

Table of Contents

Plenary Session 1: Power Systems Operation and Control

(Session Chair: Dr. Thanh Trung Do)

- 1.1 Impact of grid forming inverters with different control strategies on the Inter-area Oscillations.....17**
 Hamed Naghavi, Jens Paetzold
 Institute of Energy Systems and Energy Management, Hochschule Ruhr West, Bottrop, Germany
- 1.2 Robust N-1 secure HV grid flexibility estimation for TSO-DSO coordinated congestion management with deep reinforcement learning23**
 Zhenqi Wang¹, Sebastian Wende-von Berg^{1,2}, Martin Braun^{1,2}
¹University of Kassel, Kassel, Germany
²Fraunhofer Institute for Energy Economics and Energy System Technology (IEE), Kassel, Germany
- 1.3 Impact of phase feed-forward control of grid-forming inverters on frequency behavior in interconnected power systems.....30**
 Maria Nuschke, Thomas Degner
 Department System Stability and Grid Integration, Fraunhofer IEE, Kassel, Germany
- 1.4 Transient Stability of Generator Groups: Factors of Influence and Countermeasures36**
 Daniel Scheifele, Hendrik Lens
 University of Stuttgart, Germany

Parallel Session 1: Power Systems Operation and Control

- P 1.1 Simulation of a Black Start Scenario Using Gas Turbine Power Plant to Start-up Thermal Power Plant.....45**
 Nico Brose¹, Dirk Lehmann¹, Thomas Meißner¹, Harald Schwarz¹, Klaus Pfeiffer², Marcel Kotte³
¹Chair of Energy Distribution and High Voltage Engineering, BTU Cottbus-Senftenberg Cottbus, Germany
²Chair of Decentralised Energy Systems, BTU Cottbus-Senftenberg Cottbus, Germany
³LEAG Konferenzcenter, Lausitz Energie Kraftwerke AG (LEAG), Lübbenau/Spreewald, Germany
- P 1.2 Long-term analysis of industrial reactive power potentials with consideration of plant-internal grid restrictions using the example of an industrial plant in a distribution grid51**
 Philipp Schweiberer, Johannes Rauch, Oliver Brückl
 Ostbayerische Technische Hochschule Regensburg, Regensburg, Germany
- P 1.3 Voltage angle based operation for converter-dominated grids.....57**
 Hassan Alhomsy, Franz Linke, Dirk Westermann
 Power Systems Group, Technische Universität Ilmenau, Ilmenau, Germany
- P 1.4 Dynamic Modelling of Transmission Systems Based on Primary Energy Sources.....63**
 Ilya Burlakin¹, Johannes Porst¹, Elisabeth Scheiner¹, Ananya Kuri^{1,2}, Gert Mehlmann¹, Uwe Kühnapfel³, Matthias Luther¹
¹Institute of Electrical Energy Systems, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany; ²Siemens AG, Erlangen, Germany; ³Institute for Automation and Applied Informatics, Karlsruhe Institute of Technology, Karlsruhe

P 1.5 Transformation, Comparison and Co-Simulation of a RMS-EMT Multi-Domain Test Network.....	69
Bernd Schweinshaut, Christian Scheibe, Gert Mehlmann, Matthias Luther Institute of Electrical Energy Systems, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany	
P 1.6 Implementation of a model predictive control algorithm for distribution grids and its validation on a real-time simulator.....	75
Sebastian Raczka, Dominik Hilbrich, Oleksii Molodchyk, Christian Rehtanz Institute for Energy Systems, Energy Efficiency and Energy Economics (ie3), TU Dortmund University, Dortmund, Germany	

Plenary Session 2: Smart and Future Grids

(Session Chair: Prof. René Hofmann)

2.1 Decarbonization of a multi-sectoral Energy System with Flexible Industrial Load Management using an Incentive Signal	83
Elisabeth Feldhoff ¹ , Steffi Naumann ² , Steffen Schlegel ¹ , Peter Bretschneider ² , Dirk Westermann ¹ ¹ Technische Universität Ilmenau, Ilmenau, Germany ² Fraunhofer IOSB-AST, Ilmenau, Germany	
2.2 Simulation Tool for the Transient Temperature Behavior of Overhead Line Conductors.....	89
Charlotte Biele, Martin Lindner, Svenja Mees, Christian Rehtanz Institute of Energy Systems, Energy Efficiency and Energy Economics, TU Dortmund University, Dortmund, Germany	
2.3 Continuous Grid-Forming Control with Transient Current Limitation	95
Kai P. Fischbach ¹ , Nils Wiese ^{1,2} , Yonggang Zhang ¹ , Martin Braun ^{1,2} ¹ Department of Energy Management and Power System Operation, University of Kassel, Germany ² Fraunhofer IEE, Kassel, Germany	
2.4 Multi-dimensional model for electrical, thermal and mechanical simulation of a Lithium-ion Cell.....	101
Alexander Fill, Luis Bubeck, Diego Knauer, Jessica Hemmerling, Kai Peter Birke University of Stuttgart, Institute for Photovoltaics, Chair for Electrical Energy Storage Systems, Stuttgart, Germany	

