The Eighth Annual IEEE PES Conference on INNOVATIVE SMART GRID TECHNOLOGY

April 23-26, 2017 | Washington D.C. Metro
Joe Paladino graduated from Middlebury College in 1977 with a degree in biology and, after teaching for a couple of years, entered graduate school at the University of Pittsburgh where he received a Master’s Degree in Civil Engineering in 1984. He went on to work for Westinghouse Electric Corporation and later joined the U.S. Department of Energy in 1992. He has worked for most of his career in the advancement and commercialization of technology to address energy and environmental issues, and over the past 10 years he has focused primarily in the area of grid modernization and smart grid adoption.

As the General Chair, I want to welcome you to ISGT 2017 which has drawn hundreds of people from academia, industry and the government to discuss issues and effective strategies for grid modernization. We may be experiencing one of the most transformational periods in the evolution of the electric grid given the impact of digital technology, emerging distributed assets, and new business approaches on traditional grid practices. It is indeed a fascinating, yet challenging time. We hope that ISGT 2017 serves as an effective forum for continued dialogue and collaboration so we can better address the challenges of this new era. Thank you for being here.
2017 IEEE PES Innovative Smart Grid Technologies Conference Technical Chair,
Farrokh Rahimi

Farrokh Rahimi graduated from Massachusetts Institute of Technology (MIT) in 1970 with a Ph.D. in Electrical Engineering. In his current role as Senior Vice President, Market Design and Consulting at Open Access Technology International, Inc. (OATI), he oversees development of market design and consulting activities. He is also a key contributor to OATI Smart Grid and Grid Modernization activities, as well as microgrid development activities of USA Microgrids, a newly established OATI company. Prior to joining OATI in 2006 he collaborated with California ISO for 8 years, Macro Corporation (now KEMA Consulting) for 8 years, Systems-Europe, Brussels Belgium for 5 years, and 13 years as a university professor and researcher at Sharif University of Technology in Iran, preceded by two years at Systems Control (now ABB), Palo Alto, California.

On behalf of the ISGT Technical Committee, I welcome you to IEEE ISGT 2017. The conference theme is “Innovative Trends in Grid Modernization”. The electric power industry is undergoing a fundamental transformation around the globe, particularly at the grid edge and distribution system levels, where the emergence of new technologies and consumer-end intelligent assets challenge the traditional approaches for grid planning, operations, and utility business models. We would like to thank all of you for participating at ISGT 2017, and hope that the conference serves as an effective forum for the industry, academia, regulators, and all those interested in the changing electricity industry landscape to share and discuss issues, trends, and innovative strategies for grid modernization.
Monday, 24 April 2017

Opening Session
Monday, 24 April, 2017 10:30 AM-12:00 PM  8:30 AM-10:00 AM  
Room: Salon AB

Speakers:
Joseph Paladino, Conference Chair, 2017 ISGT Conference
Tom Pierpoint, Representative, PEPCO Welcome to DC
Damir Novosel, IEEE PES President - More Power to the Future Grid
Farrokh Rahimi, Technical Chair, 2017 ISGT Conference

Grid Modernization Technology Vision (plenary session)
Monday, 24 April, 2017  8:30 AM-10:00 AM
Room: Salon AB

Session Chair: Ebrahim Vaahedi, OATI

To respond to their business requirements and chart the future technology deployment strategy, utilities, research organizations and technology developers need to know the state of the art in available technology solutions and the future technology trends. In this plenary session, the executives of a number of major technology providers share their insight on the smart grid strategic roadmaps, technology maturity and their business value.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0402, Grid modernization drivers, requirements and Challenges  
  M. CARLSON, Siemens
* 2017ISGT0400, DER Integration and DERMS  
  A. IPAKCHI, OATI
* 2017ISGT0404, ADMS and grid technology evolution  
  G. RACKLIFFE, ABB
* 2017ISGT0403, Delivering Grid-Optimizing Outcomes through Digital” Technologies  
  J. DE BEDOUT, GE
* 2017ISGT0401, Enabling hardware technology and future IoT data architecture  
  T. GODART, Intel

Recent Trends and Developments in Grid Modernization (panel session)
Monday, 24 April, 2017  10:30 AM-12:00 PM  (Utility Track)
Room: Salon C

Session Chair: Julio Romero Aguero, Quanta Technology

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, which 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.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0280, Evolving Our Grid: Technologies and Capabilities Necessary for the 21st Century
  E. TAKAYESU, Southern California Edison
* 2017ISGT0281, Planning for the Next Generation Grid
  B. CRABLE, Dominion
* 2017ISGT0279, Energy Storage Roadmap
  S. BAHRAMIRAD, Commonwealth Edison
* 2017ISGT0282, Smart Grid: A Customer Perspective
  K. LEFKOWITZ, Pepco Holdings Inc
* 2017ISGT0283, TBD
  K. LYNN, US Department of Energy

Quasi-Static Time Series (QSTS) Simulations for Distribution System Analysis (panel session)  (Cross Cutting Track)
Monday, 24 April, 2017 10:30 AM-12:00 PM
Room: Salon FG

Session Chair: Matthew Reno, Sandia National Laboratories

PRESENTATIONS AND PANELISTS:
* 2017ISGT0321, Introduction to advanced distribution time-series analysis: research motivations, challenges and applications
  M. RENO, Sandia National Laboratories
* 2017ISGT0380, New Methods for Rapid Time-Series Analysis
  X. ZHANG, Georgia Institute of Technology
* 2017ISGT0323, Temporal decomposition of distribution system-level time-series analysis
  B. MATHER, NREL
* 2017ISGT0324, Distribution power flow computational parallelization using diakoptics (circuit tearing)
  D. MONTENEGRO, EPRI

Development and Deployment of Microgrids and Nanogrids (panel session)
Monday, 24 April, 2017 10:30 AM-12:00 PM  (Technology Track)
Room: Salon DE

Session Chair: Ebrahim Vaahedi, OATI
Energy industry is witnessing a proliferation of Microgrids and Nanogrids. This paradigm shift is the result of the benefits such as resiliency, reliability as well as economic and environmental benefits reinforced by such systems. This panel session will focus on a number of microgrid and Nanogrid projects discussing:

- Technical challenges developing and deploying
- Actual derived Benefits
- Lessons learned

PRESENTATIONS AND PANELISTS:

* 2017ISGT0333, The development and deployment of a Nanogrid
  M. SHAHIDEPOUR, IIT
* 2017ISGT0332, Transactive Microgrid at OATI's South Campus
  E. VAAHEDI, OATI
* 2017ISGT0336, The development and deployment of microgrids
  S. RAGHUPATHULA, SEL
* 2017ISGT0334, Microgrid deployments at Con Edison
  S. BAHRAMIRAD, Commonwealth Edison
* 2017ISGT0388, Microgrid Testbed Program at NREL
  B. MILLER, NREL

System Planning with High DER Penetration I (paper session)
Monday, 24 April, 2017 10:30 AM-12:00 PM
Room: Salon H

Session Chair: Farrokh Rahimi, OATI

PAPERS AND AUTHORS:

* 2017ISGT0106, Evaluating PEV's Impact on Long-Term Cost of Grid Assets
  D. MAO, The Ohio State University
  D. MEYER, The Ohio State University
  J. WANG, The Ohio State University
* 2017ISGT0132, Increasing the Hosting Capacity for Renewable Energy in Distribution Networks
  L. MACEDO, Sao Paulo State University
  J. FRANCO, Sao Paulo State University
  R. ROMERO, Sao Paulo State University
  M. ORTEGA-VAZQUEZ, University of Washington
  M. RIDER, University of Campinas
* 2017ISGT0207, Impact of Load and Renewable Energy Uncertainties on Single and Multiple Energy Storage Systems Sizing
  I. BIYYA, Ecole Mohammedia D'ingenieurs
  G. ANIBA, Ecole Mohammedia D'ingenieurs
  M. MAAROUFI, Ecole Mohammedia D'ingenieurs
* 2017ISGT0223, Renewables Firming Using Grid Scale Battery Storage in a Real-Time Pricing Market
  C. QUANN, Colorado State University
  T. BRADLEY, Colorado State University
T&D Interface issues and Solutions I (paper session)
Monday, 24 April, 2017 10:30 AM-12:00 PM
Room: Salon J

Session Chair: Ron Melton, PNNL

PAPERS AND AUTHORS:
* 2017ISGT0103, Effects of Communication Latency and Availability on Synthetic Inertia
   R. CONCEPCION, Sandia National Laboratories
   F. WILCHES-BERNAL, Sandia National Laboratories
   R. BYRNE, Sandia National Laboratories
   M. ABUELLA, University of North Carolina at Charlotte
   B. CHOWDHURY, University of North Carolina at Charlotte
* 2017ISGT0231, Three-Phase AC Optimal Power Flow Based Distribution Locational Marginal Price
   R. YANG, National Renewable Energy Laboratory
   Y. ZHANG, National Renewable Energy Laboratory

Provision of Grid Services from Microgrids: Challenges, Opportunities, and Risks (panel session) (Utility Track)
Monday, 24 April, 2017 1:00 PM-2:30 PM
Room: Salon C

