, Tsinghua University
Wednesday Morning, continued

- 17PESGM1118, Aggregate DG Security Contribution to the National Grid System Based on Probabilistic Methods
  Z. ZHANG, University of Bath
  F. LI, University of Bath
  C. BUDD, University of Bath

- 17PESGM1201, Designing K-Nearest Neighbors Model for Low Voltage Load Forecasting
  O. VALGAEV, Austrian Institute of Technology
  F. KUPZOG, Austrian Institute of Technology
  H. SCHMECK, Karlsruhe Institute of Technology

- 17PESGM1456, Coupled Stochastic and Robust Transmission Expansion Planning
  D. LIU, Shanghai Jiao Tong University
  H. CHENG, Shanghai Jiao Tong University
  S. FANG, Shanghai Jiao Tong University

- 17PESGM1491, An Assessment of Energy Deficits in the Future Electricity System of the United Kingdom with a Significant Penetration of Intermittent Renewable Generators
  H. WYMAN-PAIN, University of Bath
  Y. BIAN, University of Bath
  S. WILLIAMS, University of Bath
  M. XU, University of Bath
  F. LI, University of Bath

- 17PESGM1536, Joint Expansion Planning of Distribution Networks, EV Charging Stations and Wind Power Generation Under Uncertainty
  P. MENESES DE QUEVEDO, University of Castilla – La Mancha
  G. MUÑOZ-DELGADO, University of Castilla – La Mancha
  J. CONTRERAS, University of Castilla – La Mancha

- 17PESGM1858, Multi-Agent Restoration Process Based on Distributed Optimization Search
  M. EL-SHARAFY, York university
  H. FARAG, York university

- 17PESGM2119, Power Hardware in the Loop Testing of a Smart Distribution System
  C. BROADEN, Smarter Grid Solutions
  P. MEDLEY, Smarter Grid Solutions
  F. WATSON, Smarter Grid Solutions
  R. CURRIE, Smarter Grid Solutions
  I. MENDOZA, National Renewable Energy Laboratory
  C. ABBEY, Smarter Grid Solutions

- 17PESGM2152, Voltage Stability Analysis of Power Distribution Networks Using Multi-Agent Approach
  M. RAHMAN, Deakin University
  A. OO, Deakin University
  M. MAHMUD, Deakin University

- 17PESGM2204, Towards Optimal Estimation of Blackout Probability Based on Sequential Importance Sampling Simulations
  J. GUO, Tsinghua University
  F. LIU, Tsinghua University
  S. HUANG, Tsinghua University
  L. CHEN, Tsinghua University
  W. WEI, Electric Power Research Institute of State Grid Sichuan Electric Power Company
  L. DING, Electric Power Research Institute of State Grid Sichuan Electric Power Company

- 17PESGM2218, Decentralized Frequency Control and Economic Dispatch in Islanded Micro-Grids
  P. LU, Hohai University
  J. ZHAO, Hohai University
  S. YANG, China Electric Power Research Institute
  K. WANG, China Electric Power Research Institute
  J. YAO, China Electric Power Research Institute

- 17PESGM2232, Identify Critical Branches with Cascading Failure Chain Statistics and Hypertext-Induced Topic Search Algorithm
  C. LUO, Wuhan University
  J. YANG, Wuhan University
  Y. SUN, pesgm2017@mirasmart.com
  J. YAN, pesgm2017@mirasmart.com
  H. HE, pesgm2017@mirasmart.com

Panelists:
- 17PESGM2673, Stochastic Optimal Load Flow with Wind and Energy Storage Systems
  K. LEE, Baylor University
- 17PESGM2666, Dynamic Energy Management Systems Considering the Performance of Battery Energy Storage System
  G. VENAYAGAMOORTHY, Clemson University
- 17PESGM2664, Aggregation of Power Capabilities of Heterogeneous Resources for the Real-Time Optimal Control of Active Distribution Networks
  M. PAOLONE, EPFL
- 17PESGM2667, Application of Stochastic Simulation to the Evaluation of Energy Storage Resource Integration in Grids with Integrated Renewable Resources
  G. GROSS, University of Illinois at Urbana-Champaign
- 17PESGM2669, Multi Objective Optimization Technique for Renewable Energy Integration
  P. BAUER, Delft University of Technology
- 17PESGM2665, Stochastic Programming for Optimal Management of an Integrated PV – Battery Storage System
  F. SILVESTRO, University of Genova
- 17PESGM2663, Improving Large Scale Day-Ahead Security Constrained Unit Commitment Performance
  Y. CHEN, MISO
- 17PESGM2668, Experiences with a Residential PV and BESS System
  J. CARR, ABB US

Big Data Analytics for Electricity Markets

Panelists:
- 17PESGM2673, Stochastic Optimal Load Flow with Wind and Energy Storage Systems
  K. LEE, Baylor University
- 17PESGM2666, Dynamic Energy Management Systems Considering the Performance of Battery Energy Storage System
  G. VENAYAGAMOORTHY, Clemson University
- 17PESGM2664, Aggregation of Power Capabilities of Heterogeneous Resources for the Real-Time Optimal Control of Active Distribution Networks
  M. PAOLONE, EPFL
- 17PESGM2667, Application of Stochastic Simulation to the Evaluation of Energy Storage Resource Integration in Grids with Integrated Renewable Resources
  G. GROSS, University of Illinois at Urbana-Champaign
- 17PESGM2669, Multi Objective Optimization Technique for Renewable Energy Integration
  P. BAUER, Delft University of Technology
- 17PESGM2665, Stochastic Programming for Optimal Management of an Integrated PV – Battery Storage System
  F. SILVESTRO, University of Genova
- 17PESGM2663, Improving Large Scale Day-Ahead Security Constrained Unit Commitment Performance
  Y. CHEN, MISO
- 17PESGM2668, Experiences with a Residential PV and BESS System
  J. CARR, ABB US
EMC Grid Task Force  

Wednesday, 19 July, 2017, 8:00 AM–12:00 PM    G – 204 Tiered Classroom

Sponsored by: Electric Machinery
Chair: R. THORNTON-JONES, Brush

Capture the latest grid requirement imposed and study the impact to the electrical machine design in order to suggest updates to electrical machine standards.

PANELISTS:
- 17PESGM2389, i. Generator Capability Envelope and Design Challenges to Accommodate Grid Code Requirements
  J. YAGIELSKI, GE
- 17PESGM2390, ii. The Impact of System Fault Related Grid Code Requirements Upon Generator Design and Generator Standards
  L. ROUCO, Comillas University
- 17PESGM2388, iii. The Impact of Grid Codes Upon Generator Excitation System Design and Standards
  L. HAJAGOS, Kestrel Power Engineering
- 17PESGM2391, iv. Impact of the New Grid on Old Generators
  R. ILIE, Israel Electric Company

Challenges and Advancements for Renewable Power Plants in Weak Grid Applications  

Wednesday, 19 July, 2017, 8:00 AM–12:00 PM    G – 206 Tiered Classroom

Sponsored by: Electric Machinery
Chair: M. RICHWINE, GE

As the penetration of renewables – particularly wind and PV – continues to increase, the prevalence of weak grid applications will, too. The industry has continued to improve the methods and controls to enable stable operation and robust recovery from disturbances for weaker and weaker grid conditions. The panel will cover the latest advancements and associated challenges from OEMs, National Labs, and Academia.

PANELISTS:
- 17PESGM2534, Model Requirements for Weak Grid Analysis
  A. ISAACS, Electranix Corporation
- 17PESGM2535, Control Challenges in Power Systems Dominated by Converter Interfaced Generation and Transmission Technologies
  I. ERLICH, University of Duisburg-Essen
A Decade of Blackout Prevention (panel)

Wednesday, 19 July, 2017, 8:00 AM–12:00 PM  S – Chicago VIII

Sponsored By:  Energy Development and Power Generation

Chair 1:  R. KREBS, Siemens AG

The energy revolution in Europe places new requirements on the transmission grid. If it comes to large scale wind power integration in the north of Europe, as well as bulk solar power production in south, long distance bulk power transmission becomes integral part of an entirely new power system where new controllable devices will operate to make transmission smarter. In the last consequence a new network layer based on HVDC technology will be built which is referred to as an overlay grid in Europe. This session is about activities carried out in Europe and focusing on the meshed HVDC grids.

PANELISTS:

- 17PESGM2823, “Digital Twin” from Power System Data Base to Dynamic Digital Mirror
  R. KREBS, Siemens AG

- 17PESGM2824, Dynamic Protection Security Assessment – Challenge, Approach and Examples
  J. JAEGGER, Institute for Electrical Power Supply Friedrich-Alexander University Erlangen-Nuremberg

- 17PESGM2825, Combining Dynamic Security Assessment and Synchrophasor Measurements for Improving Power System Planning and Operation
  U. KERIN, Siemens AG

- 17PESGM2826, Wide Area Protection & Control Technologies (Cigre B5.14-Report)
  V. TERZIJA, University of Manchester

- 17PESGM2827, A Short History of PMUs and WAMS
  A. PHADKE, Virginia Tech

- 17PESGM2828, Lessons Learned from Recent Emergencies and Blackouts (Cigre C2-21 Report)
  S. GRAAF, TenneT

- 17PESGM2829, Beginning of Protection Security Assessment – First Approaches in Worldwide Projects
  G. ZIEGLER, Siemens AG

International Practices in Energy Internet (panel)

Wednesday, 19 July, 2017, 8:00 AM–12:00 PM  G – 100 Tiered Classroom

Sponsored by:  Energy Development and Power Generation

Chairs:  L. L. LAI, Guangdong University of Technology, Guangzhou China
        K. P. WONG, University of Western Australia, Perth Australia

In January 2011, the Energy Internet was described in the Proceedings of the IEEE. In July 2014, Energy production and consumption have kept increasing as economies grow. The large-scale development and utilization of fossil energy has resulted in serious problems such as resource shortage, environmental pollution and climate change. Energy internet is among the few major technological development areas for energy and the next generation ICT technologies. It is the next level of smart grid technology aiming for more renewable penetrations and greater prosumer participations. In this panel, speakers from different countries will talk about their experience and good practices in this area and also future trend.

PANELISTS:

- 17PESGM2968, Novel Control of MTDC/HVDC Connected Wind Power Plant for Grid Support
  Z. XU, Hong Kong Polytechnic University

- 17PESGM2969, The Grid Challenges of the Energy Internet
  A. ZOBAA, Brunel University London

- 17PESGM2970, Energy Internet Developments: UK’s Perspectives
  X. ZHANG, University of Birmingham

- 17PESGM2971, Energy Internet in Australia
  Z. DONG, University of Sydney
Wednesday Morning, continued

- 17PESGM2972, Introduction of Energy Internet Practice at China Southern Power Grid
  X. DONG, Electric Power Research Institute, China Southern Power Grid

- 17PESGM2973, A Novel Wind and Hydro Hybrid Real-Time Coordinated Control Strategy for Generation Optimization
  H. ZHANG, State Grid Electric Power Research Institute

- 17PESGM2974, Market Oriented Optimal Dispatch Scheme for Multi-Stages Dynamic Energy Storage Based Hybrid Energy System
  Z. ZHANG, University of Electronic Science and Technology of China

- 17PESGM2975, Protection System Performance in Weak AC Grids through HiL Tests
  G. YANG, Technical University of Denmark

- 17PESGM2976, Distributed Generation Development, Challenges and Practice in China
  H. LIANG, China Electric Power Research Institute

- 17PESGM2977, Sizing of Renewable and Storage System
  C. LAI, University of Oxford

Transactions Paper Session 08 (transactions paper)

Wednesday, 19 July, 2017 8:00 AM–10:00 AM       G – 304 Tiered Classroom
Sponsored by:                     Energy Development and Power Generation
Chair:                           B. WOJSZCZYK, DP Global

PAPERS AND AUTHORS:

- 17PESGM0101, Formal Analysis of Drum-Boiler Units to Maximize the Load-Following Capabilities of Power Plants  [Transaction Number: TPWRS-00877-2015]
  A. EL-GUINDY, Technische Universität München
  D. HAN, Technische Universität München
  M. ALTHOFF, Technische Universität München

- 17PESGM0158, The Adequacy of the Present Practice in Dynamic Aggregated Modelling of Wind Farm Systems  [Transaction Number: 10.1109/TSTE.2016.2563162]
  L. P. KUNJUMUHAMMED, Imperial College London
  B. C. PAL, Imperial College London
  C. OATES, GE Grid Solutions
  K. DYKE, GE Grid Solutions

- 17PESGM0471, Novel Multi-Stage Stochastic DG Investment Planning with Recourse  [Transaction Number: TSTE-00113-2016.R1]
  S. SANTOS, INESC TEC and FEUP
  D. FITIWI, INESC TEC and FEUP
  A. BIZUAYEHU, INESC TEC and FEUP
  M. SHAHIE-KHAH, INESC TEC and FEUP
  M. ASENSIO, UCLM
  J. CONTRERAS, UCLM
  C. CABRITA, UBI
  J. CATALAO, INESC TEC and FEUP

  S. SANTOS, INESC TEC and FEUP
  D. FITIWI, INESC TEC and FEUP
  A. BIZUAYEHU, INESC TEC and FEUP
  M. SHAHIE-KHAH, INESC TEC and FEUP
  M. ASENSIO, UCLM
  J. CONTRERAS, UCLM
  C. CABRITA, UBI
  J. CATALAO, INESC TEC and FEUP

- 17PESGM0478, Coordinated Operation of a Neighborhood of Smart Households Comprising Electric Vehicles, Energy Storage and Distributed Generation  [Transaction Number: TSG-00398-2015.R2]
  N. PATERAKIS, TU/e
  O. ERDINC, Yildiz Technical University
  I. PAPPI, INESC TEC and FEUP
  A. BAKIRTZIS, AUTH
  J. CATALAO, INESC TEC and FEUP

- 17PESGM0805, Wind Turbine Blade Breakage Monitoring with Deep Autoencoders  [Transaction Number: TSG-00330-2016]
  L. WANG, City University of Hong Kong
  Z. ZHANG, City University of Hong Kong
Wednesday Morning, continued

J. XU, China Longyuan Power Group Corporation Ltd.
R. LIU, China Longyuan Power Group Corporation Ltd.

17PESGM0837, Small Signal Instability of PLL-Synchronized Type-4 Wind Turbines Connected to High Impedance AC Grid during LVRT. [Transaction Number: TEC-00124-2016]
J. HU, Huazhong University of Science and Technology
Q. HU, Huazhong University of Science and Technology
B. WANG, Huazhong University of Science and Technology
H. TANG, China Electric Power Research Institute
Y. CHI, China Electric Power Research Institute

17PESGM0925, On Inertial Dynamics of Virtual-Synchronous-Controlled DFIG-Based Wind Turbines [Transaction Number: TEC-00084-2015]
S. WANG, Huazhong University of Science and Technology
J. HU, Huazhong University of Science and Technology
X. YUAN, Huazhong University of Science and Technology
L. SUN, Huazhong University of Science and Technology

17PESGM1644, Efficient Control of Energy Storage for Increasing the PV Hosting Capacity of LV Grids. [Transaction Number: 10.1109/TSG.2016.2609892]
S. HASHEMI, Technical University of Denmark
J. ØSTERGAARD, Technical University of Denmark

17PESGM2323, Maximum Power Point Tracking of a Wind Power Plant with Predictive Gradient Ascent Method [Transaction Number: 10.1109/TSTE.2016.2615315]
C. KIM, Hanyang University
Y. GUI, Hanyang University
C. CHUNG, Hanyang University

Research and Education for Food-Water-Energy Nexus (panel)
Wednesday, 19 July, 2017, 8:00 AM–10:00 AM     G – 203 Executive Meeting Room
Sponsored by:             Power & Energy Education
Chair:                           A. PAHWA, Kansas State University

Food, energy, and water systems each are becoming more stressed with growing populations, aging infrastructures, climate change, and greater climate variability. Already, water scarcity threatens to constrain agricultural and electricity production. There is widespread scientific consensus that the problem is likely to grow substantially in the near future, especially if restrictions are placed on carbon emissions. The impacts caused by water’s fundamental importance to agricultural and energy systems is referred to as the food-energy-water nexus. Greater integration between the food, energy and water systems is required to build resilience due to the changes, stresses, and fluctuations that are occurring in nature and our communities. In this panel several experts will discuss interdependencies between these systems to define a pathway towards research and education to address the food-energy-water nexus for a sustainable future.

PANELISTS:

17PESGM2123, Use of Synthetic Power Grid Models in Consideration of the Impact of Water Constraints on Power Grid Operation and Short-Term Planning
T. OVERBYE, Texas A&M University

17PESGM2124, Building Resilience for Food, Energy, and Water Systems
A. KUH, University of Hawaii

17PESGM2125, Interdependencies between the Electric Power System and the Water Delivery and Treatment Systems
V. VITTAL, Arizona State University

17PESGM2126, The Stabilizing Role of the Energy-Water Nexus
A. FARID, Dartmouth University

17PESGM2127, A Food-Energy-Water Calculator, with Initial Application to Western Kansas
M. HILL, University of Kansas

Industry Experiences with Advanced Distribution Managements Systems (panel)
Wednesday, 19 July, 2017, 8:00 AM–12:00 PM     G – 300 Tiered Classroom
Sponsored by:             Power System Operation, Planning & Economics
Chair:                           K. SCHNEIDER, Pacific Northwest National Laboratory

As the industry continues to deploy Distribution Management Systems (DMS) the concept of Advanced Distribution Management Systems (ADMS) has emerged. The difference between DMS and ADMS is typically the level of integration with other systems such as GIS, OMS, AMI, EMS, etc. While there are significant benefits to be gained by integrating these systems, there are also significant challenges. This
panel will explore current industry experiences with the deployment of DMS and ADMS technologies, and discuss the future path of where the industry is moving.

PANELISTS:
- 17PESGM2397, TBD
  E. LIGHTNER, Department of Energy
- 17PESGM2398, TBD
  R. SHERICK, Southern California Edison
- 17PESGM2399, TBD
  J. GIBSON, Avista Corp.
- 17PESGM2400, TBD
  K. DING, Centerpoint Energy

Integrated Resource Planning with Renewable Penetration and Distributed Energy Resources  
**panel**

*Wednesday, 19 July, 2017, 8:00 AM–12:00 PM   G – 400 Tiered Classroom*

Sponsored by: Power System Operation, Planning & Economics

Chair: J. YAN, SCE

The integrated resource planning is a comprehensive decision supporting tool to provide long-term planning that ensures that sufficient resources to meet forecasted customer needs at the least cost, taking into account the variety of supply and demand resources and applicable environmental mandates. With high penetration of renewables and adoption on DERs, the complexity of integrated resource planning has been significantly increased. This session will discuss the major challenges, opportunities and industry practices in the integrated resource planning process.

PANELISTS:
  M. HENDERSON, ISO New England
- 17PESGM2795, Integrated Resource Planning with Renewable Penetration and Distributed Energy Resources – MISO's Experience
  J. LAWHORN, Midcontinent Independent System Operator
- 17PESGM2796, Integrated Resource Planning with Renewable Penetration and Distributed Energy Resources – PJM's Experience
  S. HERLING, PJM interconnection
- 17PESGM2794, Integrated Resource Planning with Renewable Penetration and Distributed Energy Resources – CAISO's Experience
  M. ROTHLEDER, California ISO
- 17PESGM2797, Overview of Integrated Resource Planning with Renewable Penetration and DERs in California
  M. NELSON, Southern California Edison

Transactions Paper Session 18  
**transactions paper**

*Wednesday, 19 July, 2017, 8:00 AM–10:00 AM  G – 308 Tiered Classroom*

Sponsored by: Power System Operation, Planning & Economics

Chair: K. CHEUNG, GE

PAPERS AND AUTHORS:
- 17PESGM0136, The Swiss Reserve Market: Stochastic Programming in Practice  
  [Transaction Number: TPWRS-01166-2014]
  F. ABBASPOURTORBATI, Swissgrid
  M. ZIMA, Swissgrid
- 17PESGM0138, Pricing Electricity through a Stochastic Non-Convex Market-Clearing Model  
  [Transaction Number: TPWRS.2016.2569533]
  F. ABBASPOURTORBATI, EPFL
  A. CONEJO, Ohio State University
  J. WANG, Argonne National Laboratory
  R. CHERKAOUI, EPFL
- 17PESGM0280, Co-Optimization of Distribution Transformer Aging and Energy Arbitrage Using Electric Vehicles  
  [Transaction Number: TSG-01260-2015]
  M. SARKER, Argonne National Laboratory
  D. OLESEN, University of Washington
  M. ORTEGA-VAZQUEZ, University of Washington
Wednesday Morning, continued

- 17PESGM0369, Plug-in Electric Vehicles Parking Lot Equilibria with Energy and Reserve Markets
  [Transaction Number: TPWRS-00042-2016.R2]
  N. NEYESTANI, INESC TEC and FEUP
  M. DAMAVANDI, INESC TEC and FEUP
  M. SHAFIE-KHAH, INESC TEC and FEUP
  A. BAKIRTZIS, AUTH
  J. CATALAO, INESC TEC and FEUP
- 17PESGM0378, A Framework of Residential Demand Aggregation with Financial Incentives
  [Transaction Number: TSG-01045-2015]
  Q. HU, Harvard University
  F. LI, University of Tennessee Knoxville
  F. XIN, General Electric
  L. BAI, ABB
- 17PESGM0430, Spinning Reserve Requirement Optimization Considering Integration of Plug-In Electric Vehicles
  [Transaction Number: TSG2597098]
  J. ZHAO, Hong Kong Polytechnic University
  C. WAN, Zhejiang University
  Z. XU, Hong Kong Polytechnic University
  K. WONG, University of Western Australia
- 17PESGM0601, A Robust Approach to Chance Constrained Optimal Power Flow with Renewable Generation
  [Transaction Number: TPWRS-00563-2015]
  M. LUBIN, Massachusetts Institute of Technology
  Y. DVORKIN, New York University
  S. BACKHAUS, Los Alamos National Laboratory
- 17PESGM1124, Combined Heat and Power Dispatch Considering Pipeline Energy Storage of District Heating Network
  [Transaction Number: TSTE-00356-2015]
  Z. LI, South China University of Technology
  W. WU, Tsinghua University
  M. SHAHIDEPOUR, Illinois Institute of Technology
  J. WANG, Argonne National Laboratory
  B. ZHANG, Tsinghua University
- 17PESGM1432, A Knowledge-Based Framework for Power Flow and Optimal Power Flow Analyses
  [Transaction Number: TSG2549560]
  A. VACCARO, University of Sannio
  C. CANIZARES, University of Waterloo


Wednesday, 19 July, 2017, 8:00 AM–12:00 PM    G – 208 Tiered Classroom
Sponsored by: Smart Buildings, Loads & Customer Systems
Chair: A. PRATT, NREL

Panelists are asked to submit abstracts supporting the treatment of techniques, methods and requirements for interfaces between consumer-side and grid planning, dispatch operations, and control architectures (e.g., SCADA / EMS, DMS, transactive systems, market systems, third-party aggregators, etc.), and treatment of the methods or approaches to integration with other energy service provider business systems to support customer-side resources and services.

