

# PROCEEDINGS

Edited by Uta Betancourt / Thomas Ackermann

## 15<sup>th</sup> Wind Integration Workshop

International Workshop on Large-Scale Integration  
of Wind Power into Power Systems as well as on  
Transmission Networks for Offshore Wind Power Plants



15 - 17 November 2016 | Vienna, Austria

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## **IMPRINT**

Proceedings  
of the 15th International Workshop on Large-Scale Integration of Wind Power into  
Power Systems as well as on Transmission Networks for Offshore Wind Power Plants  
published in 2016 by:

**Energynautics** GmbH  
Robert-Bosch-Straße 7  
64293 Darmstadt  
Germany  
[www.energynautics.com](http://www.energynautics.com)  
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ISBN: 978-3-9816549-4-3

Cover Design by:  
Ines Drewianka, **Energynautics** GmbH, Germany

Printed by:  
Kopierart GbR, Berlin, Germany  
[www.kopierart.de](http://www.kopierart.de)

# Table of Contents

<b>Session 1 – Keynote Session</b>	<b>1</b>
13:00 – 15:10 / 15 November 2016 / Room Grand Waterfront 1 – 3 / Session chair: Thomas Ackermann (Energynautics, Germany)	
<b>Status of Wind Power in Power Systems around the World</b> T. Ackermann (Energynautics, Germany)	
<b>Impact of Wind Power on Power Grid Operation</b> K. Kaschnitz (APG, Austria)	
<b>Network Development In The Transmission Grid Of APG</b> H. Popelka (APG, Austria)	
<b>Renewables and the Impact on the Electricity Market</b> H. Proidl (E-Control, Austria)	
<b>Session 2A: Ancillary Services</b>	<b>3</b>
15:30 – 17:50 / 15 November 2016 / Room Grand Waterfront 1 / Session chair: Eckard Quitmann (Enercon, Germany)	
<b>Wind Generation Participation in Power System Frequency Response</b> V. Gevorgian, Y. Zhang (NREL, USA), E. Ela (EPRI, USA)	
<b>Diverse Fast Frequency Response Services in Systems with Declining Synchronous Inertia</b> N. Miller, S. Pajic (GE Energy Consulting, USA)	
<b>Controllable Grid Interface for Testing Ancillary Service Controls and Fault Performance of Utility-Scale Wind Power Generation</b> V. Gevorgian, P. Koralewicz, R. Wallen, E. Muljadi (NREL, USA)	
<b>Wind Frequency Reserve Control: Performance Assessment Through Simulation and Impacts on Wind Turbines' Operation</b> Y. Wang, J. Callec, G. Delille, D. Guy (EDF, France)	
<b>The Design and Practice of the Power Regulation Ancillary Service Market in the Northeast China Grid</b> H. Zhang, S. Du (Northeast Power Dispatching Center of SGCC, China)	
<b>System Frequency as Robustness Indicator and Input Parameter for Future Synthetic Inertia Response</b> J. Garzon, K. Burges, M. Döring (Ecofys Germany, Germany), S. Remppis (University of Stuttgart, Germany)	
<b>Session 2B: RfG Implementation in Europe</b>	<b>47</b>
15:30 – 17:30 / 15 November 2016 / Room Grand Waterfront 2 / Session chair: Ralph Pfeiffer (Ampriion, Germany)	
<b>Implementation of a Network Code on Requirements for Grid Connections of Generators: Commission Regulation (EU) 2016/631 of 14 April 2016</b> H. Urdal (ENTSO-E WG CNC)	
<b>National Implementation in Estonia of COMMISSION REGULATION (EU) 2016/631 of 14 April 2016 Establishing a Network Code on Requirements for Grid Connection of Generators</b> J. Kilter (Elering, Estonia)	
<b>Implementation of the Requirements of EU Regulation Establishing a Network Code on Requirements for Grid Connection of Generators for Offshore Power Park Modules – The Dutch Experience</b> B. van Hulst (TenneT, Netherlands)	
<b>European Network Codes – Great Britain Implementation Progress</b> R. Wilson (National Grid, United Kingdom)	
<b>EU Network Code Requirements for Generators – National Implementation in Germany (FNN)</b> L. Hankel (VDE-FFN, Germany)	