Session Chair: Farrokh Rahimi, OATI

The energy industry landscape is changing due to the increased penetration of Distributed Energy Resources (DERs), new technologies, and increased demand-side participation in retail and wholesale markets. These lead to operational challenges for bulk power and distribution operators, as well as prosumers, including Microgrid operators. This panel session will address the opportunities, challenges, and risks of using Microgrid capabilities to provide grid services for bulk power and distribution operation. The panelists will cover the following topics:
• Impact of DERs and Renewable Generation on Bulk Power and Distribution Operations and Utility Business
• Role of Microgrids in the Changing Energy Landscape: Economics, Reliability, and Resiliency Enhancement
• Challenges and Opportunities for Provision of Grid Services from Microgrids
• Illustrative Business Case Examples

PRESENTATIONS AND PANELISTS:
* 2017ISGT0298, Impediments and opportunities for microgrids to provide grid services for both distribution system and bulk power system
   C. IRWIN, DOE
* 2017ISGT0296, Networked Microgrids for Enhancing Distribution System Operations
   M. SHAHIDEHPOUR, IIT
Modern power systems are encountering significant changes due to the emerging of dynamic sources and loads, which further brings about the challenges of reliability, safety and control issues in the operation. The introduction and existence of DERs and DGs in electric grids has enabled but also resulted in problems with microgrid operation. With a vision into the future, these technologies are inevitably becoming critical in the power system: a) microgrid control, b) power system robustness/self-healing, and c) grid edge intelligence. This panel will cover the topics of how to enable a resilient operation of power system with the optimal balancing of these technologies. By covering this, multiple areas are to be discussed under the same scope, including future protection techniques, smart edge devices, microgrid controllers, and self-healing grid architectures.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0341, Insights on grid architecture evolution
  D. ZHAO, Argonne National Laboratory
* 2017ISGT0342, Emerging Technologies for Microgrid Protection and Control
  S. MELIPOULOS, Georgia Institute of Technology
* 2017ISGT0340, Emerging Technologies in Distribution Automation
  J. ROMERO AGUERO, Quanta Technology
* 2017ISGT0343, Microgrids at Work: Real-World business case examples of companies utilizing microgrids to achieve their energy strategies for the 21st century
  P. PABST, S&C Electric Company
* 2017ISGT0344, Distribution Grid Resilience with Microgrids
  Z. WANG, Iowa State University
* 2017ISGT0151, Optimal Energy Scheduling of a Stand-alone Multi-Sourced Microgrid Considering Environmental Aspects  
  H. MORADI, Florida Atlantic University  
  D. DE GROFF, Florida Atlantic University  
  A. ABTAHI, Florida Atlantic University  
* 2017ISGT0171, Development of a Microgrid Control System for a Solar-Plus-Battery Microgrid to Support a Critical Facility  
  J. WANG, GE Grid Solutions  
  B. CISSE, GE Grid Solutions  
* 2017ISGT0201, Designing Proper Control Set-point Signal for PQ Inverters of Isolated Microgrids  
  F. DOOST MOHAMMADI, West Virginia University  
  H. KESHTKAR VANASHI, West Virginia University  
  A. FELIACHI, West Virginia University  
* 2017ISGT0243, A Simulation Testbed for Cascade Analysis  
  S. HASAN, Vanderbilt University  
  A. CHHOKRA, Vanderbilt University  
  R. JAIN, North Carolina State University  
  A. DUBEY, Vanderbilt University  
  N. MAHADEVAN, Vanderbilt University  
  G. KARSAI, Vanderbilt University  
  S. LUKIC, North Carolina State University  

Advances in Management of Grid Dynamics I (paper session)  
Monday, 24 April, 2017 1:00 PM-2:30 PM  
Room: Salon J  

Session Chair: Mohammad Rizwan, Delhi Technological University, Delhi India  

PAPERS AND AUTHORS:  
* 2017ISGT0051, PMU-based Online Change-Point Detection of Imbalance in Three-Phase Power Systems  
  T. ROUTTENBERG, Ben Gurion University of the Negev  
  Y. XIE, Georgia Institute of Technology  
* 2017ISGT0067, Local Detection of PMU Measurement Errors Using Dynamic State Estimators  
  A. ROUHANI, Northeastern University  
  A. ABUR, Northeastern University  
* 2017ISGT0226, Optimal PMU Placement to Achieve Complete Observability of Idaho Power Co. System  
  O. CINIGLIO, Idaho Power Co.  
  M. PAPIC, Idaho Power Co.  
  M. VAIMAN, V&R Energy Systems Research, Inc.  
  M. VAIMAN, V&R Energy Systems Research, Inc.  
* 2017ISGT0229, Challenges and Trade-offs of a Cloud Hosted Phasor Measurement Unit-based Linear State Estimator  
  V. CHAKATI, Arizona State University  
  M. PORE, Arizona State University  
  A. PAL, Arizona State University
International Smart Grid Developments (panel session)
Monday, 24 April, 2017 1:00 PM-2:30 PM (Cross Cutting Track)
Room: Salon FG

Session Chair: Nader Farah, Esta International

Speakers from Europe, Asia, and Latin America present the US audience a broad perspective of the international Smart Grid programs in their respective regions. European regulatory and policy initiatives have served as drivers and enablers of Smart Grid programs in Europe. Asian countries have undertaken a spectrum of innovative Smart Grid programs to meet regional needs. Smart Grid programs are at various stages of development and implementation in Latin America.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0373, European Smart Grid Enabling Regulation and Policies
  K. WIDEGREN, Widegren Energy
* 2017ISGT0374, Asian Smart Grid Developments and Role of Smart Grid Forums
  R. PILLAI, Global Smart Grid Forum
* 2017ISGT0375, Smart Grid in Mexico and Latin America
  O. MIRANDA, Smart Grid Mexico

Industry Best Practices in Using Synchrophasor Technology (panel session)
Monday, 24 April, 2017 3:00 PM-5:00 PM (Technology Track)
Room: Salon DE

Session Chair: Marianna Vaiman, V&R Energy Systems Research, Inc.
Session Chair: Michael Cassiadoro, Total Reliability Solutions, LLC

This Panel Session, jointly organized by IEEE PES Cascading Failure Working Group and NASPI Task Teams, will bring together a team of industry experts from BPA, ERCOT, PJM,
and SDG&E to share their experience in deploying and using synchrophasor technology in order to improve reliability of the smart grid and enhance wide-area situational awareness. The panelists will discuss importance and benefits of synchrophasor technology for wide area real-time monitoring, disturbance detection, prevention of major blackouts, automated real-time controls, integrating renewable resources, and improving power system modeling.

PRESENTATIONS AND PANELISTS:

- **2017ISGT0289, NASPI Control Room Solutions Task Team – Advancing the Use of Synchrophasor Data in the Operations Horizon**
  M. CASSIADORO, Total Reliability Solutions, LLC; D. BRANCACCIO, BRIDGE Energy Group; R. QUINT, NERC
- **2017ISGT0294, Synchrophasor Deployment and Synchrophasor Based Applications at SDG&E**
  T. RAHMAN, San Diego Gas & Electric
- **2017ISGT0295, Integrating Synchrophasors in the Control Room at PJM**
  E. BERNABEU, PJM Interconnection
- **2017ISGT0293, ERCOT Post Smart Grid Regional Demonstration Project Roadmap**
  B. BLEVINS, ERCOT
- **2017ISGT0291, BPA Experience with Synchrophasors: From Wide-Area Measurements to Wide-Area Control**
  D. KOSTEREV, Bonneville Power Administration; S. YANG, Bonneville Power Administration; P. ETINGOV, PNNL; N. LEITSCHUH, Bonneville Power Administration; V. VANZANDT, Former Bonneville Power Administration

Innovations in Smart Grid Education (panel session)
Monday, 24 April, 2017 3:00 PM-5:00 PM  (Cross Cutting Track)
Room: Salon FG

Session Chair: Kenneth Lutz, University of Delaware

Traditional power engineering curriculums for undergraduate and graduate students are changing to incorporate smart grid innovations. Such innovations include new grid technologies, communications and information technologies, cybersecurity, control, and big data.