PANELISTS:
- 17PESGM2936, Full title TBD
  M. HUMMON, Tendril
- 17PESGM2937, Full title TBD
  B. WARDEN, Comverge
- 17PESGM2938, Full title TBD
  D. CHRISTENSEN, NREL
- 17PESGM2940,
  T. BARHAM, PECI
- 17PESGM2941, Full title TBD
  S. CHANDLER, Navigant

Transactions Paper Session 11 (transactions paper)

Wednesday, 19 July, 2017, 8:00 AM–10:00 AM    G – 306 Tiered Classroom
Sponsored by: Substations Committee and Insulated Conductors Committee and Marine Systems Coordinating Committee
Chair: J. GRAVELLE, Xcel Energy
PAPERS AND AUTHORS:

- **17PESGM0011**, Controlled Switching of a 1200 MVA Transformer in Manitoba  
  W. CHANDRASENA, Manitoba Hydro  
  D. JACOBSON, Manitoba Hydro  
  P. WANG, Manitoba Hydro

- **17PESGM0046**, Substation Grounding Studies with More Accurate Fault Analysis and Simulation Strategies  
  *[Transaction Number: 10.1109/TPWRD.2016.2598176]*
  X. WU, American Electric Power  
  V. SIMHA, American Electric Power  
  Y. XUE, FlexGrid Application  
  R. WELLMAN, American Electric Power

- **17PESGM0251**, Triggered Current Limiters – Their Arc Flash Mitigation and Damage Limitation Capabilities  
  *[Transaction Number: 10.1109/TPWRD.2016.2602098]*
  J. PRIGMORE, Exponent Inc.  
  J. SCHAFFER, G&W Electric

- **17PESGM0422**, Experimental and Theoretical Analysis of Cable Discharge  
  *[Transaction Number: TPWRD.2016.2602361]*
  I. LAFAIA, Polytechnique Montreal  
  F. GHASSEMI, National Grid UK  
  A. AMETANI, Doshisha University  
  J. MAHSEREDJIAN, Polytechnique Montreal  
  S. DENNIS, National Grid UK  
  A. MANU HADDAD, Cardiff University  
  S. ROBSON, Cardiff University

- **17PESGM0441**, Field Test and Simulation of Transients on the RTE 225 kV Cable  
  *[Transaction Number: TPWRD.2015.2506733]*
  I. LAFAIA, Polytechnique Montreal  
  A. AMETANI, Doshisha University  
  J. MAHSEREDJIAN, Polytechnique Montreal  
  A. NAUD, RTE-France  
  T. CORREIA DE BARROS, Instituto Superior Técnico, University of Lisbon  
  I. KOÇAR, Polytechnique Montreal

- **17PESGM0446**, Active Control of DC Fault Currents in DC Solid-State Transformers during Ride-Through Operation of Multi-Terminal HVDC Systems  
  *[Transaction Number: 10.1109/TEC.2016.2575139]*
  R. LI, University of Strathclyde  
  L. XU, University of Strathclyde  
  L. YAO, China Electric Power Research Institute  
  B. WILLIAMS, University of Strathclyde

- **17PESGM2014**, General Analysis of Vacuum Circuit Breaker Switching Overvoltages in Offshore Wind Farms  
  *[Transaction Number: TPWRD-00757-2015]*
  V. TERZIA, University of Manchester  
  M. POPOV, TU Delft

- **17PESGM0075**, Dynamic Modeling of a Supply Vessel Power System for DP3 Protection System  
  *[Transaction Number: DOI 10.1109/TTE.2016.2594156]*
  A. BOVERI, University of Genova  
  F. D’AGOSTINO, University of Genova  
  A. FIDIGATTI, ABB S.p.a.  
  E. RAGAINI, ABB S.p.a.  
  F. SILVESTRO, University of Genova

**Understanding and Dealing with High Harmonic Distortions: How Much is Too Much? System and Equipment Immunity & Limits** *(panel)*

*Wednesday, 19 July, 2017, 8:00 AM–9:00 AM*  
*G – 222 Multifunction Room*

*Sponsored by:*  
Transmission and Distribution  
Chair:  
P. RIBEIRO, UNIFEI

Traditionally, harmonic limits are based on the thermal impacts on capacitors, transformers and motors. However, with the increasing number of power electronic interface devices to supply electrical loads these limits have little or no meaning. Tests and measurements have indicated that power electronic interfaces, such as power supplies, converters, etc., start to mal-operate at total voltage distortions higher than 15% – when the highest limit for lower voltages is between 8–10%. This panel will discuss the implications and mechanisms of higher values of harmonic distortions based on the impact of system and equipment immunity. Recent case studies of higher harmonic distortion equipment impact will be presented and examined.
Wednesday Morning, continued

PANELISTS:
- 17PESGM2581, High Distortions: Case Study 2
  T. LAUGHER, TVA
- 17PESGM2582, The Possibility of High Distortions Caused by SupraHarmonics
  S. RÖNNBERG, ITU
- 17PESGM2583, High Distortions: Immunity Tests on Power Supplies
  P. RIBEIRO, UNIFEI
- 17PESGM2584, High Distortions: Case Study 1
  S. PEELE, Duke Energy
- 17PESGM2585, Harmonization of IEEE 519 Voltage Limits with IEC 61003-6
  D. MUELLER, Enernex
- 17PESGM2586, The Possibility of High Distortions Caused by SupraHarmonics
  M. BOLLEN, IREQ

Distributed Generation (DG) Regulation, Engineering, Modeling, and Impacts (super session)

Wednesday, 19 July, 2017, 8:00 AM–12:00 PM  S – Sheraton II
Sponsored by:  PES Super Session
Chair:  N. HATZIARGYRIOU, National Technical University of Athens

Latest on regulations affecting DG, including rate design, community solar, value of solar, and US Assembly Bill 2514.
IEEE Standard 1547 and the future of standards for interconnecting distributed resources with electric power systems, including challenges, gaps, and needs.
Grid integration challenges and solutions associated with grids incorporating high penetration levels of DG, including modeling, analysis, and technology solutions (energy storage, demand response, etc.).
Microgrids, including applications, business cases, challenges, and solutions.
Protection and control challenges (and solutions) associated with grids incorporating DG.

PAPERS AND AUTHORS:
- 17PESGM3089, Regulatory Barriers for Cost Effective Integration of Distributed Generation
  G. STRBAC, Imperial College London
- 17PESGM3088, Market Participation of Distributed Energy Resources – A System Operator’s View
  T. ZHENG, ISO New England
- 17PESGM3087, Probabilistic Modelling and Impact of Distributed Generation on System Dynamics
  J. MILANOVIĆ, University of Manchester
- 17PESGM3086, TBD
  E. MULJADI, NREL
- 17PESGM3090, TBD
  H. YU, China Electric Power Research Institute
- 17PESGM3091, TBD
  J. GAJDA, Duke Energy

Design and Implementation of Microgrids in Modern Power Systems (tutorial)

Wednesday, 19 July, 2017, 8:00 AM–12:00 PM  S – Chicago X
Sponsored by:  Power & Energy Society

This tutorial introduces the concepts, fundamental theories, practical design process, and applications of various types of microgrids. The course is intended for engineers, researchers, and industry managers who want to learn more about latest developments of microgrid technologies as well as the design and implementation of microgrid systems. Participants will learn several aspects of the engineering design and analytical studies required for successful integration of modern microgrids. Initial discussion will cover the definition and objectives of microgrids, the current market, challenges and barriers of microgrid development, and real world experiences with microgrid projects will be presented. Engineering challenges will be discussed, including selection and integration of Distributed Energy Resources (DERs), microgrid protection, communication systems, and control hierarchy.

The workshop will also include an overview of actual industrial-scale microgrids commissioned by S&C engineers and group exercises for better understanding of the concepts and processes. One project is the recipient of 2015 Smart Grid Project of the Year award from Power magazine.
Security and safety of a power system network are fundamental aspects of electric utility operation. As the security issues related to the power industry become more critical, the challenge of maintaining secure operation of bulk power systems is growing. The utilities and regional organizations should be able to assess quickly an outcome of a larger impact on the transmission network. Major blackouts are frequently caused by cascading outages. Since cascading outages may have such a wide-spread effect, NERC, under its transmission planning standards requires analyses of cascading events. This tutorial developed by the IEEE Cascading Failure Working Group addresses industry best practices in assessment of cascading outages as a part of NERC compliance studies. This half-day tutorial pioneers hands-on training as a part of the tutorial. It includes training on performing cascading studies to comply with NERC TPL-001-4 and CIP-014-2 standards. The attendees are encouraged to bring their laptops with them to run the studies, or they will be able to observe computations performed by instructors. The tutorial covers industry experience in preparing to the NERC audit and NERC perspective on performing cascading analysis under transmission planning standards. This tutorial, taught by a team of experts from industry, is intended for power system engineers, regulators, transmission owners, power engineering students, and academics.

The costs associated with new network infrastructure needed to cope with increasing renewable generation capacity, have to be covered and allocated to network users. Also, incentive policies that benefit renewable generation investment may allocate costs disproportionally among network users (including both generation and demand) so as to foster development of remote renewable generation. Who are the actual beneficiaries of new network investment? Which are the right price signals to foster efficient system expansion? Should locational tariffs be applied in the context of renewables? And overall: Who should pay for green network infrastructure? In this panel, invited experts will share their views and ideas with regard to network cost allocation under increasing transmission and distribution infrastructure for renewables.

Panelists:
- 17PESGM2717, Network Cost Allocation in Electricity Markets without Fuels
  J. Taylor, University of Toronto
- 17PESGM2718, The Importance of Locational Signals in Electricity Markets: The Case of Great Britain
  G. Strbac, Imperial College London
- 17PESGM2719, The Chilean Distribution Reform: Regulatory Proposals to Finance Distribution Networks with a High Penetration of Renewables
  H. Rudnick, Pontificia Universidad Catolica de Chile
  D. Watts, Pontificia Universidad Catolica de Chile
- 17PESGM2716, Network Cost Allocation in Brazil: Subsidies vs. Efficient Transmission Expansion
  B. Bezerra, PSR, Brazil
- 17PESGM2720, Application-Use Cases and Cost Allocation Models for Battery Energy Storage as an Enabler of Green Network Infrastructure: A Case Study for Colombia, Brazil and Mexico
  D. Elizondo, Quanta Technology, USA

Impact of the Use of Node-Breaker Representation in Power Flow and Transient Stability Analysis Software on Dynamic Performance (panel)

Wednesday, 19 July, 2017, 9:00 AM–12:00 PM       S – Tennessee
Sponsored by:             Power System Dynamic Performance
Chair:                           V. Vittal, Arizona State University
Wednesday Morning, continued

This panel session will examine the impact of the node-breaker representation in power flows and transient stability analysis simulation tools on static and dynamic contingency analysis. This panel which includes both software vendors and users will provide a unique perspective from both developers and users. The panel includes participants from North America and Brazil. The panelist will discuss both the analytical issues and results on application to actual systems. The panel will also discuss the ability to directly import real-time data from state estimators.

PANELISTS:
- 17PESGM0163, Lessons Learned from Using Node-Breaker Models for Transient Stability Studies
  J. WEBER, PowerWorld Corporation
- 17PESGM0164, Implementation of Node/Breaker Modeling for Power System Applications
  L. WANG, Powertech Labs, Surrey, BC, Canada
- 17PESGM0165, Application and Utilization of an Integrated Node-Breaker Model and Topology Processor in PSS®E
  K. SHORT, Siemens Power Technologies International
- 17PESGM0166, System Wide Model Validation in WECC Using Peak Reliability State Estimator Node-Breaker Model in GE PSLF
  B. THOMAS, GE Energy Connections
- 17PESGM0167, Implementation of Real-Time Node-Breaker Model in PSLF—A Step toward Determining Dynamic Transfer Capability of the Grid
  S. KINCIC, Peak Reliability
- 17PESGM0168, Automated Contingency Generation and Analysis Using Node-Breaker Models
  E. VITTAL, Electric Power Research Institute
- 17PESGM0162, A Flexible Three-Phase/Positive Sequence Node-Breaker Model for Operation and Planning
  G. TARANTO, COPPE UFRJ
- 17PESGM0169, Dynamic Simulations with Bus-Breaker Considerations at Hydro-Québec
  L. LOUD, IREQ, Canada
- 17PESGM0170, Application of Bus-Breaker Models in Transient Stability Analysis Program for Evaluating Dynamic Performance of the Entergy System
  S. KOLLURI, Entergy Corporation

Reforming the Power Engineering Educational Curriculum amid the Industry Transformation (panel)

Wednesday, 19 July, 2017, 10:00 AM–12:00 PM   G – 203 Executive Meeting Room

Sponsored by:             Power & Energy Education
Chair:                           M. HONG, Case Western Reserve University

From the 1990’s, power engineering programs in many universities underwent steady decline due to reduced funding sources and the rise of competing fields of information technology and consumer electronics. Recovery has slowly taken place in recent years, however, since the smart grid initiative programs under government and industry sponsorships. This panel session will discuss efforts in reforming the power engineering education curriculum amid the industry’s transformation towards the new technological and operational paradigm of the future. Representing both academics and industry, the panelists will discuss both retrospective and prospective views of the curriculum development efforts, integration of power electronics as a necessary disciplinary area of curriculum to support renewable energy, industrial needs in workforce development, and experience from collaborative curriculum development across multiple universities.

PANELISTS:
- 17PESGM2553, Enabling Role of Power Electronics in Power Engineering Education and Research Programs
  A. MEHRIZI-SANI, Washington State University
- 17PESGM2554, Evolution of the Curriculum over the Years
  P. SAUER, University of Illinois, Urbana-Champaign
- 17PESGM2555, Educating Power Engineers for the Future Electric Grid – The GridED Experience
  T. REDDOCH, Electric Power Research Institute
- 17PESGM2556, The Urgent Needs in the Power Engineering Industry: Skill Sets and Workforce Development
  E. BUZZELLI, FirstEnergy Technologies
Transactions Paper Session 19 (transactions paper)

Wednesday, 19 July, 2017, 10:00 AM–12:00 PM   G – 304 Tiered Classroom
Sponsored by:             Power System Operation, Planning & Economics
Chair:                           X. LUO, ISO New England

PAPERS AND AUTHORS:

• 17PESGM0379, Dynamic Gain-Tuning Control (DGTC) Approach for AGC with Effects of Wind Power  [Transaction Number: TPWRS-00589-2014]
  Y. XU, Purdue University Northwest
  F. LI, University of Tennessee
  Z. JIN, Western Digital
  M. VARIANI, University of Tennessee

• 17PESGM0397, Testing and Validation of Power System Dynamic State Estimators Using Real Time Digital Simulator (RTDS)  [Transaction Number: 10.1109/TPWRS.2015.2453482]
  A. SHARMA, IIT Bhubaneswar
  S. CHAKRABARTI, IIT Kanpur
  S. SRIVASTAVA, IIT Kanpur

• 17PESGM0619, Probabilistic Security-Constrained Unit Commitment with Generation and Transmission Contingencies  [Transaction Number: TPWRS.2016.2550585]
  R. FERNANDEZ BLANCO, University of Washington
  Y. DVORKIN, New York University
  M. ORTEGA-VAZQUEZ, University of Washington

  B. SOLANKI, University of Waterloo
  A. RAGHURAJAN, University of Waterloo
  K. BHATTACHARYA, University of Waterloo
  C. CANIZARES, University of Waterloo

• 17PESGM1094, Optimal Energy Storage Siting and Sizing: A WECC Case Study  [Transaction Number: TSTE.2016.2616444]
  R. FERNANDEZ BLANCO, University of Washington
  Y. DVORKIN, New York University
  Y. WANG, University of Washington
  D. KIRSCHEN, University of Washington

• 17PESGM1415, Unit Commitment Under Gas-Supply Uncertainty and Gas-Price Variability  [Transaction Number: 10.1109/TPWRS.2016.2602659]
  B. ZHAO, Ohio State University
  R. SIOSHANSI, Ohio State University

• 17PESGM1464, Strategic Valuation of Smart Grid Technology Options in Distribution Networks  [Transaction Number: TPWRS2587999]
  I. KONSTANTELOS, Imperial College London
  S. GIANNELLOS, Imperial College London
  G. STRBAC, Imperial College London

• 17PESGM1718, Corrective Model-Predictive Control in Large Electric Power Systems  [Transaction Number: DOI 10.1109/TPWRS.2016.2598548]
  J. MARTIN, University of Michigan
  I. HISKENS, University of Michigan

• 17PESGM1827, Stochastic Scheduling of Battery-Based Energy Storage Transportation System with the Penetration of Wind Power  [Transaction Number: TSTE2586025]
  Y. SUN, North China Electric Power University
  J. ZHONG, North China Electric Power University
  W. TIAN, Illinois Institute of Technology
  M. SHAHIDEHPOUR, Illinois Institute of Technology

• 17PESGM2253, Transfer Capability Improvement Through Market-Based Operation of Series FACTS Devices  [Transaction Number: 10.1109/TPWRS.2015.2508720]
  M. SAHRAEI-ARDAKANI, University of Utah

Transactions Paper Session 22 (transactions paper)

Wednesday, 19 July, 2017, 10:00 AM–12:00 PM   G – 306 Tiered Classroom
Sponsored by:             Power Systems Relaying & Control
Chair:                           F. FRIEND, AEP

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Power Quality Issues with Solar Power Plants (panel)

Wednesday, 19 July, 2017, 10:00 AM–11:00 AM   G – 222 Multifunction Room
Sponsored by: Transmission and Distribution
Chair: D. MUELLER, Enernex

Solar power plants contribute green energy to our power grids, but the conversion of energy from dc to ac voltage introduces power quality issues to utility distribution and transmission systems. Learning from past lessons will allow the industry to prevent future concerns

PANELISTS:
• 17PESGM2587, 23rd Harmonics Resonance from Grid Reconfigurations
  T. LAUGHNER, TWA
Wednesday Morning, continued — Wednesday Afternoon

- 17PESGM2588, Customer Impact of High Order Harmonics from a PV Plant
  M. NORWALK, SCE
- 17PESGM2589, Potential for Interharmonic Distortions
  D. MUELLER, Enernex
- 17PESGM2590, Measurement Considerations of Solar Panels
  R. BINGHAM, Dranetz
- 17PESGM2591, Duke Energy Experiences with Solar Plants
  J. GRAPPE, Duke Energy
- 17PESGM2592, Southern Company Experiences with Solar Plants
  M. PAGE, Southern Company

Student Faculty Industry Luncheon (luncheon)
Wednesday, 19 July, 2017, 11:45 AM–1:30 PM   S – Chicago VI+VII

Wednesday Afternoon

Paper Forum 07 (paper forum)
Wednesday, 19 July, 2017, 1:00 PM–5:00 PM   S – Sheraton I
Sponsored By:  Admin
Chairs:  A. APOSTOLOV, Omicron Electronics
         C. DENT, University of Edinburgh

PAPERS AND AUTHORS:
- 17PESGM0049, Stochastic Simulations and Stability to Determine Maximum Wind Power
  Penetration of an Island Network
  W. BRICENO VICENTE, Siemens Wind Power
  R. CAIRE, Grenoble INP
  N. HADJSAID, Grenoble INP
- 17PESGM0215, A Novel Robust Magnetizing Inrush Fast Identification Criterion Based on Partial
  Hausdorff Distance
  Q. GUO, Electric Power Research Institute of Guangzhou Power Supply Co. Ltd.
  L. CHEN, Huazhong University of Science and Technology
  J. XIE, Electric Power Research Institute of Guangzhou Power Supply Co. Ltd.
  J. LIU, Electric Power Research Institute of Guangzhou Power Supply Co. Ltd.
  J. XIONG, Electric Power Research Institute of Guangzhou Power Supply Co. Ltd.
  W. MO, Electric Power Research Institute of Guangzhou Power Supply Co. Ltd.
  H. ZHAO, Huazhong University of Science and Technology
- 17PESGM0246, An Intelligent Relay Based on Fuzzy Logic Applied to Differential Protection of
  Synchronous Generators
  R. BATAGLIO, University of São Paulo (EESC)
  R. MONARO, University of São Paulo (Polytechnic)
  D. COURY, University of São Paulo (EESC)
- 17PESGM0342, Phasor Estimation with Finite Impulse Response Notch Filtering and Half-Cycle
  Discrete Fourier Transform
  J. HWANG, Woosuk university
- 17PESGM0537, Protection and Fault Locating Method of Series Compensated Lines by Wavelet
  Based Energy Traveling Wave
  Y. LIU, Georgia Institute of Technology
  A. MELIPOULOS, Georgia Institute of Technology
  N. TAI, Shanghai Jiao Tong University
  L. SUN, Georgia Institute of Technology
  B. XIE, Georgia Institute of Technology
- 17PESGM0600, Seismic Resilience Assessment and Adaptation of the Northern Chilean Power
  System
  S. ESPINOZA, Pontificia Universidad Católica de Chile
  R. SACAAN, Pontificia Universidad Católica de Chile
  H. RUDNICK, Pontificia Universidad Católica de Chile
  A. POULOS, National Research Center for Integrated Natural Disaster Management
  J. DE LA LLERA, National Research Center for Integrated Natural Disaster Management
  M. PANTIELI, University of Manchester
  P. MANCARELLA, University of Manchester
  A. NAVARRO, Universidad de Chile
  R. MORENO, Universidad de Chile
Wednesday Afternoon, continued

• 17PESGM0660, Network Motif as an Indicator for Cascading Outages due to the Decrease of Connectivity
  Q. CHEN, North China Electric Power University
  H. REN, North China Electric Power University
  D. WATTS, Pontificia Universidad Católica de Chile
  C. SUN, North China Electric Power University
  Z. MI, North China Electric Power University

• 17PESGM0673, A Phase-Selection Scheme Based on Spectrum Characteristic of Transient Component
  X. WANG, China Electric Power Research Institute
  Z. ZHOU, China Electric Power Research Institute
  D. DU, China Electric Power Research Institute

• 17PESGM0845, A Markov Chain Based Method for Probabilistic Load Flow with Wind Power
  J. ZHU, Shanghai Jiao Tong University
  T. ZHAO, Shanghai Jiao Tong University
  Y. ZHANG, Shanghai Jiao Tong University

• 17PESGM1041, An Impact-Increment Based Monte Carlo Simulation Reliability Assessment Approach for Transmission Systems
  Y. LEI, Tianjin University
  K. HOU, Tianjin University
  H. JIA, Tianjin University
  P. ZHANG, Tianjin University
  Y. MU, Tianjin University
  R. SONG, Tianjin University
  L. ZHU, Tianjin University

• 17PESGM1492, Voltage-Based Fault Identification for a PMU-Based Wide Area Backup Protection Scheme
  F. YU, University of Strathclyde
  C. BOOTH, University of Strathclyde
  A. DYSKO, University of Strathclyde

• 17PESGM1603, Protection of Smart Distribution Systems with Distributed Energy Resources and Solid State Transformers
  U. SINGH, North Carolina State University
  M. BARAN, North Carolina State University

• 17PESGM1724, Line Failure Probability Bounds for Power Grids
  T. NESTI, CWI
  A. ZOCCA, CWI
  B. ZWART, CWI

• 17PESGM1736, A Robust Optimization-Based Strategy for Optimal Power System Protection Considering Uncertainties
  Y. XIANG, University of Wisconsin-Milwaukee
  L. WANG, University of Wisconsin-Milwaukee

• 17PESGM1781, Probabilistic Wind Power Ramp Forecasting Based on a Scenario Generation Method
  M. CUI, University of Texas at Dallas
  C. FENG, University of Texas at Dallas
  Z. WANG, University of Texas at Dallas
  J. ZHANG, University of Texas at Dallas
  Q. WANG, National Renewable Energy Laboratory
  A. FLORITA, National Renewable Energy Laboratory
  Y. KRISHNAN, National Renewable Energy Laboratory
  B. HODGE, National Renewable Energy Laboratory

• 17PESGM1880, Effect of Multi-BESS Coordinated WTGs on Power System Reliability
  U. OH, Gyeongsang National University
  Y. LEE, Gyeongsang National University
  J. CHOI, Gyeongsang National University
  J. LIM, International University of Korea
  J. CHA, Daejin university