## Session 2C: Storage Examples

81

15:30 – 17:30 / 15 November 2016 / Room Grand Waterfront 3 / Session chair: Paul Gardner  
(DNV GL - Energy, United Kingdom)

### District Heating and Cooling is a Cost-Effective Way to Integrate the Fluctuating Wind Energy – It's Like a Virtual Battery

A. Dyrelund (Ramboll Energy, Denmark)

### Control Strategy and Sizing of a Flywheel Energy Storage Plant for the Frequency Control of an Isolated Wind-Hydro Power System

J. I. Sarasúa, B. Torres, J. I. Pérez-Díaz (Technical University of Madrid (UPM), Spain), M. Lafoz (CIEMAT, Spain)

### Using Smart Loads to Improve Frequency Response at Hydro-Québec and Enhance Renewable Energy Integration

F. Monette, P. Cadieux (Hydro-Québec TransÉnergie, Canada), A. Moreau (IREQ/Hydro-Québec, Canada), S. Jasmin, P. Trudel (Systemex Energies, Canada)

### wind2hydrogen – A Pilot Plant for the Production of Renewable Hydrogen

A. Zauner, R. Tichler (Johannes Kepler University Linz, Austria)

## Session 3A: Harmonics I

109

08:30 – 10:30 / 16 November 2016 / Room Grand Waterfront 1 / Session chair: Jian Sun (Rensselaer Polytechnic Institute, USA)

### Harmonic Stability – Practical Experience of a TSO

C. Buchhagen, M. Greve, A. Menze, J. Jung (TenneT TSO, Germany)

### New Evaluation Methods for Harmonic Emission of Renewable Generation

I. Athamna, M. Mühlberg (FGW – Federation of German Windpower and other Renewable Energies, Germany), F. Santjer (UL International [DEWI], Germany), K. Malekian, F. Safargholi (TU Chemnitz, Germany), M. Meyer (Helmut-Schmidt-University, Germany), H. Vennegeerts (FGH, Germany), J. Meyer, M. Domagk (TU Dresden, Germany), F. Ackermann, S. Reichert (Fraunhofer ISE, Germany), R. Klosse, K. Kuech (WindGuard Certification, Germany)

### Cross Coupling of Grid-Connected Inverter Impedance over Frequency – Phenomena, Effects and Modelling

Y. Xu, H. Nian (Zhejiang University, China), J. Sun (Rensselaer Polytechnic Institute, USA)

### Modeling and Autonomous Control of STATCOM for Damping Wind Power System Resonance

Y. Zhang, X. Chen (Nanjing University of Aeronautics and Astronautics, China), J. Sun (Rensselaer Polytechnic Institute, USA)

### Power Quality Improvement of Wind Power Plants by Active Filters Embedded in STATCOMs

Ł. Kocewiak, L. Zeni, B. Hesselbæk, N. Barberis Negra, T. Stybe Sørensen (DONG, Denmark), M. Gautschi, B. Blaumeiser, S. Vogelsanger (ABB, Switzerland)

## Session 3B: Stability Issues

143

08:30 – 10:30 / 16 November 2016 / Room Grand Waterfront 2 / Session chair: TBA

### Research on Transient Stability of Large Scale Onshore Wind Power Transmission via LCC HVDC

R. Cai, M. Andersson, H. Xie (ABB, China)

### Damping Power System Oscillations by Wind Power Plants

S. De Rijcke, N. Hamann (Nordex Energy, Germany), A. Harjula, J. Seppanen, A. Kuusela, I. Luukkonen (Fingrid OYJ, Finland)