The topics discussed in smart grid engineering education will touch on all three themes of this ISGT conference. A major topic of technologies will cover smart grid enabling technologies, communications and information technologies, and consumer technologies that touch on the Internet of Things. For utility and service provider topics, there will be discussions of how these new technologies can be used to improve grid operations and control. Cross-cutting topics include cybersecurity, new grid architectures, and grid control under new paradigms, such as transactive energy systems.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0314, Emerging technologies and new challenges – smart grids education experience at MIT  
   P. VOROBEV, Massachusetts Institute of Technology
* 2017ISGT0311, Smart Grids: A new course on smart grids at The University of Texas at Austin  
   R. BALDICK, University of Texas at Austin
* 2017ISGT0310, Smart Grid Education for Next Generation Power Engineers: Lessons Learned  
   V. ARAVINTHAN, Witchita State University
* 2017ISGT0312, Smart Grid - Research and Innovations in Microgrids, Electric Vehicles, Solar PV and Energy Storage  
   R. GADH, UCLA - WINMEC & Smart Grid Energy Research Center
* 2017ISGT0315, Curriculum changes to incorporate smart grid innovations at Illinois  
   P. SAUER, University of Illinois at Urbana–Champaign
* 2017ISGT0313, Smart Grid Education, Research and Innovation at Clemson  
   K. VENAYAGAMOORTHY, Clemson University
* 2017ISGT0309, A Holistic View of the Smart Grid  
   K. LUTZ, University of Delaware

Advances in Management of Grid Dynamics II (paper session)  
Monday, 24 April, 2017 3:00 PM-5:00 PM  
Room: Salon H

Session Chair: Jay Giri, GE Grid Solutions

PAPERS AND AUTHORS:
* 2017ISGT0074, Analytical Derivation of Controller Parameters for Series Connected LCC Multiterminal HVDC Systems through the use of a Decoupling Filter  
   S. HAMMER, Siemens AG  
   C. HAHN, University of Erlangen-Nuremberg  
   M. LUTHER, University of Erlangen-Nuremberg
* 2017ISGT0162, A Comparative Study on SVC and STATOCM in Dynamic Voltage Stability Improvement of a System with Different Load Characteristics  
   B. ALGHAMDI, King Abdulaziz University  
   T. LE, Chalmers University of Technology  
   M. ALAMRI, Chalmers University of Technology
* 2017ISGT0183, Improved Synthetic Power Grid Modeling with Correlated Bus Type Assignments  
   Transaction Number: TPWRS2634318  
   S. ELYAS, Virginia Commonwealth Univ  
   Z. WANG, Virginia Commonwealth Univ
* 2017ISGT0200, Control of an SSSC for Oscillation Damping of Power Systems with Wind Turbine Generators  
   R. MCCANN, University of Arkansas  
   M. ALSARRAY, University of Arkansas
* 2017ISGT0258, Selective Scheduling: Controlling Non Preemptive Devices in Smart Grid Environment  
   N. CHAKRABORTY, Indian Institute of Technology Patna
System Operation with High DER Penetration I (paper session)
Monday, 24 April, 2017 3:00 PM-5:00 PM
Room: Salon J

Session Chair: Ron Wasley, ESTA

PAPERS AND AUTHORS:
* 2017ISGT0134, Implementing VVO with DER Penetration
  W. HARTMANN, Beckwith Electric
* 2017ISGT0143, Application of Autonomous Smart Inverter Volt-VAr Function for Voltage Reduction Energy Savings and Power Quality in Electric Distribution Systems
  F. DING, National Renewable Energy Laboratory
  A. NGUYEN, SolarCity
  S. WALINGA, SolarCity
  A. NAGARAJAN, National Renewable Energy Laboratory
  M. BAGGU, National Renewable Energy Laboratory
  S. CHAKRABORTY, National Renewable Energy Laboratory
  M. MCCARTY, SolarCity
  F. BELL, SolarCity
* 2017ISGT0152, Network-Cognizant Design of Decentralized Volt/VAr Controllers
  K. BAKER, National Renewable Energy Laboratory
  A. BERNSTEIN, National Renewable Energy Laboratory
  C. ZHAO, National Renewable Energy Laboratory
  E. DALL’ANSE, National Renewable Energy Laboratory
* 2017ISGT0166, Voltage-VAr Optimization (VVO) in IDMS: future trends, challenges & opportunities
  V. ALIMISIS, General Electric
  L. COSTA, General Electric
  P. TORDJMAN, General Electric
* 2017ISGT0250, Short-Term State Forecasting-Based Optimal Voltage Regulation in Distribution Systems
  R. YANG, National Renewable Energy Laboratory
  H. JIANG, National Renewable Energy Laboratory
  Y. ZHANG, National Renewable Energy Laboratory
* 2017ISGT0099, Design and Optimization of RES based Standalone Hybrid System for Remote Applications
  P. ANAND, I.K.G. Punjab Technical University
  S. BATH, G. Z.S. Campus College of Engineering & Technology
  M. RIZWAN, Delhi Technological University, Delhi India

Technological Considerations for a Next Generation Distribution System Platform (DSPx) (panel session)
Monday, 24 April, 2017 3:00 PM-5:00 PM (Utility Track)
Room: Salon C

Session Chair: Joseph Paladino, DOE

Description: Over the past year, the U.S. Department of Energy has sponsored an effort to develop a taxonomy of functional requirements needed to enable the full participation of
distributed energy resources with respect to grid planning, operations and market activities. These functional requirements were derived from the policy objectives of several states, including those state commissions involved with the project. The effort has included an examination of the technologies needed to enable these functions, including assessing their state of maturity, and has undertaken a systems architecture approach to develop considerations for rationally implementing DSPx functionality. In this session, the project team and key stakeholders involved with the effort will present their work and how it can be applied.

PRESENTATIONS AND PANELISTS:
* Joe Paladino, Technical Advisor, U.S. Department of Energy
* 2017ISGT0391, TBA
  J. TAFT, Chief Architect for Electric Grid Transformation, Pacific Northwest National Laboratory
* 2017ISGT0392, TBA
  R. GEIGER, Principal, Rick Geiger Consulting
* 2017ISGT0393, TBA
  M. TISDALE, Executive Director, More Than Smart
* 2017ISGT0389, TBA
  E. TAKAYESU, Southern California Edison

Monday Evening Poster Session

ISGT Poster Session (poster session)
Monday, 24 April, 2017 5:00 PM-7:00 PM
Room: Skyview Lounge

Session Chair: Farrokh Rahimi, OATI

PAPERS AND AUTHORS:
* 2017ISGT0008, An Adaptive control and optimal operating method of microgrid with heat-load
  H. ZHAO, Beijing Electrical Power Research Institute
  T. JING, China Agricultural University
  Y. Haoran, China Agricultural University
* 2017ISGT0010, A Study on Probability of Distribution Loads Based on Expectation Maximization Algorithm
  A. GANJAVI, University of Nottingham
  E. CHRISTOPHER, University of Nottingham
  C. JOHNSON, University of Nottingham
  J. CLARE, University of Nottingham
* 2017ISGT0022, Integration of Solar Energy and Optimized Economic Dispatch using Genetic Algorithm A case-study of Abu Dhabi
  M. AKMAL, Abu Dhabi University
  S. ALI, Abu Dhabi University
  Y. AL KHALIL, Abu Dhabi University
  N. IQBAL, Abu Dhabi University
  S. ALZAABI, Abu Dhabi University
* 2017ISGT0023, Frequency Dependent Line modeling and Equipment Sizing for a Transmission Level Wind Farm Integration
  A. YAZDANI, CSUS
  M. ZARGHAMI,
* 2017ISGT0026, An Automated Vulnerability Analysis Technique for Smart Grid Infrastructure
  Y. KWON, Korea Electric Power Research Institute
  H. KIM, Korea University
  K. KOUMADI, Korea Electric Power Research Institute
  Y. LIM, Korea Electric Power Research Institute
  J. LIM, Korea University
* 2017ISGT0027, Transient Stability Impact of Large-Scale Photovoltaic System on Electric Power Grids
  S. KHALIL, Texas A&M university at Qatar
  H. ABU-RUB, Texas A&M University at Qatar, Doha, Qatar
  A. MOHAMED, Texas A&M University at Qatar, Doha, Qatar
  A. MOHAMED, Texas A&M University at Qatar, Doha, Qatar
* 2017ISGT0030, A Comprehensive Software Suite for Power Grid Stability Monitoring Based on Synchronphasor Measurements
  J. MA, Burns & McDonnell
  S. FEUERBORN, Burns & McDonnell
  C. BLACK, Southern Company
  V. VENKATASUBRAMANIAN, Washington State University
* 2017ISGT0054, Online False Data Detection and Lost Packet Forecasting System Using Time Series Neural Networks for IEC 61850 Sampled Measured Values
  M. EL HARIRI, Florida International University
  T. YOUSSEF, Florida International University
  H. HABIB, Florida International University
  O. MOHAMMED, Florida International University
* 2017ISGT0057, Hierarchical Energy Management System Demonstration in a Semi-Virtual Grid
  Y. BECK, Holon Institute of Technology
* 2017ISGT0059, Technical Review of Protection Settings Considering the Influence of Distributed Generation
  S. MATOS, Universidade Federal do Espirito Santo
  L. ENCARNACAO, Universidade Federal do Espirito Santo
  C. DONADEL, Instituto Federal do Espirito Santo
* 2017ISGT0065, Vulnerability Analysis for Simultaneous Attack in Smart Grid Security
  S. PAUL, South Dakota State University
  Z. NI, South Dakota State University
* 2017ISGT0066, Project and system firm capacity definitions with long term hydro scheduling
  E. HREINSSON, University of Iceland
* 2017ISGT0068, Dynamic Analysis of OLTC and Voltage Regulator under Active Network Management Considering Different Load Profiles
  S. ALKAABI, Masdar Institute of Science and Technology
  H. ZEINELDIN, Masdar Institute of Science and Technology
  V. KHADKIKAR, Masdar Institute of Science and Technology
  M. ELMOURSI, Masdar Institute of Science and Technology
* 2017ISGT0069, Micro controller Based Highly Efficient Three Phase Three Level Transformer less PV Inverter
S. CHATHAMPALLY, SCMS
* 2017ISGT0071, Recurrent Neural Network Based User Classification for Smart Grids
  K. TORMAI, Péter Pázmány Catholic University
  A. OLÁH, Péter Pázmány Catholic University
  R. DRENYOVSZKI, Pallas Athene University
  L. KOVÁCS, Pallas Athene University
  I. PINTÉR, Pallas Athene University
  J. LEVENDOVSZKY, Budapest University of Technology and Economics
* 2017ISGT0075, Simplified Power Flow Modeling Approach Considering On-Load Tap Changers
  S. ALKAABI, Masdar Institute of Science and Technology
  H. ZEINELDIN, Masdar Institute of Science and Technology
  V. KHADKIKAR, Masdar Institute of Science and Technology
* 2017ISGT0076, Power Hardware-in-the-Loop Evaluation of PV Inverter Grid Support on Hawaiian Electric Feeders
  A. NELSON, National Renewable Energy Laboratory
  K. PRABAKAR, National Renewable Energy Laboratory
  A. NAGARAJAN, National Renewable Energy Laboratory
  S. NEPAL, National Renewable Energy Laboratory
  A. HOKE, National Renewable Energy Laboratory
  M. ASANO, Hawaiian Electric Company
  R. UEDA, Hawaiian Electric Company
  E. IFUKU, Hawaiian Electric Company
* 2017ISGT0083, Assessment of Hypothesized Substation Cyberattack Using Linearized Power Flow Approach
  Z. YANG, Michigan Technological University
  C. TEN, Michigan Technological University
* 2017ISGT0086, State Estimation Error Detection System for Online Dynamic Security Assessment
  Y. TSUJII, Hitachi,Ltd.
  K. KAWAKITA, Hitachi,Ltd.
  M. KUMAGAI, Hitachi,Ltd.
  A. KIKUCHI, Hitachi,Ltd.
  M. WATANABE, Hitachi,Ltd.
* 2017ISGT0089, Distributed Consensus Management for Islanded Hybrid AC/DC Microgrid
  S. LIU, State Grid Corporation of China
  H. HE, Shanghai Jiao Tong University
  B. HAN, Shanghai Jiao Tong University
  G. LI, Shanghai Jiao Tong University
* 2017ISGT0094, Evaluation of the ENTSO-E Initial Dynamic Model of Continental Europe Subject to Parameter Variations
  F. SEGUNDO SEVILLA, ZHAW
  P. KORBA, ZHAW
  K. UHLEN, NTNU
  E. HILLBERG, STRI
  G. LINDAHL, STRI
  W. SATTINGER, Swissgrid
* 2017ISGT0095, Energy Flexibility in the Philippines’ Power System
  J. BILLANES, University of Southern Denmark
* 2017ISGT0098, Supervised Learning for Optimal Power Flow as a Real-Time Proxy
  R. CANYASSE, Technion
  G. DALAL, Technion
  S. MANNOR, Technion