Parallel Session 2: Grid Integration of E-Mobility / Smart and Future Grids

P 2.1 Modeling of Demand Factors and Average Daily Load Profiles for Private and Public Charging Points in Urban Areas.....	111
Simon Kreutmayer ¹ , Simon Niederle ² , Christoph J. Steinhart ³ , Christina Nußbaumer ³ , Michael Finkel ¹ , Rolf Witzmann ² ¹ Augsburg University of Applied Sciences, Augsburg, Germany ² Technical University of Munich, Munich, Germany ³ SWM Infrastruktur GmbH & Co. KG, Munich, Germany	
P 2.2 Electric vehicle and vehicle to grid technology influence on renewable energy supported grid – a case study on Germany	119
Shemin Sagaria, Tobias Boström The Arctic Centre for Sustainable Energy, UiT – The Arctic University of Norway, Tromsø, Norway	

P 2.3 Selection of learning algorithms to improve energy prediction in a photovoltaic system	125
Samer Rajah, Alejandro Rodríguez-Gómez, Francisco J. Muñoz-Gutiérrez Electrical Engineering Department, University of Malaga, Malaga, Spain	
P 2.4 Integrated Planning of Multi-energy Grids: Concepts and Challenges	132
Marwan Mostafa ¹ , Daniela Vorwerk ² , Johannes Heise ¹ , Alex Povel ³ , Natalia Sanina ⁴ , Davood Babazadeh ¹ , Christian Töbermann ⁴ , Arne Speerforck ³ , Christian Becker ¹ , Detlef Schulz ² ¹ Institute of Electrical Power and Energy Technology, TU Hamburg, Hamburg, Germany ² Electrical Power Systems, Helmut Schmidt University, Hamburg, Germany ³ Institute of Engineering Thermodynamics, TU Hamburg, Hamburg, Germany ⁴ Technische Hochschule Lübeck, Lübeck, Germany	
P 2.5 Optimal Energy Scheduling for a Microgrid with Battery and Hydrogen Storage	139
Simon Sassen, Andreas Fink Helmut Schmidt University, Institute of Computer Science, Hamburg, Germany	
P 2.6 Influence on Capacitor Lifetime due to Reduction of Link Capacitance for Devices operating on an Open Industrial DC grid	145
Simon Puls ¹ , Jan-Niklas Koch ² , Slavi Warkentin ² , Holger Borcherdig ² ¹ Lenze SE, Extetal, Germany ² OWL University of Applied Sciences and Arts, Lemgo, Germany	

Plenary Session 3: Power Systems Measurement and Identification

(Session Chair: Prof. Nikolaos Hatziaargyriou)

3.1 Sensor Set Review and Application for a German residential Energy Management System	153
Edvard Avdevicius, Felix Heider, Detlef Schulz Helmut Schmidt University, Department of Electrical Power Systems, Hamburg, Germany	
3.2 Subgrid Identification and Islanding in Future Medium Voltage Smart Grids based on Container Virtualisation and Machine Learning	161
Frederik Puhe ^{1,2} , Thomas Schwierz ² , Christian Rehtanz ² ¹ Westnetz GmbH, Department Technology, Dortmund, Germany ² TU Dortmund University, Institute of Energy Systems, Energy Efficiency and Energy Economics (ie3), Dortmund, Germany	
3.3 Optimized grid reduction for state estimation algorithms in under-determined distribution grids	167
Dominik Hilbrich, Sebastian Raczka, Christian Rehtanz Institute for Energy Systems, Energy Efficiency and Energy Economics (ie3), TU Dortmund University, Dortmund, Germany	

Parallel Session 3: Power Systems Measurement and Identification / Smart and Future Grids

P 3.1 Analysis and optimization of the steady state voltage deviation demand for reactive power planning using installed reactive power sources	175
Johannes Rauch ¹ , Oliver Brückl ¹ , Bernd Engel ² ¹ Ostbayerische Technische Hochschule Regensburg, Regensburg, Germany ² Technische Universität Braunschweig, Braunschweig, Germany	

