IEEE PES Innovative Smart Grid Technologies, Europe

October, 12-15, 2014 Istanbul

Istanbul Technical University
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Dear Colleagues,

On behalf of IEEE and the Organizing Committee, we are pleased to welcome you to the 5th Innovative Smart Grid Technologies (ISGT 2014) Conference. It’s a great honor for us to see you here at Istanbul Technical University’s Main Campus. The first IEEE PES ISGT Europe conference was held in Gothenburg in 2010. Then very successful series of conferences took place in Manchester, Berlin and Copenhagen respectively.

The ISGT Europe 2014 forms a technical platform for the participants from all around the world to discuss the recent theoretical studies in the area of smart grid and associated technical developments to transform the existing grid into a smart grid including an increasing number of distributed energy resources and electrical storage facilities.

Approximately 400 high quality papers were submitted to ISGT 2014 from all around the world. Due to the limitation of space, 263 papers were accepted for poster and oral presentation. The ISGT Europe 2014 has 29 paper sessions and 2 groups of poster sessions, 3 tutorials, 3 keynote speeches, 3 plenaries and 9 panels. These cover electrical generation & storage technologies, integration of electric vehicles, demand side management, micro-grid operation and integration, smart grid communications and network security, energy management and electricity market, wide area network monitoring and control, smart grid protection and control.

In the frame of social events, a dinner reception will take place during the conference. The first dinner will be on a cruise boat traveling through the Bosphorus on the evening of the second day of the conference. The gala dinner on the other hand, will be held in Baltaliman Portaxe Restaurant on October 15th, Wednesday evening.

I would like to thank the Rector of Istanbul Technical University for providing us the university facilities for every stage of ISGT Europe 2014. I would like to thank our Platinum supporter EAE Electric, Gold supporter Makel Electric and Silver supporters Alstom Grid and ENTELS Elettronica. I also thank all Panel Supporters. My special thanks go to my colleagues for their great effort in organizing the conference.

I hope your attendance at this conference will give you an opportunity to contact directly with the professionals dealing with smart grids and also have nice days in Istanbul where the contents meet.

Yours Sincerely,
Conference General Chair

Prof. Dr. Ömer Usta, Istanbul Technical University (ITU)

Local Organizing Committee

Ömer Usta, Chair, ITU
Ahmet Cansız, Co-Chair, ITU
Celal Kocatepe, Co-Chair, Yıldız Technical University (YTU)
İstemihan Genç, Technical Program Coordinator, ITU
Lale Erdem Atılgan, Social Event Coordinator, ITU
Mehmet Tahir Sandikkaya, Technical Co-Chair, ITU
Fatih Küçüktezcan, Web, Printing & Publishing Coordinator, ITU
Fatih Özveren, Student Activities Coordinator, ITU

IEEE PES ISGT Committee

Miroslav Bogovic, PES President
Noel Schulz, IEEE PES Past President
Alan Rotz, IEEE PES Past President
Pat Ryan, IEEE PES Executive Director
Mohammad Shahidehpour, IEEE PES ISGT 2012 USA
Melisa Selak, IEEE PES ISGT Europe Steering Committee
Costas Vournas, IEEE PES Region 8 Representative
Lina Bertling Tjernberg, IEEE PES ISGT Europe Steering Committee Chair

Honorary Committee

Prof. Dr. Mehmet Karaca, Rector, ITU
Prof. Dr. İsmail Yüksel, Rector, YTU
Yusuf Kaya, EAE Electromechanik
International Technical Program Committee

Lina Bertling Tjernberg, KTH, SE
Miles A Redfern, the University of Bath, UK
Kai Strunz, TU Berlin, DE
Matti Lehtonen, Aalto University, Finland
Li Haiyu, the University of Manchester, UK
Deniz Yıldırım, ITU, TR
Uğur S Selamoğulları, YTU, TR
Canbolat Uçak, Yeditepe University, TR
Tankut Yalçınöz, Mevlana University, TR

Damir Novosel, Quanta Technology, USA
Herman Koch, Siemens AG
Jay Giri, Alstom
Kıvanç Sonsuz, EAE Elektrik
Mehmet Bayrak, Sakarya University, TR
Fuat Küçük, ITU, TR
John D. McDonald, GE Energy, USA
Okan Özgönenel, Ondokuz Mayis University, TR
The ISGT Europe 2014 conference will be held in Suleyman Demrel Cultural Center (SDKM) at Istanbul Technical University Maslak Campus. Registration and information desks will be available in the entrance (level 0) throughout the conference. Keynotes, plenary and panel sessions will take place in the main conference hall. Paper sessions will be held in the senate room, seminar room, and room A and B. Poster sessions A and B will be on the second floor. Exhibition stands will be on the first floor throughout the conference.

For the paper sessions the authors need to have the presentation on a memory stick in the format of *.ppt, *.pptx or *.pdf. Presentation file should be named using the following format: Paper ID followed by underscore then followed by presenter last name, such as 2014ISGTEU0XXX_last name. Presenters for oral sessions are requested to upload the presentation on the related room 15 minutes prior to the beginning of the session.

It is recommended to meet the Poster Session Chair at least 30 minutes before the poster session to find your assigned poster location and arrange your materials on the poster board. Presenters are kindly requested to setup and take down their posters on their own. Plenary and panel speakers should send the presentation to the session chair before the conference started.

Wireless LAN will be provided within SDKM. Login information will be obtained from the registration desk.

The welcome reception will take place in SDKM on Monday, October 13 between 17:15-19:30. The Cruise Dinner through the Bosphorus will be on Tuesday, October 14 between 19:00-23:00. The transfer from SDKM to Istinye port will be provided by busses at 18:00 in front of SDKM. After the dinner participants can take the busses at Istinye port to their hotels. The Gala Dinner by the Bosphorus will be on Wednesday, October 15 between 19:00-23:00. The transfer from SDKM to Baltalimanı will be on busses at 18:00. After the dinner participants can take the busses at Baltalimanı to their hotels.

A certificate of attendance will be given to participants on request. Please make your request when you get registered. The certificates will be available from the information desk on Wednesday, October 15, 2014.
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<td>9:30 - 17:00</td>
<td><strong>Registration</strong> - SDKM, ITU</td>
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<td>10:00 - 17:00</td>
<td><strong>IEEE PES Chapter Training Meeting</strong> - SDKM Senate Room, ITU</td>
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<td>13:30 - 15:00</td>
<td><strong>IEEE ISGT Europe 2014 Istanbul Tutorial A, B, C</strong> - SDKM, ITU</td>
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**Tutorial A, SDKM Room A**

“Evolution of EMS Control Centers – Managing the Future Smart Grid PMU Synchro-phasor Measurements at Control Centers”

Jay Giri, ALSTOM

**Tutorial B, SDKM Room B**

“Cyber Security of Smart Grid”

Chen-Ching Liu, Washington State University

**Tutorial C, SDKM Room C**

“EVs Charging Integration in Distribution Grid”

Johan Driesen, KU Leuven

| 15:00 - 15:30            | **Coffee Break** |
| 15:30-17:00              | **Tutorial A, Tutorial B, Tutorial C** (Continued) |
Evolution of EMS Control Centers - Managing the future Smart Grid PMU-Synchro-Phasor Measurements at Control Centers

Jay Giri, Alstom Grid, USA

Dr. Jay Giri (M’78-F’00) is Director of Power Systems Technology and Strateg In at ves at Alstom Grid’s NMS business in Redmond, Washington. In 1978, Jay and 11 other engineers co-founded Energy System Computer Applications (ESCA). In 2010, ESCA after a few corporate mergers became part of Alstom Grid. He has a PhD from Clarkson University in New York and a B.Tech from the Indian Institute of Technology (IIT), Madras. In 2002, he was elected IEEE Fellow and is a member of the IEEE PES Governing Board. He is an Alstom Grid Senior Fellow.

Abstract: Energy Management Systems (EMS) have been deployed for decades at utility control centers to monitor and manage the electric grid in real-time. Today these EMS capabilities are poised to be enhanced quite dramatically with growth of synchrophasor PMU measurements. This tutorial will describe:

- The history and evolution of the EMS from its digital genesis in the 1970s.
- 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)
- The EMS for the future grid
Tutorial B

Sunday, 13:30 – 17:00
Workshop Room B

Cyber Physical Systems Security for the Smart Grid

Chen-Ching Liu, Washington State University, USA, and University College Dublin, Ireland

Prof. Dr. Chen-Ching Liu is Boeing Distinguished Professor at Washington State University, Pullman, and Director of Energy Systems Innovation (ESI) Center. He is also Professor of Power Systems at University College Dublin, Ireland. During 1983-2005, he was a Professor of EE at University of Washington, Seattle. Dr. Liu was Palmer Chair Professor at Iowa State University from 2006 to 2008. In 2008, he joined University College Dublin, where he was Deputy/Acting Principal of Engineering, Mathematical and Physical Sciences. Chen-Ching completed his Ph.D. from the University of California, Berkeley. He received an IEEE Third Millennium Medal in 2000 and the Power and Energy Society Outstanding Power Engineering Educator Award in 2004. Professor Liu received a Doctor Honoris Causa from Polytechnic University of Bucharest, Romania in 2013. He chaired the IEEE Power and Energy Society Fellow Committee, Technical Committee on Power System Analysis, Computation and Economics, and Outstanding Power Engineering Educator Award Committee. Professor Liu is a Fellow of the IEEE.

Abstract: The electrical power grid is a complex cyber physical system (CPS) that forms the lifeblood of a modern society. Its reliable and secure operation is of paramount importance to national security and economic well-being. The power grid today is a highly automated network, where a variety of communication networks and information systems are interconnected to the physical grid for the purpose of monitoring, protection, control, and market functions. Numerous publications - from government, industry, and academia - have noted the growing concern of cyber threats to the electrical grid and the critical need to protect the grid against cyber attacks. Moreover, the increased reliance on information and communication technology in the smart grid will significantly increase the attack surface, which further underscores the importance of cyber security.

As a result, cyber security of the power grid — encompassing attack prevention, detection, and response — is one of the major research challenges at ECCB, and it is an important issue that requires international cooperation and multidisciplinary collaboration.
Electric Vehicle Charging in Electricity Distribution Systems

Johan Driesen, KU Leuven, ESAT-ELECTA, Belgium

Professor Johan Driesen (S’93–M’97–SM’12) was born in 1973 in Belgium. He received the M.Sc. degree in 1996 as Electrical Engineer from the K.U. Leuven, Belgium. He received the Ph.D. degree in Electrical Engineering at K.U. Leuven in 2000 on the element solution of coupled thermal-electromagnetic problems and related applications in electrical machines and drives, microsystems and power quality issues. Currently he is a professor at the K.U. Leuven and teaches power electronics, renewables and drives. In 2000-2001 he was a visiting researcher in the Imperial College of Science, Technology and Medicine, London, UK. In 2002 he was working at the University of California, Berkeley, USA. Currently he conducts research on distributed energy resources, including renewable energy systems, power electronics and its applications, for instance renewable energy and electric vehicles.

Abstract: This tutorial starts with an overview of the main charging principles that are used for powering up battery electric vehicles and plug-in electric vehicles. After a short introduction on electromobility, the main standardized systems (AC, DC, different modes) and advanced principles such as wireless charging are discussed, referring to practical cases where vehicles have to be charged in different environments and different use cases or business models. The link with power system integration is made by addressing the impact of this new type of power consumption on the power flow and stability. “Smart” solutions are proposed, such as droop control and demand side management implementations. Models for the trends and hardware implementations are broken down. Examples from ongoing research and live trials are given. This tutorial intends to make a bridge between developments in smart grids, electromobility and intelligent hard- and software solutions enabling the deployment of electric vehicles.
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<td><strong>Registration</strong> - SDKM, ITU</td>
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<td><strong>Welcoming Remarks</strong></td>
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<td><strong>Omer Usta</strong>, Chair IEEE PES ISGT Europe 2014</td>
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<td>10:00 - 10:30</td>
<td><strong>Keynote A</strong>: “Energy Storage Market”</td>
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<td><strong>Andrew Jones</strong>, Managing Director, S&amp;C Electric Europe</td>
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<td>11:00 - 12:30</td>
<td><strong>Plenary A</strong>: “Future Trends in Smart Grid”</td>
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<td><strong>Damir Novosel</strong>, President of Quanta Technology Expert</td>
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<td>12:30 - 13:30</td>
<td><strong>Lunch Break</strong></td>
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<td>13:30 - 15:00</td>
<td><strong>Panel 1</strong></td>
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<td><strong>Smart Grid Reliability</strong></td>
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<td>Chair: <strong>Sasa Djokic</strong></td>
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<td><strong>Development in Energy Storage Technologies</strong></td>
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<td><strong>Panel 3</strong></td>
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<td><strong>Smart Grid Experiences and Field Tests</strong></td>
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<td>15:30 - 17:15</td>
<td><strong>Paper Session 5</strong></td>
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<td><strong>Computational Intelligence in Smart Grid</strong></td>
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<td>Chair: <strong>Noel Schulz</strong></td>
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**Monday, October 13, 2014**
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<td><strong>Paper Session 2</strong>&lt;br&gt;Integration of Electrical Vehicles into Smart Grid&lt;br&gt;Chair: Henry M Louie</td>
<td><strong>Paper Session 3</strong>&lt;br&gt;Power System Stability and Security 1&lt;br&gt;Chair: Costas Vournas</td>
<td><strong>Paper Session 4</strong>&lt;br&gt;Residential Demand Response 1&lt;br&gt;Chair: Ehab El-Saadany</td>
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<td><strong>Paper Session 6</strong>&lt;br&gt;Microgrid Operation&lt;br&gt;Chair: Fabio Massaro</td>
<td><strong>Paper Session 7</strong>&lt;br&gt;Power System Monitoring, Operation and Control&lt;br&gt;Chair: Ali Abur</td>
<td><strong>Paper Session 8</strong>&lt;br&gt;Power Quality and Reliability&lt;br&gt;Chair: Geert Deconinck</td>
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Andrew Jones, S&C Electric Europe LTD Managing Director, S&C Electric Europe

Mr. Jones received his MBA from Sheffield Hallam University in 1993. Andrew Jones has exceptional technical knowledge in the energy sector, specializing in smart grid technology, and has published over 30 papers and has been involved as a BEAMA, British Standard, CIGRE and IEC bodies. Andrew has a mechanical engineering degree from Swansea University and an MBA from Sheffield. He started his career with an apprenticeship in mechanical engineering with Aluminium Wire and Cable in Swansea before taking an HND in mechanical engineering. He then held a number of roles at Alcan Wire and Conductor and became commercial manager responsible for sales of all electrical products including Middle East, Africa and parts of Asia. During this time he also completed the Institute of Quality Assurance Membership Exams and MBA. Following this, he worked at CCL as Business Development Manager, before the company was purchased by Ancon and he was made Commercial Director of the Electrical Division and Wire Rope Divisions responsible for full P&L and sales on a global basis. In 2004 Andrew joined S&C as Territory Manager before setting up the European business in 2008, taking the role of Managing Director. Andrew regularly speaks across a wide range of energy topics, including smart grid.

Abstract: Current state of storage technology? Current and emerging markets. A personal opinion on what are the key areas to watch in the near future. Although Energy Storage has become the ‘buzz word’ of the industry, there is still a lot of confusion surrounding: technology, costs, markets, and how to use storage. This speech will be a quick run through of the current energy storage landscape and will cover the global electrical network changes happening now. I will cover changes in storage adoption on, the current state of technology, applications and markets already served, and will end with a personal prediction of the future.
Plenary A

Monday, 11:00 – 12:30
Conference Main Hall

Future Trends in Smart Grid

**Chair: Damir Novosel**, Quanta Technology, USA

Damir Novosel (SM 1994, F 2003) is president of Quanta Technology. Previously, he was vice president of ABB Automation Products and president of KEMA T&D US. He is elected to National Academy of Engineers in 2014. Dr. Novosel is IEEE PES President Elect. He served as chair of the PES Techno Council, vice president of technology, and a member of the PES Governing Board from 2010 to 2012. Damir is also member of the CIGRE US National Committee. Damir holds 16 US and international patents and published over 100 articles in Transactions, Journals and Proceedings, receiving PES 2011 and 2013 Prize Paper Awards. Damir has led or participated in numerous IEEE standards, publications, and other initiatives, such as keynotes and panels. Damir has been contributing to education, including an adjunct professorship of Electrical Engineering at North Carolina State University, support of college scholarships, and support to industry courses and tutorials. He holds PhD, MSc, and BS degrees in electrical engineering from Mississippi State University, where he was a Fulbright scholar, the University of Zagreb, Croatia, and the University of Tuzla, Bosnia and Herzegovina, respectively.

**Transitioning to the Grid of the Future**

**Wanda Reder**, VP – Power Systems Solutions, S&C Electric Company

Wanda Reder is the Vice President of the Power Systems Solutions at S&C Electric Company. In her role, she oversees the activity for S&C to design, integrate and install self-healing distribution systems while providing technology, develop microgrids, and interconnect renewable and storage facilities. An exemplary volunteer leader, Wanda Reder’s national role as president of the IEEE Power and Energy Society in 2014 helped grow membership and establish new initiatives.
RTE and TSOs as key players of the Smart Grids Deployment in Europe

Michel Béna, Smart Grids Director for RTE, the French TSO.

Michel Béna has been Smart Grids Director for RTE, the French TSO, since 2012. He's in charge of the involvement of RTE in technical plots projects and in the discussions around the evolution of the French Electrical System related to Smart Grids. Before that, he's been working in the power system transmission R&D field, such as long-term planning, dynamic security and voltage control. He graduated from SUPELEC (1990).