* 2017ISGT0111, Continuation Power Flow Analysis for PV Integration Studies at Distribution Feeders
  J. WANG, North Carolina State University
  X. ZHU, North Carolina State University
  D. LUBKEMAN, North Carolina State University
  N. LU, North Carolina State University
  N. SAMAAN, Pacific Northwest National Laboratory

* 2017ISGT0112, Empirical Analysis of Convergence and Sensitivity of Demand Response based on Real Time Pricing
  S. LOKHANDE, Tata Consultancy Services Ltd
  Y. BICHPURIYA, Tata Consultancy Services Ltd

* 2017ISGT0115, RES Hosting Capacity Improvement Using a Central Energy Storage System
  P. HASANPOR DIVSHALI, KTH Royal Institute of Technology
  L. SÖDER, KTH Royal Institute of Technology

* 2017ISGT0123, Lessons Learned from Two Utility-Owned Islandable Microgrid Implementations
  A. VUKOJEVIC, Duke Energy
  T. FENIMORE, Duke Energy
  S. LAVAL, Duke Energy

* 2017ISGT0125, Analysis of Contribution from Solar Generators for short circuit in an Urban Distribution System
  S. PAZZINI DA SILVA MATOS, Universidade Federal do Espirito Santo
  L. ENCARNACAO, Universidade Federal do Espirito Santo
  C. DONADEL, Instituto Federal do Espirito Santo

* 2017ISGT0137, Implementation of Hardware-in-the-Loop Simulation Workbench for A Hybrid AC/DC Microgrid
  D. SHI, Nanyang Technological University
  C. JIN, Nanyang Technological University
  Z. ZHANG, Nanyang Technological University
  P. WANG, Nanyang Technological University
  F. CHOO, Nanyang Technological University
  L. KOH, Nanyang Technological University

* 2017ISGT0138, Multi-Objective Optimization of Energy Storage and Wind DGs for Self-Adequacy of Microgrid equipped with Fast DC Charging Station
  S. EL BATAWY, University of Ontario Institute of Technology
  M. GRAY, IEEE
  W. MORSI, IEEE

* 2017ISGT0139, Analyzing Subsynchronous Torsional Interactions in Large-Scale Power Systems in Frequency Domain
  P. ZADEHHOST, Powertech Labs. Inc.
  F. HOWELL, Powertech Labs. Inc.
  X. LIN, Powertech Labs. Inc.
* 2017ISGT0148, Variable Voltage Method to Reduce the Components of an Asymmetrical Multilevel Inverter
  L. WANG, Powertech Labs. Inc.
  J. SINGH, National Institute of Technology Kurukshetra
  R. DAHIYA, National Institute of Technology Kurukshetra
  L. SAINI, National Institute of Technology Kurukshetra

* 2017ISGT0159, Scalable Open Source Smart Grid Simulator (SGSim)
  E. EBEID, University of Southern Denmark
  R. JACOBSEN, Aarhus University
  F. STEFANNI, EDALab s.r.l.
  D. QUAGLIA, Verona University

* 2017ISGT0163, OPL - A Language for Dynamic Power Flow Formulation and Binding
  M. KHAN, KTH Royal Institute of Technology
  M. FIDAI, KTH Royal Institute of Technology
  G. VALDENMAIER, KTH Royal Institute of Technology
  Y. ZHAO, KTH Royal Institute of Technology
  L. OSTERLUND, Brolunda Consulting
  L. NORDSTROM, KTH Royal Institute of Technology

  M. KAMAL, University of Akron
  J. KOCIS, University of Akron

* 2017ISGT0185, Design and Development of a Microgrid Control System for Integration of Induction Generation With Storage Capability at Saint Paul Island, Alaska
  A. KHATIB, Schweitzer Engineering Laboratories, Inc.
  B. NAYAK, Schweitzer Engineering Laboratories, Inc.
  B. DAI, Schweitzer Engineering Laboratories, Inc.
  J. COLEMAN, TDX Power, Inc.
  S. HOSKINS, TDX Power, Inc.
  J. TIERSON, TDX Power, Inc.

* 2017ISGT0186, Impact of Density of Wind Turbine Induction Generator on Static Voltage Stability of Distribution Network
  F. XIA, Wuhan University
  H. CHEN, Wuhan University

* 2017ISGT0187, Performance Guaranteed Inertia Emulation for Diesel-Wind System Feed Microgrid via Model Reference Control
  Y. ZHANG, University of Tennessee Knoxville
  A. MELIN, Oak Ridge National Laboratory
  S. DJOUDI, University of Tennessee Knoxville
  M. OLAMA, Oak Ridge National Laboratory

* 2017ISGT0194, Sizing Methodology for Combined Renewable Energy Systems
  J. SWARTZ, Rutgers University
  A. GHOFRANI, Rutgers University
  M. JAFARI, Rutgers University

* 2017ISGT0197, A Cyber-Physical Resilience Metric for Smart Grids
  I. FRIEDBERG, Queen's University Belfast
  K. MCLAUGHLIN, Queen's University Belfast
  P. SMITH, AIT Austrian Institute of Technology
* 2017ISGT0209, Autonomous Control of Smart Inverters in Grid Connected and Islanded Mode
  M. SHUVRA, UNC Charlotte
  B. CHOWDHURY, UNC Charlotte

* 2017ISGT0210, Substation Monitoring to Enhance Situational Awareness - Challenges and Opportunities
  A. ASHOK, PNNL
  S. SRIDHAR, PNNL
  M. RICE, PNNL
  J. SMITH, SEL

* 2017ISGT0212, Predetermined Time-Step Solver for Rapid Quasi-Static Time Series (QSTS) of Distribution Systems
  M. RENO, Sandia National Laboratories
  R. BRODERICK, Sandia National Laboratories

* 2017ISGT0213, Enhancement of Distribution Load Modeling Using Statistical Hybrid Regression
  Y. TANG, MICHIGAN TECHNOLOGICAL UNIVERSITY
  S. ZHAO, MICHIGAN TECHNOLOGICAL UNIVERSITY
  C. TEN, MICHIGAN TECHNOLOGICAL UNIVERSITY
  K. ZHANG, MICHIGAN TECHNOLOGICAL UNIVERSITY

* 2017ISGT0216, Linear Quadratic Gaussian Control for Resonance Damping in Microgrids with Cascaded Converters
  A. NIRAGIRE, University of Arkansas
  R. ABDULKADER, University of Arkansas
  R. MCCANN, University of Arkansas