• 17PESGM2001, Study on the Current Differential Protection for Half-Wave-Length AC Transmission Lines
  L. TANG, Tsinghua University
  X. DONG, Tsinghua University
  H. REN, Tsinghua University
  S. SHI, Tsinghua University

• 17PESGM2207, Speeding up Simulations of Cascading Blackout in Power Systems by Identifying High Influential Lines
  Z. MA, Tsinghua University
F. LIU, Tsinghua University
C. SHEN, Tsinghua University
X. ZHANG, Tsinghua University
S. MEI, Tsinghua University
F. GAO, Electric Power Research Institute of State Grid Ningxia Electric Power Company

• 17PESGM2278, Energy Storage in the Western Interconnection: Current Adoption, Trends and Modeling Challenges
  K. OIKONOMOU, University of Utah
  V. SATYAL, WECC
  M. PARVANIA, University of Utah

Paper Forum 08 (paper forum)

Wednesday, 19 July, 2017, 1:00 PM–5:00 PM   S – Sheraton V
Sponsored by: Admin
Chair: H.-M. CHOU, Texas A&M University

PAPERS AND AUTHORS:

• 17PESGM0092, Improved Practices in Machine Learning Algorithms for NTL Detection with Imbalanced Data
  G. FIGUEROA, National Tsing Hua University
  Y. CHEN, National Tsing Hua University
  N. AVILA, National Tsing Hua University
  C. CHU, National Tsing Hua University

• 17PESGM0243, Symmetrical Fault Detection During Power Swings: An Interpretable Supervised Learning Approach
  M. LWIN, University of Texas at Austin
  K. MIN, University of Texas at Austin
  S. SANTOSO, University of Texas at Austin

• 17PESGM0345, A Parallel Approach for Multi-Contingency Transient Stability Constrained Optimal Power Flow
  Y. YANG, Guangxi University
  W. LIU, Guangxi University
  J. DENG, State Grid Shanxi Electric Power Research
  H. LIU, Guangxi University
  H. WEI, Guangxi University
  T. WANG, Guangxi University

• 17PESGM0472, Centralized Load Shedding Based on Thermal Limit of Transmission Lines Against Cascading Events
  B. HOSEINZADEH, Aalborg University
  M. AMINI, Carnegie Mellon University
  C. LETH BAK, Aalborg University

• 17PESGM0543, Visual Steering and Modeling Environment for Smart Grid Models and Simulations
  G. CHIN, Pacific Northwest National Laboratory
  E. FITZHENRY, Pacific Northwest National Laboratory
  A. MCBAIN, Pacific Northwest National Laboratory
  S. BEUS, Pacific Northwest National Laboratory
  L. MARINOVICI, Pacific Northwest National Laboratory
  J. HANSEN, Pacific Northwest National Laboratory
  K. STUDARUS, Pacific Northwest National Laboratory

• 17PESGM0546, Electromagnetic Transient Events (EMTE) Classification in Transmission Grids
  M. KHOSHDELI, University of Nevada Reno
  I. NIAZAZARI, University of Nevada Reno
  R. JALILZADEH-HAMIDI, University of Nevada Reno
  H. LIVANI, University of Nevada Reno
  B. PARVIN, University of Nevada Reno

• 17PESGM0620, Online Thevenin Parameter Tracking Using Synchrophasor Data
  M. JAMEI, Arizona State University
  A. SCAGLIONE, Arizona State University
  C. ROBERTS, Lawrence Berkeley National Laboratory
  A. MCEACHERN, Power Standards Lab
  E. STEWART, Lawrence Berkeley National Laboratory
  S. PEISERT, Lawrence Berkeley National Laboratory
  C. MCPARLAND, Lawrence Berkeley National Laboratory
Wednesday Afternoon, continued

- 17PESGM0663, Load Shedding against Short-Term Voltage Instability Using Random Subspace Based SVM Ensembles
  L. ZHU, Tsinghua University
  C. LJU, Tsinghua University
  Y. HAN, Tsinghua University

- 17PESGM0872, Fast Event Identification through Subspace Characterization of PMU Data in Power Systems
  W. LI, Rensselaer Polytechnic Institute
  M. WANG, Rensselaer Polytechnic Institute
  J. CHOW, Rensselaer Polytechnic Institute

- 17PESGM0874, Decentralized Multi-Area State Estimation with Hybrid Measurements
  X. FAN, Pacific Northwest National Laboratory
  D. DUAN, University of Wyoming

- 17PESGM1051, Capture Renewable Energy Uncertainty by Pair Convex Hull and Its Application to Robust DCOPF
  L. ZENG, TianJin University
  H. CHIANG, Cornell University

- 17PESGM1324, A Genetic Algorithm Based Calibration Approach on Validating Cascading Failure Analysis
  B. LI, ETH Zurich
  B. GJORGIEV, ETH Zurich
  G. SANSAVINI, ETH Zurich

- 17PESGM1409, Heuristics for Efficient Transmission Network Expansion Planning with Load Uncertainties
  S. DAS, Indian Institute of Technology Delhi
  P. BIJWE, Indian Institute of Technology Delhi

- 17PESGM1541, Short-Circuit Current of Grid-Connected Voltage Source Converters: Multi-Timescale Analysis Method
  W. TANG, Huazhong University of Science and Technology
  J. HU, Huazhong University of Science and Technology
  X. KONG, State Grid of China

- 17PESGM1560, Deep Belief Network Based Nonlinear Representation Learning for Transient Stability Assessment
  L. ZHENG, State Key Lab of Power Systems
  H. CHIANG, Cornell University

- 17PESGM1689, Fast Power System Simulation Using Semi-Analytical Solutions Based on Padé Approximants
  C. LIU, University of Tennessee Knoxville
  B. WANG, University of Tennessee Knoxville
  K. SUN, University of Tennessee Knoxville

- 17PESGM1814, A Truncated Gaussian Mixture Model for Distributions of Wind Power Ramping Features
  M. CUI, University of Texas at Dallas
  Z. WANG, University of Texas at Dallas
  C. FENG, University of Texas at Dallas

- 17PESGM1874, A Three-Stage Enhanced Reactive Power and Voltage Optimization Method for High Penetration of Solar
  X. KE, Pacific Northwest National Laboratory
  J. HOLZER, Pacific Northwest National Laboratory
  N. SAMAAAN, Pacific Northwest National Laboratory
  Y. MAKAROV, Pacific Northwest National Laboratory
  B. VYAKARANAM, Pacific Northwest National Laboratory

- 17PESGM1987, MILP Formulation for the Optimal Operation of the Integrated Gas and Power System
  J. FANG, Aalborg University
Trusted Monitoring and Intelligent Consumption Data Management for Smart Buildings (panel)

Wednesday, 19 July, 2017, 1:00 PM–5:00 PM    G – 100 Tiered Classroom

Sponsored by:     Analytic Methods for Power Systems
Chairs:           Z. VALE, Polytechnic of Porto
                 S. CHANDLER, Navigant

Intelligent buildings have to tackle the challenges of smarter energy management, enhanced automation and connectivity. Facing environmental policies and cost-reduction objectives, building managers are asking for adequate solutions to predict, monitor, control, command, and optimize energy consumption, in the context of all the energy transactions and service provision opportunities. The trend toward smart building is enabled by the growing integration of Information Technology and Operational Technology. An unwanted consequence of this is the growing exposure to cyber-attacks. Legacy automation systems have been traditionally thought secured by isolation and physical protection. Now, they are exposed to fast-expanding cyber-threats, targeting their availability, integrity and confidentiality. A joint initiative, gathering engineers and researchers from energy, automation, ICT and security background is likely to deliver the innovative intelligent building system architecture and a set of advanced technological capabilities to solve the dilemma of efficiency and security in intelligent buildings.

PANELISTS:

- 17PESGM2660, Efficiency and Security in Intelligent Buildings
  A. BÉCUE, Airbus DS Cybersecurity

- 17PESGM2661, Trusted & Unified Monitoring and Control in Building Management Systems
  E. NUGENT, PcVue Inc.

- 17PESGM2657, Machine Learning Methods for On-Line Flexibility Prediction and Optimal Resource Allocation in Smart Buildings
  E. MOCANU, Eindhoven University of Technology

- 17PESGM2656, Intelligent Management of Consumption Data and Load Flexibility
  G. KUMAR VENAYAGAMOORTHY

- 17PESGM2662, Semantic Interoperability as Enabler for Energy-Aware Systems
  P. BOURGUIGNON, ENGIE

- 17PESGM2658, IEEE PES Smart Buildings – Loads – Customer Systems Committee Contribution I
  S. CHANDLER, Navigant

- 17PESGM2834, Transactive Microgrids
  F. RAHIMI, Open Access Technology International, Inc. (OATI)

- 17PESGM2655, Designing Home Area Network for Home Energy Management System
  N. LU, North Carolina State University

Transactions Paper Session 05  (transactions paper)

Wednesday, 19 July, 2017, 1:00 PM–3:00 PM    G – 304 Tiered Classroom

Sponsored by:     Analytic Methods for Power Systems
Chair:            L. MARTI

PAPERS AND AUTHORS:

  W. YAO, University of Tennessee
Wednesday Afternoon, continued

Y. LIU, University of Tennessee
D. ZHOU, University of Tennessee
Z. PAN, University of Tennessee
M. TILL, University of Tennessee
J. ZHAO, University of Tennessee
L. ZHU, University of Tennessee
L. ZHAN, General Electric
Q. TANG, Hunan University
Y. LIU, University of Tennessee

• 17PESGM0266, GPU-Based Fast Decoupled Power Flow with Preconditioned Iterative Solver and Inexact Newton Method [Transaction Number: TPWRS-00097-2016]
  X. LI, Northeast Dianli University
  F. LI, University of Tennessee, Knoxville
  H. YUAN, University of Tennessee, Knoxville
  H. CUI, University of Tennessee, Knoxville
  Q. HU, University of Tennessee, Knoxville

• 17PESGM0317, Frequency Divider [Transaction Number: 10.1109/TPWRS.2016.2569563]
  F. MILANO, University College Dublin
  A. ORTEGA, University College Dublin

• 17PESGM0553, The QC Relaxation: A Theoretical and Computational Study on Optimal Power Flow [Transaction Number: TPWRS-00204-2015]
  C. COFFRIN, Los Alamos National Laboratory
  H. HIJAZI, Australian National University
  P. VAN HENTENRYCK, University of Michigan

• 17PESGM0579, Robust State Estimator Based on Maximum Exponential Absolute Value [Transaction Number: 10.1109/TPWRS.2015.2485280]
  Y. CHEN, North China Electric Power University
  J. MA, University of Sydney
  P. ZHANG, SGCC
  F. LIU, Tsinghua University
  S. MEI, Tsinghua University

• 17PESGM0743, A Kernel-Based Predictive Model of EV Capacity for Distributed Voltage Control and Demand Response [Transaction Number: TSG-01497-2015.R2]
  H. VALIZADEH HAGHI, Northwestern University
  Z. QJ, University of Central Florida

• 17PESGM0760, BFS Algorithm for Voltage-Constrained Meshed DC Traction Networks with Nonsmooth Voltage-Dependent Loads and Generators [Transaction Number: 15786935]
  P. ARBOLEYA, University of Oviedo
  B. MOHAMED, University of Oviedo
  C. GONZALEZ-MORAN, University of Oviedo
  I. EL-SAYED, University of Oviedo

• 17PESGM1385, A Laplacian-Based Approach for Finding Near Globally Optimal Solutions to OPF Problems [Transaction Number: DOI 10.1109/TPWRS.2016.2550520]
  D. MOLZAHN, Argonne National Laboratory
  C. JOSZ, Reseau de Transport d’Electricite
  I. HISKEN, University of Michigan
  P. PANCATI, Reseau de Transport d’Electricite

Power Grid Cascading – Industry Perspectives (panel)

Wednesday, 19 July, 2017, 1:00 PM–3:00 PM  G – 300 Tiered Classroom

Sponsored by: (AMPS) Computer Analytical Methods
M. PAPIC, Idaho Power
M. VAIMAN, V&R Energy

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Cascading failures in electric power systems is a complicated and difficult problem to assess and presents a critical threat to power grid security, with severe consequences to society. Addressing this problem requires adequate cascading methodologies and tools that are accepted by industry and regulatory bodies.

The goal of this panel is to present and share industry experience in the field of simulation, analysis and prevention of cascading outages. It will highlight recent developments and practical applications in identifying measures for minimizing cascading risk. It will also identify industry needs and research priorities in this area, and discuss ways of solving the future challenges and opportunities associated with new technologies such as renewable energy sources, microgrids, PMUs, etc.

This Panel brings together experts from ISOs and utilities in US, Europe and Asia, who provide a wide range of expertise on cascading techniques and applications that have been recently implemented by industry.

**PANELISTS:**
- **17PESGM2354, Cascading Failure Working Group – Industry Perspectives in Cascading Analysis**  
  M. PAPIC, Idaho Power  
  M. VAIMAN, V&R Energy
- **17PESGM2355, An Approach for Cascading Analysis – ERCOT Transmission Planning**  
  S. KANG, ERCOT
- **17PESGM2352, Cascading Failure Risk and Prevention of AC/DC Hybrid Power Grids Connected with Large Renewable Generations**  
  L. YAO, China Electric Power Research Institute
- **17PESGM2356, Analysis of Cascading Outages at Peak Reliability**  
  B. WANGEN, Peak Reliability
- **17PESGM2357, The Role of GB WAMS System in Managing the Risk and Impact of Cascading Failure in GB Power System**  
  P. MOHAPATRA, Scottish Power Energy Networks
- **17PESGM3081, Online Situational Awareness for Reducing the Risk of Blackouts**  
  S. MASLENNIKOV, ISO New England

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**Advances in the Computation of Power System Transients (panel)**

*Wednesday, 19 July, 2017, 1:00 PM–5:00 PM  
G – 222 Multifunction Room*

**Sponsored by:**  
(AMPS) Transient Analysis and Simulation

**Chairs:**  
J. MAHSEREDJIAN, École Polytechnique de Montréal  
A. RAMIREZ, Cinvestav-Guadalajara

This panel session is about solution methods and models for the computation of power system transients. The focus is on electromagnetic transients in power systems. Both off-line and real-time simulation methods are presented.

This panel presents recent research on accurate models, such as power electronic converters, wind turbine generators, transformers, circuit breakers and synchronous machines. This panel also presents recent contributions in fast and accurate simulation methods for power electronics circuits. Model order reduction methods and parallelization techniques are contributed for efficient simulations of very large networks. Co-simulation approaches are also presented for combining different types of solution methods and models.

**PANELISTS:**
- **17PESGM2516, Controlled Switching of a 1200 MVA Transformer in Manitoba**  
  W. CHANDRASENA, Manitoba Hydro
- **17PESGM2517, An Equivalent Circuit Method for Modelling and Simulation of Modular Multilevel Converter in Real-Time HIL Test Bench**  
  W. LI, OPAL-RT TECHNOLOGIES
- **17PESGM2518, Application of Balanced Realizations to Dynamic Power System Equivalents**  
  A. RAMIREZ, Cinvestav-Guadalajara
- **17PESGM2519, Duality Derived Transformer Models for Low-Frequency Electromagnetic Transients**  
  S. JAZEBI, New York University
- **17PESGM2520, Advancements in Transformer Modeling for GIC Studies**  
  A. REZAEE-ZARE, Hydro One
- **17PESGM2521, Accurate and Efficient Synchronous Machine Models for Electromagnetic Transients**  
  U. KARAAGAC, École Polytechnique de Montréal
Wednesday Afternoon, continued

Planning 21st-Century’s Electricity Infrastructure under Uncertainty: Challenges and Opportunities (panel)

Wednesday, 19 July, 2017, 1:00 PM–4:00 PM       G – 204 Tiered Classroom
Sponsored by: Energy Development and Power Generation
Chairs: A. STREET, Pontifical Catholic University of Rio de Janeiro, Brazil
R. MORENO, Universidad de Chile & Imperial College London

Recent advances in optimization under uncertainty techniques and computational power have provided highly powerful tools for planning future electricity infrastructure. Such tools and computational power, however, are not unlimited and thus we have to model only those features that are considered relevant in system planning to keep our problems tractable. In this context, which operational details and features should we consider in planning studies? What is critical for designing a transmission network under uncertainty that is consistent with 21st-century needs and opportunities? Problem complexity is also compounded by the increasing participation of new generation and flexible network technology, demand response, storage and further smart grid technology. In this panel, invited experts will share their views and ideas with regard to what is critical for designing 21st-century’s electricity infrastructure under uncertainty.

PANELISTS:
• 1PESGM2454, Flexible Transmission Network Planning under Uncertainty: A Min-Max Regret Approach
  G. STRBAC, Imperial College London
• 1PESGM2455, Robustness and Efficiency in Transmission Expansion Planning under Uncertainty
  H. RUDNICK, Pontificia Universidad Catolica de Chile
• 1PESGM2456, Planning Infrastructure under Uncertainty in a Growing Hydro System: The Brazilian Experience
  L. BARROSO, Brazilian Ministry of Mines and Energy
• 1PESGM2453, Transmission Planning and Energy Storage Investments: Centralized vs. Merchant
  D. KIRSCHEN, University of Washington

International Practices in Smart Grid for Smart City (panel)

Wednesday, 19 July, 2017, 1:00 PM–5:00 PM       G – 200 Tiered Classroom
Sponsored by: Energy Development and Power Generation
Chairs: L. L. LAI, Guangdong University of Technology
K. P. WONG, University of Western Australia

As a result of information technology advanced and its deep integration with the electric power industry, smart grid forms a solid foundation to build smart city. Meanwhile, the construction of smart city will also greatly stimulate the enormous potential of smart grid. City managers must be fully aware of the potential of the smart grid, so that the smart urban construction can play an important role. It is expected that with the continuous advancement of technology, smart grid and smart city construction will mutually promote and facilitate each other. Electricity consumption and electricity load are a true reflection of the socio-economic health of a city. The selection of data mining technology to analyze the mass amount of data from smart grid to support decision making for the government to effectively reduce operating costs and improve operational efficiency of smart city will be one of the big issues.

PANELISTS:
• 1PESGM2978, The Relationship Between Smart Grids and Smart Cities
  A. ZOBAA, Brunel University London
• 1PESGM2979, Smart Grid for Smart City: Opportunities and Challenges
  X. ZHANG, University of Birmingham
• 1PESGM2980, Smart Grid for Smart City: China Mission and Practice
  L. LAI, Guangdong University of Technology
• 1PESGM2981, The Impact of Time of Use (TOU) Rate Structure on the Consumption Pattern of the Residential Customers
  W. LEE, University of Texas at Arlington
• 1PESGM2982, Experience and Lesson Learned from Demonstration Project in Smart Grid for Smart City in Australia
  Z. DONG, University of Sydney
• 1PESGM2983, Demonstration of Smart Distribution Self-Healing Control for Smart City at China Southern Power Grid
  X. DONG, Electric Power Research Institute, China Southern Power Grid
Wednesday Afternoon, continued

- 17PESGM2984, Warning and Risk Assessment on Distribution Network in Smart City with Natural Disasters Consideration
  H. ZHANG, State Grid Electric Power Research Institute
- 17PESGM2985, Functional Modelling in the Operation of a Cyber Physical Energy System
  G. YANG, Technical University of Denmark
- 17PESGM2986, Data Driven Approach for Cyber Physical Social System Modelling
  J. ZHAO, Chinese University of Hong Kong

Industry Presentations in University Undergraduate and Postgraduate Programs (panel)

Wednesday, 19 July, 2017, 1:00 PM–3:00 PM   G – 203 Executive Meeting Room
Sponsored by:             Power & Energy Education
Chair:                           T. SAHA, University of Queensland

Power engineering education has been significantly changing with the introduction of many new courses. This has been due to massive penetration of renewable energy sources, ageing assets and extensive use of ICT in power systems. University laboratories are being updated regularly to cope up with the changes. Industry is adopting new tools and techniques to address the changes. University academics regularly invite industry practitioners in the class room to share their hands on experience. Industry practitioners can provide experience of state-of-the-art technologies used in the field for our students.

PANELISTS:
- 17PESGM0180, Workforce Development in Power-Related Field through ONR-Funded CUSP™
  N. MOHAN, University of Minnesota
- 17PESGM0181, Experiences Learnt in Industry Led Electric Utility Master Degree Program at Curtin University
  S. ISLAM, Curtin University
- 17PESGM0182, The Important Role of Power Industry in Development of Electrical Power Systems MSc Programme
  X. ZHANG, University of Birmingham
- 17PESGM0183, Using Integrated Industry Practice in Educating Future Power Engineers
  X. ZHANG, University of Birmingham
- 17PESGM0178, Industry Participation in Undergraduate and Graduate Programs at the University of Saskatchewan
  R. GOKARAJU, University of Saskatchewan
- 17PESGM0179, Industry Expert’s Participation in University of Queensland (UQ) Undergraduate and Postgraduate Programs
  T. SAHA, University of Queensland

Smart Grid Data Analytics and Integrations (panel)

Wednesday, 19 July, 2017, 1:00 PM–4:00 PM   S – Sheraton IV
Sponsored by:             Power System Instrumentation and Measurements
Chairs:                         W. LUAN, China EPRI
                              E. SO, NRC

PANELISTS:
- 17PESGM2755, Data Analysis to Support the Distribution Network Operation and Maintenance
  T. LIN, Beijing Electric Power Company
- 17PESGM2756, Update and Results from EPRI’s Grid Analytics – Data Mining Initiative
  D. DORR, EPRI
- 17PESGM2757, IoT & Machine Learning – The Business of Efficiency
  M. STEINER, Awesense technologies
- 17PESGM2758, Applications of Smart Grid Data at BC Hydro
  A. BERRISFORD, BC Hydro
- 17PESGM2754, Missing Analytics – Hunting for the Magic Algorithms for the Future
  D. HOUSEMAN, EnerNex

Flexible Transmission System Operation with Natural Gas Constraints (panel)

Wednesday, 19 July, 2017, 1:00 PM–3:00 PM   G – 400 Tiered Classroom
Sponsored by:             Power System Operation, Planning & Economics
Chairs:                         M. KHODAYAR, Southern Methodist University
                              S. NUTHALAPATI, Texas A&M University

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The increase in the installed capacity of the renewable energy resources and the fluctuation and uncertainty in demand side requires higher flexibility in generation and transmission sectors to maintain the stability and reliability of the electricity network. Integration of natural gas generation as fast response resources improves the flexibility of the electricity network. However, the constraints and contingencies in the natural gas supply chain could limit the effect of such generation assets to compensate for the imbalances in generation and demand. This panel is focused on flexibility in generation and transmission sectors considering the imposed constraints and contingencies in the natural gas networks in short-term operation planning of electricity network. The coordination between the natural gas and electricity network to improve the flexibility of the electricity networks with high penetration of renewable energy resources were addressed from academic and industrial perspectives.