How one state in the US (Vermont) is integrating Smart Grid technologies into daily operations

Chris Root, The Chief Operating Officer for Vermont Electric Power Company

Mr. Root has over 30 years of utility operations and engineering leadership experience. He's currently the Chief Operating Officer for Vermont Electric Power Company in Rutland, VT. He's responsible for the engineering, construction and operation of the transmission system in the state of Vermont. Previously, he was the Senior Vice President of Network Strategy at National Grid responsible for engineering and asset management of the electric and gas networks in the US. He was a Senior VP for 17 years in various roles in Transmission and Distribution but on Operational, Engineering and Construction. He oversaw several operational mergers and was Emergency Director for over 70 significant events through the years. Mr. Root has a BS in Electrical Engineering from Northeastern University and a MEng in Electrical Power Engineering from Rensselaer Polytechnic Institute. He attended the Program for Management Development at the Harvard Business School. Mr. Root is a registered Professional Engineer in the states of MA and RI.
Grid modernization and the role of photovoltaics

**Miroslav Begovic**, University Center of Excellence in Photovoltaic Research at Georgia Tech.

Dr. Miroslav M. Begovic is a Professor in the School of Electrical and Computer Engineering and a faculty member of the University Center of Excellence in Photovoltaic Research at Georgia Tech, one of two such centers in the United States. He received a PhD from Virginia Tech and MS and Dpl. Ing. from Belgrade University. His research interests are in monitoring, analysis, and control of power systems, as well as development and application of renewable and sustainable energy systems. Dr. Begovic has published over 125 publications and completed numerous research projects during his career at Georgia Tech. He has been a member of the IEEE PES Power System Relay Committee for two decades and chaired many of its working groups. Dr. Begovic is currently the Chair of the Electric Energy Technological Interest Group at Georgia Tech., former Chair of the Emerging Technologies Coordination Committee of IEEE PES, member of the IEEE Grid Task Force, IEEE PES Director of the Georgia Tech, and Treasurer of the IEEE Power and Energy Society in 2010-2011 and candidate for IEEE Power and Energy Society President. He is a Fellow of the IEEE and member of Sigma Xi, Eta Kappa.

Power flow control in transmission network

**Frank Lambert**, Associate Director of NEETRAC at Georgia Tech.

Frank C. Lambert (S70-M73-SM87) Mr. Lambert serves as the Associate Director of the National Electric Energy Testing Research and Application Center (NEETRAC) at Georgia Tech (Atlanta). He is responsible for interfacing with NEETRAC's members to develop and conduct research projects dealing with transmission and distribution issues. Mr. Lambert previously worked at Georgia Power Company for 22 years in transmission / distribution system design, construction, operation, maintenance, and automation. He was a member of the IEEE PES Distrubtion Committee and the PES Switchgear Committee, and served on the PES Governing Board as the Vice President for Chapters. Mr. Lambert holds a bachelor's and M.S. degree in Electrical Engineering from the Georgia Institute of Technology.

**Plenary Abstract:** Reliable and efficient electrical grid operation is critical to society. Electrical energy networks have been experiencing significant changes in the last decade caused by new technology trends, environmental drivers, and weather patterns. Changes in public needs and regulatory requirements. The electrical power and energy industry in the next decade will be different than today to meet the demands of the society and address challenges. As “Smart Grid” technologies are required to manage grid complexity, there have been a number of “Smart Grid” deployments in recent years. This plenary panel includes technology and business leaders that address the challenges of a highly automated, strongly interconnected North American energy network.
In the general area of Power System analysis, Dr. Djokic's research focuses on the assessment of reliability and power quality performance of networks with highly dispersed micro-generation/storage resources, including highly dispersed micro-generation systems, as well as on the development of improved system load models, fully incorporating demand-side management and responsive demand functionalities. Dr. Djokic is a Senior Member of IEEE, Member of IET, Associate Member of IESNA and SaRS, and also actively participates in a number of IEEE, CIGRE, CIRED, UIE and BS/IEC international committees and working groups.

**Panel Abstract:** Improved Reliability Performance is often assumed to be one of the very basic aspects of the future “smart grids,” which should also provide functional and flexible control, monitoring, and communication systems and incorporate various demand-responsive and demand-manageable services for reducing CO2 emissions and other drivers of climate change, while maintaining the highest possible levels of power quality, accessibility, and affordability of electricity supply for customers. However, “smart grids” (SG) will result in increasingly complex electricity networks, featuring significantly higher penetrations of variable renewable-based distributed generation (DG) technologies, introducing new highly efficient, intelligent, and flexible control, monitoring and communication systems and incorporating various demand-responsive and demand-manageable services.

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**Panel 1**

Monday, 13:30 – 15:00
Conference Man Hall

**Smart Grid Reliability**

Chair: **Sasa Djokic**, University of Edinburgh, UK

Co-Chair: **Alfredo Testa**, The Second University of Naples, Italy

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Monday, October 13, 2014
Incorporating Regular Requirements in Reliability Analysis of Smart Grids
Sasa Djokic, the University of Edinburgh, UK

Self-Healing City Networks and Distribution Automation
Matti Lehtonen, Aalto University, Finland

Distribution System Reliability Improvement by Car Park Storage Facilities
Aydogan Özdemir, ITU, Turkey

Enabling Methodologies for Large Scale Reliability Analysis in Smart Grids
Alfredo Vaccaro, University of Sannio, Italy
Claudio Canizares, University of Waterloo, Canada

Supply Interruptions and Voltage Dips in a Smart Grid Scenario
Alfredo Testa, Second University of Naples, Italy
Paper Session 1: Smart Grid Experiences and Field Tests

Date       Monday, 13:30 – 15:00
Chair      Miroslav Begovic

2014ISGTEU0153
Multifunctional Operation of a Virtual Power Plant in an Active Distribution Grid: Modelling Approaches and First Field Test Experiences from the SmartRegion Pellworm Project
Simon Koopmann (RWTH Aachen, Germany), Steffen Nicolai (Fraunhofer IOSB, Germany), Armin Schnettler (RWTH Aachen, Germany)

2014ISGTEU0599
Experience from Real Tests on Multiple Smart Meter Switching
Yasir Arafat (Chalmers University of Technology, Sweden), Lina Bertling Tjernberg (KTH Stockholm, Sweden), Per-Anders Gustafsson (Gothenburg Energy, Sweden)

2014ISGTEU0495
Experience of Communication Problems in PLC-based AMR Systems in Finland
Bashir Siddiqui (Tampere University of Technology, Finland)

2014ISGTEU0375
Multi-Goal Optimization in Power Matching City: A Smart Living Lab
Jan Pieter Wijbenga (TNO, Netherlands), Pamela MacDougall (TNO, Netherlands), René Kamphuis (TNO, Netherlands), Albert van den Noort (DNV GL, Netherlands), Tjerk Sanberg (DNV GL, Netherlands), Elke Klaassen (TU Eindhoven, Netherlands)

2014ISGTEU0465
Experimental Validation of a Single Phase Intelligent Power Router
Francesc Girbau-Llistuella (CITCEA-UPC, Spain), Joan-Marc Rodriguez-Bernuz (CITCEA-UPC, Spain), Eduardo Prieto-Araujo (CITCEA-UPC, Spain), Andreas Sumper, Electrical Engineering (CITCEA-UPC, Spain)

2014ISGTEU0430
Thermal Behaviour of Low Voltage Cables in Smart Grid - Related Environments
Nicolas Höning (CWI Amsterdam, Netherlands), Erik De Jong (Flex Power Grid Lab, Netherlands), Gabriël Bloemhof (DNV GL, Netherlands), Han La Poutré (CWI Amsterdam, Netherlands)
Paper Session 2: Integration of Electrical Vehicles into Smart Grid

Date: Monday, 13:30 – 15:00
Chair: Henry M Louie

2014ISGTEU0141
Stochastic Impact Assessment of the Heating and Transportation Systems Electrification on LV grids
Iker Diaz de Cerio Mendaza (Aalborg University, Denmark), Birgitte Bak-Jensen (Aalborg University, Denmark), Zhe Chen (Aalborg University, Denmark), Allan Jensen (HEF Net A/S, Denmark)

2014ISGTEU0460
Estimating Plug-in Electric Vehicle Demand Flexibility through an Agent-Based Simulation Model
Gonzalo Bustos-Turu (Imperial College London, UK), Koen H. Van Dam (Imperial College London, UK), Salvador Acha (Imperial College London, UK), Nilay Shah (Imperial College London, UK)

2014ISGTEU0479
A Review of Plug-in Electric Vehicles as Distributed Energy Storages in Smart Grid
Xianjun Zhang (MISO, USA), Qin Wang (MISO, USA), Guangyue Xu (Siemens Industry Inc., USA), Zijing Wu (Denver University, USA)

2014ISGTEU0545
The Nikola project - Intelligent Electric Vehicle Integration
Peter Bach Andersen (DTU, Denmark), Mattia Marinelli (DTU, Denmark)

2014ISGTEU0544
Vehicle-to-Grid Automatic Load Sharing with Driver Preference in Micro-Grids
Yubo Wang (University of California, USA), Hamidreza Nazari-Pour (University of California, USA), Chi-Cheng Chu (University of California, USA), Rajit Gadh (University of California, USA), Hemanshu Pota (University of New South Wales, Australia)

2014ISGTEU0476
Autonomous Reactive Power Control by Electric Vehicles
Robert Kohrs (Fraunhofer ISE, Germany), Kilian Dallm Zerbe (Fraunhofer ISE, Germany), Michael Mierau (Fraunhofer ISE, Germany), Christof Wittwer (Fraunhofer ISE, Germany)
Paper Session 3: Power System Stability and Security 1

Date: Monday, 13:30 – 15:00
Chair: Costas Vournas

2014ISGTEU0628
Analysis on the Effect of Rotor Angle Control for Transient Stability Enhancement
Qiang Wei (Shandong University, China), Weimin Guo (HAEP Electric Research Institute, China), Xueshan Han (Shandong University, China), Tianya Li (Queensland University of Technology Brisbane, Australia), Ming Yang (Shandong University, China)

2014ISGTEU0297
Interval Based Network Operation Respecting N-1 Security Criterion
Premysl Vorac (University of West Bohemia, Czech Republic), Eduard Janecek (University of West Bohemia, Czech Republic), Daniel Georgiev (University of West Bohemia, Czech Republic)

2014ISGTEU0038
Sensitivity Analysis on Short-Circuit Current Contribution from VSC-HVDC Systems Connecting Far and Large Offshore Wind Power Plants
Mario Ndreko (TU Delft, Netherlands), Marjan Popov (TU Delft, Netherlands), Jens C. Boemer (TU Delft, Netherlands), Mart A. M. M. van der Meijden (TU Delft, Netherlands)

2014ISGTEU0366
Wide Area Prosumption Control and Sensitivities of Aperiodic Small Signal Stability Indicators
Martin Wittrock (DTU, Denmark), Hjortur Arne (DTU, Denmark), Hejde Nielsen (DTU, Denmark)

2014ISGTEU0551
Linking Damping of Electromechanical Oscillations to System Operating Conditions using Neural Networks
Francesco Sulla (Lund University, Sweden), Emil Måsbäck (Lund University, Sweden), Olof Samuelsson (Lund University, Sweden)

2014ISGTEU0117
A Three-layer Severity Index for Power System Voltage Stability Assessment using Time-series from Dynamic Simulations
Luigi Vanfretti (KTH Stockholm, Sweden), Felix Rafael Segundo Sevilla (KTH Stockholm, Sweden)
Paper Session 4: Residential Demand Response 1

Date: Monday, 13:30 – 15:00
Chair: Ehab El-Saadany

2014ISGTEU0260
Modelling of Household Electro - Thermal Technologies for Demand Response Applications
Lingxi Zhang (University of Manchester, UK), Nicholas Good (University of Manchester, UK), Alejandro Navarro-Espinosa (University of Manchester, UK), Pierluigi Mancarella (University of Manchester, UK)

2014ISGTEU0326
Challenges in Utilisation of Demand Side Response for Operating Reserve Provision
Hassan Qazi (University College Dublin, Ireland), Daniel Burke (University College Dublin, Ireland), Damian Flynn (University College Dublin, Ireland)

2014ISGTEU0125
A Home Energy Management Algorithm in a Smart House Integrated with Renewable Energy
Avijit Saha (Virginia Tech, USA), Murat Kuzlu (Virginia Tech, USA), Warodom Khamphanchai (Virginia Tech, USA), Manisa Pipattanasomporn (Virginia Tech, USA), Saifur Rahman (Virginia Tech, USA), Onur Elma (Yildiz Technical University, Turkey), Ugur S. Selamogullari (Yildiz Technical University, Turkey), Mehmet Uzunoglu (Yildiz Technical University, Turkey), Bunyamin Yagciktekin (Yildiz Technical University, Turkey)

2014ISGTEU0389
Large-scale Residential Demand Response Pilot ICT Architecture
Matthias Strohbe (Ghent University, Belgium), Koen Vanthournout (Ghent University, Belgium), Tom Verschueren (Ghent University, Belgium), Wim Cardinaels (VITO-EnergyVille, Belgium), Chris Develde (Ghent University, Belgium)

2014ISGTEU0419
Non-Intrusive Load Curve Disaggregation using Sparse Decomposition with a Translation-Invariant Boxcar Dictionary
Simon Arberet (CSEM, Switzerland), Andreas Hutter (CSEM, Switzerland)

2014ISGTEU0502
Study of Load Curves Concerning the Influence of Socioeconomic and Cultural Characteristics on Residential and Commercial Energy Consumption

Panel 2

Monday, 15:30 – 17:15
Conference Mann Hall

Developments in Energy Storage Technologies

Chair: Ahmet Cansiz, ITU, Turkey

Prof. Dr. Ahmet Cansiz is a professor in the Electrical Engineering Department, Istanbul Technical University, Turkey. He obtained Ph.D. degree from the Illinois Institute of Technology, USA, in 1999. He has a wide experience in thermodynamics of the cryogenic systems, superconductivity applications such as superconducting levitation, superconducting bearing system, superconducting MagLev, superconducting magnet c energy storage and superconducting ywheel energy storage. His research area also focuses on interdisciplinary subjects such as heat transfer phenomena in heat exchangers, integration of renewable energy with grids and energy storage technologies. He has more than 40 publications on the subject of electromagnetics, electromechanics, thermodynamics and energy storage related topics. He is a member of IEEE and IEEE Magnetics Society.

Panel Abstract: Major challenges on the integration of the energy distribution and energy storage technologies with the smart grids are the major focus of the panel. Variety of energy storage devices associated with the smart grids will be discussed such as superconducting devices of ywheels, superconducting magnet c energy storage, fault current limiters and superconducting power cables. Implementations of not only renewable energy sources such as wind and solar energy but also energy storage devices such as electrochemical storage will be discussed for the power grids. The batteries, supercapacitors, chemical storage will be discussed from the point of view of the stable operation of power grids. To ensure the generation and load balance at all times new approaches will be discussed. The stability and security are one of the main concerns in the panel for the power system operators to ensure the grid withstands contingency events. In this respect, how the energy storage systems can be used to enhance the stability and security of energy delivery will be discussed. The related issues about stability, regulation, congestion, loss and heat will be discussed. The panel will also cover the surrounding issues such as costs, markets, application and predictions for the future.
Challenges in the Integration of High Temperature Superconducting Devices with the Smart Grid
Ahmet Cansız, Istanbul Technical University, Faculty of Electrical and Electronics Engineering Department, Istanbul.

Fuel Cells and Sustainable Development
Can Erkey, Koç University, Chemical and Biological Engineering Department, Istanbul.

Energy storage for the provision of fast-acting instantaneous reserve
R.B. Buckley, the Robinson Research Institute, Victoria University of Wellington, Wellington, New Zealand.

Energy Storage Technologies for Smart Grid
Andrew Jones, Managing Director, S&C Electrical Europe.

Basics of Flow Batteries and Field Demonstration
Marisa L. Crow, Electrical and Computer Engineering Department, Missouri S&T, MO, USA.
Paper Session 5: Computational Intelligence in Smart Grid

Date: Monday, 15:30 – 17:15
Chair: Noel Schulz

2014ISGTEU0324
Optimal Placement of Multi-Terminal HVDC Interconnections for Increased Operational Flexibility
Matthias Bucher (ETH Zurich, Switzerland), Roger Wiget (ETH Zurich, Switzerland), Gabriel Hidalgo-Barquero Pérez (ETH Zurich, Switzerland), Göran Andersson (ETH Zurich, Switzerland)

2014ISGTEU0305
Synthetic Generation of Solar States for Smart Grid: A Multiple Segment Markov Chain Approach
Wayes Tushar (Singapore University of Technology and Design, Singapore), Shisheng Huang (Singapore University of Technology and Design, Singapore), Chau Yuen (Singapore University of Technology and Design, Singapore), Jian Andrew Zhang (CSIRO, Australia), David Smith (NICTA, Australia)

2014ISGTEU0026
Application of Hybrid Heuristic Optimization Algorithms for Solving Optimal Hydrothermal System Operation
Martha Camargo (University Nacional de San Juan, Argentina), Jose Rueda (TU Delft, Netherlands), Osvaldo Año (University Nacional de San Juan, Argentina), István Erlich (University of Duisburg-Essen, Germany)

2014ISGTEU0591
A Combined GA and IPM Approach for Unit Commitment Problem
Worawat Nakawiro (King Mongkut’s Institute of Technology Ladkrabang, Thailand)

2014ISGTEU0390
Impact of Distributed Generation on the Operational Planning of Medium Voltage Distribution Networks Using Genetic Algorithms
Alexandre Souza (Polytechnic School of São Paulo University, Brazil), Nelson Kagan (Polytechnic School of São Paulo University, Brazil), Miguel Udaeta (Polytechnic School of São Paulo University, Brazil), Klaus de Gus (Federal University of Paraná, Brazil)

2014ISGTEU0243
Adaptive Decentralized Coordinated Neural Control of Hybrid Wind Thermal Energy Systems in Smart Grids

Paper Session 6: Microgrid Operations

Date: Monday, 15:30 – 17:15
Chair: Fabio Massaro

Integration of a Hybrid Power Station in the Insular Power System of Crete
Andreas Ntomaris ( Aristotle University of Thessaloniki, Greece), Stylianos Vagropoulos ( Aristotle University of Thessaloniki, Greece), Anastasios Bakirtzis ( Aristotle University of Thessaloniki, Greece)

A Control Algorithm for the Stable Operation of Interfaced Converters in Microgrid Systems
Edris Pouresmaeil (University of Southern Denmark, Denmark), Majid Mehrasa (Babol University of Technology, Iran), Bo Nørregaard Jørgensen (University of Southern Denmark, Denmark), Ozan Erdinç (Arel University, Turkey), João Catalao (University of Beira Interior, Portugal)

Active Synchronization Control for Microgrid Reconnection after Islanding
Di Shi (NEC Laboratories America, USA), Yusheng Luo (Florida State University, USA), Ratnesh Sharma (NEC Laboratories America, USA)

Scalable and Optimal Coalition Formation of Microgrids in a Distribution System
Shantanu Chakraborty (NEC Corporation, Japan), Shin Nakamura (NEC Corporation, Japan), Toshiya Okabe (NEC Corporation, Japan)