* 2017ISGT0218, Communication Requirements for Hierarchical Control of Volt-VAr Function for Steady-State Voltage
  J. QUIROZ, Sandia National Laboratories
  M. RENO, Sandia National Laboratories
  O. LAVROVA, Sandia National Laboratories
  R. BYRNE, Sandia National Laboratories

* 2017ISGT0220, PReSS Towards a Secure Smart Grid: Protection Recommendations against Smart Spoofing
  C. WICKRAMAARACHCHI, University of Southern California
  R. KANNAN, University of Southern California
  C. CHELMIS, University at Albany, SUNY
  V. PRASANNA, University of Southern California

* 2017ISGT0222, Coordinated Primary Control Reserve by Flexible Demand and Wind Power Generation
  E. ABBASI, Amec Foster Wheeler

* 2017ISGT0232, Optimized Solar Photovoltaic Generation in a Real Local Distribution Network
  H. SADEGHIAN, Virginia Commonwealth University
  M. ATHARI, Virginia Commonwealth University
  Z. WANG, Virginia Commonwealth University
* 2017ISGT0238, Voltage Control by Using Capacitor Banks and Tap Changing Transformers in a Renewable Microgrid
  P. PENKEY, University of Idaho
  H. SAMKARI, University of Idaho
  B. JOHNSON, University of Idaho
  H. HESS, University of Idaho

* 2017ISGT0241, Assessment of Battery Energy Storage for Distribution Capacity Upgrade Deferral
  L. GARCIA-GARCIA, ComEd
  E. PAASO, ComEd
  M. AVENDANO-MORA, ComEd

* 2017ISGT0242, Placement and Sizing of Parallel Reactive Power Compensation in the Presence of Distributed Generation For Line Loss Reduction
  T. MASAUD, Texas A&M University -Kingsville
  C. UKAH, Texas A&M University-Kingsville
  R. MISTRY, Texas A&M University-Kingsville
  R. CHALLOO, Texas A&M University-Kingsville

* 2017ISGT0248, Smart Charging for an Electric Vehicle Aggregator Considering User Tariff Preference
  J. CLAIRAND, Universidad de las Américas - Ecuador
  J. RODRÍGUEZ GARCÍA, Universitat Politècnica de València
  C. ÁLVAREZ BEL, Universitat Politècnica de València

* 2017ISGT0252, Economic Dispatch in Microgrids
  P. THEKKUMPARAMBATH MANA, Pacific Northwest National Laboratory
  J. FULLER, Pacific Northwest National Laboratory

  R. KONISHI, Graduate School of Keio University
  Y. TAKENOBU, Waseda University
  M. TAKAHASHI, Keio University
  Y. HAYASHI, Waseda University

* 2017ISGT0256, A New Adaptive Inverse-Time Protection Scheme for Modern Distribution Systems with Distributed Generation
  E. PURWAR, Indian Institute of Technology Varanasi (Banaras Hindu University)
  D. VISHWAKARMA, Indian Institute of Technology Varanasi (Banaras Hindu University)
  S. SINGH, Indian Institute of Technology Varanasi (Banaras Hindu University)

* 2017ISGT0257, RSSI-Based Spoofing Detection in Smart Grid IEEE 802.11 Home Area Networks
  B. CHATFIELD, Georgia Southern University
  R. HADDAD, Georgia Southern University

* 2017ISGT0261, Location Identification of High Impedance Faults Using Synchronized Harmonic Phasors
  M. FARAJOLLAHI, University of California, Riverside
  A. SHAHSAVARI, University of California, Riverside
  H. MOHSENIAN-RAD, University of California, Riverside

* 2017ISGT0262, Centralized Control for DC Microgrid Using Finite State Machine
  M. SALEH, CUNY City College of New York
  Y. ESA, CUNY City College of New York
  A. MOHAMED, CUNY City College of New York
Tuesday, 25 April 2017

Policy and Regulatory Considerations Related to Grid Modernization (Plenary Session)
Tuesday, 25 April, 2017 8:30 AM – 10:00 AM
Room: Salon AB

Session Chair: Joseph Paladino, DOE

Policies and regulatory rules set by both federal and state governments have significantly influenced the scope and pace of grid modernization. The plenary session will provide a discussion by individuals in federal and state governments on the impact of their policies and the challenges that need to be addressed to enable the enhanced grid functionality envisioned for a future grid.

Speakers:
Jorge Camacho, Independent Consultant
Kim Jones, Senior Electricity Analyst, North Carolina Utilities Commission, and Chair of the NARUC Staff Subcommittee on Electricity
Thomas Pierpoint, Director, Business Applications, Pepco (an Excelon Company)
Lorenzo Kristov, Principal, Market and Infrastructure Policy, California Independent System Operator
David Meyer. Senior Policy Analyst, U.S. Department of Energy

IIoT Analytics for Transmission Grid Asset Management (panel session)
Tuesday, 25 April, 2017 10:30 AM-12:00 PM  (Technology Track)
Room: Salon DE

Session Chair: John Lauletta, Exacter, Inc.

IIoT sensor technology provide a number of opportunities for enhanced grid maintenance and management. However, there are challenges to address. This Panel will discuss Predictive
Analytics, IIoT sensors, and present a case study demonstrating the opportunities conditions-based Predictive Maintenance enables.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0347, Next Generation Sensors for Grid Management
  J. DE ABRUE-GARCIA, University of Akron
* 2017ISGT0345, Predictive Maintenance Analytics for Grid Management and Operation
  J. LAULETTA, Exacter, Inc.
* 2017ISGT0346, Grid Cybersecurity Considerations with accelerating IIoT
  P. FELDMAN, Midwest ISO
* 2017ISGT0348, Case Study: Analytics for Transmission Grid Predictive Maintenance
  J. REGAN, Pacific Gas & Electric
* 2017ISGT0349, Integrating Construction and Sensors for Enhanced Transmission Design
  G. HUFFMAN, Burns & McDonnell

**Stakeholder Opportunities and Risks I (paper session)**
**Tuesday, 25 April, 2017 10:30 AM-12:00 PM**
**Room: Salon H**

Session Chair: Joseph Paladino, DOE

PAPERS AND AUTHORS:
* 2017ISGT0064, Social Virtual Energy Network: Exploring Innovative Business Models of Prosumer Aggregation with Virtual Power Plants
  M. WAINSTEIN, University of Melbourne
  R. DARGAVILLE, University of Melbourne
  A. BUMPUS, University of Melbourne
* 2017ISGT0121, Optimal Battery Charging in Smart Grids with Price Forecasts
  S. VAN DER KOOIJ, VU Amsterdam
  P. KEMPKER, TNO
  H. VAN DEN BERG, TNO
  S. BHULAI, VU Amsterdam
* 2017ISGT0128, A Data-driven Approach for Quantifying Energy Savings in a Smart Building
  R. ADHIKARI, Virginia Tech
  X. ZHANG, Virginia Tech
  M. PIPATTANASOMPORN, Virginia Tech
  M. KUZLU, Virginia Tech
  S. RAHMAN, Virginia Tech
* 2017ISGT0175, Research on Risk and Utilization Rate of Power Equipment Based on Data Envelopment Analysis
  Y. ZENG, Tianjin University
  W. GUO, Tianjin University
  X. LI, Tianjin University
  C. QIN, Tianjin University
  B. HE, State Grid Energy Research Institute
  W. SUN, State Grid Jiangsu Economic Research Institute

**System Operation with High DER Penetration II (paper session)**
**Tuesday, 25 April, 2017 10:30 AM-12:00 PM**
Room: Salon J

Session Chair: Nader Farah, ESTA International

PAPERS AND AUTHORS:
* 2017ISGT0184, Security-Constrained Unit Commitment With Integration of Battery Storage in Wind Power Plant
  N. HAJIBANDEH, C-MAST, Univ. of Beira Interior, Covilhã, Portugal
  S. BADAKHSHAN, Sharif University of Technology
  M. EHSAN, Sharif University of Technology
  S. SOLEYMANI, Science and Research Branch Islamic Azad University
* 2017ISGT0224, A Unit Commitment for Electricity Market Participation of Wind Farms
  E. ABBASI, Amec Foster Wheeler
  S. HOSSEINI, Sharif University of Technology
  M. DOROSTKAR GHAMSARI, Sharif University of Technology
* 2017ISGT0227, An Experimental Study of Energy Consumption in Buildings Providing Ancillary Services
  S. AFSHARI, University of Michigan
  J. WOLFE, University of Michigan
  M. NAZIR, University of Michigan
  I. HISKENS, University of Michigan
  J. JOHNSON, University of Michigan
  J. MATHIEU, University of Michigan
  Y. LIN, National Renewable Energy Laboratory
  A. BARNES, Los Alamos National Laboratory
  D. GELLER, Los Alamos National Laboratory
  S. BACKHAUS, Los Alamos National Laboratory
* 2017ISGT0266, Ex-post Stable and Fair Payoff Allocation for Renewable Energy Aggregation
  H. KHAZAEI, Stony Brook University
  Y. ZHAO, Stony Brook University
* 2017ISGT0244, Data Mining based on Random Forest Model to Predict the California ISO Day-ahead Market Prices
  A. SADEGHI-MOBARAKEH, University of California, Riverside
  M. KOHANSAL, University of California, Riverside
  E. PAPALEXAKIS, University of California, Riverside
  H. MOHSENIAN-RAD, University of California, Riverside