### Enhanced Stability Analysis of Wind Turbines Concerning Subsynchronous Control Interactions

S. Jensen (Senvion, Germany)

### Simulative Investigations on the Transient Behaviour of Fossil Power Plants during Shutdown Processes

C. Gierow, M. Hübel, J. Nocke, E. Hassel (University of Rostock, Germany)

### Effects of VSM Convertor Control on Penetration Limits of Non-Synchronous Generation in the GB Power System

R. Ierna, J. Zhu (National Grid, United Kingdom), A. J. Roscoe, M. Yu, A. Dysko, C. D. Booth (University of Strathclyde, United Kingdom), H. Urdal (Urdal Power Solutions, United Kingdom)

## Session 3C: Power System Balancing

177

08:30 – 10:30 / 16 November 2016 / Room Grand Waterfront 3 / Session chair: TBA

### **Twenty Years of European Wind Power Production – Balancing Effects in Europe with a Focus on Germany**

P. Henckes, A. Knaut, F. Obermüller (University of Cologne, Germany)

### **Power System Operational Flexibility Assessment - Methods and Case Studies from US Power Systems**

A. Tuohy, E. Lannoye, E. Ela (EPRI, USA), J. Matevosyan, C. Anderson, J. Matevosyan (ERCOT, USA), A. Alvarez, W. Dong, L. Plano, B. Moradzadeh (Pacific Gas & Electric, USA)

### **Balancing Wind Energy Within the South African Power System**

B. Ernst (Fraunhofer IWES, Germany), R. van Heerden, T. Bischof-Niemz, C. Mushwana (CSIR, South Africa)

### **Sizing of Secondary Reserves Covering Short-Term Variability**

L. Wagner, N. Martensen (Energynautics, Germany), F. Montealegre (Ecofys, Germany)

### **Best Practice of Integrating Renewables into the German Energy Markets with Virtual Power Plants as Technology to Manage the "Energiewende"**

T. Buschmann, U. Focken, M. Lange (energy & meteo systems, Germany)

## Session 4A: Modelling

209

11:10 – 13:00 / 16 November 2016 / Room Grand Waterfront 1 / Session chair: TBA

### **Latest Developments in Negative Sequence Extensions for Generic RMS Models of Wind Turbines**

J. Fortmann (HTW Berlin, Germany), F. Schabe (Senvion, Germany), A. Mendonça (Wobben Research and Development, Germany), A. Morales (DgSILENT Ibérica, Spain), Ö. Göksu, P. Sørensen (DTU, Denmark)

### **Compatibility of IEC 61400-27-1 Ed1 and WECC 2nd Generation Wind Turbine Models**

Ö. Göksu, P. Sørensen (DTU, Denmark), J. Fortmann (HTW Berlin, Germany), A. Morales (DgSILENT Ibérica SL, Spain), S. Weigel (DgSILENT, Germany), P. Pourbeik (PEACE PLLC, USA)

### **Unified Framework for Model Validation**

N. Menemenlis, M. Huneault, R. Gagnon (IREQ/Hydro-Québec, Canada), C. Smith (UVIG, USA), R. Zavadil (EnerNex, USA), R. Quint (NERC, USA), S. Yang (Bonneville Power Administration, USA)

### **Comparison of Standard Wind Turbine Models with Vendor Models for Power System Stability Analysis**

A. Honrubia-Escribano, E. Gómez-Lázaro (University of Castilla-La Mancha, Spain), F. Jiménez-Buendía (Gamesa Innovation & Technology, Spain), E. Muljadi (NREL, USA)

## Session 4B: Voltage Control

237

11:10 – 13:00 / 16 November 2016 / Room Grand Waterfront 2 / Session chair: Charles-Éric Langlois (Hydro-Québec TransÉnergie, Canada)