Microgrid Design Considerations for a Smart-Energy University Campus

Switching Frequency Optimized Granular Maximum Power Point Tracking for PV Systems
Moustafa Adly (TU Berlin, Germany), Kai Strunz (TU Berlin, Germany)
Paper Session 7: Power System Monitoring, Operation and Control

Date  Monday, 15:30 – 17:15
Chair  Ali Abur

2014ISGTEU0602
Estimation of Load Model Parameters from PMU Measurements
Paweł Regulski (University of Manchester, UK), Peter Wall (University of Manchester, UK), Zina Rusdovic (University of Manchester, UK), Vladimir Terzić (University of Manchester, UK)

2014ISGTEU0552
Analysis of a Centralized Control Strategy in Mitigating Inter-Area Power Oscillations
Otso Mäki (Aalto University, Finland), Janne Seppänen (Finnish, Finland), Liisa Haarla (Aalto University, Finland), Kai Zenger (Aalto University, Finland), Jukka Turunen (Statnett, Norway), Antti-Juhani Nikkilä (Finnish, Finland)

2014ISGTEU0562
Grid-Constrained Optimal Predictive Power Dispatch in Large Multi-Level Power Systems with Renewable Energy Sources, and Storage Devices
Philipp Fortenbacher (ETH Zurich, Switzerland), Andreas Ulbig (ETH Zurich, Switzerland), Stephan Koch (ETH Zurich, Switzerland), Göran Andersson (ETH Zurich, Switzerland)

2014ISGTEU0341
Use of Air Chamber in Gas-Turbine Units for Frequency Control and Energy Storage in a System with High Wind Penetration
Ioannis Kandiloros (National Technical University of Athens, Greece), Costas Vournas (National Technical University of Athens, Greece)

2014ISGTEU0485
Real Time Simulation of a Robust LQG based Wide Area Damping Controller in Power System
Mahendra Bhadu (Indian Institute of Technology Delhi, India), Nilanjan Senroy (Indian Institute of Technology Delhi, India)

2014ISGTEU0331
Online Optimal Control of Reactive Power Sources Using Measurement-Based Approach
Van Hoan Pham (University of Duisburg-Essen, Germany), István Erlich (University of Duisburg-Essen, Germany)
Paper Session 8: Power Quality and Reliability

Date  Monday, 15:30 – 17:15
Chair  Geert Deconinck

2014ISGTEU0601
The Effect of Temporal and Spatial Variation of Harmonic Sources on Annual Harmonic Performance of Distribution Networks
Sami Abdelrahman (University of Manchester, UK), Huilian Liao (University of Manchester, UK), Jovica Milanovic (University of Manchester, UK)

2014ISGTEU0264
Combination of Skeletonization and Morphology Edge Detection for Detecting Time Location of Power Disturbances
I Gusti Ngurah Agung Dwijaya Saputra (The University of Liverpool, UK), Jeremy Smith (The University of Liverpool, UK), Qinghua Wu (The University of Liverpool, UK)

2014ISGTEU0265
Detection and Classification of Power Disturbances Using Mathematical Morphology with Trapezoid Structuring Elements and Signal Envelopes
Jie Zhu (The University of Liverpool, UK), Tianyao Ji (South China University of Technology, China), Mengshi Li (South China University of Technology, China), Qinghua Wu (South China University of Technology, China), Jeremy Smith (The University of Liverpool, UK)

2014ISGTEU0325
Comparison of Voltage Sag and Outage Cost in Urban Meshed 110-kV Subtransmission Network Planning
Bruno de Oliveira e Sousa (Aalto University, Finland), Atte Pihkala Helen (Helsinki Energy, Finland), Matti Lehtonen (Aalto University, Finland)

2014ISGTEU0611
Causality Assessment for Power Quality Stationary Disturbances
Andrés Pavas (Universidad Nacional de Colombia, Colombia), Camilo Garzón (Universidad Nacional de Colombia, Colombia)

2014ISGTEU0622
Incorporating Regulator Requirements in Reliability Analysis of Smart Grids Part 1: Input Data and Models
Sasa Djokic (The University of Edinburgh, UK), Mohd Ikhwan Muhammad Ridzuan (The University of Edinburgh, UK), Ignacio Hernando-Gil (The University of Edinburgh, UK), Roberto Langella (Second University of Naples, Italy), Alfredo Testa (Second University of Naples, Italy)
Poster Session A

Date: Monday, 17:15 – 19:30
Chair: Omer Usta/Beledin Turky

2014ISGTEU0025
Eigen-Analysis Based Power Quality Event Data Clustering and Classification
Ebrahim Balouji (Gaz Unversity, Turkey), Ozgul Saror (Gaz Unversity, Turkey)

2014ISGTEU0061
A Fuzzy Based Maximal Preventive Reactive Power Allocation Procedure
Ragab El Sehiemy (Kafrelshekh Unversity, Egypt), Adel Abou El Ela (Unversity of Menouya, Egypt), Abdul Allah Shaheen (South Delta Electricty Distrbution Company, Tanta, Egypt)

2014ISGTEU0070
Optimal Bidding Strategies of a Mixed RES Portfolio by Stochastic Programming
Evaggelos Kardakos (Ar stotle Unversity of Thessalonk, Greece), Christos Simoglou (Ar stotle Unversity of Thessalonk, Greece), Anastasios Bakirtzis (Ar stotle Unversity of Thessalonk, Greece)

2014ISGTEU0078
Assessing and Comparing Smart Grid Demonstration Projects
Ruben Lopez (Grenoble-Alpes Unversity, France), Damien Picault (Grenoble-Alpes Unversity, France), Oussama Accouche (Grenoble-Alpes Unversity, France), Didier Broda (Grenoble-Alpes Unversity, France), Nouredine Hadjsaid (Grenoble-Alpes Unversity, France)

2014ISGTEU0081
Identification of Electric Power System Stress through Feeder Voltage Measurement
Ren Kang (Unversity of Oxford, UK), Malcolm McCulloch (Unversity of Oxford, UK)

2014ISGTEU0092
Applying Heuristics and Stochastic Optimization for Load-Responsive Charging in a Smart Grid Architecture
Tobias Kuster (Technische Unversity, Berlin, Germany), Marco Lützenberger (Technische Unversity, Berlin, Germany), Marcus Voß (Technische Unversity, Berlin, Germany), Daniel Freund (Technische Unversity, Berlin, Germany), Sahin Albayrak (Technische Unversity, Berlin, Germany)
Conceptual Architecture of Building Energy Management Open Source Software (BEMOSS)
Warodom Khamphanchai (Vrgn Tech, USA), Avijit Saha (Vrgn Tech, USA), Kruthika Rathinavel (Vrgn Tech, USA), Manisa Pipattanasomporn (Vrgn Tech, USA), Murat Kuzlu (Vrgn Tech, USA), Saifur Rahman (Vrgn Tech, USA), Bora Akyol (Pacc Northwest Natonal Laboratory, USA), Jerome Haack (Pacc Northwest Natonal Laboratory, USA)

Process Approaches for the Integration of Controllable Resources
Oliver Warweg (Fraunhofer IOSB, Germany), Alexander Arnoldt (Fraunhofer IOSB, Germany), Jens Ehrhardt (Mtteldeutsche Energ e AG, Germany)

Comparative Analysis of Multiband Stabilizer for Damping of Power System Oscillations
Hasan Ul Banna (Unversitat Pozit de Catalunya, Spain), Alvaro Luna (Unversitat Pozit de Catalunya, Spain), Hamidreza Ghorbanie (Unversitat Pozit de Catalunya, Spain), Pedro Rodriguez (Unversitat Pozit de Catalunya, Spain), Shaoqing Ying (Unversitat Pozit de Catalunya, Spain)

Distributed Optimization Algorithm for Heat Pump Scheduling
Michael Diekerhoff (RWTH Aachen, Germany), Stefanie Vorkampf (RWTH Aachen, Germany), Antonello Monti (RWTH Aachen, Germany)

Optimal Operation Tracking Energy Management System for a Battery-Equipped BTS Microgrid
Alexander Viehweider (NEC Corporaton on, Japan), Koji Kudo (NEC Corporaton on, Japan)

Protection Coordination of Directional Overcurrent Relays Considering Fault Current Direction
Hebatallah Sharaf (Caro Unversty, Egypt), H.H. Zeineldin (Caro Unversty, Egypt), Doaa Khalil (Caro Unversty, Egypt), Essam El Din Abo El Zahab (Caro Unversty, Egypt)

Review of Congestion Management Methods for Distribution Networks with High Penetration of Distributed Energy Resources
Shaojun Huang (Techni cal Unversity of Denmark, Denmark), Qiuwei Wu (Techni cal Unversity of Denmark, Denmark), Zhaoxi Liu (Techni cal Unversity of Denmark, Denmark), Arne Nielsen (Techni cal Unversity of Denmark, Denmark)
Poster Session A (continued)

Date  Monday, 17:15 – 19:30

2014ISGTEU0218
A Demand Side Prediction Method for Persistent Scheduled Power-cuts in Developing Countries
Takuma Kogo (NEC Corporation, Japan), Shin Nakamura (NEC Corporation, Japan), Pravinraj S. (SRM Technologies Private Ltd, India), Arumugam B. (SRM Technologies Private Ltd, India)

2014ISGTEU0219
Uncertainty in Real-Time Voltage Stability Assessment Methods Based on Thevenin Equivalent due to PMU's Accuracy
Angel Perez (Technical University of Denmark, Denmark), Jakob Møller (Technical University of Denmark, Denmark), Hjörtur Jóhannsson (Technical University of Denmark, Denmark), Jacob Østegaard (Technical University of Denmark, Denmark)

2014ISGTEU0227
Exploring Methods to Evaluate the Carbon Impact of Network Investment Deferral
Laura Daniels (University of Reading, UK), Ben Potter (University of Reading, UK), Phil Coker (University of Reading, UK)

2014ISGTEU0228
Feeder Load Balancing in MV Distribution Networks Using Soft Normally-Open Points
Wanyu Cao (Card University, UK), Jianzhong Wu (Card University, UK), Nick Jenkins (Card University, UK)

2014ISGTEU0235
Inertia Estimation using PMUs in a Laboratory
Peter Wall (The University of Manchester, UK), Pawel Regulski (The University of Manchester, UK), Zina Rusidovic (The University of Manchester, UK), Vladimir Terziya (The University of Manchester, UK)

2014ISGTEU0237
Balancing Power Consumption and Production in Smart Grids
Markus Bestehorn (Land s+Gyr, Switzerland), Theodor Borsche (ETH Zürich, Switzerland)

2014ISGTEU0241
The Value of Flexibility in the Distribution Grid
2014ISGTEU0246
Evaluation of Peak-Shifting Techniques for Residential Air Conditioning Demand in Saudi Arabia
Gareth McLorn (Saud Aramco, Saudi Arabia), Abdullah Sheikh (Saud Aramco, Saudi Arabia), Rafat Rob (Saud Aramco, Saudi Arabia)

2014ISGTEU0254
Complex Bid Model and Strategy for Dispatchable Loads in Real Time Market Base Demand Response
Muhammad Babar (Endhoven University of Technology, Netherlands), Phuong Nguyen (Endhoven University of Technology, Netherlands), Vladimir Cuk (Endhoven University of Technology, Netherlands), Rene Kamphuis (Endhoven University of Technology, Netherlands), Wil Kling (Endhoven University of Technology, Netherlands)

2014ISGTEU0276
Pseudo-Measures Modeling Using Neural Network and Fourier Decomposition for Distribution State Estimation
Francesco Adinolfi (Unversity of Genova, Italy), Fabio D'Agostino (Unversity of Genova, Italy), Andrea Morini (Unversity of Genova, Italy), Matteo Saviozzi (Unversity of Genova, Italy), Federico Silvestro (Unversity of Genova, Italy)

2014ISGTEU0277
Optimization of Generation and Aggregated Consumption Shifting for Demand Response Programs Definition
Pedro Faria (Polytechnic of Porto, Portugal), Zita Vale (Polytechnic of Porto, Portugal)

2014ISGTEU0283
Demand Response for Different Power Supply Systems
Vladimir Stepanov (Irkutsk State Technical University, Russia), Konstantin Suslov (Irkutsk State Technical University, Russia), Elena Stashkevich (Irkutsk State Technical University, Russia), Nikolai Voropaev (Institute SB RAS, Russia), Zbigniew Styczynski (Otto von Guericke University, Germany)

2014ISGTEU0290
Optimum Allocation of FCB Thermal Power Plant Using Ordinal Optimization Theory
En Lu (South China University of Technology, China), Mingbo Liu (South China University of Technology, China), Jian Ning (Hohai University, China), Haoming Liu (Hohai University, China), Yunhe Hou (The University of Hong Kong, Hong Kong)

2014ISGTEU0292
Mixed Integer Linear Programming Formulation for Robust State Estimation
Poster Session A (continued)

Date  Monday, 17:15 – 19:30

2014ISGTEU0343
**Planned Communities as Microgrid Applications**
*Panayiotis Moutis* (University of Greenwich, UK), *Spyros Skarvelis-Kazakos* (University of Greenwich, UK), *Maria Brucoli* (Arup, UK), *Joel Hung* (Arup, UK), *Shu-Wei Wu* (Arup, UK)

2014ISGTEU0344
**On The Roadmap to Supergrid in Sicily: LIDAR Technology and HTLS Conductors for Uprating the 150 kV Lines**
*Andrea Puccio* (University Of Palermo, Italy), *Mariano Giuseppe Ippolito* (University Of Palermo, Italy), *Fabio Massaro* (University Of Palermo, Italy), *Giovanni Filippone* (Terna Sp.A., Italy)

2014ISGTEU0355
**Agent-Based Control for Building Energy Management in the Smart Grid Framework**
*Luis Hurtado* (Eindhoven University of Technology, Netherlands), *Phuong Nguyen* (Eindhoven University of Technology, Netherlands), *Wil Kling* (Eindhoven University of Technology, Netherlands)

2014ISGTEU0358
**A Study on the Power System Security with Increased PV Penetration by Applying the Robust Power System Security**
*Yoshiharu Okumoto* (Chugoku Electric Power Co., Japan), *Naoto Yorino* (Hiroshima University, Japan), *Yoshifumi Zoka* (Hiroshima University, Japan), *Yutaka Sasaki* (Hiroshima University, Japan), *Tomohisa Akiyoshi* (Hiroshima University, Japan), *Tomohiro Isoya* (Hiroshima University, Japan)

2014ISGTEU0359
**Increasing the Penetration Level of Distributed Generation without Violating Overcurrent Based Protection System Coordination**
*Ahmed Abu Elanien* (Alexandria University, Egypt)

2014ISGTEU0364
**Charging Optimization of Battery Electric Vehicles including Cycle Battery Aging**
*Annette Trippe* (TUM CREATE, Singapore), *Raghavendra Arunachala* (TUM CREATE, Singapore), *Anja Herms* (TUMCREATE Singapore), *Tadashi Ishida* (TUMCREATE Singapore)
2014ISGTEU0374
Load Kick-Back Effects due to Activation of Demand Response In View of Distribution Grid Operation
Xue Han (Technical University of Denmark, Denmark), Fabrizio Sossan (Technical University of Denmark, Denmark), Henrik Bindner (Technical University of Denmark, Denmark), Shu You (Technical University of Denmark, Denmark), Henrik Hansen (Dan sh Energy Assoc at on, Denmark), Peder Cajar (DONG Energy, Denmark)

2014ISGTEU0377
An Improved Analytical Method of Generators Aggregation Based on Structure Preserving Technique
Lin Zhu (South China University of Technology, China), Sha Li (South China University of Technology, China), Zexiang Cai (South China University of Technology, China)

2014ISGTEU0379
Functionality Identification for the Testing Systems with Large-scale Highly-concentrated Wind Power Integration by Long-distance Transmission Lines
Jiabing Hu (Huazhong University of Science & Technology, China), Yunhe Hou (The University of Hong Kong, Hong Kong), Feng Liu (Tsinghua University, China), Yongning Chi (China Electric Power Research Institute, China), Shuanglei Feng (China Electric Power Research Institute, China), Haiyan Tang (China Electric Power Research Institute, China), Guobing Song (X’an Jiaotong University, China), Xiaoming Yuan (Huazhong University of Science & Technology, China)

2014ISGTEU0381
The Feasibility of the Composite Insulator with Fiber Bragg Grating Embedded in the Rod
Heming Deng (State Grid Electric Power Research Institute, China), Wei Cai (State Grid Electric Power Research Institute, China), Chunxiang Liu (State Grid Electric Power Research Institute, China), Jinhai He (State Grid Electric Power Research Institute, China)

2014ISGTEU0384
Electric Space Heating Scheduling for Real-time Explicit Power Control in Active Distribution Networks
Giuseppe Tommaso Costanzo (Technical University of Denmark, Denmark), Andrey Bernstein (Ecole Polytechnique Federale de Lausanne, Switzerland), Lorenzo Enrique Reyes Chamorro (Ecole Polytechnique Federale de Lausanne, Switzerland), Henrik Bindner (Technical University of Denmark, Denmark), Jean-Yves Leboudec (Ecole Polytechnique Federale de Lausanne, Switzerland), Mario Paolone (Ecole Polytechnique Federale de Lausanne, Switzerland)

2014ISGTEU0394
A Review of Demand Response Business Cases
**Balancing Asymmetrical Load Using a Static Var Compensator**

Amar Alsulami (ABB, Sweden), Muhamad Reza (ABB, Sweden), Kailash Srivastava (ABB, Sweden), Massimo Bongiorno (Chalmers University of Technology, Sweden)

2014ISGTEU0413

**Analysis of Latency for Cellular Networks for Smart Grid in Suburban Area**

Niwas Maskey (Technical Research Center of Finland, Finland), Seppo Horsmanheimo (Technical Research Center of Finland, Finland), Lotta Tuomimäki (Technical Research Center of Finland, Finland)

2014ISGTEU0416

**Smooth Energy Consumption for Demand Side Scheduling Using Heuristic Optimization**

Yuefang Du (University of Liverpool, UK), Lin Jiang (University of Liverpool, UK), Yanbing Bi (University of Liverpool, UK), Yuanzheng Li (University of Liverpool, UK)