Distribution System Planning Analysis Tools – Bridging the Gap between Current Capabilities and Future Needs (panel session)
Tuesday, 25 April, 2017 10:30 AM-12:00 PM (Cross Cutting Track)
Room: Salon FG

Session Chair: Juliet Homer, PNNL

As technological capabilities increase and distributed energy resources (DERs) become more and more common, new practices and tools are emerging that support increasingly detailed and complex distribution system planning. In this panel we will talk about bridging the gap
between current capabilities and future needs when it comes to distribution system planning. The panel will talk about what is currently available, what is available in a developmental or nascent state and what is still on the horizon. Data needs and availability for varying levels of analysis will also be discussed.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0354, Time Series Simulations and High Penetrations of PV  
  K. SCHNEIDER, PNNL
* 2017ISGT0355, Summary of Existing Distribution System Analysis Capabilities and Gaps  
  J. HOMER, PNNL
* 2017ISGT0356, Tools for Optimal DER Siting  
  J. GROSH, Lawrence Livermore National Laboratory
* 2017ISGT0357, Distribution Planning in the Cloud - transforming customer engagement and system optimization  
  B. FITZSIMONS, GridUnity

Distribution System Operator (DSO) Cost Benefit Assessments (panel session) 
Tuesday, 25 April, 2017 10:30 AM-12:00 PM (Utility Track) 
Room: Salon C

Session Chair: Esa Paaso, ComEd

PRESENTATIONS AND PANELISTS:
* 2017ISGT0381, DSO Cost Benefit Assessment  
  F. RAHIMI, OATI
* 2017ISGT0382, DSO Cost Benefit Assessment  
  S. BAHRAMIRAD, Commonwealth Edison
* 2017ISGT0383, DSO Cost Benefit Assessments  
  F. FARZAN, Quanta-Technology

Advances in Transactive Energy Systems and Grid Architecture (panel session)  
Tuesday, 25 April, 2017 1:00 PM-2:30 PM (Cross Cutting Track)  
Room: Salon FG

Session Chair: Ron Melton, PNNL  
Session Chair: Christopher Irwin, DOE

This panel will present results from U.S. Department of Energy projects on transactive energy systems and grid architecture. The material will include an overview of the Transactive Energy Systems road map being prepared by the GridWise Architecture Council and the work on a modeling and simulation environment for evaluating transactive energy systems. Grid architecture work on bulk power system market structure models and layered decomposition leading to a uniform model of transactive nodes will round out the presentations.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0329, GWAC's Transactive Energy Systems Roadmap  
  M. KNIGHT, PNNL
* 2017ISGT0327, Transactive Market Design Choices and Their Implications  
  L. KRISTOV, CAISO
Opportunities and Challenges for PMU Implementation in Distribution Systems and Microgrids (panel session)
Tuesday, 25 April, 2017 1:00 PM-2:30 PM  (Technology Track)
Room: Salon DE

Session Chair: Sahar Hendabadi, ComEd

PRESENTATIONS AND PANELISTS:
* 2017ISGT0337, Advanced PMU applications in distribution automation
  J. WANG, Argonne National Laboratory
* 2017ISGT0338, Distribution PMU applications for ComEd
  E. PAASO, ComEd
* 2017ISGT0339, Distribution Applications of Synchrophasor Technology – Trends, Experiences and Challenges
  J. ROMERO AGUERO, Quanta Technology

System Operation with High DER Penetration III (paper session)
Tuesday, 25 April, 2017 1:00 PM-2:30 PM
Room: Salon J

Session Chair: Murat Kuzlu, Virginia Tech

PAPERS AND AUTHORS:
* 2017ISGT0129, Using Battery Energy Storage to reduce renewable resource curtailment
  C. ROOT, VELCO
  H. PRESUME, VELCO
  D. PROUDFOOT, Quanta Technology
  L. WILLIS, Quanta Technology
  R. MASIELLO, Quanta Technology
* 2017ISGT0165, Nondominated sorting genetic algorithm-II in subpopulation tables for service restoration
  L. MARQUES, University of Sao Paulo
  A. DELBEM, University of Sao Paulo
  J. LONDON JR., University of Sao Paulo
* 2017ISGT0177, Integrated System to Enable High-penetration Feeder-level PV: Preliminary Design and Simulation Results
  M. ZEIFMAN, Fraunhofer Center for Sustainable Energy Systems
  M. KROMER, Fraunhofer Center for Sustainable Energy Systems
  K. ROTH, Fraunhofer Center for Sustainable Energy Systems
With the proliferation of renewable and variable sources of energy at the transmission level, and the increasing numbers of Distributed Energy Resources (DERs) such as rooftop solar, storage, EVs, smart communities, as well as end-use customers' capabilities to manage their demand at the distribution level, transmission and distribution grids are being operated in ways they were not originally designed for. At the system/transmission level, issues such as
changing power flow patterns, decreasing inertial frequency response capabilities, and changing load patterns present new challenges to the transmission grid operators. These challenges are further exacerbated by the new regulatory requirements such as FERC NOPRs and orders that aim at breaking barriers for the participation of demand-side assets in wholesale energy markets. At the distribution/retail level, issues such as reversal of power flows, phase imbalances, voltage fluctuations etc., are keeping distribution grid operators occupied. The aging power grid infrastructure that dates back to early part of the 20th century is going through fundamental changes to meet the new requirements of the 21st century and beyond. New communications, and control technologies allowing improved visibility and controllability, along with new analytical and computing technologies providing for coordinated forecasting and scheduling of all conventional and unconventional assets are being rolled out to allow participation of all generation and load assets for the provision of energy and variety of ancillary services in support of transmission and distribution grid operations.

This Panel Session will focus on the technical and operational aspects of the ongoing transmission and distribution grid transformation and discuss the current/future state. Also, the Panel will leverage industry, regulatory, standards, and technology/vendor and utility experiences; review the on-going initiatives, assess requirements and impacts, and present emerging scenarios and their challenges and benefits.

**PRESENTATIONS AND PANELISTS:**

* 2017ISGT0368, TBD
  R. SHERICK, Southern California Edison
* 2017ISGT0369, TBD
  R. MASIULLO, Quanta Technology
* 2017ISGT0370, TBD
  M. AMIN, University of Minnesota
* 2017ISGT0371, TBD
  A. STEVEN, GO15
* 2017ISGT0372, TBD
  C. VILLARREAL, Minnesota Public Utilities Commission

**Advanced Distribution Management Systems Research and Development at the U.S. DOE (panel session)**

**Tuesday, 25 April, 2017 3:00 PM-5:00 PM  (Cross Cutting Track)**

**Room:** Salon FG

Session Chair: Eric Lightner, DOE
Session Chair: Ron Melton, PNNL

This panel will present updates on the U.S. DOE Advanced Distribution Management System Program. This program consists of five projects addressing different aspects of ADMS. The panel will include presentations by the leaders of each project with time for discussion of the collective set of projects and the DOE ADMS program. The projects include: Creation of an open platform for development of advanced distribution system planning and operations applications; an ADMS hardware testbed; demonstration of an advanced distribution system operations tool; creation of a framework for integrating information between EMS, DMS and BMS, and design of advanced control algorithms.
PRESENTATIONS AND PANELISTS:
* 2017ISGT0316, GridAPPS-D - An Open Platform for Developing Advanced Distribution System Planning and Operations Applications
  R. MELTON, PNNL
* 2017ISGT0320, Volt-VAR use case evaluation on ADMS testbed
  M. BAGGU, National Renewable Energy Laboratory
* 2017ISGT0317, Community Control of Distributed Resources for Wide Area Reserve Provision
  D. CALLAWAY, Lawrence Berkeley National Laboratory
* 2017ISGT0319, Multi-Scale Integration of Control Systems (EMS/DMS/BMS)
  L. MIN, Lawrence Livermore National Laboratory
* 2017ISGT0318, Hierarchical Control of Distributed Energy Resources
  S. BACKHAUS, Los Alamos National Laboratory

Microgrids and Grid Edge Enabling Technologies II (paper session)
Tuesday, 25 April, 2017 3:00 PM-5:00 PM
Room: Salon H