P 3.2 Generation of realistic Smart Meter Data from Prosumers for future energy system scenarios	183
Tom Steffen ¹ , Béla Wiegel ¹ , Davood Babazadeh ¹ , Amine Youssfi ² , Christian Becker ¹ , Volker Turau ²	
¹ Hamburg University of Technology, Institute of Electrical Power and Energy Technology, Hamburg, Germany	
² Hamburg University of Technology, Institute of Telematics, Hamburg, Germany	
P 3.3 Power Quality Measurement for Analysis of Highly Time-Variant and Short-Time Disturbances	189
Christoph Szymczyk, Gerd Bumiller	
Institute of Computer Science, Hochschule Ruhr West, University of Applied Sciences, Bottrop, Germany	
P 3.4 ConvLSTM based Real-time Power Flow Estimation of Smart Grid with High Penetration of Uncertain PV	194
Fanta Senesoulin ¹ , Issarachai Ngamroo ² , Sanchai Dechanupaprittha ¹	
¹ Department of Electrical Engineering, Faculty of Engineering, Kasetsart University, Bangkok, Thailand	
² Department of Electrical Engineering, Faculty of Engineering, KMITL, Bangkok, Thailand	
P 3.5 Availability and costs of flexibility options for grid congestion management	200
Tobias Müller ¹ , Michael Becker ¹ , Gregor Peil ^{1,2} , Markus Zdrallek ¹	
¹ Institute of Power Systems Engineering, University of Wuppertal, Wuppertal, Germany	
² BayWa r.e. Solar Energy Systems GmbH, Duisburg, Germany	
P 3.6 Provision of grid-serving flexibility by agricultural operations and households in rural power distribution grids	208
Felix Klabunde, Carsten Wegkamp, Bernd Engel	
Technische Universität Braunschweig, Braunschweig, Germany	
P 3.7 Integrated Energy Management Concept for Residential Areas using Energy Packages.....	215
Florian Mahr, Johann Jaeger	
Institute of Electrical Energy Systems, Friedrich-Alexander-University Erlangen-Nuremberg (FAU), Nuremberg, Germany	
P 3.8 Analysis of an automated cross-sectoral renewal planning of electricity, gas and heat grids.....	222
Bernd Bastian Wierzba ¹ , Tobias Riedlinger ¹ , Markus Zdrallek ¹ , René Schmitz ²	
¹ Institute of Power Systems Engineering, University of Wuppertal, Germany	
² Regionetz GmbH, Aachen, Germany	

Plenary Session 4: Grid Integration of E-Mobility

(Session Chair: Dr. Markus Dietmannsberger)

4.1 Influence of Electric Vehicle AC-Chargers on the Resonance Behavior of Domestic Distribution Grids	231
Lukas Wieckhorst, Manuel Wingfelder, Lutz Hofmann	
Leibniz University Hannover, Institute of Electric Power Systems, Electric Power Engineering Section, Hannover, Germany	

- 4.2 AI-based charging management for the integration of electric vehicles using a reference low voltage grid in Hamburg.....236**
 Yuzhuo Fu¹, Dennis Salvador Versen², Andreas Stadler¹, Edvard Avdevicius¹, Gazmend Mavraj¹, Meriam Jebali ep Samet¹, Nils Pinke¹, Oliver Schmalholz¹, Maik Plenz¹, Marcus Stiemer², Detlef Schulz¹
¹Electrical Power Systems, Helmut Schmidt University/University of the Federal Armed Forces Hamburg, Germany
²Theory of Electrical Engineering and Numerical Simulations, Helmut Schmidt University/University of the Federal Armed Forces Hamburg, Germany
- 4.3 Technical Concept to Realize the Combination of Vehicle-to-Grid and Vehicle-to-Home for Usage in Smart Buildings244**
 Andreas Freymann¹, Florian Maier¹, Stefan Lösch², Alexander Wenzel², Luke Adam⁴, Paul Scheer³, Thomas Schrodi¹
¹Anwendungszentrum KEIM, Fraunhofer Institute for Industrial Engineering IAO, Esslingen am Neckar, Germany
²Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Bremen, Germany
³Fraunhofer Institute for Industrial Engineering IAO, Stuttgart, Germany
⁴ProNES automation GmbH, Landau in der Pfalz, Germany
- 4.4 Charging Infrastructure 2.0 – Statistical analysis of incentive-based charging behavior in low-voltage private charging infrastructure.....250**
 Nils Alexander Müller¹, Evamaria Zauner², Julia Gartner¹, Bernd Engel¹
¹Technische Universität Braunschweig, elenia Institute for High Voltage Technology and Power Systems, Braunschweig, Germany
²Thüga AG, Munich, Germany