2014ISGTEU0418

**Load Shifting in the Existing Distribution Network and Perspectives for EV Charging – Case Study**

Lauri Kütt (Aalto University School of Electrical Engineering, Finland), Eero Saarijärvi (Aalto University School of Electrical Engineering, Finland), Matti Lehtonen (Aalto University School of Electrical Engineering, Finland), Argo Rosin (Tallinn University of Technology, Estonia), Heigo Mölder (Tallinn University of Technology, Estonia)

2014ISGTEU0586

**Impact of Non-Programmable Renewable Sources in Day-Ahead Market in Sicily. Reasons to Make More Flexible and Smarter the National Transmission Grid**

Salvatore Favuzza (University of Palermo, Italy), Mariano Giuseppe Ippolito (University of Palermo, Italy), Antonino Madonia (University of Palermo, Italy), Fabio Massaro (University of Palermo, Italy), Enrico Maria Carlini (TERNA Sp.A., Italy), Cristiano Quaciari (TERNA Sp.A., Italy)
Tuesday,
October 14,
2014
<table>
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<tr>
<th>Time</th>
<th>Event</th>
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<tr>
<td>09:00 - 09:30</td>
<td>Keynote B: “Smart Grid Standards and Interoperability”&lt;br&gt;John D. McDonald, PE GE Energy Management Digital Energy Director, Technical Strategy &amp; Policy</td>
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<tr>
<td>09:30 - 11:00</td>
<td>Plenary B: “Innovative Smart Grids – From Concept to Implementation in Eurasia”&lt;br&gt;Kai Strunz, TU Berlin</td>
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<td>11:00 - 11:30</td>
<td>Coffee Break</td>
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<td>11:30 - 13:00</td>
<td>Room A&lt;br&gt;Panel 3&lt;br&gt;Smart Energy Supply Networks&lt;br&gt;Chair: Jianzhong Wu</td>
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<td>13:00 - 14:30</td>
<td>Poster Session B, SDKM 2nd Floor, Chair: Ahmet Cansız</td>
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<td>14:30 - 16:00</td>
<td>Panel 5&lt;br&gt;Smart Grid Security&lt;br&gt;Chair: Lucie Langer</td>
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<td>14:30 - 16:00</td>
<td>Paper Session 12&lt;br&gt;Smart Grid Communications&lt;br&gt;Chair: Li Haiyu</td>
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<td>16:00 - 16:30</td>
<td>Coffee Break</td>
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<td>16:30 - 18:00</td>
<td>Panel 6&lt;br&gt;Smart Distribution Networks&lt;br&gt;Chair: Hasan Basri Çetinkaya</td>
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<td>16:30 - 18:00</td>
<td>Paper Session 16&lt;br&gt;Physical and Cyber Security of Smart Grid&lt;br&gt;Chair: Robert Q. Kerr</td>
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<td><strong>Paper Session 9</strong></td>
<td><strong>Electrical Vehicle Charging</strong></td>
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<td><strong>Paper Session 13</strong></td>
<td><strong>Power Generation and Energy Storage Technologies</strong></td>
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<td>Chair: [Kai Strunz]</td>
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<td><strong>Paper Session 14</strong></td>
<td><strong>Power System Stability and Security 2</strong></td>
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<td>Chair: [Lin Jiang]</td>
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<td><strong>Paper Session 15</strong></td>
<td><strong>Demand Side Management 1</strong></td>
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<td>Chair: [Koen Kok]</td>
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<td><strong>Paper Session 17</strong></td>
<td><strong>Network Integration of Dist. Energy Resources</strong></td>
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<td><strong>Paper Session 18</strong></td>
<td><strong>DC Grid and Power Electronic Applications</strong></td>
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<td>Chair: [Farid Jakobi]</td>
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<td><strong>Paper Session 19</strong></td>
<td><strong>Energy Management</strong></td>
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<td>Chair: [Aydogan Ozdemir]</td>
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Keynote B

Tuesday, 09:00 – 09:30
Conference Mann Hall

Smart Grid Standards and Interoperability

John D. McDonald, P.E., GE Energy Management Digital Energy Director, Technical Strategy & Policy Development


Abstract: The purpose of this talk is to familiarize participants with Smart Grid concepts and solutions, including Distribution Optimization, Transmission Optimization, Asset Optimization, Demand Optimization, Smart Meters and Communications, and Workforce and Engineering Design Optimization. Smart Grid industry standards efforts will be discussed, including NIST, IEEE, CIGRE, and IEC. An overview of recent Smart Grid deployments will be given, including the lessons learned from the deployments.
Innovative Smart Grids – From Concept to Implementation in Eurasia

Chair: Kai Strunz, Technische Universität Berlin, Germany

Prof. Kai Strunz graduated with the Dipl.-Ing. Degree from Saarland University Saarbrücken, Germany, in 1996, and he was awarded the Dr.-Ing. Degree with summa cum laude from the same university in 2001. From 1995 to 1997, Dr. Strunz pursued research at Brunel University London. From 1997 to 2002, he worked at the Division Recherche et Développement at Electrotechnique de France (EDF) in the Paris area. From 2002 to 2007, he was Assistant Professor of Electrical Engineering at the University of Washington Seattle. Since September 2007, he has been Professor for Sustainable Electrical Networks and Sources of Energy at Technische Universität Berlin. He was the chairman of the conference IEEE PES Innovative Smart Grid Technologies held at TU Berlin from 14 to 17 October 2012. He is the chairman of the IEEE Power & Energy Society Subcommitee on Distributed Generation and Energy Storage and Chairman of the IEEE Power & Energy Society Subcommitee on Research and Education. On behalf of the Intergovernmental Panel on Climate Change (IPCC), Dr. Strunz acted as Review Editor for the Special Report on Renewable Energy Sources and Climate Change Mitigation. Kai Strunz received the Dr.-Eduard-Marti Award from Saarland University in 2002, the National Science Foundation (NSF) CAREER Award in 2003, and the Outstanding Teaching Award from the Department of Electrical Engineering of the University of Washington in 2004.

Family of Energy Management Systems for Smart Grids: Concept and Implementation in China

Hongbin Sun, Tsinghua University, China

Prof. Hongbin Sun received his double B.S. degrees from Tsinghua University in 1992, the Ph.D. from Dept. of EE, Tsinghua University in 1997. He is now Changjiang Chair Professor of Education and Ministry of China, full professor of electrical engineering of Tsinghua University, and assistant director of State Key Laboratory of Power Systems of China. He is IET Fellow and IEEE Senior Member. In recent 20 years, he led a research group at Tsinghua University and was the science chair of the National High Technology Research and Development Program of China from 2006 to 2011.
**Project SUSTAINABLE: Smart Distribution System Operation for Maximizing the Integration of Renewables**

*Nuno Silva*, Efacec, Portugal

Nuno Silva graduated from University of Porto in 2003 with a specialization in Power Systems, and he received his PhD in Electrical Engineering at the Control and Power Group, Imperial College London in 2009 and complemented his skills with an Executive MBA at Católica Porto Business School in 2014. He currently works at EFACEC, where he is Deputy Director of Strategic Projects of the Switchgear & Automation Business Unit. He is project manager on several national and international smart grid and electric mobility projects. Distributed Generation, Smart Grids, automation, and power system economics are his areas of activity.

**Markets with Different Speeds: Selected Electric Vehicle Projects and Development Perspectives**

*Tina Zerul*, EON, Germany

Tina Zerul is Program Manager E-Mobility and coordinates the technical and economic European R&D research and demonstration programs for German private energy utility EON. She also addresses the policy framework around electric vehicles as member of the National Platform E-Mobility, the German government's consultancy body. In order to align e-mobility issues with both the larger clean transport debate in the European Union and the smart grid developments, she is also a Member of the Task Force E-Mobility within Eurelectric, the European Utilities' association. Tina Zerul got her Master in Economics from Cologne University in 2003 and Trinity College Dublin and also holds university degrees in Journalism and Wind Energy Studies (2012). At Cologne University, she worked as a research fellow for the Energy Economics Institute.

**First Returns of Experience on the Nice Grid Demonstration Project**

*Rodolphe de Beaufort*, Alstom, France

Rodolphe de Beaufort joined Alstom Grid in 2013, as Smart Grid and Smart Cities Marketing Director in the Innovation & Strategy transversal team. Rodolphe is in charge of business development, innovation, and strategic partnerships to cater on and regulatory policy. He is a specialist in innovation and strategy at Alstom Grid.
Rodolphe de Beaufort holds a Masters Degree in Engineering from Arts et Métiers – Paris Tech, with a specialization in Innovative Products.

**Plenary Abstract:** What is the status of Smart Grid projects in Europe and Asia? The plenary gives answers by highlighting selected key smart grid developments and plans across the region. The EU-project SUSTAINABLE paves the way for active distribution networks with high penetration of renewables in Europe. The Nice Grid project leads to an innovative smart solar-energy district in Southern France. Further discussions focus on European electric vehicle projects as well as the successful implementation of Energy Management Systems in smart grids of China.
Dr. Jianzhong Wu joined Cardiff University in June 2008 (Lecturer 2008; Senior Lecturer 2013; Reader 2014). From 2006 to 2008, he was a Research Fellow in the University of Manchester. He received his PhD in 2004 from Tsinghua University, China and then worked there from 2004 to 2006. His final post in Tsinghua University was Associate Professor. Dr. Wu researches on power system analysis and control, Smart Grid and energy infrastructure. One of his research focuses is in the area of modelling, analysis and design of integrated smart energy supply networks. He has contributed to a number of EU and UK funded projects as a Principal Investigator or a Co-Investigator. He has published more than 80 papers in refereed journals and conferences. He is a co-author of book “Smart Grid: Technology and Applications” (2012, Wiley). His professional involvements include, Secretary-General and Vice Chairman of the UK Branch of China Electrotechnical Society, member and Section 3 leader of the CIGRE working group WG C6.21 Smart Metering – state of the art, regulation, standards and future requirements, member of the Organising Committee of 2013 5th International Conference on Applied Energy (ICAE), Vice-Chair of the Organising Committee of 2012 IEEE PES Innovative Smart Grid Technologies (ISGT Asia).

Panel Abstract: Energy supply networks are beginning to undergo a radical transformation which includes: the introduction of new components, new network configurations, new design and operation philosophies, and new incentives and business models. This revolution is in response to energy demand growth, climate change and fuel security concerns. It is enabled by advances in low carbon technologies, renewable energy technologies, information and communication technologies and is supported by government energy policies and strategies. This revolution affects all energy vectors, e.g., electric power networks, heat and cooling systems, gas and hydrogen networks, and significantly increasing the coupling and interactions between them.
Landscape overview of integrated smart energy supply networks
Jianzhong Wu, Card Unversity, UK

Energy Hub model for neighbourhood community energy systems
Turhan Demiray, ETH Zurich, Switzerland

Smart energy networks in China
Hongjie Jia, Tanjin University, China

Options for Addressing the balancing Challenges: Integrated analysis of gas and electricity networks
Meysam Qadrdan, Imperial College London, UK
Panel 4

Tuesday, 11:30 – 13:00
Senate Room

Women in Power: Smart Distribution Applications
Chair: Simay Akar

Presentations

Smart Distribution Applications
Noel Schultz, Kansas State University

Smart Distribution Applications
Shay Bahramirad, PES WP Committee Chair Manager Smart Grid and Technology
Paper Session 9: Electrical Vehicle Charging

Date: Tuesday, 11:30 – 13:00
Chair: Dragan Jovicic

2014ISGTEU0122
Optimal Scheduling of Electrical Vehicle Charging Under Two Types of Steering Signals
Thijs van der Klauw (Univ. Twente, Netherlands), Marco E. T. Gerards (Univ. Twente, Netherlands), Johann L. Hurink (Univ. Twente, Netherlands), Gerard J. M. Smit (Univ. Twente, Netherlands)

2014ISGTEU0233
Load Profile for a Bus Rapid Transit Flash Station of Full-Electric Buses
Mario Rios (Univ. de Los Andes, Colombia), Luis Muñoz (Univ. de Los Andes, Colombia), Sergio Zambrano (Univ. de Los Andes, Colombia), Adrián Albarracín (CODENSA S.A., Colombia)

2014ISGTEU0594
Decentralized Control of Plug-in Electric Vehicles under Driving Uncertainty
Marina González Vayá (ETH Zürich, Switzerland), Göran Andersson (ETH Zürich, Switzerland), Stephen Boyd (Stanford Univ. vsy, USA)

2014ISGTEU0295
Analysis of the Impacts of Plug-in Electric Vehicle Charging on the Part of a Real Medium Voltage Distribution Network
Adnan Bosovic (Elektroprivreda, Bosnia and Herzegovina), Sahih Sadovic (Elektroprivreda, Bosnia and Herzegovina), Mustafa Music (Elektroprivreda, Bosnia and Herzegovina)

2014ISGTEU0404
Charging Strategies to Minimize the Energy Cost for an Electric Vehicle Fleet
Van-Linh Nguyen (Univ. Grenoble-Alpes, France), Tuan Ttanh-Quoc (Univ. Grenoble-Alpes, France), Seddik Bacha (Univ. Grenoble-Alpes, France), Ngoc-An Luu (Univ. Grenoble-Alpes, France)

2014ISGTEU0274
Impact of Electric Vehicles on Household Voltage Profiles and Possible Mitigation Approaches
Warodom Khampchanai (Virginia Tech, USA), Manisa Pipattanasomporn (Virginia Tech, USA), Saifur Rahman (Virginia Tech, USA), Ali T. Al-Awami (King Fahd Univ. of Petroleum & Minerals, Saudi Arabia)
Paper Session 10: Voltage Control 1

Date      Tuesday, 11:30 – 13:00
Chair      Frank C. Lambert

2014ISGTEU0365
Voltage Control in LV Networks: An Initial Investigation
Andreas T. Procopiou (University of Manchester, UK), Chao Long (University of Manchester, UK), Luis F. Ochoa (University of Manchester, UK)

2014ISGTEU0554
Comparison of the Low Voltage Distribution Network Voltage Control Schemes
Juho Tuominen (Tampere University of Technology, Finland), Sami Repo (Tampere University of Technology, Finland), Anna Kulmala (Tampere University of Technology, Finland)

2014ISGTEU0363
Method for Instantly Determining Line Drop Compensator Parameters of Low-Voltage Regulator Using Multiple Classifiers
Hiroshi Kikusato (Waseda University, Japan), Naoyuki Takahashi (Waseda University, Japan), Jun Yoshinaga (Waseda University, Japan), Yu Fujimoto (Waseda University, Japan), Yasuhiro Hayashi (Waseda University, Japan), Shinichi Kusagawa (Takaoka Toko Co., Japan), Noriyuki Motegi (Takaoka Toko Co., Japan)

2014ISGTEU0457
Controller Hardware in the Loop Approaches Supporting Rapid Prototyping of Smart Low Voltage Grid Control
Mario Faschang (Veneta University of Technology, Austria), Alfred Einfalt (Semens AG, Austria), Roman Schwalbe (Austrian Institute of Technology, Austria), Ralf Mosshammer (Semens AG, Austria)

2014ISGTEU0338
Voltage Control of Active MV Networks Integrating Renewable and Storage Units: Advanced Algorithm and Lab Tests
Diana Moneta (RSE, Italy), Claudio Carlini (RSE, Italy), Giacomo Viganò (RSE, Italy), Daniele Stein (ENEL, Italy), Lilia Consiglio (ENEL, Italy)

2014ISGTEU0556
Frequency and Voltage Control in Microgrids: Modeling and Simulations in Islanded Mode
Paper Session 11: Electricity Market

Date: Tuesday, 11:30 – 13:00
Chair: Osman Sevaioğlu

2014SGTEU0426
Analysis and Models of Electricity Prices in the Italian Ancillary Services Market
Federico Moscetti (UNIBER, Siena, Italy), Simone Paoletti (UNIBER, Siena, Italy), Antonio Vicino (UNIBER, Siena, Italy)

2014SGTEU0587
Local Electricity Market Design for the Coordination of Distributed Energy Resources at District Level
Michail Amatatzis (TU Eindhoven, Netherlands), Phuong Hong Nguyen (TU Eindhoven, Netherlands), Wil Kling (TU Eindhoven, Netherlands)

2014SGTEU0013
Cyclone Dagmar of 2011 and Its Impacts in Finland
Sinan Küfeoğlu (Aalto University, Finland), Matti Lehtonen (Aalto University, Finland)

2014SGTEU0548
Optimising Market Share and Profit Margin: SMDP-based Tariff Pricing under the Smart Grid Paradigm
Rodrigue T. Kuate (Aston University, UK), Maria Chli (Aston University, UK), Hai H. Wang (Aston University, UK)

2014SGTEU0071
Hydrothermal Producer Offering Strategy in a Transmission-Constrained Electricity Market - An MPEC Approach
Evangelos Kardakos (Aristotle University of Thessaloniki, Greece), Christos Simoglou (Aristotle University of Thessaloniki, Greece), Anastasios Bakirtzis (Aristotle University of Thessaloniki, Greece)

2014SGTEU0616
Impact Assessment of Wind Power and Demand Side Management on Day-Ahead Market Prices
David Steen (Chalmers University of Technology, Sweden), Pavan Balram (Chalmers University of Technology, Sweden), Le Anh Tuan (Chalmers University of Technology, Sweden), Lina Reichenberg (Chalmers University of Technology, Sweden), Lina Bertling Tjernberg (KTH, Stockholm, Sweden)
Poster Session B

Date    Tuesday, 13:00 – 14:30
Chair    Ahmet Cansiz

2014ISGTEU0349
A Multi-Agent Model for Assessing Electricity Tariffs
Ioana Piscă (Brunel University, UK), Colin Axon (Brunel University, UK), Peter Hobson (Brunel University, UK), Gareth Taylor (Brunel University, UK), David Wallom (University of Oxford, UK)

2014ISGTEU0353
A Study on Short-term Electric Load Forecasting using Wavelet transform
Bon-gil Koo (Pusan National University, South Korea), Heung-seok Lee (Pusan National University, South Korea), Juneho Park (Pusan National University, South Korea)

Design Aspects of a Medium Voltage Hybrid DC Breaker
Jesper Magnusson (KTH Stockholm, Sweden), Ara Bissai (KTH Stockholm, Sweden), Göran Engdahl (KTH Stockholm, Sweden), Juan A. Martinez Velasco (University of Politecnica de Catalunya, Spain)