Session Chair: Farrokh Albuyeh, OATI

PAPERS AND AUTHORS:
* 2017ISGT0044, Development of Prediction-based Operation Planning Method for Domestic Air-Conditioner with Adaptive Learning of Installation Environment
  R. KUROHA, Waseda University
  Y. FUJIMOTO, Waseda University
  W. HIROHASHI, Waseda University
  Y. AMANO, Waseda University
  S. TANABE, Waseda University
  Y. HAYASHI, Waseda University
* 2017ISGT0114, Active Distribution Network Sustainability Assessment: A System Dynamic Approach
  W. WEI, Tianjin University
  H. GAO, Tianjin University
  T. XU, Tianjin University
  K. XU, Tianjin University
  J. ZHU, State Grid Beijing Electric Power Co.
  H. ZHAO, State Grid Beijing Electric Power Co.
  Z. LI, State Grid Beijing Electric Power Co.
  L. GUO, State Grid Tianjin Electric Power Co.
  L. SHI, State Grid Tianjin Electric Power Co.
  X. Zhai, State Grid Tianjin Electric Power Co.
* 2017ISGT0144, Design of an Adaptive Sending Rate for Frequency Regulation of a Smart Microgrid with Optimal LQR Controller
  F. DOOST MOHAMMADI, West Virginia Universtity
  H. KESHTKAR VANASHI, West Virginia Universtity
  A. FELIACHI, West Virginia University
  V. K. KULATHUMANI, West Virginia Universtity
* 2017ISGT0145, Identification of Time Elasticity of Load Based on Analytic Hierarchy Process
  K. YONGHONG, Hunan University
L. CANBING, Hunan University
L. GUOBIN, Hunan Communication Technology Service Co., Ltd.
* 2017ISGT0189, Novel Direct Power Control of Single-Phase Three-Level SVPWM Inverter for Photovoltaic Generation
  Z. ALI, University of New Haven
  J. ZHAO, University of New Haven
  E. MANLA, University of New Haven
  J. MA, Southwest Jiaotong University
  W. SONG, Southwest Jiaotong University
* 2017ISGT0190, Hardware and Software Model Evaluation of a Dynamic Load Balancer for Mitigation of Current Unbalance in Distribution Circuits
  H. MIRZAEEN, Quanta Technology
  T. CHANG, Quanta Technology
  F. KATIRAEI, Quanta Technology
  M. ZAVALE-IRAHEHTA, San Diego Gas and Electric

Situational Awareness and Control (paper session)
Tuesday, 25 April, 2017 3:00 PM-5:00 PM
Room: Salon J

Session Chair: Kenneth Lutz, University of Delaware

PAPERS AND AUTHORS:
* 2017ISGT0031, Situational Awareness in an Electric Utility’s Control Center of its Generators’ Damping Capabilities
  P. ARUNAGIRINATHAN, Clemson University
  G. VENAYAGAMOORTHY, Clemson University
* 2017ISGT0085, Implementing Automatic Transfer Scheme in a Main-Tie-Main Configuration Using IEC 61850
  F. PENG, Schweitzer Engineering Laboratories (SEL)
  S. MOHAJERYAMI, University of North Carolina at Charlotte
  O. ZIAEE, University of Nebraska-Lincoln
  B. FALAHATI, Schweitzer Engineering Laboratories (SEL)
* 2017ISGT0127, Multi-level Control Framework for Enhanced Flexibility of Active Distribution Network
  K. NAINAR, Aalborg University
  B. POKHREL, Aalborg University
  J. PILLAI, Aalborg University
  B. BAK-JENSEN, Aalborg University
* 2017ISGT0217, Interoperability Test for IEC 61850-9-2 Standard-based Merging Units
  E. SONG, National Institute of Standards and Technology
  K. LEE, National Institute of Standards and Technology
  G. FITZPATRICK, National Institute of Standards and Technology
  Y. ZHANG, National Institute of Standards and Technology
* 2017ISGT0245, Synchrophasor Data Analytics in Distribution Grids
  D. ARNOLD, Lawrence Berkeley National Lab
  C. ROBERTS, Lawrence Berkeley National Lab
  O. ARDAKANIAN, University of British Columbia
  E. STEWART, Lawrence Berkeley National Lab
**Smart Devices and Interoperability - DOE Grid Modernization Laboratory Consortium Projects (panel session)**

**Tuesday, 25 April, 2017 3:00 PM-5:00 PM**  
**(Technology Track)**

**Room: Salon DE**

Session Chair: Benjamin Kroposki, NREL

**PRESENTATIONS AND PANELISTS:**

* 2017ISGT0358, Overview of the GMLC Devices and Integrated Systems Technical Area  
  B. KROPOSKI, NREL

* 2017ISGT0359, Smart Grid Interoperability Strategy  
  S. WIDERGREN, Pacific Northwest National Laboratory

* 2017ISGT0360, Current status and gaps in Interoperability and Interconnection Standards  
  D. NARANG, National Renewable Energy Laboratory

* 2017ISGT0361, Development of “drive-cycles” for smart grid devices to provide grid services  
  R. PRATT, Pacific Northwest National Laboratory

* 2017ISGT0362, GMLC Testing Network and Open Model Library  
  A. ELLIS, Sandia National Laboratories

* 2017ISGT0363, Pioneering Partnership to allow PV inverters to provide frequency regulation to improve grid stability in Hawaii  
  A. HOKE, National Renewable Energy Laboratory

**Creating the Grid Operating System of the Future (panel session)**

**Tuesday, 25 April, 2017 3:00 PM-5:00 PM**  
**(Utility Track)**

**Room: Salon C**

Session Chair: Doug Houseman, EnerNex

**PRESENTATIONS AND PANELISTS:**

* 2017ISGT0376, Introduction and Closing Comments  
  D. HOUSEMAN, EnerNex

* 2017ISGT0377, SCE® Grid Management System  
  J. BUBB, SCE

* 2017ISGT0378, The future of OT  
  M. STUBBER, Selkirk Insights

* 2017ISGT0379, OT and the future  
  B. WILLIAMS, Oracle

**Wednesday, 26 April 2017**

**Utility Executive (Plenary Session)**

**Wednesday, 26 April, 2017 8:30 AM - 10:00 AM**

**Room: Salon AB**

Session Chair: **Jay Giri**, GE Grid Solutions

Utility executives will share their recent practical experiences with smart grid deployments. They will also discuss challenges and future plans.
Speakers:
Chantal-Aimee N. Hendrzak, PJM
Rana Mukerji, NYISO
Mark Karl, Vice President, Market Development, ISO-NE
Tom Pierpoint, Exelon

The Smart Grid Energy Marketplace of the Future (panel session)
Wednesday, 26 April, 2017 10:30 AM-12:00 PM  (Cross Cutting Track)
Room: Salon FG

Session Chair: Alan Washburn, Burns & McDonnell

This panel session will discuss what changes in technology, regulation, and business will be needed to enable a grid with very diverse distributed energy resources and a more open market. The framework for starting this discussion will be the recent notice of proposed rulemaking from FERC regarding the participation of electric storage resources and distributed energy resource aggregations in the RTO/ISO markets in conjunction with the results of several recent pilot programs. The pilot programs discussed will include PSE&G's Solar 4 All® Grid Security and Storm Preparedness solar plus battery pilot projects and PG&E's Energy Storage for Market Operations pilot program.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0330, Session Introduction
  A. WASHBURN, Burns & McDonnell
* 2017ISGT0305, Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators
  M. HERBERT, Federal Energy Regulatory Commission
  A. POWERS, Public Service Electric & Gas
* 2017ISGT0307, Chaos in the Storage Industry
  S. OSBORNE, Greensmith Energy Management Systems
* 2017ISGT0308, Integrating Storage and Distributed Energy Resources into Regional Transmission Organization Markets
  S. HERLING, PJM Interconnection

Innovative Research at the NIST Smart Grid Testbed (panel session)
Wednesday, 26 April, 2017 10:30 AM-12:00 PM  (Utility Track)
Room: Salon C

Session Chair: Chris Greer, National Institute of Standards and Technology(NIST)

Cyber-physical systems (CPS) can be described as smart systems that encompass computational and physical components - seamlessly integrated and closely interacting to sense and respond to the changing state of the real world. The Smart Grid is considered an example of a cyber-physical system.

NIST performs vital research addressing many of the critical elements that make up the Smart Grid. A critical part of this research portfolio is implemented in a newly constructed Smart Grid
Interoperability Testbed. The Smart Grid Interoperability Testbed facility creates a unique set of interconnected and interacting labs in several key measurement areas that will accelerate the development of Smart Grid interoperability standards by providing a combined testbed platform for system measurements, characterization of smart grid protocols, and validation of smart grid standards, all organized around the microgrid concept.