### **Voltage Control Support and Coordination between Renewable Generation Plants in MV Distribution Systems**

L. Petersen, F. Iov (Aalborg University, Denmark), A. D. Hansen, M. Altin (DTU, Denmark)

### **Dynamic Voltage Support of DFIG Wind Power Plants**

C. Wessels, M. Ruben (Nordex Energy, Germany)

### **Voltage Transient in Large Wind Power Collector Networks**

D. Muthumuni, L. Kothalawala, A. Gogarri (Manitoba HVDC Research Centre, Canada), S. Wijesinghe (Innogy Renewables, United Kingdom)

### **STATCOM Option with DFIG Wind Turbine Systems**

C. Wessels, M. Gessert (Nordex Energy, Germany), T. Christ, T. Küper (Westnetz, Germany)

### **Wind Farm Cable Temperature Monitoring: Implementation and Learning**

K. Kazerooni, A. Poralis (WSP | Parsons Brinckerhoff, United Kingdom), D. Ruthven, P. Cunningham (SP Energy Networks, United Kingdom)

## Session 4C – Market and Economic Issues

271

11:10 – 13:00 / 16 November 2016 / Room Grand Waterfront 3 / Session chair: Hannele Holttinen  
(VTT, Finland)

### **Revenue Sufficiency and Reliability in a Zero Marginal Cost Future**

B. Frew, M. Milligan, G. Brinkman, A. Bloom, K. Clark, P. Denholm (NREL, USA)

### **Reliability through Spatial Aggregation – The Capacity Value of Wind Power in Europe**

S. Hagspiel (University of Cologne, Germany)

### **Empirical Analysis of Congestion Management Actions in Germany and their Interaction with Specific Boundary Conditions**

M. Döring, K. Burges (Ecofys Germany, Germany), W. Friedl, H. Aghaie (AIT – Austrian Institute of Technology, Austria)

### **Economic Impact Assessment of using Congestion Management Methods to Enable Increased Wind Power Integration on Gotland, Sweden**

V. Gliniewicz, G. Ryckebusch (Vattenfall R&D, Sweden), D. A. Brodén (KTH Royal Institute of Technology, Sweden)

### **The Maturing of Wind Integration in Australia: Improvements Required in Market Operation for More Consistent, Economic and Efficient Dispatch Outcomes**

R. Jennings (Pacific Hydro, Australia), J. Dyson (Greenview Strategic Consulting, Australia), K. Summers (Pacific Hydro, Australia)

### **Stochastic Trading Across Time under German TSO Constraints**

S. Ottersen, D. Jost, M. Jansen, M. Siebert (Fraunhofer IWES, Germany)

## Session 5A: Harmonics II

311

14:00 – 15:40 / 16 November 2016 / Room Grand Waterfront 1 / Session chair: Łukasz Kocewiak  
(DONG Energy Wind Power, Denmark)

### **Characterization of Harmonic Emission of Individual Wind Turbines and PV Inverters based on Measurements, Part II – Wind Turbines**

F. Santjer, K. Nolopp, S. Tentzerakis (UL International [DEWI], Germany), S. Adloff (WRD Wobben Research and Development, Germany), I. Athamma, M. Mühlberg (FGW – Federation of German Windpower and other Renewable Energies, Germany), M. F. Meyer, M. Jordan (Helmut-Schmidt-University, Germany), R. Klosse, K. Kuech (WindGuard Certification, Germany), F. Ackermann (Fraunhofer ISE, Germany), J. Meyer, M. Domagk, M. Pourarab (TU Dresden, Germany)

### **Application of Type 4 Wind Turbine Harmonic Model for Wind Power Plant Harmonic Study**

L. Shuai, K. H. Jensen (Siemens Wind Power, Denmark), Ł. H. Kocewiak (DONG, Denmark)

### **Feasibility of a Standard Passive Harmonic Filter for Wind Farm Connections at Medium Voltage Level**

A. Kazerooni, L. Koo, (WSP|Parsons Brinckerhoff, United Kingdom), C. Brozio, E. Chalmers (SP Energy Networks, United Kingdom)  
Z. Emin (PSC UK, United Kingdom)