2014ISGTEU0422
Challenges & Opportunities towards Smart Grid in Turkey; Distribution System Operator Perspective-Final
Turgul Atasoy (Baskent Electrcity Distribution, Turkey), Hülya Erdener Akiç (Baskent Electrcity Distribution, Turkey), Erdenz Eröl (Baskent Electrcity Distribution, Turkey), Özden Erdoğan (Baskent Electrcity Distribution, Turkey), Özcan Gügüç (Baskent Electrcity Distribution, Turkey), Okan Benli (Baskent Electrcity Distribution, Turkey)

2014ISGTEU0431
A Power Grid Enterprise Control Method for Energy Storage System Integration
Aramazd Muzhikyan (Masdar Institute of Science and Technology, UAE), Amro Farid (Masdar Institute of Science and Technology, UAE), Kamal Youcef-Toumi (Massachusetts Institute of Technology, USA)

2014ISGTEU0432
Influence of Supply Security Requirements on Underground Cabling Rates in Finland
Juha Haakana (Lappeenranta University of Technology, Finland), Jukka Lassila (Lappeenranta University of Technology, Finland), Janne Niinistö
Managing Energy in Time and Space in Smart Grids Using TRIANA
Gerwin Hoogsteen (University of Twente, Netherlands), Albert Molderink (University of Twente, Netherlands), Johann L. Hurink (University of Twente, Netherlands), Gerard J. M. Smit (University of Twente, Netherlands)

Developing Situation Awareness in Major Disturbances of Electricity Supply
Heidi Krohns-Välimäki (Tampere University of Technology, Finland), Hanna Aalto (Tampere University of Technology, Finland), Kaisa Pyylkkänen (Tampere University of Technology, Finland), Janne Strandén (Tampere University of Technology, Finland), Pekka Verho (Tampere University of Technology, Finland), Janne Sarsama (Technical Research Centre of Finland, Finland)

Bad Data Processing When Using the Coupled Measurement Model and Takahashi's Sparse Inverse Method
Ali Abur (Northeastern University, USA), Bülent Bilir (Northeastern University, USA)

Distributed Model Predictive Control for Active Power Control of Wind Farm
Haoran Zhao (Technical University of Denmark, Denmark), Qiuwei Wu (Technical University of Denmark, Denmark), Claus Nygaard Rasmussen (Technical University of Denmark, Denmark), Qingslai Guo (Tsinghua University, China), Hongbin Sun (Tsinghua University, China)

Investigation of Load-Frequency-Control with Increasing Penetration of Converter-Based Generators
Theresa Noll (TU Dortmund, Germany), Dominik Hilbrich (TU Dortmund, Germany), Ulf Häger (TU Dortmund, Germany), Marco Greve (TU Dortmund, Germany), Johannes Schwippe (TU Dortmund, Germany), Christian Rehtanz (TU Dortmund, Germany)

A Novel Approach for Distributed Renewable Generation and Shunt Capacitor Placing in Smart-Grid
Okan Ozgonenel (Ondokuz Mayis University, Turkey), Serap Karagol (Ondokuz Mayis University, Turkey), Umit Kemalettin Terzi (Marmara University, Turkey)

Local Control of Fully Inverter Based Micro Grids in Islanding Operation Mode Considering Generation Disturbances in RES
Poster Session B (continued)

Date      Tuesday, 13:00 – 14:30

Technology, Iran), **Moein Moeini-Aghtaei** (Sharif University of Technology, Iran),
**Aydogan Ozdemir** (Istanbul Technical University, Turkey)

2014ISGTEU0491

**Voltage Support Control of Unbalanced Distribution Systems by Reactive Power Regulation**

**Vito Calderaro** (University of Salerno, Italy), **Vincenzo Gallo** (University of Salerno, Italy),
**Giorgio Graditi** (ENEA, Italy), **Francesco Lamberti** (University of Salerno, Italy),
**Antonio Piccolo** (University of Salerno, Italy)

2014ISGTEU0505

**Battery Energy Storage System Size Optimization in Microgrid using Particle Swarm Optimization**

**Thongchart Kerdpohl** (Kyushu Institute of Technology, Japan), **Yaser Qudaih** (Kyushu Institute of Technology, Japan),
**Yasunori Mitani** (Kyushu Institute of Technology, Japan)

2014ISGTEU0510

**Advanced Energy Storage and Demand-Side Management in Smart Grids using Buildings Energy Efficiency Technologies**

**Dimitrios Tsiamitros** (TEI of West Macedonia, Greece), **Dimitrios Stimioniaris** (TEI of West Macedonia, Greece),
**Nikolaos Poulakis** (TEI of West Macedonia, Greece), **M. Alparslan Zehir** (Istanbul Technical University, Turkey),
**Alp Batman** (Istanbul Technical University, Turkey), **Mustafa Bagiyanik** (Istanbul Technical University, Turkey),
**Aydogan Ozdemir** (Istanbul Technical University, Turkey), **Evaggelos Dialynas** (National Technical University of Athens, Greece)

2014ISGTEU0516

**Optimization of an air conditioning unit operation according to renewable energy availability and user’s comfort**

**Ana Cabrera** (Technical University of Catalonia, Spain), **Cosmin Koch-Ciobotaru**
(Technical University of Catalonia, Spain), **Hassan ul Banna** (Technical University of Catalonia, Spain),
**Siddharta Ghosh** (University of Southampton)

2014ISGTEU0527

**Unsynchronized Fault Location Independent on Line Parameters for Transmission Systems**

**Vitor de Almeida Jr.** (University of Sao Paulo, Brazil), **Yao Qiyang** (Mianyang Science and Technology University, China)
2014ISGTEU0537
Electrical Load Clustering: the Italian Case
Luca Semeraro (Univ. of Pisa, Italy), Emanuele Crisostomi (Univ. of Pisa, Italy), Alessandro Franco (Univ. of Pisa, Italy), Giuseppe Giunta (Univ. of Pisa, Italy), Alberto Landi (Univ. of Pisa, Italy), Marco Raugi (Univ. of Pisa, Italy), Mauro Tucci (Univ. of Pisa, Italy)

2014ISGTEU0539
Risk Assessment of Smart Energy Transfer in Distribution Networks
Muhammad Buhari (Univ. of Manchester, UK), Kostantinos Kopsidas (Univ. of Manchester, UK), Chomba Tumelo-Chakonta (Univ. of Manchester, UK), Alexandra Kapetanaki (Univ. of Manchester, UK)

2014ISGTEU0549
PSS Tuning Method based on Power System Model Identification using PMU
Pavel Chusovitin (Ural Federal Univ. of Russa), Valery Tashchilin (Ural Federal Univ. of Russa), Grigory Shabalin (Ural Federal Univ. of Russa), Andrey Pazderin (Ural Federal Univ. of Russa)

2014ISGTEU0558
Modeling the Optimal Behavior of PEV Parking Lots in Energy and Reserve Market
Nilufar Neyestani (Univ. of Beira Inter., Portugal), Maziar Yazdani Damavandi (Univ. of Beira Inter., Portugal), Masadre Shafie-khah (Univ. of Beira Inter., Portugal), Joao Catalao (Univ. of Beira Inter., Portugal), Javier Contreras (Univ. of Castilla-La Mancha, Spain)

2014ISGTEU0561
Optimization of Robust Power Oscillation Dampers for DFIG Wind Turbines Considering N-1 Outage Contingencies
Issarachai Ngamroo (King Mongkut’s Inst. of Technology Ladkrabang, Thailand), Tossaporn Surinankaew (King Mongkut’s Inst. of Technology Ladkrabang, Thailand)

2014ISGTEU0573
Reactive Power Capability of a Sub-Transmission Grid Using Real-Time Embedded Particle Swarm Optimization
Rengin Cabadag (Dresden Univ. of Technology, Germany), Uwe Schmidt (Dresden Univ. of Technology, Germany), Peter Schegner (Dresden Univ. of Technology, Germany)

2014ISGTEU0577
Evaluation of Enhancements to Thevenin Equivalent Based Methods for Real-Time Voltage Stability Assessment
Date Tuesday, 13:00 – 14:30

2014ISGTEU0582
**Future Demand for Prospective Providers of Control Reserves**
*Stefan Kippelt* (TU Dortmund, Germany), *Thorsten Schlüeter* (TU Dortmund, Germany), *Christian Rehtanz* (TU Dortmund, Germany)

2014ISGTEU0592
**A Modelling Study of Renewable and Stored Energy Sharing and Pricing Management System Developed for Multi-Apartment Complexes**
*Vedat Kiray* (Turgut Ozal University, Turkey), *Tamer Topal* (Kırkkale University, Turkey), *Lutfu Sagbansu* (Turgut Ozal University, Turkey), *Ismail Atacak* (Gaz University, Turkey)

2014ISGTEU0660
**Tri-generation and Solar Power for an Efficient and Environmental Friendly Power Generation**
*Essam Al-Ammar* (King Saud University, Saudi Arabia)

2014ISGTEU0603
**An Integrated Control for Overvoltage Mitigation in the Distribution Network**
*Mohamed Mansoor Vijuthukattuva Mohamed Ali* (Eindhoven University of Technology, Netherlands), *Phuong Nguyen* (Eindhoven University of Technology, Netherlands), *Wil Kling* (Eindhoven University of Technology, Netherlands)

2014ISGTEU0606
**Unified Hybrid (AC/DC) Distribution Networks Droop-Based Load-Sharing Strategy**
*Victor Maryama* (CERTI Foundation, Brazil), *Vitor Zeni* (CERTI Foundation, Brazil), *Cesare Pica* (CERTI Foundation, Brazil), *Marcelo Heldwein* (Federal University of Santa Catarina, Brazil), *Márcio Ortmann* (Federal University of Santa Catarina, Brazil)

2014ISGTEU0610
**Local Control of Active and Reactive Power in Inverter Based Micro Grids**
*Hamed Maleki* (Shahid Beheshty University, Iran), *Mojtaba Khederzadeh* (Shahid Beheshty University, Iran), *Vahid Asgharian* (Istanbul Technical University, Turkey)

2014ISGTEU0612
**Methodology for Service Restoration in Large-Scale Distribution Systems with Multimodal Network Models**
*Andre Blom* (Eindhoven University of Technology, Netherlands), *Sven Schönhofer* (Eindhoven University of Technology, Netherlands)
Parameter Estimation for Low-Order Models of Complex Buildings
Anita Martincevic (University of Zagreb, Croatia), Antonio Starcic (University of Zagreb, Croatia), Mario Vasak (University of Zagreb, Croatia)

Symplectic Numeric Integration for Coarse-grained Event-driven Electricity Metering
Mikhail Simonov (Istituto Superior Mario Boella, Italy)

A PQ Control Strategy of Voltage-Controlled Inverters
Yang Chen (Shanghai University of Electrical Power, China), Jinbin Zhao (Shanghai University of Electrical Power, China), Wei Cao (Shanghai University of Electrical Power, China), Keqing Qu (Shanghai University of Electrical Power, China), Fen Li (Shanghai University of Electrical Power, China)

An Adaptive Control Strategy of Converter based DG to Maintain Protection Coordination in Distribution System
Chi Su (Aalborg University, Denmark), Zhou Liu (Aalborg University, Denmark), Zhe Chen (Aalborg University, Denmark), Yanting Hu (Glyndwr University, UK)
Dr. Lucie Langer (CISSP) has been with the Safety & Security Department of AIT Austrian Institute of Technology since 2012. She is currently responsible for several applied research projects on IT security aspects of critical infrastructures and smart grids. Before joining AIT she has been working as a Technology Consultant in the private sector for two years, focusing on access rights and infrastructure management in large-scale IT projects. From 2006 to 2010 she was a Research Assistant with the Cryptography & Computer Algebra Group at Technische Universität (TU) Darmstadt. She received her PhD in 2010 from the Computer Science Department of TU Darmstadt, and holds a master’s degree in Mathematics from TU Darmstadt (2006) and Darmstadt University of Applied Sciences (2004).

Panel Abstract: This panel brings together academic, applied research and industry experts with different viewpoints on the area of securing future smart grids, including those with deep knowledge of cyber-security, resilience and future energy systems. They will reflect on existing efforts to secure smart grids and argue the case for areas where they see future research and standardization as of paramount importance. Additionally, the panelists will be asked to comment on how organizations, such as Distributed Systems Operators (DSOs), are supposed to navigate and prioritize the myriad of security standards that are available from bodies such as NIST, IEC, ISO, etc.; how do we effectively address security in the smart grid when there is a combination of legacy systems, which cannot be readily changed and are quite insecure, and new ICT systems? Moreover, from an operational perspective, how do we address the cross-cutting issues that smart grid security introduces when managing the grid, i.e., different organizational departments must coordinate, etc. Also, more generally, how do we manage the multidisciplinary knowledge that is required for ensuring the security of a smart grid (and ensuring the effective use of security solutions)?

Panel 5
Tuesday, 14:30 – 16:00
Conference Main Hall
Privacy Challenges in Smart Grids  
Dominik Engel, Josef Ressel Center for User-Centric Smart Grid Privacy, Austria

Smart Grid Security Analytics  
Robert Griffin, RSA - the Security Division of EMC, UK

Smart Grid Security Standardization  
Ralph Eckmaier, Independent Consultant, Austria

Where to Stop Securing the Smart Grid  
Mehmet Tahir Sandikkaya, ITU, Turkey
Paper Session 12: Smart Grid Communications

Date Tuesday, 14:30 – 16:00
Chair Li Haiyu

2014ISGTEU0566
Investigation of Current Variation Effect on PLC Channel Characteristics of Low-Voltage High Power Busbar Systems
Zeynep Hasirci (Karadeniz Technical University, Turkey), Ismail Hakki Çavdar (Karadeniz Technical University, Turkey), Nermin Suljanovic (University of Tuzla, Turkey), Aljo Mujic (University of Tuzla, Turkey)

2014ISGTEU0225
Performance Analysis of Data Processing Architectures for the Smart Grid
Akshay Uttama Nambi (TU Delft, Netherlands), Matteo Vasinari (EPFL, Switzerland), Venkatesha Prasad (TU Delft, Netherlands), Karl Aberer (EPFL, Switzerland)

2014ISGTEU0352
MIMO Modeling and Data Rates for Medium-Voltage Narrowband-PLC in Smart Distribution Grids
Theofilos Papadopoulos ( Aristotle University of Thessaloniki, Greece), Andreas Chrysoschos (Aristotle University of Thessaloniki, Greece), Grigoris Papagiannis (Aristotle University of Thessaloniki, Greece), Ahmed Elsaamadouny (University of Texas, USA), Naofal Al-Dhahir (University of Texas, USA)

2014ISGTEU0420
Transfer Function of Power Line Channel – Influence of Topology Parameters and Power Line Topology Estimation
Petr Mlynak (Brno University of Technology, Czech Republic), Jiri Misurec (Brno University of Technology, Czech Republic), Martin Koutny (Brno University of Technology, Czech Republic), Radek Fudtiak (Brno University of Technology, Czech Republic)

2014ISGTEU0238
Permutation Coding with Differential Quinary Phase Shift Keying for Power Line Communication
Kehinde Ogunyanda (University of Johannesburg, South Africa), Ayokunle D. Familua (University of the Western Cape, South Africa), Theo G. Swart (University of Johannesburg, South Africa), Hendrik C. Ferreira (University of Johannesburg, South Africa), Ling Cheng (University of the Western Cape, South Africa)
Paper Session 13: Power Generation and Energy Storage Technologies

Date Tuesday, 14:30 – 16:00
Chair Kai Strunz

2014ISGTEUJ0494
Multi-Period Three-Phase Unbalanced Optimal Power Flow
Alison O’Connell (University College Dublin, Ireland), Andrew Keane (University College Dublin, Ireland)

2014ISGTEUJ0019
Distributed Energy Storage using Domestic Hot Water Tanks and a Novel Thermocline Sensor
Peter Armstrong (Oxford University, UK), Malcolm McCulloch (Oxford University, UK)

2014ISGTEUJ0607
Wind Farm Associated with Flywheel Energy Storage Plants
Michal Chudy (University of Pretoria, South Africa), Lynette Herbst (University of Pretoria, South Africa), Jorg Lalk (University of Pretoria, South Africa)

2014ISGTEUJ0441
Coordinating Control for a Wind-Hydro-Storage System Considering the Constraint of SOC
Tianyi Chen (Tsinghua University, China), Laijun Chen (Tsinghua University, China), Tianwen Zheng (Tsinghua University, China), Shengwei Mei (Tsinghua University, China)

2014ISGTEUJ0392
Integration of Compressed Air Energy Storage with Wind Turbine to Provide Energy Source for Combustion Turbine Generator
Troy Nguyen (Florida Institute of Technology, USA)

2014ISGTEUJ0361
Microgrid Power Balancing with Redox Flow Batteries
Spyros Skarvelis-Kazakos (University of Greenwich, UK), Babatunde Giwa (University of Greenwich, UK), David Hall (C-Tech Innovation Ltd., UK)
Paper Session 14: Power System Stability and Security 2

Date: Tuesday, 14:30 – 16:00
Chair: Lin Jiang

2014ISGTEU0434
Assessment of the Effectiveness of Asymmetrical Line Compensation for Mitigation of SSR in Meshed Networks
Atia Adrees (University of Manchester, UK), Jovica Milanovic (University of Manchester, UK)

2014ISGTEU0320
A Novel Approach to Account for Uncertainty and Correlations in Probabilistic Power Flow
Emanuele Ciapessoni (Ricerca sul Sistema Energetico RSE S.p.A., Italy), Diego Cirio (Ricerca sul Sistema Energetico RSE S.p.A., Italy), Stefano Massucco (University of Genova, Italy), Andrea Pitto (Ricerca sul Sistema Energetico RSE S.p.A., Italy), Federico Silvestro (University of Genova, Italy)

2014ISGTEU0459
Vertical Provision of Reactive Power for Voltage Stability
Marco Greve (TU Dortmund, Germany), Johannes Schwippe (TU Dortmund, Germany), Theresa Noll (TU Dortmund, Germany), Christian Rehtanz (TU Dortmund, Germany)

2014ISGTEU0528
Syncophasor Measurement Based Small Signal Stability Assessment using FFT-CWT Approach in Japan-Campus-WAMS
Khairudin Khairudin (Kyushu Institute of Technology, Japan), Yasunori Mitani (Kyushu Institute of Technology, Japan)

2014ISGTEU0596
Global Initialization Technique in Waveform Relaxation Method for Transient Stability Analysis of a Japanese Power System
Takao Tsuji (Yokohama National University, Japan), Frédéric Magoulès (Ecole Centrale Paris, France), Takanori Sakamoto (Yokohama National University, Japan), Tsutomu Oyama (Yokohama National University, Japan), Kenko Uchida (Waseda University, Japan)

2014ISGTEU0463
Paper Session 15: Demand Side Management 1

Date Tuesday, 14:30 – 16:00

Chair Koen Kok

2014ISGTEU0146
Economic Assessment of Distribution Network Reinforcement Deferral through Post-Contingency Demand Response
Eduardo Marinez (University of Manchester, UK), Pierluigi Mancarella (University of Manchester, UK)

2014ISGTEU0443
Discrete Elastic Residential Load Response under Variable Pricing Schemes
Killian McKenna (University College Dublin, Ireland), Andrew Keane (University College Dublin, Ireland)

2014ISGTEU0333
Contract Design for Demand Response
Tobias Haring (ETH Zurich, Switzerland), Göran Andersson (ETH Zurich, Switzerland)

2014ISGTEU0541
Security Constrained Economic Dispatch with Flexible Thermostatically Controlled Loads
Vincenzo Trovato (Imperial College London, UK), Simon Tindemans (Imperial College London, UK), Goran Strbac (Imperial College London, UK)

2014ISGTEU0597
Reliability Evaluation of DR and TVTR Considering the Cost of Interruptions
Alexandra Kapetanaki (University of Manchester, UK)

2014ISGTEU0027
Economic Evaluation of Active Network Management Alternatives for Congestion Avoidance – the DSO Perspective
Lode Van Halemwyck, (University of Gent, Belgium), Johan Verstraeten (Eand s CVBA, Belgium), Matthias Strobbe (University of Gent, Belgium), Chris Develder (University of Gent, Belgium)
Mr. Çetnkaya is a Power Sector Specialist with about 6 years of university and 7 years of SIEMENS experience in energy both in utility scale and industrial scale projects especially focused on stability, transients, smart grids and large scale renewable integration to the grid. Mr. Çetnkaya also worked on Turkish Transmission System for 5 years in university as a research assistant. The study was covering 380 kV and 154 kV levels to study FACTS devices primarily on UPFC and its effects on a real system as a doctor of philosophy. Mr. Çetnkaya has been involved in a number of projects in the following areas. MV projects (primary/secondary design & equipment selection), steady-state and dynamic network analyses for utility/industrial scale projects, transient analyses, renewable integration challenges & grid compliance. Mr. Çetnkaya is also an instructor of several internal/external technical courses. He also has so many publications in national/international journals and conference proceedings related to system dynamics, renewables and smart grids.