**PANELISTS:**

1. **17PESGM2906, Utility Situational Awareness System (USAS) Proof of Concept**  
J. MAREAN, Gas Technology

2. **17PESGM3064, Challenges to Providing Adequate Natural Gas Pipeline Services to Power Generators**  
K. PETAK, ICF International

3. **17PESGM3065, Challenges to Providing Adequate Natural Gas Pipeline Services to Power Generators**  
F. BROCK, ICF International

4. **17PESGM2905, Electricity-Natural Gas Operation Planning with Hourly Demand Response for Deployment of Flexible Ramp**  
M. SHAHIDEHPOUR, Illinois Institute of Technology

5. **17PESGM3040, Coordinating Electricity and Natural Gas Infrastructures in Turkey – Challenges & Solutions**  
O. BÜLENT TÖR, EPRA – Engineering Procurement Research Analysis

6. **17PESGM2903, Coordination Among Natural Gas and Electricity Networks**  
M. MCGRANAGHAN, EPRI

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**Transactions Paper Session 23 (transactions paper)**

*Wednesday, 19 July, 2017, 1:00 PM–3:00 PM G – 306 Tiered Classroom*

**PAPERS AND AUTHORS:**

1. **17PESGM0081, Loop Shaping of a Wide-Area Damping Controller Using HVDC**  
D. ROBERSON, University of Wyoming  
J. O’BRIEN, University of Wyoming

2. **17PESGM0157, A Combined Wavelet and Data-Mining Based Intelligent Protection Scheme for Microgrid**  
S. SAMATARAY, IIT Bhubaneswar  
D. MISHRA, McGill University  
G. JOOS, McGill University

3. **17PESGM0267, Synchrophasor Based Intelligent Autoreclosing Scheme for Series Compensated Transmission Lines**  
S. GAJARE, ABB Corporate Research Center  
A. PRADHAN, Indian Institute of Technology Kharagpur, Kharagpur

4. **17PESGM0328, Influence of Neutral-Point Voltage Deviation of PWM Converter on Insulation Monitoring in Medium-Voltage Networks**  
P. WANG, Nanjing University of Science and Technology

5. **17PESGM0481, A Bounded Model of the Communication Delay for System Integrity Protection Schemes**  
C. HUANG, LLNL

6. **17PESGM1768, Generalized Alpha Plane for Numerical Differential Protection Applications**  
K. SILVA, University of Brasilia  
R. BAINY, University of Brasilia

7. **17PESGM2244, An Empirical Fourier Transform Based Power Transformer Differential Protection**  
S. MURUGAN, National Institute of Technology Tiruchirappalli  
S. SIMON, National Institute of Technology Tiruchirappalli  
S. KINATTINGAL, National Institute of Technology Tiruchirappalli  
S. PANUGOTHU, National Institute of Technology Tiruchirappalli  
N. PADHY, Indian Institute of Technology Roorkee
Virtual power plant, VPP represents an “Internet of Energy,” and a system that aggregates distributed energy resources such as demand response resources, distributed battery storage, electric vehicle (EV), and smart buildings. VPP could provide grid services and flexibility requirement in an era of large penetration of variable renewable generation such as solar photovoltaic and wind power. This panel will explore: 1) dispatchable energy resources in smart buildings and smart houses and from EV, 2) demand response trading market, and 3) the implications for reliable power system operation.

PANELISTS:
- 17PESGM2417, Dispatchable Energy Resources in Smart Buildings
  S. PAUDYAL, Michigan Technological University
- 17PESGM2418, VPP Pilots in Japan: DER Aggregation and a New Market for Negawatt Trading
  A. HIROSHI, CRIEPI
- 17PESGM2416, Demand-Side Flexibility by Smart Houses
  H. AKI, National Institute of Advanced Industrial Science and Technology (AIST)
- 17PESGM2419, Virtual Power Storage by EVs
  Y. OHTA, Tokyo City University

Operational Reliability of FACTS & HVDC (panel)
Wednesday, 19 July, 2017, 1:00 PM–5:00 PM  G – 240 Multifunction Room
Sponsored By: Substations
Chair 1: Joe Warner, ABB

With the increase in high voltage power electronic installations, a major issue of concern for owners is operational reliability. Utility experience is to be presented along with results from a global survey focused on static var compensators.

PANELISTS:
- 17PESGM3023, Operational Reliability of FACTS & HVDC at American Transmission Company
  M. LONDO, American Transmission Company
- 17PESGM3024, Operational Reliability of FACTS & HVDC at Hydro-Québec
  N. VERVILLE, Hydro-Québec
- 17PESGM3082, Operational Reliability of FACTS & HVDC at Xcel Energy
  M. CAMERON, Xcel Energy
- 17PESGM3083, WGI4 Operational Reliability Survey of SVCs
  M. HALONEN, ABB

Smart Grid and Sags: Characterization and Need for New Indices (panel)
Wednesday, 19 July, 2017, 1:00 PM–2:00 PM  G – 226 Multifunction Room
Sponsored by: Transmission and Distribution
Chair: F. ZAVODA, IREQ

For a long period of time, the sags were classified using UNIPEDE type tables. The IEEE P1564 Guide for Voltage Sag Indices proposed two indices: Sag Severity index and Sag Energy index. Recent work on sag characterization and evaluation opened the door for the development of new sag indices. This panel will discuss: 1. The impact of some Smart Distribution applications (i.e. Feeder reconfiguration, protection philosophy) on sag occurrence; 2. Additional standards methods for phase angle jump, dip type, characteristic voltage and PN factor as single event characteristics for voltage sags applications; 3. An update on Sag Severity and Sag Energy indices; 4. The impact of sags on new loads with power electronic interface; 5. Etc.

PANELISTS:
- 17PESGM1624, ?????
  G. LAZAROIU, University Politehnica of Bucharest
- 17PESGM1625, ???
  M. MCGRANAGHAN, EPRI
- 17PESGM1626, Assessment of Power Quality Performance in Distribution Networks
  J. MILANOVIĆ, University of Manchester
- 17PESGM1627, Need for New Sag Indices
  F. ZAVODA, IREQ
Applications of Microgrids to Improve the Reliability, Resiliency, and Efficiency of Distribution Systems (panel)

Wednesday, 19 July, 2017, 1:00 PM–3:00 PM        G – 206 Tiered Classroom

Sponsored by: Transmission and Distribution
Chair: A. KHODAEI, University of Denver

Microgrids, as promoters of pervasive distributed generation, improved grid reliability, and the greener energy economy, have been significantly deployed over the past few years and are anticipated to grow even more in the near future. The many benefits of microgrids, however, cannot be efficiently captured if these costly installations are not intelligently designed. This session will bring together leading authorities in microgrid deployment to discuss applications of microgrids for distribution reliability and efficiency improvement while offering some of the identified and proven solutions. This session will be coordinated by the IEEE Microgrid Taskforce within the Distributed Resource Integration Working Group.

PANELISTS:

- 17PESGM2738, Microgrid Design
  M. HIGGINSON, S&C Electric Company
- 17PESGM2739, Microgrid Design – Stability Issues
  M. BARAN, North Carolina State University
- 17PESGM2740, Microgrid Design
  F. KATIRAEI, Quanta
- 17PESGM2741, Microgrid Design – A Utility Perspective
  A. PAASO, ComEd

Transactions Paper Session 26 (transactions paper)

Wednesday, 19 July, 2017, 1:00 PM–3:00 PM        G – 308 Tiered Classroom

Sponsored by: Transmission and Distribution
Chair: G. TODESCHINI, Swansea University

PAPERS AND AUTHORS:

- 17PESGM0172, Resonance-Free Shunt Capacitors—Configurations, Design Methods and Comparative Analysis [Transaction Number: TPWRD-01313-2015]
  W. XU, University of Alberta
  T. DING, University of Alberta
  X. LI, University of Alberta
  H. LIANG, University of Alberta

  A. BORGHETTI, University of Bologna – Italy
  F. NAPOLITANO, University of Bologna – Italy
  C. NUCCI, University of Bologna – Italy
  F. TOSSANI, University of Bologna – Italy

- 17PESGM0224, Damped High Passive Filter – A New Filtering Scheme for Multipulse Rectifier Systems [Transaction Number: TPWRD-01647-2015]
  X. LI, University of Alberta
  W. XU, University of Alberta
  T. DING, University of Alberta

- 17PESGM0613, Dynamic Interactions of the MMC-HVDC Grid and Its Host AC System Due to AC-Side Disturbances [Transaction Number: DOI: 10.1109/TPWRD.2015.2512178]
  F. BADRKHANI AJAEI, University of Western Ontario
  R. IRAVANI, University of Toronto

  J. ZHAN, University of Saskatchewan
  C. CHUNG, University of Saskatchewan
  E. DEMETER, SaskPower

- 17PESGM0993, Synchronverter-Based Emulation and Control of HVDC Transmission [Transaction Number: 15683594]
  R. AOUINI, LR11ES15 Laboratoire de Systèmes Electriques
  B. MARINESCU, IRCCyN-BP 92101-1
Wednesday Afternoon, continued

K. BEN KILANI, LR1ES15 Laboratoire de Systèmes Electriques
M. ELLEUCH, LR1ES15 Laboratoire de Systèmes Electriques

• 17PESGM1220, CPU/FPGA-Based Real-Time Simulation of a Two-Terminal MMC-HVDC System
[Transaction Number: TPWRD-00867-2015.R1]
T. OULD-BACHIR, Opal-RT
H. SAAD, RTE-France
S. DENNETIERE, RTE-France
J. MAHNEREDJIAN, Polytechnique Montreal

• 17PESGM1643, Consensus Control for Energy Storage System
[Transaction Number: TSG-00645-2016]
J. KHANZI, Penn State University at Harrisburg
Z. MIAO, University of South Florida

• 17PESGM2216, Optimization of the Size of UPQC System Based on Data-Driven Control Design
[Transaction Number: TSG-00645-2016]
J. YE, Nanyang Technological University
H. GOOI, Nanyang Technological University

• 17PESGM2236, Impact of Inertia and Effective Short Circuit Ratio on Control of Frequency in Weak Grids Interfacing LCC-HVDC and DFIG-Based Wind Farms
[Transaction Number: TPWRD.2016.2607205]
A. YOGARATHINAM, Penn State
J. KAUR, Penn State
N. CHAUDHURI, Penn State

Latest Advances in Wind and Solar Power Integration (panel)

Wednesday, 19 July, 2017, 1:00 PM–5:00 PM
S – Ohio
Sponsored by: Wind Power Coordinating Chair: J. Smith, UVIG

We will present the latest advances in the state of knowledge of wind and solar power integration in the bulk power system. This includes: lessons learned and best practices in wind and PV integration studies; storage as an enabler for higher wind and PV penetrations; use of wind and solar forecasts in system operations; how to manage impacts of DERs on the bulk power system; reliability of inertialless power systems; how markets need to evolve with high penetrations of wind and PV; how generation and transmission planning need to evolve; and has renewable energy arrived yet?

PANELISTS:

• 17PESGM2897, Five Indisputable Facts on Renewables Integration
A. BLOOM, NREL

• 17PESGM2898, One Day We’re Going to Need Storage, Just Not Today
D. STENCLIK, GE

• 17PESGM2899, Forecasting Can Do a Lot of Good, and Here Is How to Use It
J. DOBOSCHINSKI, IWES Fraunhofer

• 17PESGM2895, DERs are Changing the Landscape and Here is What We Still Need to Figure Out
D. LEW, GE

• 17PESGM2900, A Future Without Inertia is Closer Than You Think
T. ACKERMAN, Energynautics

• 17PESGM2933, Do You Think Our Current Markets Can Handle All the Renewables Coming Down the Pike?
E. ELA, EPRI

• 17PESGM2898, How Does Our Generation and Transmission Planning Need to Evolve?
J. MCCALLEY, Iowa State University

• 17PESGM2902, Has Renewable Energy Arrived Yet?
M. AHLSTROM, Nextera Energy Resources

Energy Storage (super session)

Wednesday, 19 July, 2017, 1:00 PM–5:00 PM
S – Sheraton II
Sponsored by: PES Super Session Chair: H. KAMATH, Electric Power Research Institute

Large-scale utility level energy storage, business cases and applications including peak shaving, reliability enhancement, intentional islanding, and micro-grids. Integration of renewable generation, energy storage, and demand response to achieve competitive energy cost.
Energy storage technologies and long-term environmental considerations.
Mobile energy storage, such as electric cars, and impact on a dynamic distribution grid.
Advancements in energy storage technologies and hybrid storage technologies.

PANELISTS:
• 17PESGM3101, Large-Scale Utility Level Energy Storage, Business Cases, and Applications
  Including Peak Shaving, Reliability Enhancement, Intentional Islanding and Microgrids
  P. DENHOLM, National Renewable Energy Laboratory
• 17PESGM3102, Integration of Renewable Generation, Energy Storage and Demand Response to
  Achieve Competitive Energy Cost
  C. VARTANIAN, MEPPI
• 17PESGM3103, Energy Storage Technologies and Long-Term Environmental Considerations
  B. CHALAMALA, SNL
• 17PESGM3104, Energy Storage Technologies and Long-Term Environmental Considerations (Safety)
  B. CANTOR, TPI Engineering
• 17PESGM3105, Advancements in Energy Storage Technologies and Hybrid Storage Technologies
  V. SRINIVASAN, ANL
• 17PESGM3106, Advancements in Energy Storage Technologies and Hybrid Storage Technologies
  C. LARSEN, Dynapower

Managing Uncertainties in the Future Grid: Evolution of EMS Control Centers –
Synchrophasor Solution (tutorial)
Wednesday, 19 July, 2017, 1:00 PM–5:00 PM  S – Chicago X
Managing the future grid will require creative, innovative solutions. This is because of uncertainties being introduced by the growth of less predictable & reliable renewable generation resources, demand response programs, distributed generation, microgrids, potential cyber-security issues and the aging infrastructure. Energy Management Systems (EMS) have been deployed for decades at utility control centers to manage the electricity grid in real-time. Today these EMS capabilities are poised to be enhanced quite dramatically with growth of synchrophasor PMU measurements. Solutions to decentralize management of the grid are also being introduced – these include distribution management systems, substation automation and advances in grid control devices. These new solutions will help us manage the uncertainties and challenges of the future smart grid.

This presentation will describe:
The history and evolution of the EMS from its digital genesis in the 1970’s.
The primary functions of a modern EMS
Emerging new industry drivers & emerging new technology trends
Impact of growth of microgrids, renewables and distributed generation on the EMS
Growth of Phasor Measurement Units (PMUs) and synchrophasor measurements worldwide
Wide area monitoring (WAMS) and wide area control (WAMPAC) solutions
Modern advanced fast-acting grid control devices
Concluding thoughts on the challenges and opportunities to manage the future grid

Student Job Fair (panel)
Wednesday, 19 July, 2017, 1:30 PM–3:00 PM  S – Chicago VI+VII

Industry Experiences in Dynamic-System Operational Monitoring and Control Using PMUs (panel)
Wednesday, 19 July, 2017, 2:00 PM–5:00 PM  G – 226 Multifunction Room
Sponsored by: Power System Dynamic Performance
Chair: D. TRUDNOWSKI, Montana Tech

PMUs have considerable potential as a tool for operational monitoring and control. Many utilities are developing and integrating PMU-based applications into their control centers that focus on monitoring and control of the dynamic stability of the system. This includes a focus on transient, oscillatory, and voltage stability applications. Other applications are focusing on using PMUs directly in grid-stabilizing feedback controls. This panel will focus on utility industry experiences with these new applications.
Integration of Distribution Systems, Data Assimilation, and Advanced Modelling into On-Line DSA (panel)

Wednesday, 19 July, 2017, 2:00 PM–5:00 PM  S – Tennessee
Sponsored by:  Power System Dynamic Performance
Chair:  C. VOURNAS, National Technical University of Athens, Greece

Dynamic Security Assessment is rapidly extending to include distribution system contribution to dynamic security, the assimilation of data sets, and various forms of advanced modelling including stability issues of power converters. The session will highlight the contribution of above concepts in theory, as well as in practical applications.

PANELISTS:

• 17PESGM2510, Improved Static Load Modeling from Synchrophasor Data for Real-Time Contingency Analysis and Voltage Stability Assessment Studies
  M. PATEL, EPRI

• 17PESGM2507, End-to-End Computational Improvement for Dynamic Security Assessment
  Z. HUANG, PNNL

• 17PESGM2512, Time Domain Simulation in Control Centers – the Current Status, Trends, and Challenges
  X. LIN, PowerTech

• 17PESGM2511, Three-Phase Transient Stability Simulator for Combined Transmission-Distribution DSA
  A. FLUECK, IIT

• 17PESGM2508, Instability of Voltage Source Converters in Weak AC Grid Conditions: A Case Study
  T. VAN CUTSEM, University of Liege

• 17PESGM2509, A Semi-Analytical Framework for Faster Deterministic and Stochastic Power System Simulations
  K. SUN, University of Tennessee

• 17PESGM2943, Reduced Model of a Wind Generation Transmission System Using Synchrophasor Data
  R. MCCANN, University of Arkansas

• 17PESGM2514, Positive Experience in Coupling Comprehensive Dynamic Models with State Estimation Output
  D. FALCAO, Federal University of Rio de Janeiro

Transactions Paper Session 06 (transactions paper)

Wednesday, 19 July, 2017, 3:00 PM–5:00 PM  G – 304 Tiered Classroom
Sponsored by:  Analytic Methods for Power Systems
Chair:  C. DEMARCO, University of Wisconsin-Madison

PAPERS AND AUTHORS:

• 17PESGM0150, Power Divider  [Transaction Number: TPWRS-01389-2015]
  C. CHEN, University of British Columbia
  S. DHOPLE, University of Minnesota (Twin Cities)

• 17PESGM0282, Analytical Expressions for Joint Distributions in Probabilistic Load Flow  [Transaction Number: 10.1109/TPWRS.2016.2612881]
  Z. WANG, Tsinghua University
  C. SHEN, Tsinghua University
Wednesday Afternoon, continued

Transactions Paper Session 9: Energy Storage & Battery Transaction Papers
(transactions paper)

Wednesday, 19 July, 2017, 3:00 PM–5:00 PM G – 308 Tiered Classroom
Sponsored by: Energy Storage & Stationary Battery Committee and Stationary Battery Committee
Chairs: C. ASHTON, Centurylink C. SEARLES, BAE Batteries USA

PAPERS AND AUTHORS:

• 17PESGM0221, Optimal Storage Scheduling Using Markov Decision Processes [Transaction Number: TSTE-00294-2015]
  S. GRILLO, Politecnico di Milano
  A. PIEVATOLO, CNR
  E. TIRONI, Politecnico di Milano

• 17PESGM0257, Optimal Operation of Energy Storage Systems Considering Forecasts and Battery Degradation [Transaction Number: http://dx.doi.org/10.1109/TSG.2016.2606490]
  K. ABDULLA, University of Melbourne
  J. DE HOOG, University of Melbourne
  V. M UENZEL, Reelectrify
  F. SUITS, IBM Research
Wednesday Afternoon, continued

- 17PESGM0314, Frequency Dynamics Constrained Unit Commitment With Battery Energy Storage
  [Transaction Number: TPWRS-01345-2015]
  K. STEER, University of Melbourne
  A. WIRTH, University of Melbourne
  S. HALGAMUGE, The Australian National University
  Y. WEN, Chongqing University
  W. LI, Chongqing University
  G. HUANG, Zhejiang University
  X. LIU, Illinois Institute of Technology

- 17PESGM0355, Optimization of Charge/Discharge Rates of a Battery Using a Two Stage Rate-Limit Control
  [Transaction Number: 07565651]
  Y. WEN, Chongqing University
  W. LI, Chongqing University
  G. HUANG, Zhejiang University
  X. LIU, Illinois Institute of Technology

- 17PESGM0358, DC Grid Voltage Regulation Using New HESS Control Strategy
  [Transaction Number: 07604123]
  S. KOLLIMALLA, Nanyang Technological University, Singapore
  A. UKIL, Nanyang Technological University, Singapore
  G. HOAY BENG, Nanyang Technological University, Singapore
  N. TUMMURU, IIT Mandi

- 17PESGM0413, Modeling of Lithium-Ion Battery Degradation for Cell Life Assessment
  [Transaction Number: 10.1109/TSG.2016.2578950]
  B. XU, University of Washington
  A. OUDALOV, ABB Switzerland Ltd.
  A. UKIL, Nanyang Technological University, Singapore
  G. ANDERSSON, ETH Zurich
  D. KIRSCHEN, University of Washington

- 17PESGM0448, Improving AGC Performance of Coal-Fueled Thermal Generators Using Multi-MW Scale BESS: A Practical Application
  [Transaction Number: TSG-00460-2016]
  X. XIE, Tsinghua University
  Y. GUO, Shijingshan Thermal Power Plant
  Y. DONG, Tsinghua University
  L. MOU, Ray Power Systems Co., Ltd.
  F. XUE, Ray Power Systems Co., Ltd.

- 17PESGM0608, Ensuring Profitability of Energy Storage
  [Transaction Number: 07464891]
  M. BRENNA, Politecnico di Milano
  F. FOIADELLI, Politecnico di Milano
  M. LONGO, Politecnico di Milano
  D. ZANINELLI, Politecnico di Milano

Data Sciences Education and Research in Power Systems (panel)

Wednesday, 19 July, 2017, 3:00 PM–5:00 PM        G – 203 Executive Meeting Room

Sponsored by:             Power & Energy Education
Chair:                           L. XIE, Texas A&M University

This panel focuses on discussing modern data sciences approaches and their applications in power systems in various domains. We explore a holistic view of data science that addresses exploratory data analysis, confirmatory data analysis and predictive data analysis. The panelists are experts in data science for power systems, having developed research, products and academic courses in the area.

The goals for the panel are: (i) bring the power systems community up to date on data science approaches and pressing challenges for its application in power systems including education of future engineers; (ii) provide a forum for the broader engagement of data scientists with the power systems community and (iii) start the development of a curricula for data sciences in power systems.
Challenges, Opportunities, and Approaches for Integrating Demand Response in Markets and Distribution Systems  (panel)

Wednesday, 19 July, 2017, 3:00 PM–5:00 PM        G – 300 Tiered Classroom

Sponsored by:             Power System Operation, Planning & Economics

Chairs:                         J. PRICE, California ISO
                               H. ZHONG, Tsinghua University

Demand response (DR) can contribute to stability and reliability to manage intermittency and uncertainty from renewable generation. Whereas conventional DR can compromise comfort by shifting loads, integrated DR improves resource flexibility (PV, energy storage, EV, etc.) while maintaining consumers’ utility, by coordinating electricity and natural gas with distributed energy resources (DER). Coordinated energy hubs can reduce peak loads and costs, thus enhancing system security and economy. However, experience highlights issues affecting DR-DER performance and participation. Aggregating smaller customers is necessary commercially but must allow market operators to manage congestion. Synergy with storage can use the same market designs reflecting participants’ costs, providing comparable opportunities but reflecting differences from generators. DR can provide dispatchable energy, reserves, and resource adequacy, all of which affect market settlements. This panel presents R&D results on optimization and control for large-scale integration, lessons learned on technical challenges and market mechanisms, and future research directions.

PANELISTS:
• 17PESGM0775, Introduction: ISO Perspective on Integrating Demand Response
  J. PRICE, California ISO
• 17PESGM0776, Challenges and Opportunities in Developing Demand Response in Organized Markets
  A. PAPALEXOPOULOS, ECCO International
• 17PESGM0777, Challenges and Opportunities in Developing Demand Response in Organized Markets
  F. RAHIMI, Open Access Technology International, Inc. (OATI)
• 17PESGM0778, Control of Loads for Power System Ancillary Services
  G. ANDERSSON, Eidgenossische Technische Hochschule (ETH)
• 17PESGM0779, Demand Response: Balancing the Needs of the Distribution and Transmission Networks
  D. KIRSCHEN, University of Washington
• 17PESGM0780, Theoretical Framework for Integrating Distributed Energy Resources into Distribution Systems
  J. LIAN, Pacific Northwest National Laboratory
  D. WU, Pacific Northwest National Laboratory
  H. CHEN, The Ohio State University
  K. KALSI, Pacific Northwest National Laboratory

Flexibility: How Can Systems Ensure the Right Type and Quantity?  (panel)

Wednesday, 19 July, 2017, 3:00 PM–5:00 PM        G – 400 Tiered Classroom

Sponsored by:             Power System Operation, Planning & Economics

Chairs:                         E. LANNOYE, EPRI International
                               A. BOTTERUD, Argonne National Lab

This session will focus on the different approaches to ensuring sufficient flexibility being adopted around the world in light of increasing variable renewable energy. Different mechanisms have been proposed and are in the process of implementation to incentivize available flexible resources and emerging energy storage and demand response technologies, to be available when needed for ramping. The discussion will focus on comparing the drivers for each approach and provide some insight into the resulting response.
Flicker Standards – Applications and Advancements  (panel)  
Wednesday, 19 July, 2017, 3:00 PM–4:00 PM  G – 206 Tiered Classroom
Sponsored by:  Transmission and Distribution
Chair:  H. SHARMA, Southern Co.