### **A Numerical Matrix-Based method in Harmonic Studies in Wind Power Plants**

M. K. Bakhtizadeh, J. Hjerrild, Ł. Kocewiak, B. Hesselbæk (DONG, Denmark), F. Blaabjerg, C. Leth Bak, X. Wang, F. Faria da Silva (Aalborg University, Denmark)

## Session 5B: Innovations

341

14:00 – 15:40 / 16 November 2016 / Room Grand Waterfront 2 / Session chair: TBA

### **Wind Turbine High Voltage Generator and System**

N. Schofield, O. Beik (McMaster University, Canada)

### **Superconducting Transformers Enabling Alternative Topologies for Offshore Wind Farms**

D. Kottonau, S. Hellmann, M. Noe, J. Geisbüsch, (Karlsruhe Institute of Technology, Germany), T. Ackermann (Energynautics, Germany)

### **Integration of Islanded Very Large Scale Onshore Wind Power with LCC HVDC and a Small STATCOM – A Novel Control Method**

M. Andersson, R. Cai, H. Xie (ABB, China)

### **Operating Wind Turbines as Dynamically Controllable Loads in Grid-Restoration Scenarios**

M. Shan, F. Welck, W. Shan, H. Becker, S. Stock (Fraunhofer IWES, Germany)

## Session 5C: Integration Aspects I

369

14:00 – 15:40 / 16 November 2016 / Room Grand Waterfront 3 / Session chair: Eckehard Tröster  
(Energynautics, Germany)

### **Stability Models in System Integration Studies for Weak Grid Connections**

M. Laubrock, S. De Rijcke, N. Hamann (Nordex Energy, Germany)

### **Process and Tools for Optimizing Wind Power Projects Connected to Weak Grids**

A. S. Trevisan, Â. Mendonça, S. Nikolai, S. Adloff, A. El-Deib, M. Fischer (Enercon, Canada)

### **Foreseen Integration of Large Amounts of Wind Power in Colombia – System Operator Perspective**

S. Mesa, E. Cardona (XM [System Operator], Colombia)

## Session 6A: Inertia Issues

391

16:00 – 18:00 / 16 November 2016 / Room Grand Waterfront 1 / Session chair: Helge Urdal (ENTSO-E Secretariat, United Kingdom)

### **Inertia: Basic Concept and Impact on ERCOT Grid**

J. Matevosyan, P. Du (Electric Reliability Council of Texas, USA)

### **Necessary Time Response of LFSM-O to Ensure Frequency Stability in the ENTSO-E Continental Europe Synchronous Area**

J. Lehner (TransnetBW, Germany)

### **Inertial Response from Wind Power Plants during a Frequency Disturbance on the Hydro-Québec System – Event Analysis and Validation**

M. Asmine, C.-E. Langlois, N. Aubut (Hydro-Québec, Canada)

### **Synthetic Inertia versus Fast Frequency Response: a Definition**

R. Eriksson, N. Modig, K. Elkington (Swedish National Grid, Sweden)

### **A VSM (Virtual Synchronous Machine) Convertor Control Model Suitable for RMS Studies for Resolving System Operator / Owner Challenges**

A. J. Roscoe, M. Yu, A. Dyško, C. Booth (University of Strathclyde, United Kingdom), R. Ierna, J. Zhu (National Grid, United Kingdom)

## Session 6B: Grid Code Validation

429

16:00 – 18:00 / 16 November 2016 / Room Grand Waterfront 2 / Session chair: Jens Fortmann  
(HTW Berlin – University of Applied Sciences, Germany)

### **Fault-Ride-Through Measurements and Model Validation of the Siemens Wind Power D3 Variablespeed Direct-drive Wind Turbine Platform**

M. Pukar, S. W. Rasmussen, R. Sharma, F. Martin (Siemens Wind Power, Denmark), T. Siepker (Siemens, Germany), J. N. Nielsen (Siemens Wind Power, Denmark)