Panel Abstract: The new era of electricity requires a smart structure for transmission and distribution systems. Control is a key enabling technology for the deployment of renewable energy systems. Solar and wind power require advanced control techniques for high-performance and reliable operation. In future power systems, there should also be a management system which controls and optimizes dispersed generation regarding technical and economic aspects.

Grid management is facing challenges like an unclear, fluctuating load, more and more often, or technical voltage volatility. There is a growing risk of voltage range management and thus malfunction or even damaged equipment on the consumer side. At the same time, the danger of overloads on lines, transformers and other equipment is growing, which can even result in grid failure. Processes in the distribution network must be made visible at all times in order to reliably assess the status.
Renewables Integration and the Challenges
Hasan Basri Çetinkaya

Decentralized Energy Management Systems
Mete Taşpınar, Smart Grid Group Manager, Siemens, Turkey

Closed-Loop Volt-Var Control (VVC)
Yusuf Üçyüz, Smart Grid Control Center, Siemens, Turkey

Orchestration of Distributed Network Applications for Fault Handling
Burcu Ardiç Serpen, Senem Yüzbaşıoğlu, Smart Grid Research & Development, Siemens, Turkey
Paper Session 16: Physical and Cyber Security of Smart Grid

Date: Tuesday, 16:30 – 18:00
Chair: Robert Griffin

2014ISGTEJ0234
Threat Assessment and Response for Physical Security of Power Substations
Jing Xie (University College Dublin, Ireland), Chen-Ching Liu (Washington State University, USA), Marino Sforza (TERNA, Italy), Martin Bilek (CEPS, Czech Republic), Radek Hamza (CEPS, Czech Republic)

2014ISGTEJ0425
A Survey of Electric Power Synchrophasor Network Cyber Security
Christopher Tate Beasley (Clemson University, USA), Xingsi Zhong (Clemson University, USA), Juan Deng (Clemson University, USA), Richard Brooks (Clemson University, USA), Kumar Venayagamoorthy (Clemson University, USA)

2014ISGTEJ0142
Distributed Specification-Based Firewalls for Power Grid Substations
Shinn-Shyan Wu (University College, Dublin, Ireland), Chen-Ching Liu (University College, Dublin, Ireland), Alexandru Stefanov (University College, Dublin, Ireland)

2014ISGTEJ0513
Mohammed Farag (Alexandra University, Egypt), Bassem Mokhtar (Alexandra University, Egypt), Mohamed Azab (The City of Scientific Research and Technological Applications, Egypt)

2014ISGTEJ0127
On Security of a Home Energy Management System
Avijit Saha (Virginia Tech, USA), Saifur Rahman (Virginia Tech, USA), Manisa Pipattanasomporn (Virginia Tech), Murat Kuzlu, (Virginia Tech)
Paper Session 17: Network Integration of Distributed Energy Resources

Date Tuesday, 16:30 – 18:00
Chair Sasa Djokic

On the Use of Wind Energy Conversion Systems for Mitigating Subsynchronous Resonance and Subsynchronous Interaction
Xuan Gao (University of Saskatchewan, Canada), Ulas Karaagac (École Polytechnique de Montréal, Canada), Sherif Faried (University of Saskatchewan, Canada), Jean Mahseredjian (École Polytechnique de Montréal, Canada)

Impact of the Integration of Renewable Energies on the Reactive Power Demand in the German Transmission Grid
Marie-Louise (TU Dortmund, Germany)

Optimum Shunt Capacitor Placement in Distribution Networks with High Penetration of Renewable Energy Resources Using Genetic Algorithms
Hany Farag (York University, Canada), Ehab El-Saadany (University of Waterloo, Canada)

Provision of Primary Control Reserve by DFIG-Based Wind Farms in Compliance with ENTSO-E Frequency Grid Codes
Davood Raoofsheibani (Technion, Haifa, Israel), Ehsan Abbasi (TU Berlin), Klaus Pfeiffer (Brandenburg Technical University, Germany)

Distributed Generation Hosting Capacity Calculation of MV Distribution Feeders in Turkey
Mufit Altin (DTU, Denmark), Emre Utku Oğuz (METU, Turkey), Erdal Bizkevelci (Alstom, Turkey), Bilal Şimşek (TEDAŞ, Turkey)

Recommended Strategies for Grid Operators Using Reactive Power Capabilities from Photovoltaic Plants
Yehia Tarek Fawzy (SMA, Germany), Kevin V. Roey (Infrax, Belgium), Annick Dexters (Infrax, Belgium)

2014SGT0029
2014SGT00595
2014SGT00288
2014SGT00090
2014SGT00302
2014SGT00043
Paper Session 18: DC Grid and Power Electronic Applications

Date Tuesday, 16:30 – 18:00
Chair Tankut Yalçınöz

2014ISGTEU0583
30kW, 200V/900V LCL IGBT DC/DC Converter Prototype Design and Testing
Masood Hajian (University of Aberdeen, UK), Dragan Jovic (University of Aberdeen, UK)

2014ISGTEU0455
Control Strategy and Application of Power Converter System in Battery Energy Storage System
Tianwen Zheng (Tsinghua University, China), Laijun Chen (Tsinghua University, China), Shengwei Mei (Tsinghua University, China)

2014ISGTEU0309
A General Control System Structure for Multi-terminal VSC-HVDC Systems
Evripidis Karatsivos (Lund University, Sweden), Jörgen Svensson (Lund University, Sweden), Olof Samuelsson (Lund University, Sweden)

2014ISGTEU0438
Fault Ride through During Loss of Converter in a 4-VSC Based HVDC Transmission
Olusegun Olowookere (University of Greenwich, UK), Spyros Kazakos Skarvelis-Kazakos (University of Greenwich, UK), Yehdego Habtay (University of Greenwich, UK), Stephen Woodhead (University of Greenwich, UK)

2014ISGTEU0261
Smart Micro-Grid Integration in DC Railway Systems
Sarah Nasr (Alstom Transport, France), Marc Petit (SUPELEC, France), Marius Iordache (Alstom Transport, France)

2014ISGTEU0575
Interconnecting Subsea DC Collection Systems into a High Reliability DC Grid
Huibin Zhang (University of Aberdeen, UK), Dragan Jovic (University of Aberdeen, UK)
Paper Session 19: Energy Management

Date: Tuesday, 16:30 – 18:00
Chair: Aydoğan Özdemir

2014ISGTEU0130
**Hierarchical MPC-based Energy Management and Frequency Regulation Participation of a Virtual Power Plant**
Tian Zhang (Nanyang Technological University, Singapore), Hoay Beng Gooi (Nanyang Technological University, Singapore)

2014ISGTEU0198
**Towards Railway-Smartgrid Energy Management Optimization for Hybrid Railway Power Substations**
Petronela Pankovits (SNCF, France), Julien Pouget (SNCF, France), Benoit Robyns (HEI, France), Florent Delhaye (Ecole Centrale de Lille, France), Stephane Brisset (Ecole Centrale de Lille, France)

2014ISGTEU0347
**Energy Management System (EMS) for Real-time Operation of DC Microgrids with Multiple Slack Terminals**
Jianfang Xiao (Nanyang Technological University, Singapore), Peng Wang (Nanyang Technological University, Singapore), Leonardy Setyawan (Nanyang Technological University, Singapore), Fook Hoong Choo (Nanyang Technological University, Singapore)

2014ISGTEU0452
**Coordination of Control and Energy Management Methods for Microgrid Systems**
Jordi Pegueroles (IREC, Spain), Lucia Igualada Gonzalez (IREC, Spain), Cristina Corchero Garcia (IREC, Spain), Miquel Cruz Zambrano (IREC, Spain), Gerard del Rosario Calaf (IREC, Spain)

2014ISGTEU0585
**Distributed Energy Management of Microgrids with Dantzig-Wolfe Decomposition**
Can Altay (Bogazici University, Turkey), Hakan Delic (Bogazici University, Turkey)

2014ISGTEU0391
**Energy Limits in Primary Frequency Control with Short-Term Frequency-Band Allocation**
Arnaud Latiers (University of Louvain, Belgium), Francois Glineur (University of Louvain, Belgium)
Wednesday, October 15, 2014
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<thead>
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<th>Time</th>
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<th>Chair</th>
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<tr>
<td>09:00 - 09:30</td>
<td><strong>Keynote C</strong>: “Implementing Smart Grid Communications”</td>
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<td>Li Haiyu, The University of Manchester</td>
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<td>09:30 - 11:00</td>
<td><strong>Plenary C</strong>: “Wide Area Monitoring, Protection and Control”</td>
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<td>Jay Giri, Alstom Grid</td>
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<td>11:00 - 11:30</td>
<td>Coffee Break</td>
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<td>11:30 - 13:00</td>
<td>ROOM</td>
<td>Conference Main Hall</td>
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<td><strong>Panel 7</strong> Smart Transmission Technologies</td>
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<td><strong>Paper Session 20</strong></td>
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<td>Chair: Herman Koch</td>
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<td>IEC 61850 Based Applications</td>
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<td>13:00 - 14:00</td>
<td>Lunch Break</td>
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<td>14:00 - 15:30</td>
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<td><strong>Panel 8</strong> Transactive Energy: Market-based Approaches to Smart Grids, the University Perspective</td>
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<td><strong>Paper Session 24</strong></td>
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<td>Chair: Koen Kok</td>
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<td>Smart Metering Applications</td>
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<td><strong>Panel 9</strong> Transactive Energy: Market-based Approaches to Smart Grids, the Industrial Perspective</td>
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<td>Chair: Serhat Ikizoğlu</td>
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<td>15:30 - 16:00</td>
<td>Coffee Break</td>
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<td>16:00 - 17:30</td>
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<td><strong>Paper Session 27</strong> Smart Grid Automation</td>
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<td><strong>Paper Session 24</strong></td>
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<td>Chair: Mehmet Bayrak</td>
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<td>Smart Metering Applications</td>
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<td><strong>Closing Session, Main Conference Hall</strong></td>
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<td>Chair: Koen Kok</td>
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| **Paper Session 21**  
Smart Grid Protection  
Chair: Desire Rasolomampionona | **Paper Session 22**  
Voltage Control 2  
Chair: Matti Lehtonen | **Paper Session 23**  
Demand Side Management 2  
Chair: Canbolat Uçak |
| **Paper Session 25**  
Smart Grid Modelling and Simulation  
Chair: Ömer Usta/Belg n Turkay | **Paper Session 26**  
Residential Demand Response 2  
Chair: Anastasios Bakirtzis |  |
| **Paper Session 28**  
Wind Power  
Chair: Deniz Yıldırım | **Paper Session 29**  
Load Forecasting  
Chair: Serhat Şeker |  |
Abstract: To maximise the integration of renewable energy sources (RESs) and to encourage the customer to adopt new low carbon technologies (LCTs), the governments in the world support the Smart Grid development. Information and communication technologies (ICTs) are at the core of the Smart Grid development as they will support the future power grids with two-way energy and information flows, detect, forecast, control, and restore faults. The advancement of ICTs, along with developing more reliable, flexible, and intelligent power systems, will enable the integration of renewable and distributed energy systems into the power grids. The technical and economic challenges of integrating ICTs into power systems and the future implications for the Smart Grid development will be discussed.
Plenary C

Wednesday, 09:30 - 11:00
Conference Main Hall

Wide Area Monitoring, Protection and Control

Chair: Jay Giri, Alstom Grid

Synchrophasor Solutions for Grid Management

Dr. Jay Gr (M’78-F’00) Jay is Director of Power Systems Technology and Strategy at Alstom Grid’s NMS business in Redmond, Washington. In 1978, Jay and 11 other engineers co-founded Energy System Computer Applications (ESCA). In 2010, ESCA after a few corporate mergers became part of Alstom Grid. He has a PhD from Clarkson University in New York and a B.Tech from the Indian Institute of Technology (IIT), Madras. In 2002, he was elected IEEE Fellow and is a member of the IEEE PES Governing Board. He is an Alstom Grid Senior Fellow.

Fault location using sparsely distributed synchronized measurements in power networks.

Ali Abur, Northeastern University in Boston.

Prof. Dr. Al Abur obtained his B.S. degree from Orta Doğu Teknik Üniversitesi, Turkey in 1979 and both his M.S. and Ph.D. degrees from the Ohio State University in 1981 and 1985 respectively. He was a Professor at Texas A&M University during 1985-2005, and the Chair of the Electrical and Computer Engineering Department at Northeastern University in Boston until September 2013. Currently, he is a Professor in the same department. His research and educational activities have been in the area of power systems. He is a Fellow of the IEEE for his work on power system state estimation. He co-authored a book and published widely in IEEE journals and conferences. He serves as an IEEE PES Distinguished Lecturer and was on the Editorial Board of IEEE Transactions on Power Systems during 1999-2011.
Practical examples of Synchro Phasor Measurements and Integration of IT and OT,

**Bas Kruimer**, Senior Manager, Accenture Smart Grid Services

Bas Kruimer is Senior Manager at Accenture Smart Grid Services in Europe with 25 years of international experience in the energy and electrical utility sector in commercial, product and business development and management roles. Bas achieved his Master of Science degree in Power Engineering at Delft University of Technology and started working at ABB in The Netherlands to later take on an international role as Global Product Manager Protect on and Substation Automation Products & Systems. Moving his focus back to The Netherlands he joined KEMA T&D Consulting to manage the Substations and HV Installations/Connections design and engineering teams and support business development. For some years he lead the KEMA Quality Management System Certification on businesses before he rejoined the utility market working for Eneco/Joule in the unbundling and commercialization process where he set up and ran the Sales team for Complex Energy and Electrical Projects. He then rejoined Quant Technology to become responsible for the grid consultancy business towards the European market. In 2014 Bas joined the Accenture Smart Grid Services team.

Wide Area Defense with Self-Healing Capabilities

**Chen-Ching Liu**, Washington State University, USA, and University College Dublin, Ireland

Prof. Dr. Chen-Ching Liu is Boeing Distinguished Professor at Washington State University, Pullman, and Director of Energy Systems Innovation (ESI) Center. He is also Professor of Power Systems at University College Dublin, Ireland. During 1983-2005, he was a Professor of EE at University of Washington, Seattle. Dr. Liu was Palmer Chair Professor at Iowa State University from 2006 to 2008. In 2008, he joined University College Dublin, where he was Deputy/Acting Provost of Engineering, Mathematical and Physical Sciences. Chen-Ching completed his Ph.D. from the University of California, Berkeley. He received an IEEE Third Millennium Medal in 2000 and the Power and Energy Society Outstanding Power Engineering Educator Award in 2004. Professor Liu received a Doctor Honoris Causa from Polytechnic University of Bucharest, Romania, in 2013. He chaired the IEEE Power and Energy Society Fellow Committee, Technical Committee on Power System Analysis, Computing and Economics, and Outstanding Power Engineering Educator Award Committee. Professor Liu is a Fellow of the IEEE.
**Panel 7**

**Wednesday, 11:30 – 13:00**  
**Conference Man Hall**

**Smart Transmission Technologies**

**Chair: Hermann Koch**, Siemens, Germany.

Dr.-Ing. Hermann Koch was born in November 1954 in Hauswurz, Germany. In 1979 he graduated in Industrial Control Engineering at the Fachhochschule Rüsselsheim. From 1980-1981 he studied at New Jersey Institute of Technology, Newark, New Jersey, USA. 1986 he graduated in Electrical Engineering at the Technische Universität Darmstadt. He received his Dr. Ing. degree in 1990 from the Technical University of Darmstadt at the High Voltage Institute. Since 1991 he has worked with Siemens High Voltage Division in different responsibilities including Gas Insulated Switchgear and Transmission Lines. Currently he is Principle Expert of Standards and Regulations of the Transmission Division.