Voltage fluctuations/flicker continue to be an issue for utility industry with the introduction of new lighting technologies along with the increased penetration of new flicker sources such as variable generation including wind and solar along with conventional flicker sources such as electric arc furnaces. This panel session will provide practical applications of the latest flicker standard IEEE Standard P1543. Real world case studies demonstrating various flicker sources and the impact of changes in system configuration will be presented. Software tools that have been developed for easy application of flicker standards for real world applications will also be presented. Then, the latest research that is being performed with regards to flicker performance of LED drivers will be presented. Finally, few improvement areas in flicker standards such as rapid voltage changes (RVCs) have been identified and the same will be addressed using real world utility scale solar plant as an example.

Integration of (VSC) HVDC in Existing Power Systems  (panel)  
Wednesday, 19 July, 2017, 3:00 PM–4:00 PM  G – 408 Tiered Classroom
Sponsored by:  Transmission and Distribution
Chairs:  D. VAN HERTEM, KU Leuven
S. TEEUWSEN, Siemens

VSC HVDC has received much attention from the industry, and the experience of the technology is rapidly increasing. During this panel, a number of realistic projects will be used to show the particular advantages of the technology over alternative options (LCC HVDC and AC technology). The focus is on how the advanced functionality was detrimental when determining the technology. This panel is organized by the working groups 15.05.19 and 15.05.18.

PANELISTS:
- 17PESGM2958, Multi-Infeed Problems at Jeju HVDC #3  
  K. HUR, Yonsei University
- 17PESGM2959, Challenges in Tapping an Existing LCC-HVDC with VSCs – Multi-Terminal/Multi-Infeed Aspects  
  H. SURYAARACHCHI, TransGrid Solutions Inc.
- 17PESGM2960, Expanding COBRAcable with a Wind Power Plant: Technical Feasibility and Ancillary Service Assessment  
  J. RUIEDA TORRES, Delft University of Technology, Netherlands
- 17PESGM2961, Power System with VSC-HVDC Interconnection – Frequency Stability Control Strategy  
  L. CAI, Global Energy Interconnection Research Institute (GEIRI) Europe GmbH
Wednesday Afternoon, continued

Transactions Paper Session 27 (transactions paper)
Wednesday, 19 July, 2017, 3:00 PM–5:00 PM G – 306 Tiered Classroom
Sponsored by: Transmission and Distribution
Chair: S. SANTOSO, University of Texas Austin

PAPERS AND AUTHORS:

- **17PESGM0111, Voltage Control in PV-Rich LV Networks Without Remote Monitoring** [Transaction Number: TPWRS.2016.2591063]
  A. PROCOPIOU, University of Manchester
  L. OCHOA, University of Melbourne

- **17PESGM0271, Detection and Classification of Transmission Line Faults Based on Unsupervised Feature Learning and Convolutional Sparse Autoencoder** [Transaction Number: TSG2598881]
  K. CHEN, Tsinghua University
  J. HU, Tsinghua University
  J. HE, Tsinghua University

- **17PESGM0294, Nonlinear Magnetic Equivalent Circuit-Based Real-Time Sen Transformer Electromagnetic Transient Model on FPGA for HIL Emulation** [Transaction Number: TPWRD-00749-2015]
  J. LIU, University of Alberta
  V. DINAVAH, University of Alberta

- **17PESGM0307, Rapid Frequency Response from Smart Loads in Great Britain Power System** [Transaction Number: 10.1109/TSG.2016.2517409]
  D. CHAKRAVORTY, Imperial College London
  B. CHAUDHURI, Imperial College London
  S. HUI, Imperial College London

- **17PESGM0443, Coordinated Economic Dispatch of Coupled Transmission and Distribution Systems using Heterogeneous Decomposition** [Transaction Number: TPWRS-01014-2015]
  Z. LI, Tsinghua-Berkeley Shenzhen Institute (TBSI)
  Q. GUO, Tsinghua University
  H. SUN, Tsinghua University
  J. WANG, Argonne National Laboratory

- **17PESGM0449, A New LMP-Sensitivity-Based Heterogeneous Decomposition for Transmission and Distribution Coordinated Economic Dispatch** [Transaction Number: TSG-00105-2016]
  Z. LI, Tsinghua-Berkeley Shenzhen Institute (TBSI)
  Q. GUO, Tsinghua University
  H. SUN, Tsinghua University
  J. WANG, Argonne National Laboratory

- **17PESGM0451, Coordinated Transmission and Distribution AC Optimal Power Flow** [Transaction Number: TSG-01490-2015]
  Z. LI, Tsinghua-Berkeley Shenzhen Institute (TBSI)
  Q. GUO, Tsinghua University
  H. SUN, Tsinghua University
  J. WANG, Argonne National Laboratory

- **17PESGM0524, A Novel Hybrid-arm Bipolar MMC Topology with DC Fault Ride-Through Capability** [Transaction Number: TPWRD-00040-2016]
  X. YU, Tsinghua University
  Y. WEI, Tsinghua University
  Q. JIANG, Tsinghua University
  X. XIE, Tsinghua University
  Y. LIU, Guangzhou Power Supply Co. Ltd.
  K. WANG, Guangzhou Power Supply Co. Ltd.

- **17PESGM0610, Cable Surge Arrester Operation Due to Transient Overvoltages Under DC-Side Faults in the MMC-HVDC Link** [Transaction Number: DOI: 10.1109/TPWRD.2015.2477493]
  F. BADRKHANI AJAEI, University of Western Ontario
  R. IRAVANI, University of Toronto

- **17PESGM0733, Analysis of Non-Characteristic Harmonics Generated by Voltage-Source Converters Operating Under Unbalanced Voltage** [Transaction Number: 10.1109/TPWRD.2016.2593884 (paper number: TPWRD-01790-2015; acceptance date: July 9th, 2016)]
  C. NASCIMENTO, Universidade Federal de Sao Carlos
  E. WATANABE, Universidade Federal do Rio de Janeiro
  O. DIENE, Universidade Federal do Rio de Janeiro
  A. DIETRICH, Universidade Federal do ABC
  A. GOEDTEL, Universidade Tecnologica Federal do Parana
  J. GYSELINCK, Universite Libre de Bruxelles
  R. DIAS, Universidade Federal do Rio de Janeiro
Wednesday Evening – Thursday Morning

Wednesday Evening

Joint Reception Hosted by PES Women in Power & Young Professionals (reception)

Wednesday, 19 July, 2017, 6:00 PM–7:30 PM        Sheraton Grand Hotel / S – Michigan B

PES’ Women in Power & Young Professionals groups invite you to a reception on Wednesday evening. This is an opportunity for all conference attendees, in particular, women, current students and engineers that have graduated within the last ten years to network, meet officers of IEEE PES, and to make contacts among their peers in the Power & Energy community. Find out how you can contribute to PES and how it can help you.

Thursday Morning

Attendee Breakfast (breakfast)

Thursday, 20 July, 2017, 6:30 AM–8:30 AM           S – Riverwalk AB

Presenter Breakfast (breakfast)

Thursday, 20 July, 2017, 6:30 AM–8:30 AM           S – Chicago VI+VII

Advancing Distribution System Modeling Tools for PV Integration (panel)

Thursday, 20 July, 2017, 8:00 AM–10:00 AM         G – 226 Multifunction Room

Sponsored by: (AMPS) Distribution System Analysis
Chairs: M. CODDINGTON, NREL
        G. SHIREK, Milsoft Utility Solutions

Leading vendors and model developers will present software advancements in regards to modeling and addressing distribution systems with both existing PV and potentially large amounts of future PV. Distribution system hosting capacity, availability and accuracy of new data with new integration services, working towards automation of PV Interconnection Studies, and advancements in Quasi-static Time Series Simulations will be presented.

PANELISTS:
• 17PESGM2732, Data Availability and Accuracy to Improve PV Studies
  G. SHIREK, Milsoft Utility Solutions
• 17PESGM2730, Software Automated Approaches to Finding Hosting Capacity
  L. TRUSSELL, DNVGL
• 17PESGM2733, DEW-ISM Implementation at PEPCO: A Model and Data Driven Approach to Automating PV Interconnection Studies
  J. BANK, EDD
• 17PESGM2731, To Move Beyond Quasistatic Time Series Simulation
  J. FULLER, Pacific Northwest National Laboratory

Intelligent Systems for Voltage Control in Smart Grids (panel)

Thursday, 20 July, 2017, 8:00 AM–10:00 AM         G – 204 Tiered Classroom

Sponsored by: (AMPS) Intelligent Systems
Chair: G. K. VENAYAGAMOORTHY, Clemson University

This panel will address the growing challenges in voltage control and reactive power management in smart grids. Renewable energies such as wind power and solar PV systems impact the voltage profiles of the power system, both at the transmission and distribution systems. The dynamics is complex and intelligent systems are required to model and control such systems. This panel will provide applications of intelligent systems to better monitor, model and control voltage and reactive power in smart grids.

PANELISTS:
• 17PESGM2625, Heuristic Optimization for Smart Wind Farm Voltage and Var Management
  J. ERLICH, University of Duisburg-Essen
• 17PESGM2626, Computational Intelligence in Voltage and Reactive Power Control
  G. VENAYAGAMOORTHY, Clemson University
Thursday Morning, continued

- 17PESGM2623, Artificial Neural Network Control to Enhance Voltage Reliability and Power Quality of Islanded Microgrid
  S. LI, University of Alabama
- 17PESGM2628, Autonomous Grid-Edge Voltage Control – A New Paradigm for the Future Grid
  D. DIVAN, Georgia Institute of Technology
- 17PESGM2627, Dependable Evolutionary Computation for On-Line Operational Planning and Control in Power and Energy Systems
  Y. FUKUYAMA, Fuji Electric Co., Ltd.
- 17PESGM2624, On-Line Optimal Voltage Control for PJM System
  J. TONG, PJM
- 17PESGM2696, A Centralized Voltage Control Using Sic-Type D-STATCOM for Distribution Networks with High Penetration PV
  C. NAKAZAWA, Fuji Electric Co., Ltd.

Paper Forum 09 (paper forum)
Thursday, 20 July, 2017, 8:00 AM–12:00 PM   S – Sheraton I
Sponsored by: Admin
Chair: A. DUBEY, Washington State University

PAPERS AND AUTHORS:
- 17PESGM0258, Harmonic Impact of the Large-Scale Conversion of Public Lighting
  A. NASSIF, ATCO Electric
  P. GAO, University of Alberta
  R. TORQUATO, UNICAMP
  W. XU, University of Alberta
- 17PESGM0295, A Nonparametric Denoising Approach for Thevenin Equivalent Parameters Estimation Based on Taut-String-Multiresolution Algorithm
  S. SHEN, Zhejiang University
  H. WANG, Zhejiang University
  P. HU, Zhejiang University
  B. HE, Zhejiang University
  Y. LIU, The University of Tennessee
  C. GAN, The University of Tennessee
- 17PESGM0372, Volt/Var Control in Distribution Networks with High Penetration of PV Considering Inverter Utilization
  A. ALKUHAYLI, North Carolina State University
  F. HAFIZ, North Carolina State University
  I. HUSAIN, North Carolina State University
- 17PESGM0418, Spectral Interpolation for Frequency Measurement at Off-Nominal Frequencies
  C. QIAN, Texas A&M University
  M. KEZUNOVIC, Texas A&M University
- 17PESGM0483, Simulation of Integrated Volt/VAR Control for PV Penetration Studies
  D. LI, NC State University
  D. LUBKEMAN, NC State University
- 17PESGM0633, Electromagnetic Transient Simulation of CIGRE DC Grid Test System with Hybrid Converter Topologies
  Z. SHEN, University of Alberta
  N. LIN, University of Alberta
  V. DINAWAHI, University of Alberta
- 17PESGM0699, Installation, System-level Control Strategy and Commissioning of the Nanjing UPFC Project
  X. YANG, State Grid Jiangsu Electric Power Company
  H. CAI, State Grid Jiangsu Economic Research Institute
  W. WANG, State Grid Jiangsu Electric Power Company
  P. SONG, Zhejiang University
  Z. XU, Zhejiang University
- 17PESGM0853, Impact of High Frequency Conducted Voltage Disturbances on LED Driver Circuits
  G. SINGH, Clemson University
  S. RONNBERG, Lulea University of Technology
  E. LARSSON, Lulea University of Technology
  E. COLLINS JR., Clemson University
  M. BOLLEN, Lulea University of Technology
- 17PESGM0859, Case Study: Applying IEEE Std. 519-2014 for Harmonic Distortion Analysis of a 180 MW Solar Farm
  K. DARTAWAN, Pterra Consulting
  A. NAJAFABADI, Pterra Consulting

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• 17PESGM0893, Application of Three-Wire Bipole Structure in MTDC and DC Grids for Conversion of AC Lines to DC Lines
  F. XU, State Grid Zhejiang Electric Power Research Institute
  Y. LU, State Grid Zhejiang Electric Power Research Institute
  P. QIU, State Grid Zhejiang Electric Power Research Institute
  X. XUAN, State Grid Zhejiang Electric Power Research Institute
  X. HUANG, State Grid Zhejiang Electric Power Research Institute
  H. YU, State Grid Zhejiang Electric Power Research Institute
  D. JIANG, Zhejiang University

• 17PESGM1099, Analysis of Voltage Notching in a Low Voltage Industrial Network During the Operation of a Six-Pulse AC/DC Converter
  D. MATVOZ, Milan Vidmar Electric Power Research Institute
  M. MAKSCI, Milan Vidmar Electric Power Research Institute

• 17PESGM1155, A Novel Dynamic Phasor Based Interface Models for Hybrid Simulations of EMT and Transient stability Models
  D. SHU, Tsinghua University
  H. YANG, Nanchang University
  X. XIE, Tsinghua University
  X. YE, Tsinghua University
  S. YU, Tsinghua University
  G. JIANG, Tsinghua University

• 17PESGM1196, Power Sharing in a Hybrid Microgrid with Bidirectional Switch
  A. DATTA, Curtin University
  A. GHOSH, Curtin University
  S. RAJAKARUNA, Curtin University

• 17PESGM1344, An FIR Filtering Technique to Enhance Performance of Single-Phase PLLs Under Adverse Grid Conditions
  S. GOLESTAN, Aalborg University
  J. GUERRERO, Aalborg University
  J. VASQUEZ, Aalborg University

• 17PESGM1589, A Comprehensive Study of Geomagnetic Disturbance (GMD) System Impact
  S. ADHIKARI, EnerNex LLC
  J. WALLING, Walling Energy Systems Consulting
  D. MUELLER, EnerNex LLC
  A. J. O'LAUGHLIN, United Illuminating Company

• 17PESGM1655, Real vs. Simulated Voltage Phasor Measurements
  J. OPARA, Lawrence Berkeley National Laboratory
  C. ROBERTS, Lawrence Berkeley National Laboratory
  E. STEWART, Lawrence Berkeley National Laboratory

• 17PESGM1959, A Hybrid Approach for Detection and Classification of Power Quality Disturbances
  P. CHANG, National Chung Cheng University
  G. CHANG, National Chung Cheng University
  Y. CHEN, National Chung Cheng University
  Y. HONG, pesgm2017@mirasmart.com
  Y. YEH, pesgm2017@mirasmart.com

• 17PESGM2004, Performance Enhancement of Pre-Filtered Multiple Delayed Signal Cancellation Based PLL
  S. GUDE, National Tsing Hua University
  C. CHU, National Tsing Hua University

Papers are limited to 2 pages (8.5" x 11")

Paper Forum 10 (paper forum)
Thursday, 20 July, 2017, 8:00 AM–12:00 PM  S – Sheraton V
Sponsored by: Admin
Chairs: A. SCHNEIDER, Retired
        J. FULLER, Pacific Northwest National Laboratory

PAPERS AND AUTHORS:
• 17PESGM0428, A Model Based Estimation for Smart Meter Missing Readings
  D. KODAIRA, Kyungpook National University
  S. HAN, Kyungpook National University
Thursday Morning, continued

- **17PESGM00490, Optimal PV Inverter Dispatch with Reactive Power Constraint in Medium Voltage Distribution System**
  X. NGUYEN, Yokohama National University
  T. TSUJI, Yokohama National University

- **17PESGM0545, Disruptive Event Classification using PMU Data in Distribution Networks**
  I. NIAZAZARI, University of Nevada Reno
  H. LIVANI, University of Nevada Reno

- **17PESGM0951, Voltage Measurements and the Sparsity of Coefficient Matrices in Distribution Systems State Estimation**
  R. SILVA, University of Campinas
  M. ALMEIDA, University of Campinas

- **17PESGM0631, Voltage Regulation for Distribution Systems with Unequal PV Integration in Different Feeders**
  L. WANG, University of Queensland
  R. YAN, University of Queensland
  T. SAHA, University of Queensland

- **17PESGM0654, Three-Phase Optimal Load Flow Model and Algorithm for Active Distribution Networks**
  Y. JU, China Agriculture University
  W. WU, Tsinghua University
  Y. LIN, State Grid
  F. GE, China Agriculture University
  L. YE, China Agriculture University

- **17PESGM0691, A Simplified and Automated Fault-Current Calculation Method Proposed for Grid-Connected Low-Voltage AC Microgrids**
  D. BUI, Chung Yuan Christian University
  S. CHEN, Chung Yuan Christian University
  S. HSU, Chung Yuan Christian University
  K. LIEN, China University of Science and Technology
  T. PHAM, National Chiao Tung University
  Y. CHANG, pesgm2017@mirasmart.com
  Y. LEE, pesgm2017@mirasmart.com
  J. JIANG, pesgm2017@mirasmart.com
  T. PHAM, pesgm2017@mirasmart.com

  P. ARBOLEYA, University of Oviedo
  M. HUERTA, University of Oviedo
  B. MOHAMED, University of Oviedo
  C. GONZALEZ-MORAN, University of Oviedo
  E. DOMINGUEZ, National Politechnic School

- **17PESGM0862, Model-Free Adaptive Controller for VSC in AC/DC Distribution Networks**
  H. LIANG, North China Electric Power University
  C. ZHENG, North China Electric Power University
  P. LI, North China Electric Power University
  Z. LIU, Anxin Power Supply Company
  J. LIANG, Cardiff University

- **17PESGM0949, Resilience-Oriented Distribution System Reconfiguration for Service Restoration Considering Distributed Generation**
  S. YAO, Nanyang Technological University
  T. ZHAO, North China Electric Power University
  P. WANG, Nanyang Technological University
  H. ZHANG, Nanyang Technological University

- **17PESGM1342, Design and Analysis of Solar PV Based Low-Power Low-Voltage DC Microgrid Architectures for Rural Electrification**
  M. HAMZA, LUMS
  M. SHEEROZ, LUMS
  S. FAZAL, LUMS
  M. NASIR, LUMS
  H. KHAN, LUMS

- **17PESGM1436, An Intermittent High-Impedance Fault Identification Method Based on Transient Power Direction Detection and Intermittency Detection**
  F. XU, Shanghai Jiao Tong University
  W. HUANG, Shanghai Jiao Tong University
  L. ZHOU, Shanghai Jiao Tong University
  N. TAI, Shanghai Jiao Tong University
  J. WEN, Anhui Electrical Engineering Company of State Grid
  L. CAO, Anhui Electrical Engineering Company of State Grid
Big Data for Integrated Energy Systems (panel)

Thursday, 20 July, 2017, 8:00 AM–12:00 PM G – 200 Tiered Classroom

Sponsored by: (AMPS) Big Data Analytics
Chairs: G. STRBAC, Imperial College London
B. ZHAOHONG, Xi’an Jiaotong University

This panel session aims to explore big data for efficient energy integration from three perspectives: data theory, data technology, and data utilization.

Information technologies change the energy sector dramatically, both in renewable energy technologies (i.e. wind, solar, storage) and in traditional energy sectors (i.e. utility, oil and gas). Data science has not yet provided tools to overcome all the challenges energy technologies face. The information revolution challenges traditional energy operations and optimizations that work with small data, using largely deterministic tools.

This session brings together energy sector experts, data scientists, and computer scientists. It will explore:

1) How to characterize big data in the energy sector?
2) How does it differ from big data in other industries?
3) How do big data and information technology transform the energy sectors (upstream, horizontal, and downstream)?
4) What new developments in tools and algorithms will transform data understanding, classification, and utilization?
Panelists:

- 17PESGM2653, Integration of Macro Energy Thinking and Big Data Thinking
  Y. XUE, State Grid of China
- 17PESGM2651, Real Time Outage Detection from Utility Big Data
  D. RIEKEN, Aclara Technologies
- 17PESGM2648, Big Data for Integrated Energy System
  S. TINDEMANS, Imperial College London
- 17PESGM2654, Big Data Analysis for Energy Internet
  J. CAO, Tsinghua University
- 17PESGM2652, Research on the Framework and Data Fusion of an Energy Big Data Platform
  G. LI, Xi'an Jiaotong University
- 17PESGM2649, Extracting Value from Smart Grid to Support Peer-to-Peer Energy System
  S. SON, Gachon University
- 17PESGM2650, Understanding and Characterising the Interdependence of Multi-Energy Systems with Big Data
  C. GU, University of Bath

State-of-the-Art of GMD Modeling and Monitoring (panel)

Thursday, 20 July, 2017, 8:00 AM – 12:00 PM
G – 203 Executive Meeting Room
Sponsored by: (AMPS) Transient Analysis and Simulation
Chair: L. MARTI, Hydro One

This session will review the state-of-the-art of tools and simulation techniques related to the analysis and simulation of geomagnetic disturbances (GMD) as they relate to the reliable operation of the high voltage transmission system. Interest and efforts in this area have grown significantly in the past few years, in part, as a response to the introduction of GMD reliability standards in North America. Some of the areas to be covered include earth impedance modelling (e.g., 1D, 3D, coastal effects), transformers, off-the-shelf simulation tools, control room real-time simulation tools. Deployment of traditional monitoring equipment such as GIC and harmonic monitors, as well as utility-grade magnetometers will also be reviewed. Additional topics include the state of space weather prediction, and the testing and validation of tools and models.