In this Panel Session NIST CPS leadership discuss research activities at the Smart Grid Interoperability Testbed.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0353, Smart Grid Testbed Roadmap
  C. GREER, National Institute of Standards and Technology (NIST)
* 2017ISGT0350, Overview of the Smart Grid Testbed
  P. BOYNTON, National Institute of Standards and Technology (NIST)
* 2017ISGT0351, Smart Grid Sensors Technologies
  G. FITZPATRICK, National Institute of Standards and Technology (NIST)
* 2017ISGT0352, Smart City Applications
  M. BURNS, National Institute of Standards and Technology (NIST)

Advances in Management of Grid Dynamics III (paper session)
Wednesday, 26 April, 2017 10:30 AM-12:00 PM
Room: Salon H

Session Chair: Farrokh Albuyeh, OATI

PAPERS AND AUTHORS:
* 2017ISGT0036, Load Forecasting using Deep Neural Networks
  S. HOSEIN, University of Cambridge
  P. HOSEIN, University of the West Indies
* 2017ISGT0042, Voltage Source Converter Connected to Very Weak Grids Under Disturbances
  M. FAHARI MOGHADDAM ARANI, University of Alberta
  Y. MOHAMED, University of Alberta
* 2017ISGT0140, Stochastic Dynamic Power Flow Analysis Based on Stochastic Response Surface Method and ARMA-GARCH Model
  N. NGUYEN, Waseda University
  Y. NAKANISHI, Waseda University
* 2017ISGT0146, Development of Voltage Control System for Multi-Terminal Low-Voltage DC Distribution System
  T. PHI HAI, Kookmin University
  H. CHO, Kookmin University
  I. CHUNG, Kookmin University
  J. KIM, Korea Electric Power Research Institute (KEPRI)
* 2017ISGT0264, Representative Day Selection Using Statistical Bootstrapping for Accelerating Annual Distribution Simulations
  B. PALMINTIER, NREL
  B. BUGBEE, NREL
  P. GOTSEFF, NREL
System Planning with High DER Penetration II (paper session)
Wednesday, 26 April, 2017 10:30 AM-12:00 PM
Room: Salon J

Session Chair: Farrokh Rahimi, OATI

PAPERS AND AUTHORS:
* 2017ISGT0037, Leveraging Smart Grid Technology and Using Microgrid as a Vehicle to Benefit DER Integration
  R. DAS, icaPower LLC
  V. MADANI, Pacific Gas and Electric Company
  A. MELIPOULOS, Georgia Institute of Technology
* 2017ISGT0073, An MILP Model for Optimal Management of Energy Consumption and Comfort in Smart Buildings
  J. PINZON AMOROCHO, University of Campinas-Unicamp
  P. VERGARA BARRIOS, University of Campinas-Unicamp
  L. P. DA SILVA, University of Campinas-Unicamp
  M. RIDER, University of Campinas-Unicamp
* 2017ISGT0084, Modular Microgrid Unit (MMGU) Specifications for a Pumped-Storage Application
  B. FALAHATI, Schweitzer Engineering Laboratories (SEL)
  M. SHAHVERDI, California State University, Los Angeles
  A. JAMEHBOZORG, California State University, Los Angeles
  M. ZARGHAMI, California State University, Sacramento
* 2017ISGT0141, Optimization in Load Scheduling of a Residential Community Using Dynamic Pricing
  T. ROY, South Dakota State University
  A. DAS, South Dakota State University
  Z. NI, South Dakota State University
  M. OLAMA, Oak Ridge National Laboratory
  I. SHARMA, Oak Ridge National Laboratory
  T. KURUGANTI, Oak Ridge National Laboratory
  D. FUGATE, Oak Ridge National Laboratory

Military Smart Grid Technology (panel session)
Wednesday, 26 April, 2017 10:30 AM-12:00 PM (Technology Track)
Room: Salon DE

Session Chair: Thomas Podlesak, U.S. Army (CERDEC)

PRESENTATIONS AND PANELISTS:
Enabling Extreme Real-time Grid Integration of Solar Energy (Energise) (panel session)
Wednesday, 26 April, 2017 1:00 PM-2:30 PM (Utility Track)
Room: Salon C

Session Chair: Guohui Yuan, Department of Energy

The panel will discuss the objectives, approaches, and expected outcomes of the recently launched R&D program by the DOE SunShot Initiative. The program aims to develop and demonstrate highly scalable distribution system planning and real-time operation solutions that seamlessly interconnect and integrate high penetration solar generation in the electricity grid. The envisioned ENERGISE solutions will require the extensive use of sensor, communication, and data analytics technologies to gather up-to-the-minute measurement and forecast data from diverse sources and perform continuous optimization analysis and active control for existing and new PV installations in real time.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0285, SunShot ENERGISE program overview
  G. YUAN, Department of Energy
* 2017ISGT0284, Northeastern ENERGISE project
  A. ABUR, Northeastern University
* 2017ISGT0286, Vermont ENERGISE project
  M. ALMASSALKHI, University of Vermont
* 2017ISGT0303, PPL ENERGISE project
  M. GREEN, PPL Electric Utilities
* 2017ISGT0304, SCE ENERGISE project
  R. SHERICK, Southern California Edison

Strengthening Energy Resilience on Military Installations (panel session)
Wednesday, 26 April, 2017 1:00 PM-2:30 PM (Technology Track)
Room: Salon DE

Session Chair: David McGeown, McGeown Associates

This session will be a discussion with the Army, Air Force, and Edison Electric Institute on how the military and the utility industry are developing centers of energy resilience. The conversation will explore how the government and utilities are cooperating to integrate Distributed Energy Resources (both renewable and alternative energy) and energy storage into new smart grid applications that support the Army mission and civilian authorities.
The session will provide the audience with an overview of the Army and Air Force goals for energy security, and the procurements that have resulted in an array of innovative new projects with utilities and the private sector, including a 50MW generation plant at Schofield Barracks in Hawaii. The panel will discuss how the utility industry's cooperation with the Department of Defense is creating new approaches to business, integrated resource planning and distribution operations to meet these new demands.

PRESENTATIONS AND PANELISTS:
* 2017ISGT0301, Army Initiatives to Strengthen Energy Resilience with renewable and alternative energy security projects
  K. STEHN, Army
* 2017ISGT0302, Utility Initiatives to Support DOD Energy Resilience
  S. KIESNER, Edison Electric Institute
* 2017ISGT0331, US Air Force Energy Assurance Initiatives
  D. IRWIN, Office of Energy Assurance

Stakeholder Opportunities and Risks II (paper session)
Wednesday, 26 April, 2017 1:00 PM-2:30 PM
Room: Salon H

Session Chair: Joseph Paladino, DOE

PAPERS AND AUTHORS:
* 2017ISGT0102, Application of AMI Data to Anomaly Detection and Dynamic Power Flow Analysis
  F. ELDALI, Colorado State University
  T. KIRK, National Rural Electric Cooperative Association
  D. PINNEY, National Rural Electric Cooperative Association
* 2017ISGT0116, Hour-Ahead Solar PV Power Forecasting using SVR Based Approach
  A. ALFADDA, Virginia Tech
  R. ADHIKARI, Virginia Tech
  M. KUZLU, Virginia Tech
  S. RAHMAN, Virginia Tech
* 2017ISGT0164, Towards the improvement of multi-objective evolutionary algorithms for service restoration
  L. MARQUES, University of Sao Paulo
  A. DELBEM, University of Sao Paulo
  J. LONDON JR., University of Sao Paulo
* 2017ISGT0214, A Data Envelopment Analysis (DEA)-Based Model for Power Interruption Cost Estimation for Industrial Companies
  O. ZIAEE, University of Nebraska-Lincoln
  B. FALAHATI, Schweitzer Engineering Laboratories, Inc.
* 2017ISGT0240, Energy and Power Savings Assessment in Buildings via Conservation Voltage Reduction
  S. KAMPEZIDOU, Georgia Institute of Technology
  H. WIEGMAN, General Electric Global Research
T&D Interface Issues and Solutions II (paper session)
Wednesday, 26 April, 2017 1:00 PM-2:30 PM
Room: Salon J

Session Chair: Kevin Schneider, PNNL

PAPERS AND AUTHORS:
* 2017ISGT0050, A Dynamic State Estimator for the Development of a Control Signal for Power System Damping Enhancement
  I. ORTEGA-RIVERA, Universidad Nacional Autónoma de México
  C. FUERTE-ESQUIVEL, Universidad Michoacana de San Nicolas de Hidalgo
  C. ANGELES-CAMACHO, Universidad Nacional Autonoma de Mexico
  G. HEYDT, Arizona State Univ
  V. VITTAL, Arizona State Univ
* 2017ISGT0063, Adaptive Mitigation of Out-of-Step Transients Based on Equal Area Criterion and Energy Balance
  E. BLOOD, Schweitzer Engineering Laboratories, Inc.
* 2017ISGT0077, Experimental Evaluation of Grid Support Enabled PV Inverter Response to Abnormal Grid Conditions
  A. NELSON, National Renewable Energy Laboratory
  G. MARTIN, National Renewable Energy Laboratory
  J. HURTT, Florida Power and Light
* 2017ISGT0080, Modeling a Microgrid as a Single Source Using the Timeframe Capacity Factor Reliability Model
  B. FALAHATI, Schweitzer Engineering Laboratories, Inc.
  A. KARGARIAN, Louisiana State University
  S. MEHRAEEN, Louisiana State University
  Y. FU, Mississippi State University
* 2017ISGT0082, A SGAM-Based Architecture for Synchrophasor Applications Facilitating TSO/DSO Interactions
  H. HOOSHYAR, KTH Royal Institute of Technology
  L. VANFRETTI, KTH Royal Institute of Technology

Cloud Computing and Cybersecurity Issues for Power Grid Applications (panel session)
Wednesday, 26 April, 2017 1:00 PM-2:30 PM (Cross Cutting Track)
Room: Salon FG

Session Chair: Jianhui Wang, Argonne National Laboratory

PRESENTATIONS AND PANELISTS:
* 2017ISGT0364, An overview of the DOE Cybersecurity for Energy Delivery Systems (CEDS) program
  C. HAWK, Department of Energy
* 2017ISGT0365, NERC CIP Standards - The Cloud, Virtualization, and CIP
  T. WHITNEY, NERC
* 2017ISGT0366, Microsoft Cloud Offerings Architecture
  J. JOYCE, Microsoft
Use of Cloud Computing for Power System Planning and Market Analytics: Benefits and Challenges
A. Rudkevich, Newton Energy Group