Hermann Koch is Past-Chairman of the IEEE PES Substations Committee. In IEC he is Secretary of SC 17C High Voltage Switchgear Assemblies and member of SG 2 Ultra High Voltages. In CIGRE he is member of the Strategic Advisory Group of SC B3 Substations. He has published more than 130 technical papers at international conferences and magazines and holds 31 patents in the field of gas insulated technology which is his area of expertise. He is engaged in studies, innovations, and R&D activities for high voltage gas insulated power transmission systems. Hermann Koch is principle on standards and innovations of Siemens Power Transmission Division.

**Panel Abstract:** The changes in the electrical power system related to the so-called smart grid will cover not only the distribution and metering topics but also strongly impact the transmission system. The interaction between the requirements coming from decentralized power generation, local large scale wind and solar power generation and the need of interregional power exchange to stabilize the power system and to meet the need of energy storage can only be solved with intelligent power transmission systems.

New topologies of AC and DC transmission systems in parallel in meshed networks require technology which are fast reacting to changes in the network coming from failures or from fast changing power generation from renewable energy sources like wind and solar. HVDC converter technologies are developing fast with new technical features and higher power transmission capabilities at lower power losses with every new project.
HVDC – Converter Technologies, Configurations and Trends  
**Jörg Dorn**, Semens AG

Operation of meshed HVDC grids - Challenges and First Solutions  
**Anne-Katrin Marten**, TU Ilmenau

High Power Compact Underground Transmission  
**Denis Imamovic**, Semens AG

New ICT (Information Communication Technology) Architectures & Tools for Efficient Smart Grid Management: First Lessons from our International Deployments  
**Lauvent Schmitt**, Alstom Turkey

Future of Power Transmission Technologies and the role of Power Semiconductors  
**Monia Beier-Möbius**, TU Chemn tz
Paper Session 20: IEC61850 Based Applications

Date Wednesday, 11:30 – 13:00
Chair John D. McDonald

2014ISGTEJ0469
Standard-based Secondary Substation Automation Unit – the ICT Perspective
Shengye Lu (Tampere University of Technology, Finland), Sam Repo (Tampere University of Technology, Finland), Davide Della Giustina Esercizio (A2A Ret Elettriche SpA, Italy)

2014ISGTEJ0289
IEC 61850-based Functional Specifications Common to Multiple Utilities
Tetsuo Otani (CREPI, Japan), Makoto Kaminaga (Tokyo Electric Power Company, Japan), Fumitoshi Hagiwara (Chubu Electric Power Company, Japan), Masahiro Kameda (Kansa Electr Power Company, Japan), Shogo Miura (Toshiba Corporation, Japan), Yoshihiro Seto (Mitsubishi Electric Corporation, Japan)

2014ISGTEJ0094
Performance and Reliability Assessment of Protection System in IEC 61850-based Smart Substation
He Ruiwen (Guangdong University of Technology, China), He Xiaowang (Guangdong University of Technology, China), Ly Mengli (Guangdong University of Technology, China), Cai Zexiang (South China University of Technology, China), Li Xiaohua (South China University of Technology, China), Zhu Lin (South China University of Technology, China)

2014ISGTEJ0184
Challenges to the Implementation of a Real-Time Process Bus According to IEC 61850-9
Gilberto Igarashi (University of São Paulo, Brazil), Josemir Santos (University of São Paulo, Brazil)

2014ISGTEJ0188
Gilberto Igarashi (University of São Paulo, Brazil), Josemir Santos (University of São Paulo, Brazil)

2014ISGTEJ0517
Paper Session 21: Smart Grid Protection

Date       Wednesday, 11:30 – 13:00
Chair      Desire Dauphin Rasolomampionona

2014ISGTEU0538
A Novel Anti-Islanding Protection Method Based on the Combination of a Q-f Droop and RPV
Ontrei Raipala (Tampere University of Technology, Finland), Anssi Mäkinen (Tampere University of Technology, Finland), Sami Repo (Tampere University of Technology, Finland), Pertti Järventausta (Tampere University of Technology, Finland)

2014ISGTEU0008
Adaptive Distance Relay Setting for Hybrid power Transmission Networks
OD Naidu (ABB, India), A. K. Pradhan, (Indian Institute of Technology, India)

2014ISGTEU0480
Insight into Microgrid Protection
Sukumar Brahma (New Mexico State University, USA), Jonathan Trejo (El Paso Electric Company, USA), Jason Stamp (Sandia National Laboratory, USA)

2014ISGTEU0565
Using Distance Protection in Smart Grid Environment
Sampo Voima (University of Vaasa, Finland), Kimmo Kauhaniemi (University of Vaasa, Finland)

2014ISGTEU0108
Evaluating Performance of Classifiers for Supervisory Protection using Disturbance Data from Phasor Measurement Units
Om Prasad Dahal (New Mexico State University, USA), Sukumar Brahma (New Mexico State University, USA), Huiping Cao (New Mexico State University, USA), Rajesh Kavasseri (North Dakota State University, USA)

2014ISGTEU0509
Coordinating Overcurrent Protection Relays in Cascaded Parallel-Series Distribution Feeders
Mahmoud Essad (Monouya University, Egypt), Abdel-maksoud Taalab (Monouya University, Egypt), Nagy Elkalashy (Monouya University, Egypt), Tamer Kawady (Monouya University, Egypt)
Paper Session 22: Voltage Control 2

Date       Wednesday, 11:30 – 13:00
Chair       Matti Lehtonen

2014ISGTEU0332
Variable Voltage Set Point Control of Tap Changers in Distribution Grids
Eva-Maria Baerthlein (GE Global Research, Germany), Marianne Hartung (GE Global
Research, Germany), Ara Panosyan (GE Global Research, Germany)

2014ISGTEU0378
Reactive Power Provision by Distribution System Operators - Optimizing Use of
Available Flexibility
Erika Kaempf (Fraunhofer IWS, Germany), Hans Abele (Transnet BW, Germany),
Sebastian Stepanescu Netze BW, Germany), Martin Braun (Fraunhofer IWS, Germany)

2014ISGTEU0524
Distribution Network Supports for Reactive Power Management in Transmission
Systems
Linwei Chen (University of Manchester, UK), Haiyu Li (University of Manchester, UK),
Victoria Turnham (Electricity North West Limited, UK), Simon Brooke (North West
Limited, UK)

2014ISGTEU0266
Applying Full MILP Model to Volt-Var Optimization Problem for MV Distribution
Networks
Saeed Rahimi (University of Genova, Italy), Yaser Tohidi (KTH Stockholm, Sweden),
Stefano Massucco (University of Genova, Italy), Federico Silvestro (University of
Genova, Italy), Mohammad Reza Hesamzadeh (KTH Stockholm, Sweden)

2014ISGTEU0336
Consensus-based Distributed Cooperative Control for Microgrid Voltage
Regulation and Reactive Power Sharing
Dawei He (Georg Institute of Technology, USA), Di Shi (NEC Laboratories America, USA),
Ratnesh Sharma (NEC Laboratories America, USA)

2014ISGTEU0318
A Comparison between Synergetic Control and Feedback Linearization for
stabilizing MVDC Microgrids with Constant Power Load
Marco Cupelli (RWTH Aachen, Germany), Mojtaba Moghimi (RWTH Aachen, Germany)
Paper Session 23: Demand Side Management 2

Date       Wednesday, 11:30 – 13:00
Chair       Canbolat Uçak

2014ISGTEU0259
Optimal Assignment of Off-Peak Hours to Lower Curtailments in the Distribution Network
Luca Merciadri (Unversity of Lège, Belgium), Sébastien Mathieu (Unversity of Lège, Belgium), Damien Ernst (Unversity of Lège, Belgium), Quentin Louveaux (Unversity of Lège, Belgium)

2014ISGTEU0424
Real-Time Simulation of Real-Time Pricing Demand Response to Meet Wind Variations
Luis Gomes (Polytechnic Institute of Porto, Portugal), Filipe Fernandes (Polytechnic Institute of Porto, Portugal), Pedro Faria (Polytechnic Institute of Porto, Portugal), Marco Silva (Polytechnic Institute of Porto, Portugal), Zita Vale (Polytechnic Institute of Porto, Portugal), Carlos Ramos (Polytechnic Institute of Porto, Portugal)

2014ISGTEU0207
Wide Area Cyclic Blackout Mitigation by Supply-Demand Matching of HVAC Counterpart Loads
Kasim Al-Salim (Unversity of Strathclyde, Scotland)

2014ISGTEU0267
Impact Analysis of Load Control for Frequency Regulation: the case of Sardinia in 2020
Stefano Massucco (Unversity of Genova, Italy), Francesco Baccino (Unversity of Genova, Italy), Francesco Conte (Unversity of Genova, Italy), Federico Silvestro (Unversity of Genova, Italy), Emanuele Ciapessoni (RSE, Italy), Deego Cro (RSE, Italy)

2014ISGTEU0614
Peak Shaving with Photovoltaic-Battery Systems
Felix Braam (Fraunhofer ISE, Germany), Raphael Hollinger (Fraunhofer ISE, Germany), Martin Llerena Engesser (Fraunhofer ISE, Germany), Stine Mueller (Fraunhofer ISE, Germany), Robert Kohrs (Fraunhofer ISE, Germany), Christof Wittwer (Fraunhofer ISE, Germany)

2014ISGTEU0521
Transactive Energy: Market-based Approaches to Smart Grid
The University Perspective: Concepts, Advanced Modelling and Application Area

Chair: Koen Kok, TNO

Koen Kok is Senior Scientist at the Center for Electric Power and Energy (CEE) of the Danish Technical University DTU. He is strongly involved in the European smart grids research field, working on numerous EU and NL-national projects developing and deploying smart grid technologies. He is the thought-leading scientist behind the PowerMatcher, an award-winning smart grid technology based on Transactive Energy principles. PowerMatcher matches demand and distributed generation on one hand with available renewable power and network capacity on the other.

Co-chair: Henrik Bindner, DTU

Henrik Bindner is Senior Scientist and Head of the Energy Systems Operation and Management (ESOM) group at the DTU Center for Electric Power and Energy (CEE). He is an expert in intelligent systems for a sustainable power infrastructure, developing technologies and control schemes enabling DER units to participate in the control of the power system.
Transactive Energy: A Field-proven Approach to Integration of Demand Response and Distributed Generation
Koen Kok, TNO, The Netherlands and DTU, Denmark.

Market Based Control for Electric Vehicles Integrations Considering Network Operational Constraints
Junjie Hu, DTU CEE, Denmark.

Market-based Ancillary Service Provision by Distributed Energy Resources
Mazher Syed, University of Strathclyde, Scotland.

Business Agents for Optimized Operation of Clusters of Demand Response Units and/or Distributed generators
Davy Geysen, VITO, Belgium.
Paper Session 24: Smart Metering Applications

Date       Wednesday, 14:00 – 15:30
Chair      Serhat Ikizoglu

2014ISGTEU0542
Adaptive Scheduling Algorithm for Link Recovery in Smart Metering Mesh Networks
Siva Subramani (Toshiba Research Europe Ltd, UK), Yichao Jin (Toshiba Research Europe Ltd, UK)

2014ISGTEU0436
Online and Scalable Data Validation in Advanced Metering Infrastructures
Vincenzo Gulisano (Chalmers University of Technology, Sweden), Magnus Almgren (Chalmers University of Technology, Sweden), Marina Papatriantafilou (Chalmers University of Technology, Sweden)

2014ISGTEU0642
Identifying Consumer Requirements as an Antidote to Resistance to Smart Meters
Rani Yesudas (The Australian National University, Australia), Roger Clarke (The Australian National University, Australia)

2014ISGTEU0514
Coarse-Grained Cycle-Accurate Electricity Metering
Mikhail Simonov (ISMB, Italy)

2014ISGTEU0497
Voltage Analytics to Infer Customer Phase
Vijay Arya (IBM Research, India), Rajendu Mitra (IBM Research, India), Richard Mueller (DTE Energy, USA), Heather Storey (DTE Energy, USA), Gerard Labut (DTE Energy, USA), Janet Esser (DTE Energy, USA), Brian Sullivan (DTE Energy, USA)
Paper Session 25: Smart Grid Modelling and Simulation

Date       Wednesday, 14:00 – 15:30
Chair      Ömer Usta/Belgin Turkay

2014ISGTEU0287

Unsupervised Energy Disaggregation Using Conditional Random Fields
Panikos Heracleous (Nagoya University, Japan), Pongtep Angkittrakul (Nagoya University, Japan), Norihide Kitaoka (Nagoya University, Japan), Kazuya Takeda (Nagoya University, Japan)

2014ISGTEU0300

Voltage-Dependent Models of Power Generation Units: A Detailed Analysis for Control Center Application
Soenke Loitz (University of Kaiserslautern, Germany), Hendrik Acker (University of Kaiserslautern, Germany), Wolfram H. Wellssow (University of Kaiserslautern, Germany), Dirk Cremer (FGH GmbH, Germany), Willi Heckmann (FGH GmbH, Germany)

2014ISGTEU0486

A Modelica-Based Execution and Simulation Engine for Automated Power System Model Validation
Francisco Gómez (KTH Stockholm, Sweden), Luigi Vanfretti (KTH Stockholm, Sweden), Svein Harald Olsen (Statnett SF, Sweden)

2014ISGTEU0627

A New VBR Modeling of Squirrel-cage Induction Machine for Power System Analysis with XTAP
Orie Sakamoto (Sophia University, Bulgaria)

2014ISGTEU0421

A Quantitative Method for the Assessment of VSC-HVdc Controller Simulations in EMT Tools

2014ISGTEU0448

A Novel Hybrid Dynamic Simulation Algorithm Based on Iterative Coordination
Shaowei Huang (Tsinghua University, China), Ying Chen (Tsinghua University, China),
Paper Session 26: Residential Demand Response 2

Date       Wednesday, 14:00 – 15:30
Chair      Anastasios Bakirtzis

2014ISGTEU0014
A Virtual Power Plant for the Aggregation of Domestic Heating Load Flexibility
Antti Alahäiväälä (Aalto University, Finland), Olli Kilikki (Aalto University, Finland),
Merkebu Degefa (Aalto University, Finland), Ilkka Seilonen (Aalto University, Finland),
Matti Lehtonen (Aalto University, Finland)

2014ISGTEU0532
Demand Side Focused Simulation Platform for the Evaluation of Demand Side
Management Approaches
Kornschnok Dittawit (Norwegian University of Science and Technology, Norway),
Finn Arve Aagesen (Norwegian University of Science and Technology, Norway)

2014ISGTEU0533
EnergyTest: A Tool for Assessing Building Energy Sustainability
Emilio Ancillotti (CNR, Italy), Raffaele Bruno (CNR, Italy), Emanuele Crisostomi
(University of Pavia, Italy), Mauro Tucci (University of Pavia, Italy), Marco Conti (CNR, Italy)

2014ISGTEU0414
Regulating Power from Supermarket Refrigeration
Niamh O’Connell (DTU, Denmark), Henrik Madsen (DTU, Denmark), Pierre Pinson
(DTU, Denmark), Mark O’Malley (University College Dublin, Ireland), Torben Green
(Danfoss, Denmark)

2014ISGTEU0307
Demand Response Potential of Residential HVAC Loads Considering Users
Preferences
Mubbashir Ali (Aalto University, Finland), Amir Safdarian (Aalto University, Finland),
Matti Lehtonen (Aalto University, Finland)

2014ISGTEU0406
Performance Assessment of Aggregation Control Services for Demand Response
Daniel Esteban Bondy (DTU, Denmark), Giuseppe Tommaso Costanzo (DTU,
Denmark), Kai Heussen (DTU, Denmark), Henrik W. Bindner (DTU, Denmark)
TNO

Koen Kok is Senior Scientist at TNO, the largest applied research institute in The Netherlands, and part-time Visiting Researcher at the Center for Electric Power and Energy (CEE) of the Danish Technical University DTU. He is strongly involved in the European smart grid research field, working on numerous EU and NL-national projects developing and field deploying smart grid technology. He is the thought-leader behind the PowerMatcher, an award-winning smart grid technology based on Transactive Energy principles. PowerMatcher matches demand and distributed generation on one hand with available renewable power and network capacity on the other.

Panel 9

Wednesday, 16:00 – 17:30
Conference Main Hall

Transactive Energy: Market-based Approaches to Smart Grid
The Industrial Perspective: Field Deployments, New Markets and Standardization

Chair: Koen Kok, TNO

Koen Kok is Senior Scientist at TNO, the largest applied research institute in The Netherlands, and part-time Visiting Researcher at the Center for Electric Power and Energy (CEE) of the Danish Technical University DTU. He is strongly involved in the European smart grid research field, working on numerous EU and NL-national projects developing and field deploying smart grid technology. He is the thought-leader behind the PowerMatcher, an award-winning smart grid technology based on Transactive Energy principles. PowerMatcher matches demand and distributed generation on one hand with available renewable power and network capacity on the other.

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Henrik Bindner is Senior Scientist and Head of the Energy Systems Operation and Management (ESOM) group at the DTU Center for Electric Power and Energy (CEE). He is an expert in intelligent systems for a sustainable power infrastructure, developing technologies and control schemes enabling DER units to participate in the control of the power system.
Couperus Smart Grid: Experiences with Market-based Coordination of Residential Heat Pumps for Wind Power Integration and Distribution-level Grid Management
Arnoud Rijneveld, Sted n, the Netherlands

Real-Time Energy Exchange (REX): An on-line Flexibility Aggregating Platform
Harry van Breen, All ander & Energy Exchange Enablers (EXE), The Netherlands.

FLECH Flexibility Clearing House: Creating a Flexibility Marketplace for the Smart Grid
Olle Sundström, IBM Research, Sw tzerland.