Panelists:

- 17PESGM2444, Earth Models
  D. BOTELER, Natural Resources Canada
- 17PESGM2445, 4. Real Time Simulation Tools
  L. MARTI, Hydro One
- 17PESGM2446, Off-the-Shelf Simulation Tools: A User's Perspective
  R. RAMOS, Southern Company
- 17PESGM2447, Transformer Modeling and Testing
  R. HORTON, EPRI
- 17PESGM2448, Modelling Harmonics
  R. WALLING, Wisconsicnt
- 17PESGM2449, GIC and Harmonics Monitoring Equipment
  S. SHELEMY, Manitoba Hydro
- 17PESGM2450, Geomagnetic Field Monitoring Equipment
  J. GANNON, Computational Physiscs Inc.
- 17PESGM2451, Testing and Model Validation
  E. BERNABEU, PJM
- 17PESGM2452, Space Weather Simulation
  A. PULKINEN, NASA

Reliability Modeling and Evaluation of Dependent Cyber-Physical Systems (panel)

Thursday, 20 July, 2017, 8:00 AM – 10:00 AM
S – Sheraton IV
Sponsored by: (AMPS) Reliability and Risk Analysis
Chairs: M. PAPIC, Idaho Power
V. ARAVINTHAN, Wichita State University

The power grid today experiences fundamental transformation that requires new approaches to assess the risks and assure its stable and reliable operation. Interactions between physical and cyber elements of a Cyber-Physical System (CPS) are much more complex than in traditional systems, therefore the methods for assessing the reliability must be reconsidereed. There is a tremendous need for research and development in the area of modeling and assessing the reliability of CPS. The overall goal of this
panel is to present state-of-the-art research and practical applications in the area of modeling and reliability evaluation of cyber-physical systems. Changing the nature of the grid requires continued and elevated engagement in developing proper models and to assure the reliability of power systems in both planning and operational environments. Understanding interactions and dependencies between physical components (lines, transformers, generator, etc) and cyber components (communication links, intelligent electronic devices, control and metering devices, etc.) is essential to develop appropriate reliability models and tools.

PANELISTS:

- **17PESGM2394**, Vulnerability Analysis of a Cyber-Physical Grid with Respect to NERC CIP Standards  
  M. PAPIC, Idaho Power
- **17PESGM2395**, Cyber-Physical Interdependencies and Power Grid Reliability  
  C. SINGH, Texas A&M University
- **17PESGM2396**, Vulnerability Metrics for Cyber-Power Systems  
  C. LIU, Washinton State University
- **17PESGM2393**, Reliability Contribution of ICT Coordinated Distributed Resources  
  S. TINDEMANS, Imperial College London
- **17PESGM2392**, Reliability Consideration in Emerging Cyber-Physical Energy Systems Task Force on Developing a Benchmarking Test System for Cyber-Physical Power Systems Reliability Studies  
  V. ARAWINTHAN, Wichita State University

Transactions Paper Session 07  (transactions paper)

Thursday, 20 July, 2017, 8:00 AM–10:00 AM  
G – 304 Tiered Classroom
Sponsored by: Electric Machinery
Chair: S. PEKAREK, Purdue University

PAPERS AND AUTHORS:

- **17PESGM0078**, A New Stray-Load Loss Formula for Small and Medium Sized Induction Motors  
  [Transaction Number: 10.1109/TEC.2016.2539959]  
  P. PILLAY, Concordia University  
  M. AL-BADRI, Concordia University  
  P. ANGERS, Hydro-Québec  
  C. DESAI, Concordia University
- **17PESGM0094**, Advanced Control Strategies of PMSG-Based Wind Turbines for System Inertia Support  
  [Transaction Number: TPWRS-00535-2016]  
  Y. LI, Hong Kong Polytechnic University  
  Z. XU, Hong Kong Polytechnic University  
  K. WONG, University of Western Australia
- **17PESGM0099**, An Algebraic Algorithm for Motor Voltage Waveform Prediction in Dual-LCI Drives with Interconnected DC-Links  
  [Transaction Number: TEC-00146-2015.R1]  
  A. TESSAROLO, University of Trieste  
  S. CASTELLAN, University of Trieste  
  S. MOHAMADIAN, Iran University of Science and Technology  
  A. SHOULAIE, Iran University of Science and Technology  
  G. FERRARI, NIDEC-ASI
- **17PESGM0324**, Acoustic Noise and Vibration Reduction of SRM by Elimination of Third Harmonic Component in Sum of Radial Forces  
  [Transaction Number: TEC07054530]  
  M. TAKIGUCHI, Tokyo Institute of Technology  
  H. SUGIMOTO, Tokyo Institute of Technology  
  N. KURIHARA, Tokyo Institute of Technology  
  A. CHIBA, Tokyo Institute of Technology
- **17PESGM0337**, Analysis and Design of Hybrid Machines for DC Generation  
  [Transaction Number: TEC-00315-2014]  
  O. LALDIN, Faraday Future, Inc.  
  S. SUDHOFF, Purdue University  
  S. PEKAREK, Purdue University
- **17PESGM0392**, Game-Theoretic Control of Active Loads in DC Microgrids  
  [Transaction Number: TEC-00245-2015]  
  L. FAN, Beijing Jiaotong University  
  V. NASIRIAN, TeraDiode, Inc.  
  H. MODARES, Missouri University of Science and Technology  
  F. LEWIS, University of Texas at Arlington  
  Y. SONG, Chongqing University  
  A. DAVOUDI, University of Texas at Arlington
Thursday Morning, continued

- 17PESGM0461, Incorporating Dynamics in a Mesh-Based Magnetic Equivalent Circuit Model of Synchronous Machines [Transaction Number: TEC-00572-2013]
  R. WANG, Continuous Solutions
  S. PEKAREK, Purdue University
  M. BASH, P.C. Krause and Associates
  A. LARSON, Kohler
  R. VANMAAREN, Kohler

- 17PESGM0639, Analytical Prediction of Torque Ripple in Surface-Mounted Permanent Magnet Motors Due to Manufacturing Variations [Transaction Number: TEC-00088-2016]
  A. PINA ORTEGA, Nexteer Automotive
  L. XU, Ohio State University

- 17PESGM1381, A Nine-Phase 18-Slot 14-Pole Interior Permanent Magnet Machine with Low Space Harmonics for Electric Vehicle Applications [Transaction Number: TEC-00142-2015]
  X. CHEN, University of Sheffield
  J. WANG, University of Sheffield
  V. PATEL, Mitsubishi Hitachi Power Systems Europe, Ltd.
  P. LAZARI, University of Sheffield

- 17PESGM0626, Hardware-in-the-Loop Emulation of Linear Induction Motor Drive for MagLev Application [Transaction Number: 15904475]
  B. JANDAGHI, University of Alberta
  V. DINAWAH, University of Alberta

Ice-Breaking Projects in Electric Power System Engineering (panel)

Thursday, 20 July, 2017, 8:00 AM–11:00 AM S – Sheraton III
Sponsored by: Energy Development and Power Generation
Chairs: U. KERIN, Siemens AG
        A.-K. MARTEN, 50Hertz Transmission GmbH

The world’s growing demand for sustainable energy is the driving force behind many research and development and industrial projects. The world’s tallest building, unmanned offshore oil platforms, floating LNG processing vessels, HVDC multi-terminal power transmission, long-distance AC transmission, FACTS design and installation, integration of dispersed generation, implementation of energy efficiency, and last but not least, power system control have one thing in common: superior electrical engineering. This session presents an overview of the ice-breaking research and development and industrial projects from all over the world, many of them being unique or even world records, and their impact on the trends driving the electric power system engineering development. The session aims at bringing together lead engineers from various disciplines to provide information on cutting-edge engineering techniques and solutions.

PANELISTS:

- 17PESGM2830, App Based Grid Control Framework and Examples for Monitoring and Control of Distribution Systems
  M. STIFTIER, Austrian Institute of Technology

- 17PESGM2915, Enhancing the Vietnamese Power System Stability in the Period of 2015–2020 through Network Development and Use of Modern Control Room Applications
  D. NGUYEN, VietNam Electricity

- 17PESGM3011, +600/-400 Mvar SVC at Ludhiana: Performance Verification by Commissioning Tests and Real Time Simulator Testing
  A. KUMAR, Powergrid Corp. of India Ltd

- 17PESGM3041, Pengarang Cogeneration Plant (PCP) Project of Petronas: The Largest and Most Efficient Cogeneration Plant in Malaysia to Provide Electric Energy to Utility and Electric Energy and Steam to RAPID Complex
  N. ESA, PETRONAS

- 17PESGM3054, Sincro.Grid – PCI Smart Grid Project
  K. DRAGAS, ELES d.o.o.

- 17PESGM3066, Offshore Grids of the Future and Today Realization – Energy Island and Krieger Flak Combined Grid Solution
  A. MARTEN, 50Hertz Transmission GmbH

- 17PESGM3092, Mobile STATCOM – The World’s First Fully Mobile STATCOM as a New Operations, Construction and Rapid Restoration Tool for Dominion Energy
  M. MCVY, Dominion Virginia Power
Protection Challenges in Modern Power Systems: Trends and Educational Aspects (panel)
Thursday, 20 July, 2017, 8:00 AM–10:00 AM     G – 222 Multifunction Room
Sponsored by: Power & Energy Education
Chair: S. LOTFIFARD, WSU

The deployment of smart grid technologies has their advantages and challenges. Examples of such technologies are renewable energy systems such as wind and solar systems, bidirectional communication systems, data acquisition with higher quality using PMUs, among others. Conventional protection schemes are unable to reliably address some of the challenges these technologies present. It is essential that the new generation of power system protection engineers become familiar with the protection challenges and opportunities of modern power systems. In this panel, experts from the power system protection field will discuss the trends in power systems protection and will discuss topics that should be included in power system protection course development at universities both at the graduate and undergraduate levels.

PANELISTS:
• 17PESGM2595, Emerging Technologies for Integrated Protection, Control and Cyber Security
  S. MELIOPOULOS, Georgia Tech
• 17PESGM2597, The Role of Hand-On Experience with Modeling, Simulation and Large Scale Testbeds in Education and Training of Future Protection Engineers
  M. KEZUNOVIC, Texas A&M University
• 17PESGM2593, Demonstrating the Need of Interdisciplinary Background for Advanced Protection Applications
  S. BRAHMA, New Mexico State University
• 17PESGM2594, What are the Building Blocks to Allow Position Future Protection to Adapt to and Master Future Challenges?
  B. JOHNSON, University of Idaho
• 17PESGM2596, Protective Relay Response: Security vs. Dependability
  S. LOTFIFARD, WSU

Facilitating Energy Storage Integration into Electricity Markets (panel)
Thursday, 20 July, 2017, 8:00 AM–10:00 AM     G – 206 Tiered Classroom
Sponsored by: Power System Operation, Planning & Economics
Chairs: M. MARWALI, New York ISO
       C. NGUYEN, GE Energy Connections

With large increases in variable energy resources to meet ambitious clean energy goals in states such as New York, California, and Massachusetts, a significant amount of flexible, dispatchable resources will be needed to maintain system reliability. To meet this need, additional energy storage may enter the grid through policy mandates or market incentives. This session with a mix of Industry, ISO/RTO, and research institution panelists with first-hand experience in energy storage will focus on the latest technologies and market developments that can enable energy storage resources to support electric system reliability and increase system efficiency.

PANELISTS:
• 17PESGM2363, Development, Scheduling, and Pricing of Energy Storage Resources in NYISO Market
  C. NGUYEN, New York Independent System Operator
• 17PESGM2364, The Impact of Battery Degradation on Energy Storage Operation and Economics
  A. BOTTERUD, Argone National Lab
• 17PESGM2365, Multiple Applications of Storage for Full Realization of Benefits
  D. NOVOSOEL, Quanta Technology
• 17PESGM2366, Overview of California ISO Market Technology Improvements to Support Greater Participation of Flexible Resources
  K. ABDUL-RAHMAN, CA-ISO
• 17PESGM2367, Frequency Regulation by Distributed Control of Batteries in Electric Vehicles
  M. SHAHIDEPOUR, Illinois Institute of Technology

Distribution Planning Under Uncertainties (panel)
Thursday, 20 July, 2017, 8:00 AM–10:00 AM     S – Arkansas
Sponsored by: Power System Operation, Planning & Economics
Chairs: G. SIMARDO, S.I.M.A.R.D. SG
       N. HADJSAID, grenoble-inp
The modern electric Distribution system is going through major changes and planning practices have to adapt. On one hand, DER (generation, storage) and new loads (EVs, Smart appliances…) are more and more connected to the distribution network while associated with an increasing use of Demand Response. On the other hand, new data is more and more available from different sources and sensors. Uncertainties of the available generation and of the new loads and the analysis of the new available data bring new challenges to distribution planners who have to deal with a new dynamic while designing the distribution system.

PANELISTS:
- **17PESGM2530**, Emergent Needs, Challenges and Tools for Planning of Smart Distribution Systems
  J. AGUERO, Quanta Technology
- **17PESGM2531**, Challenges and Solutions for Planning with Active Distribution Systems
  J. SMITH, EPRI
- **17PESGM2532**, Planning of Distribution Grids under Uncertainties
  P. MALLET, ENEDIS
- **17PESGM2533**, New Architectures for Smart Distribution
  M. DE NIGRIS, RSE Italy

International Practices in Power System Planning: Processes, Methods and Techniques (panel)

Thursday, 20 July, 2017, 8:00 AM–10:00 AM   S – Ohio
Sponsored By: Power System Operation, Planning & Economics
Chairs: M. NI, NARI Technology
P. ZENG, China EPRI

The power systems around the world are facing the same challenges, as well as some special issues in their own systems. For example, integrating large amount of renewable resources in the power system is a common challenge faced by many countries, but the solutions are different. Some countries mainly use the local integration method, which requires a strong and smart distribution system. And some apply the method of large amount centralized integration. Therefore, different planning processes, methods and techniques will be used. The purpose of this panel is to invite experts and practitioners around the world to share and exchange practices and techniques in this important field with a view to promote best practices in power system planning.

PANELISTS:
- **17PESGM2945**, 3. USA Eastern Interconnection Planning, Practice and Experience
  D. OSBORN, Midcontinent ISO
- **17PESGM2947**, 2. Power System Planning Practice in Japan
  Y. UMAHASHI, Tokyo Electric Power Co.
- **17PESGM2948**, 4. Metropolitan Smart Grid Planning in Guangzhou: Challenges and Prospectives
  L. GAN, Guangzhou Power Supply Co., Ltd.
- **17PESGM2949**, Planning Practice of an Independent City Power System
  Y. WEI, Xingyi City Electric Power Company
- **17PESGM3080**, PowerNetwork Planning for Integrating High Penetration of Windfarms, a Scottish Power Practices
  P. MOHAPATRA, Scottish Power Energy Networks

Transactions Paper Session 20  (transactions paper)

Thursday, 20 July, 2017, 8:00 AM–10:00 AM   G – 306 Tiered Classroom
Sponsored by: Power System Operation, Planning & Economics
Chair: X. LU, Argonne National Lab

PAPERS AND AUTHORS:
  C. DIAZ, XM S.A. E.S.P.
  M. WEBSTER, Pennsylvania State University
  J. VILLAR, Comillas Pontifical University
  F. CAMPOS, Comillas Pontifical University
- **17PESGM0189**, Synchronous-Based Distributed Secondary Voltage/VAR Control via Cellular Network [Transaction Number: TSG-00084-2016]
  A. BORGHETTI, University of Bologna – Italy
  R. BOTTURA, University of Bologna – Italy
Power distribution systems are evolving rapidly as a consequence of the proliferation of Distributed Energy Resources (DER). The adoption of this technology, particularly of photovoltaic distributed generation, is impacting all aspects of modern distribution engineering and introducing new challenges that need to be addressed holistically, from a variety of perspectives. For instance, application of distribution automation is a key multidisciplinary area that requires not only expertise in related equipment and technologies, but also understanding of protection systems and communications, and evaluation of reliability benefits to developing business cases that justify cost-effective deployment. Traditional techniques used for application of distribution automation in distribution systems need to be revisited and updated before being applied to scenarios that include high penetration of DER. This panel session will explore the implications of the proliferation of DER in key distribution engineering aspects, particularly in distribution automation, switching and overcurrent protection, reliability and voltage engineering.
Thursday Morning, continued

DER Integration and DER Management Systems  (panel)  
Thursday, 20 July, 2017, 8:00 AM–10:00 AM     S – Chicago IX
Sponsored by: Transmission and Distribution  
Chair: Y. AGALGAONKAR, Pacific Northwest National Laboratory

Distribution systems are facing increasingly new economic and technical challenges due to the ever growing proliferation of distributed energy resources (DERs). Utilities are adopting new technologies to integrate DERs effectively. The DER management system (DERMS) is an appealing system to manage various types DERs such as Electrical Vehicles, different distributed generation (DG) technologies, and batteries, etc. DERMS system can be categorized based on their functionality. DERMS functionality can range from demand response to DG integration. DERMS implementation is usually customized, and DERMS applications can vary based on the utility requirements. This panel will discuss DER integration challenges faced by various utilities across the Europe and North America, and how DERMS can help address them. The panel will also discuss different DERMS implementation cases and vendor features. The panel will try to disseminate information and discuss DER integration challenges, utility requirements, DERMS vendor architectures, current DERMS trends and DERMS implementation experience.

PANELISTS:
- 17PESGM3050, Introduction: DER Integration and DERMS  
  Y. AGALGAONKAR, Pacific Northwest National Laboratory
- 17PESGM3052, A DER Enabled ADMS Within the Larger Domain of DERMS  
  E. BOARDMAN, ALSTOM Grid Inc. / GE
- 17PESGM3051, Challenges in Integration of Renewable Energies in Germany  
  I. ERLICH, University of Duisburg-Essen
- 17PESGM3048, DER Integration Challenges  
  A. PAHWA, Kansas State University
- 17PESGM3053, DER Integration Challenges and Solution Options  
  X. FENG, ABB

Extreme Events and Grid Resiliency  (super session)  
Thursday, 20 July, 2017, 8:00 AM–12:00 PM     S – Sheraton II
Sponsored by: PES Super Session  
Chair: J. LIU, PJM Interconnection LLC

Extreme Events and Grid Resiliency
What level of blackout is acceptable under extreme events conditions?
How to respond to a disaster situation?
Coordination of electric and natural gas infrastructure and inter-dependence during an extreme event or a natural disaster.
Substation design for resiliency under storms, earthquake, and other natural disaster conditions.
Advances in understanding and modeling Geomagnetic Disturbances (GMD) and Electromagnetic Pulse (EMP) phenomena, impact assessments, and mitigation.

PANELISTS:
- 17PESGM3069, Power System Resiliency: Technical, Regulatory and Organizational Solutions  
  A. BOSE, Washington State University
- 17PESGM3067, Online DSA Technology and Its Applications in Emergency Operation of Power Systems  
  L. WANG, Powertech Labs, Surrey, BC, Canada
Thursday, 20 July, 2017, 8:00 AM–5:00 PM  

**Distribution Automation/Management Systems and Integration with DERs and Microgrids (tutorial)**

*This course introduces the intuitive concepts, fundamental theories, practical technologies on distribution system modeling, automation management, including the core functionalities and real use cases of the Distribution Automation and Management Systems (DA/DMS) and the advanced applications in Smart Distribution, as well as the integration with Distributed Energy Resources (DERs) and Microgrids. The potential audience would include power system planning/operation engineers, project/product managers, business leaders in power utilities, smart grid solution providers, system developers, research institutes, as well as individual researchers, college students and other individuals working on or interested in the Smart Distribution Solutions. The course will cover the following break-down topics: Overall Framework and Architecture of DA/DMS Systems in Smart Distribution, Distribution System Modeling for automation and management, Static and Dynamic Data for DA/DMS, Advanced Real-time and Analytic Applications in DMS, DMS integration with other systems (OMS, AMI, DRM) in Smart Distribution, Advanced DMS in integration with DERs through DERMS (Distributed Energy Resource Management) and integration with Microgrids, including DERs/Microgrids connection and disconnection to/from the Distribution Grid; and New Trends in ADMS Development.*

**Transmission System – The Interconnected Bulk Electric System**

*Cyber-attack on an Electric Power T&D communications system can have a devastating impact and cause widespread power outages as evident from the Dec 2015 cyber-attack on a Ukrainian Electric Power Distribution System. Securing Electric Power System from cyber-attacks is of national importance and in North America NERC is spearheading the effort in developing and enforcing Critical Infrastructure Protection (CIP) Standards for Bulk Electric System (BES). Local and state regulating agencies are also looking at cybersecurity of the Electric Power Distribution Systems. Substation protection, automation and control systems along with distribution field devices have changed significantly in the past decade. These systems have become more interconnected and provide end users with much more information to allow for higher reliability and greater levels of control. Interoperability between different vendor products and systems has been achieved using open standards. This change in technology has not only brought huge benefits from an operational point of view, it also permits to address cyber security issues similar to other traditional, enterprise systems which have been facing the same industry challenges for years. The tutorial discusses cybersecurity basics including passwords & access management, authentication, encryption, network security monitoring, techniques in cyber alarming, logging, and auditing. The tutorial also covers NERC CIP requirements applicable to T&D systems along with brief overview of IEEE and IEC standards. Cybersecurity implementation examples of substation protection, automation and controls systems including devices inside as well as outside the substations are also discussed. Utility perspective on Cybersecurity and NERC CIP compliance will be included.*
Computing in Optimization – Tales from Methodology Developers, Tool Makers and Users (panel)

Thursday, 20 July, 2017, 10:00 AM–12:00 PM  G – 222 Multifunction Room

Sponsored by: (AMPS) Computer Analytical Methods
Chairs: F. PAN, Pacific Northwest National Laboratory
J. LIN, PJM

New Optimization technologies and computer architectures are essential analytical tools in planning and operating power systems. Recent developments in power systems such as distributed energy resources, demand-side management, and integration of renewables strain these analytical tools to solve larger, more complex and possibly decentralized problems. This panel will present some advances in optimization methodologies, innovation in hardware architectures, and users’ experience and feedback on optimization tools. Through the panel open discussion, the participants will share their visions and discuss possible gaps and potential solutions.

PANELISTS:
• 17PESGM2723, Optimal Power Flow: Relaxations and Online Algorithms
S. LOW, California Institute of Technology

• 17PESGM2724, An Innovative Decomposition and Coordination Approach for Large-Scale Unit Commitment Problems with Combined Cycle Units
P. LUH, University of Connecticut

• 17PESGM2727, Early Optimization Successes with D-Wave Quantum Computers
S. REINHARDT, D-Wave

• 17PESGM2725, Challenges and Potential Solutions toward Large-Scale Power System Optimization Applications for Market Clearing and Economic Planning: GE’s Experiences
J. WAN, Grid Solution, Alstom Grid LLC

• 17PESGM2728, Multi-Faceted Challenging Problems in Advanced Electricity Market Clearing
C. YU, ABB

• 17PESGM2833, Visual Analytics and Decision Making with High-Dimensional Data
K. MUELLER, Stony Brook University – State University of New York

• 17PESGM2832, Prospects for Using Shared-Memory and Distributed-Memory Parallelism to Speed Up the Solution of SCUC MIP Models
E. ROTHBERG, GUROBI Optimization

Intelligent Control Systems for Micro-Grids (panel)

Thursday, 20 July, 2017, 10:00 AM–12:00 PM  S – Arkansas

Sponsored by: (AMPS) Intelligent Systems
Chairs: G. K. VENAYAGAMOORTHY, Clemson University
Z. VALE, Polytechnic of Porto

A microgrid is a small scale, self-supporting power network driven by on-site generation sources with the ability to separate from an external grid for sustainability or energy security purposes. Microgrids integrate modular distributed energy sources, such as wind, solar, and fuel cells, with storage devices and controllable loads to form a low-voltage distribution system. The optimal control of microgrids is a challenging task and requires foresight and insight of the variable sources and sinks including their types. This panel will address advances from the intelligent system community in optimal and sustainable operations of microgrids.

PANELISTS:
• 17PESGM2629, Multi-Player Scalable Operational Optimization in Micro-Grids
Z. VALE, Polytechnic of Porto

• 17PESGM2631, Dynamic Energy Management Systems for a Smart Microgrid
G. VENAYAGAMOORTHY, Clemson University

• 17PESGM2694, Microgrid Control Based on Approximate Dynamic Programming and Artificial Neural Networks
S. LI, University of Alabama

• 17PESGM2630, Multi Agent Based Microgrid Grid Controller for Three Phase Distribution Systems
J. SOLANKI, West Virginia University
Challenges and Solutions of Interfacing Techniques for EMT/TSA Hybrid Simulation (panel)

Thursday, 20 July, 2017, 10:00 AM–12:00 PM    G – 226 Multifunction Room
Sponsored by: (AMPS) Transient Analysis and Simulation
Chair: X. WANG, Carleton University

In recent years power systems have been undergoing significant changes due to wide use of power electronics devices. Electromagnetic transient (EMT) type programs are good at simulating the transients of power electronics devices. At the same time, Transient Stability Analysis (TSA) programs are powerful tools to simulate the interaction between power electronics devices and large power systems. It is a natural way of thinking to develop hybrid simulation techniques which can combine the advantages of both EMT and TSA programs, achieving both a precise and accurate simulation. This panel session will invite experts from some of the major power system simulation tool vendors to discuss the challenges and solutions of hybrid simulation interfacing techniques in industry applications. The objective of the panel is to provide a state-of-the-art description of EMT-TSA hybrid simulation to researchers and engineers.

PANELISTS:
• 17PESGM2607, A Real-Time Simulation Platform Using TSAT and RTDS
  X. LIN, PowerTech
• 17PESGM2608, Example Studies Using Hybrid Simulation
  G. IRWIN, Electranix
• 17PESGM2609, Large-Scale Hybrid Simulation of Electro-Mechanical Transient and Electro-Magnetic Transient
  X. ZHANG, China EPRI
• 17PESGM2610, Challenges of Real-Time Hybrid EMT-TS Simulations for Large-Scale Systems with Power Electronic Devices
  V. JALILI-MARANDI, Opal-RT
• 17PESGM2606, Experiences of Hybrid Simulation on RTDS Real Time Platform
  Y. ZHANG, RTDS

Probabilistic Reliability Assessment for Grid with Increasing Uncertainty from Renewables (panel)

Thursday, 20 July, 2017, 10:00 AM–12:00 PM    S – Sheraton IV
Sponsored by: (AMPS) Reliability and Risk Analysis
Chairs: D. GORINEVSKY, Stanford University
        N. ABDEL-KARIM, NERC

The US power system is undergoing fundamental transformation with increase of variable generation. To maintain reliability of the power system, NERC and ISO/RTO advance its probabilistic assessment. Existing procedures and rules for reliability assessment have evolved and work well for predictable generation. Dealing with the increasingly uncertain generation requires new data driven probabilistic methods using load forecast models, load forecast error data, and historical outage and failure data. Assessing essential reliability services requires collection, modeling, and analysis of new data types, beyond the existing procedures. Regulatory implementation requires that the methods are simple and verifiable. The proposed panel will provide multidimensional view of the analysis methods and requirements that are needed to address the on-going change. The speakers include academic/consultant, NERC, ISO, and utility. The panel will include four individual talks and a short moderated discussion. The presentations will provide cohesive coverage of the subject.

PANELISTS:
• 17PESGM2343, Analytical Tools for Probabilistic Analysis of Grid Reliability
  D. GORINEVSKY, Stanford University
• 17PESGM2342, NERC Approaches to Reliability with Changing Resource Mix
  N. ABDEL-KARIM, NERC
• 17PESGM2345, Economic Implications of the Reliability Index
  E. LITVINOV, ISO New England
• 17PESGM2344, Utility Perspective on Dealing with the Grid Changes
  M. PAPIC, Idaho Power
Incorporating Distributed Energy Resources in the ISO Wholesale Electricity Market (panel)

Thursday, 20 July, 2017, 10:00 AM–12:00 PM     S – Michigan B
Sponsored by: Power System Operation, Planning & Economics
Chairs: T. ZHENG, ISO New England
                          F. F. LI, University of Tennessee

Distributed energy resources, such as solar photovoltaic, combined heat and power, microgrid, wind turbine, energy storage, etc. are experiencing a tremendous growth in recent years. DERs are generally located in the distribution system and categorized as “behind-the-meter” generators. DERs are small, sparsely located in the distribution system, not visible nor directly controlled by the system operator and uncertain in output level. The large penetration of DERs will not only bring benefits, but also challenges. This panel will discuss the following questions:

• What are the roles and benefits of DER for the ISO market?
• What are the control technologies for aggregated DERs, and how are they going to be coordinated with existing controls?
• What are challenges brought by DERs to ISO operations, and how are they going to be dispatched by the ISO?
• What is the viable market mechanism for aggregated DERs to participate in the wholesale electricity market?

PANELISTS:
• 17PESGM2426, Opportunities and Challenges of DER from an RTO’s Perspective
  F. BRESSLER, PJM
• 17PESGM1676, Integrating Distributed Energy Resources into the ISO New England Wholesale Market
  H. YOSHIMURA, ISO New England
• 17PESGM1646, Wholesale Market Design for Distributed Energy Resources
  S. OREN, University of California at Berkeley
• 17PESGM1647, The Operation of Distributed Energy Resources with Markets Participation
  X. WANG, Centrica
• 17PESGM2515, The Economics of Pricing in Non-Convex Power Markets with DER
  R. O’NEILL, FERC

Grid 3.0 Market Transformation (panel)

Thursday, 20 July, 2017, 10:00 AM–12:00 PM     G – 204 Tiered Classroom
Sponsored By: Power System Operation, Planning & Economics
Chair 1: D. SUN, The Glarus Group
                          K. LI, SMUD

The pace of change is accelerating in the power industry. Grid 1.0 interconnected classical utilities till the late 90s. Grid 2.0 brought efficiency through regional operations over the last 20 years. We are now standing on the edge of a transformation to Grid 3.0 with an explosion in the volume and complexity of participants/devices and associated transactions. Essential business functions of Grid 3.0 will leverage, where appropriate, experiences from wholesale markets of Grid 2.0, but also extended to meet broader challenging requirements of Grid 3.0. We need to address critical challenges including traversing different tiers in the top-to-bottom grid and business architecture, and in parallel coordinating with other distributed/aggregated entities. The panel of experts will share their experiences and visions reflecting their diverse perspectives.

PANELISTS:
• 17PESGM2405, Emerging Local Energy Market – A UK Perspective
  X. WANG, Centrica
• 17PESGM2406, Grid 3.0: Economic Platform and Locational Pricing with High DER Penetration
  R. TABORS, TCR
• 17PESGM2407, Grid 3.0: RTO, Meet DSO
  F. BRESSLER, PJM
• 17PESGM2408, Re-Thinking Reliability and Resource Adequacy for an Integrated Decentralized Electric System
  L. KRISTOV, CAISO
• 17PESGM2409, Pricing and Control Coordination Across Multiple Layers in Grid 3.0
  G. ROSENWALD, The Glarus Group
• 17PESGM2410, Grid 3.0: The Power of Customer Aggregation
  J. LEE, Advanced Microgrid Solutions
Multiple energy systems integration is an emerging way of accommodating renewable energy, since the power system, heat system and gas system, are strongly complementary in terms of efficiency, controllability and flexibility among various process such as energy generation, transmission and distribution, conversion, storage, and consumption. New devices are available for the integration of multiple energy systems and information technology associated with these devices. Integrating these energy systems thus has great potential of exploiting the flexibility of energy system to better accommodate renewable energy. So far, researchers have mainly focused on the combined forecasting on energy consumption, coordination of gas and electricity, and thermo-electric coordination. This panel will address this promising and dynamic area, while focusing on the new theoretical insights, innovative forecasting and modeling techniques and practical experiences on using multiple energy systems integration to accommodating intermittent renewable energy.

PANELISTS:

- **17PESGM2482, Energy Systems Integration: A Megatrend or Just Business as Usual?**
  M. O’MALLEY, University College Dublin
- **17PESGM2481, Using Energy System Integration to Increase Grid Flexibility and Increase Renewable Energy Deployments**
  B. KROPOSKI, NREL
- **17PESGM2483, Multi-Energy Virtual Storage for Low Carbon Systems**
  P. MANCARELLA, University of Melbourne
- **17PESGM2484, Clearing and Pricing for Coordinated Gas and Electricity Day-Ahead Markets Considering Wind Power Uncertainty**
  J. WANG, ANL
- **17PESGM2478, Standardized Matrix Modeling of Multiple Energy Systems**
  N. ZHANG, Tsinghua University, China
- **17PESGM3085, Lessons Learned from the Open Data Track of Global Energy Forecasting Competition 2017**
  T. HONG, University of North Carolina Charlotte

Transactions Paper Session 21  (transactions paper)

Thursday, 20 July, 2017, 10:00 AM–12:00 PM  G – 304 Tiered Classroom

Sponsored by:  Power System Operation, Planning & Economics

Chair:  L. CHEN, Tsinghua University

PAPERS AND AUTHORS:

- **17PESGM0338, Optimal Allocation of PMUs in the Presence of Conventional Measurements Considering Contingencies** [Transaction Number: 10.1109/TPWRD.2016.2524658]
  N. MANOUSAKIS, National Technical University of Athens
  G. KORRES, National Technical University of Athens
- **17PESGM0417, Real-Time Contingency Analysis with Corrective Transmission Switching** [Transaction Number: TPWRS-01607-2015]
  X. LI, Arizona State University
  P. BALASUBRAMANIAN, Midcontinent Independent System Operator
  M. SAHRAEI-ARDAKANI, University of Utah
  M. ABDI-KHORSAND, Arizona State University
  K. HEDMAN, Arizona State University
  R. PODMORE, Incremental Systems Corporation
  Y. GUO, Cornell University
  L. TONG, Cornell University
  W. WU, Tsinghua University
  B. ZHANG, Tsinghua University
  H. SUN, Tsinghua University
- **17PESGM1191, Continuous-Time Marginal Pricing of Electricity** [Transaction Number: TPWRS-01846-2015]
  M. PARVANIA, University of Utah
  R. KHATAMI, University of Utah
Thursday Morning, continued

  H. NOSAIR, Iowa State University
  F. BOUFFARD, McGill University

- 17PESGM1555, A New Nested Benders Decomposition Strategy for Parallel Processing Applied to the Hydrothermal Scheduling Problem  [Transaction Number: TSG-01121-2015]
  T. DOS SANTOS, CEPEL – Brazilian Electric Energy Research Center
  A. DINIZ, CEPEL – Brazilian Electric Energy Research Center
  C. BORGES, UFRJ – Federal University of Rio de Janeiro

- 17PESGM1605, A Network Topology Optimization Model Based on Substation and Node-Breaker Modeling  [Transaction Number: TPWRS-00753-2014]
  M. HEIDARIFAR, University of Tehran

- 17PESGM1734, Load Flow Calculation with Voltage Regulators Bidirectional Mode and Distributed Generation  [Transaction Number: 10.1109/TPWRS.2016.2576679]
  J. MASSIGNAN, University of São Paulo
  B. PEREIRA JR, University of São Paulo
  J. LONDON JR, University of São Paulo

- 17PESGM1068, Queuing Analysis Based PEV Load Modeling Considering Battery Charging Behavior and Their Impact on Distribution System Operation  [Transaction Number: TSG.2016.2550219]
  O. HAFEZ, Umm Al-Qura University
  K. BHATTACHARYA, University of Waterloo

Transactions Paper Session 24 (transactions paper)
Thursday, 20 July, 2017, 10:00 AM–12:00 PM  G – 306 Tiered Classroom
Sponsored by: Smart Buildings, Loads & Customer Systems
Chair: A. PRATT, NREL

PAPERS AND AUTHORS:
- 17PESGM0194, C-Vine Copula Mixture Model for Clustering of Residential Electrical Load Pattern Data  [Transaction Number: TPWRS2614366]
  M. SUN, Imperial College London
  I. KONSTANTELOS, Imperial College London
  G. STRBAC, Imperial College London

- 17PESGM0474, Consideration of the Impacts of a Smart Neighborhood Load on Transformer Aging  [Transaction Number: TSG-00552-2015.R2]
  N. PATERAKIS, TÜ/E
  O. ERDINC, Yildiz Technical University
  R. GODINA, INESC TEC and FEUP
  E. RODRIGUES, INESC TEC and FEUP
  J. CATALAO, INESC TEC and FEUP

  O. ERDINC, Yildiz Technical University
  A. TASCIKARAOGLU, Yildiz Technical University
  N. PATERAKIS, TÜ/E
  Y. EREN, Yildiz Technical University
  J. CATALAO, INESC TEC and FEUP

- 17PESGM0629, Decentralized Coordination of a Building Manager and an Electric Vehicle Aggregator  [Transaction Number: TSG-00663-2016]
  J. CONTRERAS-OCAÑA, University of Washington
  M. SARKER, Argonne National Laboratory
  M. ORTEGA-VAZQUEZ, University of Washington

- 17PESGM0889, An Online Optimal Dispatch Schedule for CCHP Microgrids Based on Model Predictive Control  [Transaction Number: TSG.2016.2523504]
  W. GU, Southeast University
  Z. WANG, Southeast University
  Z. WU, Southeast University
  Z. LUO, Southeast University
  Y. TANG, Southeast University
  J. WANG, Southeast University
Thursday Afternoon

On the Importance of Benchmarks to Drive Innovation in Grid Modeling (panel)

Thursday, 20 July, 2017, 1:00 PM–3:00 PM    G – 306 Tiered Classroom
Sponsored by: (AMPS) Computer Analytical Methods
Chairs: J. GROSH, Lawrence Livermore National Laboratory
Z. HUANG, PNNL

In many areas of technology, benchmarks have been used to drive a community view of progress and achievement. In high performance computing, the Top 500 Benchmark is used to highlight and motivate advancements in parallel computing architectures. For power grids, there are no commonly accepted approaches to defining measures of performance for important algorithms and calculations, in particular those at large scale for important problems of interest. Without such benchmarks, research in parallel computing for the electric grid modeling and simulation lacks quantifiable targets for achievement. Therefore, this panel is to discuss the importance of benchmarking for shaping research agenda in the parallel computing for the grid. We will examine benchmarks used in other fields such as fluid dynamics and math libraries, how these are developed, and common pitfalls. Finally, the panel will discuss how the community might develop and deploy benchmarks for use in grid research and commercial use.

PANELISTS:

• 17PESGM2788, On the Importance of Benchmarks to Drive Innovation in Grid Modeling
  J. GROSH, Lawrence Livermore National Laboratory

• 17PESGM2798, The Arpa-E Grid Data Experience – Challenges and Importance of Benchmarks
  T. HEIDEL, ARPA-e, US Department of Energy

• 17PESGM2799, Benchmarking Grid Modernization: Dataset, Model, and Workflow Development
  C. BARROWS, National Renewable Energy Lab

• 17PESGM2800, Toward Distribution Systems Benchmarks: Large Scale Synthetic Data and Rich Scenario Generation
  B. PALMINTIER, National Renewable Energy Laboratory

• 17PESGM2801, How Benchmarks are Used for Multi-Physics Simulations
  R. NEELY, Lawrence Livermore National Laboratory
Resilient Control Systems for Cyber Physical Power and Energy Systems

Thursday, 20 July, 2017, 1:00 PM–3:00 PM
G – 304 Tiered Classroom

Sponsored by: (AMPS) Intelligent Systems
Chairs: G. K. VENAYAGAMOORTHY, Clemson University
M. BEN-IDRIS, University of Nevada, Reno

This panel addresses the design, developments and implementations of resilient control systems for power and energy systems driven by cyber (computer networks and communications) systems. The smart grid is a cyber physical power and energy systems (CPPES). CPPES control systems’ complexity is enormous given its nature of system of systems, multi-time scale requirements, variability, uncertainty, security, platforms for simulation and test beds, and many others. The panel will emphasize on many of these issues.

PANELISTS:
• 17PESGM2622, Cyber-Physical Decentralized Energy Services Platform
  S. GRIJALVA, Georgia Institute of Technology
• 17PESGM2621, Cellular Computational Networks for Resilient Control Systems in Smart Grids
  G. VENAYAGAMOORTHY, Clemson University
• 17PESGM2618, Cyber-Physical System Resilience Testing with an Hybrid Real-Time Simulation Platform
  Z. VALE, Polytechnic of Porto
• 17PESGM2697, A Real-Time Remedial Action Scheme to Harden Cyber-Physical Energy Systems against Catastrophic Failures
  M. BEN-IDRIS, University of Nevada, Reno
• 17PESGM2619, Fault Tolerant Distributed Computing Platform for Resilient Control in Cyber-Power System
  A. SRIVASTAVA, Washington State University
• 17PESGM2620, The Role of Large Scale Testbeds in Achieving Improved Resiliency of Control Systems
  M. KEZUNOVIC, Texas A&M University

Big Data in Power Systems: Transmission, Distribution, and Data Analytic Applications

Thursday, 20 July, 2017, 1:00 PM–5:00 PM
G – 200 Tiered Classroom

Sponsored by: (AMPS) Big Data Analytics
Chair: M. KEZUNOVIC, Texas A&M University
N. YU, University of California, Riverside

The large-scale, heterogeneous, and complex data sets collected by ubiquitous sensor networks have great potential to transform the way we model, monitor and control the electric power system at the bulk transmission level, and at the distribution system with DERs. The challenges, opportunities and success stories of big data applications in electric power system at both transmission and distribution levels will be discussed.

Integrating data tools across different levels of operation, this panel will also focus on analytical approaches and methodologies to integrate, analyze and visualize the spatiotemporal data sets that are available from cyber and physical components of the power networks. This panel will bring together experts to discuss rapidly developing data analytics techniques that can address architectural, computational, and practical challenges in power transmission and distribution networks in presence of the DG high penetration levels.

PANELISTS:
• 17PESGM2883, Automated Data Collection and Fault Location
  T. LAUGHLER, TVA
• 17PESGM2884, Online Data Quality Monitoring: A Spatial-Temporal Approach
  L. XIE, Texas A&M University
• 17PESGM2885, Big Data in Power Systems: Data Analytics Applications
  M. WANG, Rensselaer Polytechnic Institute
• 17PESGM2886, Big Data in Power Systems: Data Analytics Applications
  R. RAJOGOPAL, Stanford University
• 17PESGM2887, Data Analytics to Support Grid Services
  R. SHERICK, Southern California Edison
• 17PESGM2888, Big Data In Distribution Applications
  D. DOUG DORR, EPRI
Modeling, Simulation, and Control of Distributed Energy Resources (panel)

Thursday, 20 July, 2017, 1:00 PM–3:00 PM  
G – 226 Multifunction Room  
Sponsored by:  
(AMPS) Transient Analysis and Simulation

Chairs:  
A. YAZDANI, Purdue University  
D. ALIPRANTIS, Purdue University

The increasing penetration of Distributed Energy Resources (DER) into the power system necessitates an in-depth understanding of their characteristics and ability to adequately model their interaction with the host networks. Such know-how should enable better planning, control, and performance. To this end, this panel will discuss various timely aspects of modeling, simulation, and control of DER, in the context of large-scale utility grids as well as within small-footprint systems (microgrids). The panel will benefit both academic researchers and practicing engineers.

PANELISTS:

• 17PESGM2580, Distributed Control of Microgrids  
A. DAVOUDI, University of Texas at Arlington

• 17PESGM2579, Modeling Techniques for Distributed Inverter Networks in Low-Inertia Power Systems  
B. JOHNSON, National Renewable Energy Laboratory

• 17PESGM2578, Modelling the Dynamic Behaviour of Load Ensembles  
I. HISKENS, University of Michigan

• 17PESGM2577, Multi-Time Scale and Flexible Load Control Strategy for Frequency Stability of Ultra-High Voltage AC/DC Hybrid Grid  
Y. YANG, State Grid Jiangsu Electric Power Research Institute

• 17PESGM2671, Distributed Enforcement of Phase-Cohesiveness for Frequency Control of Islanded Inverter-Based Microgrids  
A. DOMINGUEZ GARCIA, University of Illinois


Thursday, 20 July, 2017, 1:00 PM–3:00 PM  
S – Arkansas

Sponsored by:  
Energy Development and Power Generation

Chairs:  
B. BLYDEN, BBRM Group, LLC  
J. MOMOH, Howard University, Washington, DC

Previous IEEE PES panel sessions on Africa have discussed the strategic importance of the interconnection of electric power systems of regions, states and individual territories as Africa’s economic role is acquiring a visible and growing scale of importance in world economies. Within these analyses, issues of Sustainable Development (SDGs), Rural Electrification, security, infrastructure modernization, new technologies and education have been looked at to suggest practical optimization and implementation strategies. This panel session will address the Role of Natural gas, Renewable Energy Micro Grids, the increasing importance of ICT and aligning with Global R&D. The session presents some results of current studies and new developments in several of these areas.

PANELISTS:

• 17PESGM2326, Challenges and Opportunities for Utility Scale Solar PV in Nigeria  
B. RAWN, Brunel University

B. BLYDEN, BBRM Group, LLC
Thursday Afternoon, continued

- 17PESGM2328, Smart Community Micro Grid Developments – Lessons Learned
  S. MOROZUMI, New Energy and Industrial Technology Development Organization (NEDO)
- 17PESGM2329, Virtual Natural Gas Supply and the Reliability Potential for Industrial Scale Micro Grids
  K. LOSCH, ZHRO
- 17PESGM2330, The Emerging Role of Global Connectivity for 21st Century Development
  G. BOLLES, People Centered Internet (PCI)
- 17PESGM2331, Redefining Sustainable Energy Infrastructure Targets in Africa: A Design Thinking & Needs-Focused Approach to Policy Development
  I. EGWAIKHIDE, SUTERGY
- 17PESGM2332, Comparative Energy Resources Analysis Based on Availability of Resources (Including Water Supply Availability and Demand Considerations), Environmental and Technological Adoption Capabilities for Africa
  T. WOLDEYESUS, Astan Energy
- 17PESGM2333, Challenges and Opportunities for Utility Scale Solar PV in Nigeria
  T. NWACHUKWU, Brunel University, UK

Analysis, Integration and Implementation of Distributed Energy Storage in Power Systems (panel)

Thursday, 20 July, 2017, 1:00 PM–4:00 PM  S – Colorado
Sponsored by: Energy Development and Power Generation
Chair: C. WANG, Wayne State University

Various distributed energy resource technologies have been tested and shown great potential as one of the enabling technologies in grid modernization by accommodating renewable sources, increasing reserve and operating capabilities of the grid, improving system stability and reliability, and lowering cost, as well as deferring system upgrades. Distributed energy resources have shown strong growth in the past couple of years and will continue this growth as more companies have announced plans to significantly increase manufacturing capabilities on storage. However, great challenges remain unresolved in the areas of energy management, system integration, reliability and actual implementation. On this panel, the panelists from industry and academia will discuss the topics on distributed energy resource system aggregation, system integration and market operation, reliability evaluation and enhancement, and actual implementation and operation experiences of distributed energy storage systems in utilities and ISO/RTOs.

PANELISTS:
- 17PESGM2485, Energy Storage for Low-Inertia Power Grid
  P. DU, ERCOT
- 17PESGM2488, Distributed Energy Resources in Microgrid Applications
  B. ZHAO, Zhejiang Electric Power Corporation Research Institute
- 17PESGM2487, The Role of Energy Storage in PJM Electricity Market
  J. LIN, PJM
- 17PESGM2489, Battery Energy Storage Systems – Modeling, Simulation and Application in Power Systems
  X. XU, S&C Electric Company
- 17PESGM2486, Reliability Evaluation of Distributed Energy Resources with Power Electronic Converters
  C. WANG, Wayne State University

Risk Based Planning (panel)

Thursday, 20 July, 2017, 1:00 PM–3:00 PM  S – Sheraton III
Sponsored by: Energy Development and Power Generation
Chairs: J. JIN, ERCOT
        Z. ZHOU, Midcontinent ISO, Inc.