PowerMatching City 2: Experiences with Multi-Objective Optimization in a Transactive Energy System
Jan Pieter Wijbenga, TNO, The Netherlands.
Paper Session 27: Smart Grid Automation

Date       Wednesday, 16:00 – 17:30
Chair      Mehmet Bayrak

2014ISGTEU0530
ICT based Performance Evaluation of Control Reserve Provision Using Electric Vehicles
Stefan Böcker (TU Dortmund, Germany), Christian Lewandowski (TU Dortmund, Germany), Thorsten Schlüter (TU Dortmund, Germany), Christian Rehtanz (TU Dortmund, Germany), Christian Wietfeld (TU Dortmund, Germany)

2014ISGTEU0312
Considering Correlations for Reliable Distributed Ancillary Service Provision
Marita Blank (University of Oldenburg, Germany), Sebastian Lehnhoff (OFFIS, Germany)

2014ISGTEU0444
Holistic View of Active Distribution Network and Evolution of Distribution Automation
Sami Repo (Tampere University of Technology, Finland), Ferdinanda Ponci (RWTH Aachen, Germany), Davide Della Giustina (A2A Ret Elettriche SpA, Italy)

2014ISGTEU0589
Towards Consistent Smart Grid Architecture Tool Support: From Use Cases to Visualization
Christian Neureiter (Salzburg University of Applied Sciences, Austria), Dominik Engel (Salzburg University of Applied Sciences, Austria), Jörn Trefke (OFFIS, Germany), Rafael Santodomingo (OFFIS, Germany), Sebastian Rohjans (OFFIS, Germany), Mathias Uslar (OFFIS, Germany)

2014ISGTEU0584
Multi-Agent Distributed Method for Dynamic Power System Rebalancing
Georgios Georgiadis (Chalmers University of Technology, Sweden), Christopher Saunders (Chalmers University of Technology, Sweden), Marina Papatriantafilou (Chalmers University of Technology, Sweden)
Paper Session 28: Wind Power

Date       Wednesday, 16:00 – 17:30
Chair       Deniz Yıldırım

2014ISGTEU0625
Scenario Selection of Wind Forecast Errors for Stochastic Unit Commitment: A UK Case Study
Jonathan Gomez (The University of Manchester, UK), Miguel Ortega-Vazquez (The University of Washington, USA), Luis F. Ochoa (The University of Manchester, UK)

2014ISGTEU0598
Mathematical Morphology-based Short-term Wind Speed Prediction Using Support Vector Regression
Lei Zhu (The University of Liverpool, UK), Q.H. Wu (South China University of Technology, China), Lin Jiang (The University of Liverpool, UK)

2014ISGTEU0553
Dynamic Economic Dispatch with Wind Power Penetration Using Group Search Optimizer with Adaptive Strategies
J.J. Chen (South China University of Technology, China), J.H. Zheng (South China University of Technology, China), Y. Liu (South China University of Technology, China), Q.H. Wu (South China University of Technology, China)

2014ISGTEU0447
Assessment of Wind Power Impact on Power System Transmission Losses
Sanna Uski (VTT, Finland), Inna Kim (Kazakh Research Institute of Power Engineering, Kazakhstan)

2014ISGTEU0546
Full Converter Wind Turbine
Daniel Mueller (Frankfurt University of Applied Sciences, Germany), Walter Kuehn (Frankfurt University of Applied Sciences, Germany)
Paper Session 29: Load Forecasting

Date Wednesday, 16:00 – 17:30
Chair Serhat Şeker

2014ISGTEJ0635
From Forecasting to Scheduling in Short Term Power Procurement using Stochastic Optimization
Manish Punjabi (Tata Consultancy Services, India), Prakash Awate (Indan Institute of Technology Bombay, India), Rajeev Gajbhiye (Indan Institute of Technology Bombay, India), Shreewardhan Soman (Indan Institute of Technology Bombay, India), Krishna Prasad (Tata Consultancy Services, India)

2014ISGTEJ0357
Use of Day-ahead Load Forecasting for Predicted Cable Rating
Rui Huang (University of Southampton, UK), Jame Pilgrim (University of Southampton, UK), Paul Lewin (University of Southampton, UK), David Scott (National Grid, UK), Daniel Morrice (National Grid, UK)

2014ISGTEJ0393
On Accuracy of Demand Forecasting And Its Extension to Demand Composition Forecasting Using Artificial Intelligence Based Methods
Yizheng Xu (University of Manchester, UK), Jovica Milanovic (University of Manchester, UK), Jingyi Cai (University of Manchester, UK)

2014ISGTEJ0011
A Simplified Short Term Load Forecasting Method Based on Sequential Patterns
Konstantinos Kouzelis (Aalborg University, Denmark), Birgitte Bak-Jensen (Aalborg University, Denmark), Pukar Mahat Energy (Aalborg University, Denmark), Jayakrishnan R. Pillai (Aalborg University, Denmark)

2014ISGTEJ0547
Assessment of Some Methods for Short-Term Load Forecasting
Pekka Koponen (VTT Technical Research Centre of Finland, Finland), Antti Mutanen (Tampere University of Technology, Finland), Harri Niska (University of Eastern Finland, Finland)
Abstract—Intelligent control approaches for smart low voltage (LV) grids have to meet the future requirements caused by increasing penetration of distributed generation (DG) from renewable sources and new network participators like electric vehicles. To meet these technical requirements complex solutions have to be developed. Due to the fact that these solutions should be implemented in one of the most critical infrastructures, a detailed test, evaluation, and deployment process is necessary. One highly relevant part of this process is controller hardware in the loop (C-HIL) testing. This paper will therefore present and discuss different C-HIL approaches as part of a rapid prototyping process to support the development of active control solutions. The approaches were investigated within the research project “DG DemoNet – Smart LV Grid”.

Index Terms—Automatic voltage control, Distributed power generation, Power system analysis computing, Power system control, Smart grid

I. INTRODUCTION

In the future, new requirements on the medium and low voltage distribution networks have to be fulfilled due to increased penetration of the power grids with decentralized generation from renewable sources, but also due to new network participators like electric vehicles. This comes along with a paradigm shift. While distribution grid operation in the past got along without monitoring of real-time information due to adequate dimensioning, trends aim for more and more online monitoring and higher utilization of the available resources. Consequently, active interventions during grid operation will be used in the future to guarantee quality parameters such as voltage bands and line load conditions. This will be possible due to emerging technologies, such as Smart Metering related communication systems that improve the affordability of low voltage automation infrastructures. Following this paradigm shift, the project “DG DemoNet – Smart LV Grid” searches for solutions for active network operation at the low voltage level [1]. To allow a cost effective development of these solutions, a rapid prototyping process [2] was introduced. A major part of this rapid prototyping process builds a controller hardware in the loop (C-HIL) simulation environment. Hardware in the loop (HIL) simulation is a common technique to support complex development and test of embedded systems. Therefore, the HIL simulation provides an effective framework by considering a model of the environment together with the selected system platform. Hard- and software can be tested with the real set-up of parameters. The C-HIL simulation is a special form of HIL focusing on the development of control systems interacting with a simulated model of the controlled environment.

HIL is used for a wide field of applications, such as wind turbine control [3] or engine control [4], to test developed hardware with simulated models of their target environment. Isermann et al. [4] discuss, that the border from the simulated to the real component is not strict, but can rather be shifted during the development phase. Thus, hybrid structures of HIL exist, which we are investigating in this work in the scope of LV grid control development.

Based on the experiences of previous projects in the medium voltage grid [5] and also in the low voltage grid [6] [7] [8], a set of suitable control approaches has been developed. These were designed to allow a step-by-step extension from simple to more and more complex control strategies. The result of this work is described in the following section of this paper.
II. CONTEXT FOR THE C-HIL APPROACHES

The context for the C-HIL approaches presented in this work is the control of the active grid components of the rural low voltage grids in the course of the project “DG DemoNet – Smart LV Grid”. The structure of the control system as well as the available infrastructure and grid components form the framework to fit the C-HIL approaches to, and lead to the requirements for the C-HIL evaluation system.

A. Rapid agile control development process

For the development of the low voltage grid control system, a seamless development process has been elaborated by Faschang et al. [2]. The five consecutive steps of this process are depicted in Figure 1.

The process begins from the first draft of the control concept, which contains the source code of the first basic control approach. Then, it leads to power grid simulation, where the behavior and the performance of the control approach is being evaluated with a simulated power grid. The third step goes even closer to real world conditions, by also taking the field communication system into account by co-simulation of the power and communication system.

Finally, before the control concept can be deployed in the field, C-HIL evaluation is carried out. This fourth step of the process approaches real world conditions by operating the control concept on the destined field hardware – coupled to the field experiment region in Salzburg also electric vehicles in every second household. In order not to exceed the limits for power quality given by EN 50160 [10], in the pilot regions, stricter voltage limits are set than necessary. The developed control concepts solve the generated voltage problems and keep voltages within the stricter limits.

B. Overall control system

Figure 2 shows the five stages of the control concept that were implemented in a smart low voltage grid controller (SLVGC), built of standard automation components and a robust industrial PC [9].

This structure represents the increasing complexity during the control development process. Each control stage builds up on the previous one. The findings that were made during realization of each stage are used to enhance the next control stage.

After verification of the functionality of each stage by co-simulation based on models of LV grids and communication channel behaviour, the stages of the concept can be implemented in a controller test environment. The development process is finished after a successful hardware-in-the-loop (HIL) test under real test conditions. With this procedure, the concept can be demonstrated step by step in real LV grids.

After evaluation in co-simulation, different approaches of C-HIL are necessary to test the hard- and software of the target system. Otherwise it is not possible to implement a controller prototype in such a critical infrastructure. The description and discussion of these C-HIL tests is the focus of the following section.

Finally, real tests of the control solution were implemented in selected LV networks in Austrian federal provinces of Salzburg and Upper Austria. The validation in the demonstration networks is in progress. In the preparation phase, voltage problems in these selected low voltage segments were created by integrating a high share of photovoltaics (PV) and electric mobility (PV installation on every second roof; in the demonstration region in Salzburg also electric vehicles in every second household). In order not to exceed the limits for power quality given by EN 50160 [10], in the pilot regions, stricter voltage limits are set than necessary. The developed control concepts solve the generated voltage problems and keep voltages within the stricter limits.

III. SLVG CONTROLLER FIELD ARCHITECTURE

The architecture of SLVGC supporting rapid prototyping is shown in Figure 3 and described in detail in [9]. It is important for the understanding of the control concepts that the different stages of control are working continuously in hot standby. If respective data quality is sufficient, always the “highest”, more complex and therefore more efficient stage is allowed to interoperate with the available actors (e.g., solar inverters, electric vehicles charging stations).

So, for instance, if the running Stage 2 is suddenly lacking information about the grid status through measurements, the previous Stage 1 is activated. The local control of Stage 1 builds the fall back, because its operation does not depend on grid status measurements (i.e., three-phase voltage measurements). The control entity “Supervisor” is responsible for managing the different stages and defines the stage that is currently allowed to interoperate with actors in the field.

IV. COMPARISON OF DIFFERENT HIL APPROACHES

To evaluate the SLVG controller’s behaviour, various hardware in the loop (HIL) evaluation set-ups with increasing integration of field control hardware are presented within this section. The basis and common platform for all of these set-
ups is given by the co-simulation set-up, which has been presented by Faschang et al. in [2] and is described in the following subsection.

A. Co-Simulation

After the initial implementation of the designed control concept (cf. first step of the rapid agile control development process depicted in Figure 1), the control strategies will be evaluated in simulations. In order to gain precise results, a co-simulation environment was developed that can simulate both the electrical grid as well as the communication system that connects controller, remote sensors, and actuators. The electrical grid models for selected test networks were validated using the ISOLVES-PSSA method [7].

This co-simulation set-up is used to enhance the development and evaluation methods for SLVG control. Conventional power grid simulation enables the development and the evaluation of the basic functionality of control algorithms. Furthermore, an extension of this simple simulation by a model of the communication channel is an inevitable step to also take the dynamics of the communication system (PLC) into account.

Co-Simulation Supervisor: The composition of the two previously mentioned simulators leads to the need of a co-simulation controlling unit. This co-simulation supervisor maintains the synchronicity of the simulators. Furthermore, it controls the flow of co-simulation and forwards simulation scenarios.

Control Supervisor: The SLVG control system is a multi-stage control system with several control stages, each one relying on the one with lower priority as a hot fallback redundancy. The Control Supervisor maintains this hierarchical structure of the control stages, supervises their internal states, and forwards their control commands and set points to the actuators.

Control Stage: The Control Stage is the device under test, which means, its performance is evaluated by co-simulation and improvements are done in an agile way [2]. In Figure 4, only one of the previously mentioned control stages is connected. There may be several of them simultaneously running with varying complexity and scope of the power grid. They are all coordinated by the Control Supervisor.

Dashboard: The Dashboard plays a key role both in the co-simulation set-up, as well as in the field. It provides a convenient overview for the developer, allows for remote control and manipulation of the simulation, and thus simplifies the evaluation of the designed control algorithm.

B. C-HIL basic approach

The previously described co-simulation environment runs on a common Microsoft Windows system (blue). In this environment the first versions of the control algorithm were developed using C++. The target system will run an Ubuntu Linux distribution (green) hosting the rapid prototyping platform as shown in Figure 5.

Figure 4 shows the basic co-simulation set-up that has been implemented and successfully utilized for control algorithm development, improvement, and evaluation in power- and communication grid co-simulation. It consists of six subsequently described simulation and control entities, which are all interconnected via a central message exchanging middleware, the Simulation Message Bus (SMB).

Power Grid Simulation: This simulator is one of the two major simulation components of the co-simulation. As there are several highly sophisticated power grid simulators on the market, one of them is chosen, which offers a suitable API for simulation control and data exchange. For this work, DigiSILENT PowerFactory was used to simulate several models of the rural low voltage grids that are supposed to be controlled by the SLVG-C.

Communication Simulation: The communication channel simulation forms the second major part of the co-simulation. Due to the fact, that all communication of the power grid under evaluation is done via the SIEMENS AMIS – PLC system, a model of this has been implemented. This statistical model relies on a data basis of approx. 2.5·10⁶ recorded message transmission logs for each of the power grids. From this model the two channel parameters propagation delay time and loss probability of a single packet can be obtained.
Taking the different operation systems of co-simulation hosting system (blue in Figure 5) and field target system (green in Figure 5) into consideration, the C-HIL basic approach is used to face cross compiling and target hardware performance issues. As shown in Figure 5, the control algorithms investigated in co-simulation are compiled for the target system. To test the success of cross compiling methods within the C-HIL basic approach, the algorithms are running on the SLVGC target system. The flexible simulation message bus (SMB) architecture allows using the same TCP socket connectors to the SMB as of the co-simulation environment.

C. C-HIL advanced approach

After co-simulation and C-HIL basic approach, the fundamental functionality of the control algorithms and the stable operation within the operating system of the target system is approved. The next step is to investigate the coordinated operation of the underlying modules SMB and Supervisor of SLVGC architecture with the compiled control stages. Therefore, the basic co-simulation modules Grid Simulation, Communication Simulation and C-HIL Supervisor and Control are connected to the SMB of the target system (cf. Figure 6).

![Figure 6: Set-up of C-HIL advanced approach](image)

Now, also the interfaces between the modules of the target system can be tested as a whole. But there is a major disadvantage in this variant of C-HIL. The real environment is simulated through the corresponding modules of co-simulation. Therefore information packets between Power Grid Simulation and Communication Simulation cause additional loading of the SMB on the target system. The target system is not that powerful in comparison to the original hosting system of co-simulation so that only selected scenarios (e.g., limited number of nodes / simulation speed) are possible.

D. C-HIL final approach

The final variant of C-HIL combines the advantages of both systems. As shown in Figure 7, the target system with its interfaces is running completely like under field test conditions without the additional loading of SMB through packet handling for co-simulation modules.

![Figure 7: Set-up of C-HIL final approach](image)

The flexible rapid prototyping architecture allows a coupling of co-simulation and target system SMBs by a simple packet forwarding entity. So the co-simulation runs on the powerful Windows PC and the SLVGC framework can be evaluated close to reality.

V. C-HIL SIMULATION RESULTS

A necessary condition for a successful C-HIL co-simulation environment is that it must not make any difference whether the simulations are performed on one single computer or if some components run on a simulation computer and others on the deployment hardware. Therefore, performance requirements for the hardware have to be chosen in a way that timing characteristics do not differ significantly within the different C-HIL set-ups. In practice the controller as well as the overall software architecture needs to be very flexible concerning timing characteristics, delays and losses. Therefore, the variations in TCP packet transmission delay between loopback and gigabit-Ethernet communication as they occur in the different C-HIL set-ups do not influence the control process and can be neglected.

As a result of this, each of the presented C-HIL set-ups produces very similar simulation results that do not show distinguishable differences when visualized as diagram. Thus, only a common simulation result is exemplarily shown in Figure 8 that is representative for all three C-HIL set-ups. In the presented example 20 three-phase meter voltage measurements are periodically polled from the Power Grid Simulation and routed via the Communication Simulation to the controller. Furthermore, three-phase transformer voltage measurements, the tap position and the active and reactive power measurements are also polled from the Power Grid Simulation. These
values are directly transmitted to the controller due to the fact that communication delay within the substation that hosts the transformer and the controller is negligible. This leads to 66 data points that are periodically transmitted over the SMB with a negligible routing delay compared to packet delay caused by the PLC meter communication, which is simulated by Communication Simulation. Thus, it is possible to run the simulation with a factor 4 faster than real time without losing synchronization of the co-simulation’s entities described in Subsection IV.A.

Figure 8 shows C-HIL simulation results of one day, indicating the highest and lowest grid voltage of the 20 meters as well as the transformer busbar voltage. For the underlying voltage profiles, a mixed sunny/cloudy PV-profile was combined with the load profiles of a summer working day. The voltage limits were chosen narrow to test the performance of the voltage controller. Short voltage variations are reasoned firstly in the averaging time frame of the meters and secondly in an inverse time characteristic of the tap position control process.

VI. SUMMARY AND OUTLOOK

In order to minimize risks continuously during the control development process for low voltage grid control development, a crucial task is the evaluation of the designed control system in C-HIL simulation.

In this work we have presented three different approaches for C-HIL integration in the control development process, which have been elaborated in the course of control development for the research project “DG DemoNet – Smart LV Grid”. As a common basis, the presented co-simulation set-up has been used and extended by real field control hardware. This step is inevitable in the development process, because by co-simulation itself, it is possible to take also the communication channel parameters into account, but not the manifold aspects of real control hardware. By discussing and analyzing the various approaches, we have found a suitable way for C-HIL simulation to support rapid prototyping of smart LV grid control and gained experience for a close coupling of field and lab environment. Even though the C-HIL simulation step in the development process is the one closest to field conditions, not all circumstances of the real target hardware, and especially the power grid that is to be controlled, can be taken into account. This remaining risk could be even more reduced by an extension of the final C-HIL approach that has been presented in Section IV.D. The idea is currently researched and bases on a horizontal coupling of the field automation hardware with the lab co-simulation and control development system. This would interlink the real low voltage grid even closer to the simulation and would thus allow the control development engineer to evaluate the control approaches under very realistic conditions.

ACKNOWLEDGEMENT

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REFERENCES