There are increasing uncertainties in power system because of the integration of wind and solar resources on generation side and increasing distributed generation, and demand side management on load side. Furthermore, NERC reliability standard requires to review a range of credible conditions and identify events producing more severe system impacts. Therefore, the traditional deterministic planning needs to be reinforced by supplementing probabilistic planning. In the past several years, there are a lot of activities in developing probabilistic planning methodology and tools. This panel will invite experts from ISOs, research institutes and universities to talk about the probabilistic planning frameworks, challenges in probabilistic planning tool development, and the potential applications of these tools. We want to discuss the stochastic method vs random samples based on probability distribution, and have a
debate about how to determine such as how many random samples are sufficient, how much probability space needs to be covered.

**PANELISTS:**

- 17PESGM2865, Probabilistic Transmission Planning: Framework, Sample Analysis, & Tools  
  D. MULCAHY, North Carolina State University
- 17PESGM2866, An Enhanced Probabilistic Contingency Analysis for Transmission Planning under High Penetration of Renewables: Data and Tool  
  M. YUE, BNL
- 17PESGM2868, TransCARE and RBPSB  
  A. GAIKWAD, EPRI
- 17PESGM2867, Z. ZHOU, Midcontinent ISO, Inc.

**Contribution for the Development of Smart Grid Technology (panel)**

Thursday, 20 July, 2017, 1:00 PM–4:00 PM  
G – 204 Tiered Classroom

**Sponsored by:** Energy Development and Power Generation  
**Chairs:** S. MUKHOPADHYAY, GTBIT, GGSIP University  
M. NEGNEVITSKY, University of Tasmania

Smart Grid is a Modernized Grid that uses extensively Information and Communication Technology right from generation from various sources including Renewable Energy Sources to utilization of electricity through transmission and distribution with a view to improve efficiency, reliability, economics, and sustainability. It may be applicable to very large integrated grid as well as small isolated one due to some restriction. This panel session, therefore, is marked by presentations highlighting contribution for the Development of Smart Grid Technology with coordinated generation, transmission, and distribution to meet the time-varying load maintaining quality as such and sharing the experience gathered for further applications elsewhere within the region or outside.

**PANELISTS:**

- 17PESGM2987, Waste to Energy  
  S. MUKHOPADHYAY, GTBIT, GGSIP University
- 17PESGM2988, Towards Gas and Continued Microgrid Development  
  B. BLYDEN, BBRM Group, LLC
- 17PESGM2989, On e-Mobility and Electric Vehicle Infrastructure in Smart Grid  
  R. RAMESH.RAYUDU@ECS.VUW.AC.NZ, Victoria University of Wellington
- 17PESGM2990, Demand Response for Tackling the Variability of Wind and Solar Generation  
  P. BATRA, Central Electricity Authority
- 17PESGM2991, Micogrids and their Management and Integration with the Main Grid  
  P. BATRA, Central Electricity Authority
- 17PESGM2992, Coordinated Volt/VAR Optimization Method for Transmission and Distribution Networks Accommodating Large-Scale DG Integration  
  W. WU, Tsinghua University
- 17PESGM2993, Flexibility in Grid Operation with High Penetration of Grid-Connected Variable Renewable Energy  
  S. SOONEE, POSOCO, PGCIL

**IEEE Standards and Guides Developed by the Hydroelectric Power Subcommittee (panel)**

Thursday, 20 July, 2017, 1:00 PM–3:00 PM  
S – Mississippi

**Sponsored by:** Energy Development and Power Generation  
**Chair:** E. VAUGHN, Bureau of Reclamation Technical Service Center, Denver, Colorado


**PANELISTS:**

  E. VAUGHN, Bureau of Reclamation Technical Service Center, Denver, Colorado
Thursday Afternoon, continued

- 17PESGM3014, IEC and IEEE 125 Governor Soft Harmonization
  M. BERGERON, General Electric
- 17PESGM3015, 11447 Guide for the Rehabilitation of Hydroelectric Power Plants
  D. BROWN, Pacific Gas and Electric
- 17PESGM3016, IEEE 1010 – Guide for Control of Hydroelectric Power Plants
  J. YALE, Chelan County PUD
- 17PESGM3017, 1248 – Guide for the Commissioning of Electrical Systems in Hydroelectric Power Plants
  D. KWONG, U.S. Army Corps of Engineers

Report on Measurements, Monitoring, and Reliability Issues Related to Primary Governor Frequency Response (panel)
Thursday, 20 July, 2017, 1:00 PM–5:00 PM  G – 222 Multifunction Room
Sponsored by:  Power System Dynamic Performance
Chair:  H. ILLIAN, EnergyMark

The “IEEE Task Force Report on Interconnected Power System Response to Generation Governing: Present Practice and Outstanding Concerns” recommended future work on primary governing frequency responses. The “LBNL Report on Use of Frequency Response Metrics to Assess the Planning and Operating Requirements for Reliable Integration of Variable Renewable Generation” further investigated the consequences of transitioning to variable renewable generation. This panel session addresses the concerns raised by those reports to provide a workable transition path from current amounts of variable renewable generation to 100% variable renewable converter interfaced generation including: 1) Required distribution of primary frequency response to assure reliability, 2) Stability issues associated with step frequency response based on frequency error, 3) Synthetic frequency response products, 4) Primary frequency response measurement, 5) Management of primary frequency response components in reliability standards or standard market design, 6) Economics of supplying primary frequency response.

PANELISTS:
- 17PESGM2576, Session Co-Chair & Secretary
  J. FELTES, Siemens
- 17PESGM2573, Overview of Session
  H. ILLIAN, Energy Mark, Inc.
- 17PESGM2571, Geographic Distribution of Frequency Response
  A. ALAM, California Independent System Operator
- 17PESGM2574, Synthetic Frequency Response Stability Issues
  J. SCHMALL, ERCOT
- 17PESGM2575, Frequency Response Measurement and Infrastructure
  B. CUMMINGS, NERC
- 17PESGM2572, Market Design Issues and Economics
  G. ZHANG, New York ISO

Grid Architecture to Integrate Massive Distributed Resources into Bulk Power Systems (panel)
Thursday, 20 July, 2017, 1:00 PM–3:00 PM  S – Ohio
Sponsored by:  Power System Operation, Planning & Economics
Chairs:  P. DU, ERCOT
         J. TONG, PJM

The penetration of distributed energy resources (DERs) continues to grow at a rapid pace. This could be creating tremendous challenges for a future power grid in ensuring its safety, reliability and efficiency. This difficulty is partially attributed to the fact that these small-sized, distributed DERs are not visible and controllable to the system operators. It also greatly limits the value of DERs which can contribute to the reliability and efficiency of the power systems. This panel will discuss the challenges in the large-scale integration and coordination of DERs from the system operation perspective, impacts on wholesale electricity markets and new lines of thoughts on novel grid architecture that could deviate from today’s practices. This new grid architecture is critical to enable the viability of DERs while improving the reliability and resilience of the future power grid.

PANELISTS:
- 17PESGM2931, Grid Architecture
  R. MELTON, PNNL
- 17PESGM2335, The Value of Distributed Locational Marginal Prices to the Operation of the Bulk Power System with Massive Distributed Resources
  R. TABORS, Tabor Caramanis Rudkevich
Thursday Afternoon, continued

- 17PESGM2337, Coordinated Operation of Transmission and Distribution Grids with Massive DERs Integration
  H. SUN, Tsinghua University
- 17PESGM2334, Distributed Energy Resources (DERs) for Power Systems Operations and Efficient Wholesale Markets
  J. TONG, PJM

Practical Solutions for Mitigating Uncertainties in the Future Grid (panel)
Thursday, 20 July, 2017, 1:00 PM–3:00 PM            G – 206 Tiered Classroom
Sponsored by: Power System Operation, Planning & Economics
Chairs: J. GIRI, GE Grid Solutions
        L. WANG, Powertech Labs

This panel addresses practical solutions implemented at utilities in North America and France to mitigate uncertainties in the future transmission and distribution grid. Managing the grid is becoming more challenging because of evolving grid influences, such as growth of variable renewable generation resources, distributed generation, microgrids, demand response, and customer engagement programs. Concurrently, however, there are nascent technologies and other advances that improve our ability to manage future grid operations. These technologies include new sub-second synchrophasor measurements and analytics; advances in high performance computing, visualization platforms, digital relays, cloud computing, etc. Other advances include adding more intelligence at substations and distribution systems, as well as self-managed microgrids and wide area monitoring systems. One key initiative is to create a ‘predict and mitigate’ proactive paradigm to enable better anticipation so that timely decisions can be made, to mitigate problems before they spread across the grid.

PANELISTS:
- 17PESGM2773, PJM Experiences
  H. CHEN, PJM
- 17PESGM2774, Distribution Grid Southern Company Experiences
  L. CLARK, Southern Co
- 17PESGM2775, RTE France Experiences
  P. PANCIATICI, RTE France
- 17PESGM2776, PG&E Experiences
  V. MADANI, PGE

Distributed Energy Resources and Market Design Considerations for Local Energy Markets (DSOs) (panel)
Thursday, 20 July, 2017, 1:00 PM–3:00 PM            G – 308 Tiered Classroom
Sponsored by: Power System Operation, Planning & Economics
Chairs: A. PAPALEXOPOULOS, ECCO International
        A. PAPAVASILIOU, Université Catholique de Louvain

Distributed energy resources are changing the energy landscape and are blurring the boundaries of the transmission and the distribution grid. As a result, distribution grid operations are gaining an increasingly important role in power system operations. The flexibility of these resources creates new opportunities in power markets, but also new challenges that need proper management to ensure maximum value is materialized for the benefits of consumers. A major challenge that has recently emerged is the development of organized Local Energy Markets at the distribution level (DSOs) capable of producing visible market locational prices at the distribution level. To some extent, the emergence of Local Energy Markets has to do with the evolution of wholesale energy markets, which are currently being reconfigured to allow nascent distributed energy resources to compete with traditional resources to provide services critical to the reliable operation of the power grid.

PANELISTS:
- 17PESGM2954, Design of Local Energy Markets and Coordination with Wholesale Energy Markets for Distributed Energy Resources
  A. PAPALEXOPOULOS, ECCO International
- 17PESGM2955, New York Developments in the Coordination between Wholesale (ISO) and Retail (DSO) Markets
  R. MUKERJI, New York ISO
- 17PESGM2956, Practical Considerations for the Development of Distribution System Operators
  M. HASTINGS, Centrica
- 17PESGM2957, T&D Interface Coordination and DSO Development In California
  L. KRISTOV, CAISO
Security Analysis and Control of Cyber-Physical Systems (CPS) (panel)

Thursday, 20 July, 2017, 1:00 PM–5:00 PM  S – Chicago IX
Sponsored by: PES Technical Council
Chairs: M. NI, NARI Technology
A. SRIVASTAVA, Washington State University

The physical power system increasingly relies on the ICT infrastructure (the cyber system) for monitoring, control and optimal operation. Failures in the cyber system can have very large impact on the security and stability of physical power system. Security analysis and control of power systems should therefore incorporate such failures. The integrated cyber-physical system (CPS) is complex, featuring stochastic behavior and a mixture of discrete events and continuous processes. Currently, there is no comprehensive methodology to analyze the security status and generate control strategies for integrated cyber-physical power system, but novel analytical approaches are emerging. This panel will discuss the challenges involved in security analysis and control of CPSs. The panelists will share their experiences in security indices, security evaluation methods, control strategy decision-makings approaches, etc., for various cyber-physical sub-systems in the power grid.

PANELISTS:
• 17PESGM3118, Continuous Monitoring of Grid Structure with SCADA Voltages: Scientific Basis and Practical Implications
  N. JIANG, University of Oklahoma
• 17PESGM3115, Cyber-Resilient Remedial Action Schemes to Manage Wind Curtailment: Designing RAS Control Fault-Tolerant Using Distributed Computing
  A. SRIVASTAVA, Washington State University
• 17PESGM3117, Assessing the Impact of Uncertainty on Demand Response Aggregation System
  A. DOMINGUEZ GARCIA, University of Illinois
• 17PESGM3119, General State Estimation and Load Flow Hybrid Method for Power System Control Center
  Y. YAN, State Grid Corporation of China
• 17PESGM3116, Cyber-Physical Power System Modeling and Security Assessment
  M. NI, NARI Technology

Lessons Learned from Cyber Attack Incidents and How to Mitigate Them? (panel)

Thursday, 20 July, 2017, 3:00 PM–5:00 PM  S – Arkansas
Sponsored by: (AMPS) Computer Analytical Methods
Chairs: M. GOVINDARASU, Iowa State University
A. HAHN, Washington State University

The focus of this panel is to share knowledge and discuss the following issues in cyber security of the power grid: (i) growing number and sophistication of cyber attacks targeted towards energy delivery systems around the world; (ii) case studies of recent attacks on power systems and lessons learned from these incidents; (iii) R&D experiences and best practices to improve the security of the modern power grid. The panel will have experts drawn from academia, national lab, and industry.

PANELISTS:
• 17PESGM2430, Cybersecurity Lessons Learned and Best Practices
  P. SKARE, PNNL
• 17PESGM2431, Security and Resiliency Challenges for Modern Grid
  M. AMIN, University of Minnesota
• 17PESGM2427, Cyber Security of Energy Delivery System: A Research Center Experience
  P. SAUER, University of Illinois, Urbana-Champaign
• 17PESGM2432, Recent Cyber Incidents on Energy Infrastructure and Potential Mitigations
  A. HAHN, Washington State University
• 17PESGM2428, Cyber Security Testbed Experimentations
  C. LIU, Washington State University
• 17PESGM2429, Resiliency for Smart Grid
  D. KUNDUR, University of Toronto
Power System Transient Overvoltages, Field Measurement and Their Analysis (panel)

Thursday, 20 July, 2017, 3:00 PM–5:00 PM G – 226 Multifunction Room

Sponsored by: (AMPS) Transient Analysis and Simulation

Chairs: R. RAMOS, Southern Company
       Y. GONG, AEP

Transient overvoltages caused by equipment switching or lightning strikes are common to power systems from distribution to transmission networks. Severe transient overvoltage could cause significant damages to substation connected equipment including power transformers and circuit breakers. Utilities often rely on EMTP type of simulation to study the switching transient to select proper equipment rating or mitigation methods. Having actual transient overvoltage measurement from the field will help utilities to verify their power system transient models, select proper equipment rating, and prevent equipment failure. However, measurement of transient overvoltages, in particular for EHV networks, is a non-trivial task. This panel session will report on measurement principles and some of the issues associated with using different voltage transducers. These include capacitively coupled voltage transducers, resistance and capacitor voltage dividers, and optical solutions. In addition, field measurement data will be presented to demonstrate measurement technologies capabilities.

PANELISTS:

- 17PESGM2680, Capacitive Voltage Transformer’s Limitation to Monitor Fast Transient Overvoltage
  N. ABDUL, Trench Canada Ltd
- 17PESGM2681, Integrated Electro-Optic Sensor and Its Applications in Electrical Power Systems
  R. ZENG, Tsinghua University
- 17PESGM2682, EHV System Transient Field Measurement and Its Application to Improve System Reliability
  Y. GONG, AEP

Power System Stabilizer Practical Issues in the Modern Grid (panel)

Thursday, 20 July, 2017, 3:00 PM–5:00 PM G – 308 Tiered Classroom

Sponsored by: Energy Development and Power Generation

Chair: L. HAJAGOS, Kestrel Power Engineering

A discussion of technical and regulatory issues related to power system stability controls and associated excitation limiters in the environment of international grid code compliance requirements. Practical issues of design and performance testing and reporting will be presented by industry leaders.

PANELISTS:

- 17PESGM2374, Influence of PSS in Power Systems Subjected to High Rate of Change in Frequency (ROCOF)
  J. TABORDA, JT Systems
- 17PESGM2375, PSS on Synchronous Condensors
  S. LEBEAU, Hydro Quebec
- 17PESGM2376, Practical Challenges and Limitations of Generator- and Exciter-Models Used for AVR, PSS and OEL/UEL Tuning and Validation-Studies, Focusing on (Exciter) Field-Current as Active Feedback in Excitation Control Systems
  M. BAECHLE, ABB
- 17PESGM2373, Compensated Frequency vs Speed as a PSS Input
  L. HAJAGOS, Kestrel Power Engineering
- 17PESGM2377, OEL and SCL Limiter Testing and PSS/Limiter Interaction
  R. KUTZNER, Hannover University
- 17PESGM2378, Challenges in the Synthesis of the Instantaneous Rotor Frequency for PSS Applications
  R. PAIVA, Reivax
- 17PESGM2379, Verification and Testing of New PSS Model PSS6C by Means of PRBS Injection
  U. SEEGER, Siemens

High Renewable Energy Penetrations within Isolated and Remote Area Power Systems (panel)

Thursday, 20 July, 2017, 3:00 PM–5:00 PM S – Ohio

Sponsored by: Energy Development and Power Generation

Chair: M. NEGNEVITSKY, University of Tasmania
Isolated and Remote Area Power Systems utilizing renewable energy technologies to satisfy the majority (>50%) of their annual energy consumption are evaluated within this panel session. Isolated power systems face significant challenges under high renewable energy penetrations given the lack of system size and inertia. Papers presenting solutions to optimize system cost and performance, possibly involving renewable energy technologies, ancillary technologies or control and application methodologies are requested.

PANELISTS:
• 17PESGM2909, High Penetration of Renewable Energy in the Greek Islands: Prospects and Challenges
  N. HATZIARGYRIOU, National Technical University of Athens
• 17PESGM2912, No Longer Ancillary: Valuing and Procuring Essential Grid Reliability Services on Renewable Island Power Systems
  D. STENCLIK, GE
• 17PESGM2910, Variable Speed Low Load Diesel Application to Maximise Renewable Energy Penetration in Isolated Power Systems
  M. NEGNEVITSKY, University of Tasmania
• 17PESGM2911, Economics of Grid Connection: Perception and Reality
  T. KEY, EPRI
• 17PESGM2913, The Role of Modeling in Optimizing Remote High-Penetration Microgrids
  J. MCDOWALL, SAFT
• 17PESGM2914, Optimization of Renewable Energy Resources
  A. SABER, ETAP

Tuning the Measurement Weights in Power System State Estimation (panel)
Thursday, 20 July, 2017, 3:00 PM–5:00 PM  G – 304 Tiered Classroom
Sponsored by: Power System Operation, Planning & Economics
Chairs: L. MILI, Virginia Tech
        A. GOMEZ-EXPOSITO, University of Seville

It has long been known that the quality of the results provided by power system state estimators crucially depends on how well measurement errors are characterized. In particular, the actual standard deviation of errors is of paramount importance, as the weighting coefficients customarily used by industrial tools are fully determined by this statistical quantity. In spite of that, and the hundreds of publications devoted to power system state estimation, little attention has been paid so far to this relevant aspect. In fact, many end users believe the weighting coefficients adopted by their estimators have not been properly tuned or have become obsolete. This panel will gather speakers from industry and academy who will share and discuss both theoretical issues and practical experiences showing how measurement weights should be chosen and the benefits attained from this optimal choice.

PANELISTS:
• 17PESGM2010, Uncertainties and Measurement Weights in Power System State Estimation
  L. MILI, Virginia Tech
• 17PESGM2008, Systematic Approach of Defining Weighting Factors for State Estimation
  X. LIU, Eversource Energy
• 17PESGM2011, Ex Ante Determination of Measurement Weights in State Estimation: The Experience of Union Fenosa Distribution
  A. GOMEZ-EXPOSITO, University of Seville
• 17PESGM2012, Phasor State Estimation Weighting Coefficients for AC and Hybrid Networks with Power Electronic Devices
  L. VANFRETTI, KTH
• 17PESGM2009, The Effect of Weighting Factors in Hybrid State Estimation Incorporating SCADA and PMU Measurements
  G. KORRES, National Technical University of Athens (NTUA)
• 17PESGM2013, The Impact of Weighting Factor on State Estimation and Its Tuning
  Y. GUO, Hydro One

Recent Developments in High-Fidelity Large-Scale Power System Datasets (panel)
Thursday, 20 July, 2017, 3:00 PM–5:00 PM  G – 306 Tiered Classroom
Sponsored by: Power System Operation, Planning & Economics
Chairs: C. COFFRIN, Los Alamos National Laboratory
        T. HEIDEL, National Rural Electric Cooperative Association
It is widely recognized that the research community lacks high-fidelity, public, large-scale power system datasets that accurately characterize the challenges faced by modern network operators such as, distributed renewable generation and evolving load profiles. This dataset shortfall has presented a significant challenge for researchers of optimization and control algorithms, because the available datasets are too easy to optimize, too small in scale, and lack a sufficient number of scenarios to fully test the robustness of novel methods. This panel brings together a diverse group of power system modeling experts to present recent developments in power system datasets, which represent a new generation of publicly-available datasets with the detail and scale required to validate emerging power system algorithms.

PANELISTS:
- 17PESGM2350, EPIGRIDS: Electric Power Infrastructure & Grid Representations in Interoperable Datasets
  C. DEMARCO, University of Wisconsin-Madison
- 17PESGM2346, Sustainable Data Evolution Technology for Power Grid Optimization
  Z. HUANG, PNNL
- 17PESGM2347, Synthetic Data for Power Grid R&D
  T. OVERBYE, Texas A&M University
- 17PESGM2349, SMARTDaTa: Standardized Multi-Scale Models of Anonymized Realistic Distribution and Transmission Data
  B. PALMINTIER, National Renewable Energy Laboratory
- 17PESGM2349, Recent Developments in European AC Power Flow Datasets: iTesla, RTE Snapshots, and PEGASE
  P. PANCIATICI, RTE France
- 17PESGM2351, High Fidelity, Year Long Power Network Data Sets for Replicable Power System Research
  P. VAN HENTENRYCK, University of Michigan

Energy Storage and Conventional Resources: Complementarity, Rivalry and Substitutability (panel)

Thursday, 20 July, 2017, 3:00 PM–5:00 PM   G – 206 Tiered Classroom
Sponsored by:  Power System Operation, Planning & Economics
Chairs:  Y. DVORKIN, New York University
         M. ORTEGA-VAZQUEZ, University of Washington

Grid-scale energy storage devices will soon be heavily deployed in transmission and distribution grids. These devices can provide simultaneously a variety of grid services. Contrary to conventional generating units, energy storage devices can only inject previously accumulated energy; and contrary to transmission lines, which move energy in space, storage moves energy in time. As a consequence, energy storage installation and operation should be coordinated with the rest of the system. This panel of experts will discuss the state-of-the-art energy storage integration, expected economic and technical impacts, as well as proposed operating and planning tools to capitalize on multi-purpose energy storage benefits. The overall value proposition of energy storage devices will be compared against competing supply- and demand-side resources. The ultimate objective of the panel will be to identify key contributions required to pave the way for the successful energy storage roll-out.

PANELISTS:
- 17PESGM2401, Non-Technology Barriers to the Deployment of Distributed Energy Storage
  R. SIOSHANSI, Ohio State University
- 17PESGM2402, Capturing the Value of Energy Storage in Energy-Environmental Planning
  A. BOTTERUD, Argonne National Lab
- 17PESGM2403, Probabilistically Security-Constrained Unit Commitment with Energy Storage
  M. ORTEGA-VAZQUEZ, University of Washington
- 17PESGM2404, Long Live the Battery! Effect of Degradation on Multi-Service Portfolios of Energy Storage
  R. MORENO, Universidad de Chile & Imperial College London
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