### **Asymmetrical Current Injection – Testing and Certification for New German Requirements**

H. Emanuel (Enercon, Germany), M. Schellschmidt, I. Mackensen, S. Adloff (WRD – Wobben Research & Development, Germany)

### **Experimental Model Validation of a Multi-Megawatt Grid Simulator to Reduce Risk of Grid Integration Testing**

R. Hadidi, J. Leonard, C. Fox (Clemson University, USA), P. Giroux, R. Gagnon (IREQ/Hydro-Québec, Canada)

### **Frequency Measurement for Inverter-based Frequency Control**

S. Engelken, C. Strafiel (WRD – Wobben Research and Development, Germany), E. Quitmann (Enercon, Germany)

### **Experimental Full Scale Assessment of Subsynchronous Resonance Behavior of a Wind Turbine with Doubly Fed Induction Generator**

T. Lund, P. M. Dyrlund, G. K. Andersen, M. S. Søgaard, L. S. Christensen (Vestas Wind Systems, Denmark), L. S. Rasmussen, J. Rusbjerg (LORC, Denmark), M. Bongiorno, S. Chernet (Chalmers University, Sweden)

## Session 6C: Forecasting I

459

16:00 – 17:40 / 16 November 2016 / Room Grand Waterfront 3 / Session chair: TBA

### **Impact of Targeted Measurements and Next-Generation Prediction Techniques on Short-Term Wind Ramp Forecasting in the Tehachapi Wind Resource Area**

J. Zack (AWS Truepower, USA), S.-H. Chen, C.-Y. Chen, C. P. Van Dam, H. Shiu (University of California, USA), C. MacDonald (Sonoma Technology, USA)

### **Analysis of Limited Area Models for Wind Power Prediction**

F. Fioretti, F. Bizzarri, G. Cirillo, C. Pregagnoli (Enel Green Power, Italy), U. De Angelis (Enel Engineering and Research, Italy), F. Marcucci, L. Torrisi, R. Tajani (Italian Air Force Meteorological Service, Italy)

### **Short-Term Wind Power Prediction Analysis of Complicated Topography in the Condition of Wind Power Brownouts**

Y. Cui, Z. Chen (Hubei Meteorological Service Center | Meteorological Energy Development Center of Hubei Province, China), L. Liu (Gansu Meteorological Service Center, China)

### **Multi-Regional Wind Power Forecasting based on Spatio-temporal Input Information in an Artificial Intelligence Model**

A. Braun (Fraunhofer IWES, Germany)

## Session 7A: Hydro Power and Wind Integration

489

08:30 – 10:20 / 17 November 2016 / Room Grand Waterfront 1 / Session chair: Georg Lettner (EEG/Vienna University of Technology, Austria)

### **Provision of Virtual Inertia by Hydro Power Plants**

R. Schürhuber (Andritz, Austria)

### **Stochastic Optimization for Hydro Storage and Wind Power Management**

E. Moser (Energieallianz, Austria)

### **Impacts of Harmonised Common Balancing Capacity Procurement in Central Europe**

B. Burgholzer (EEG/Vienna University of Technology, Austria)

### **Profit-Maximization of Repowering in a Hydro-Power Cascade Under Flexibility Constraints**

M. Rössler (EEG/Vienna University of Technology, Austria)

### **Studying Possibilities of Hydropower in Wind Integration**

H. Farahmand (Norwegian University of Science and Technology, Norway), H. Holttinen, J. Kiviluoma (VTT, Finland), M. Milligan (NREL, USA), L. Söder (KTH Royal Institute of Technology, Sweden)

## Session 7B: Value of Wind/Solar Power

501

08:30 – 10:20 / 17 November 2016 / Room Grand Waterfront 2 / Session chair: IEA secretariat (IEA, France)

### **System Friendly Deployment – How Variable Renewable Energy Can Contribute to its Own Integration**

S. Mueller, E. Bianco, T. Dubbeling, M. Heenen (International Energy Agency, France)

### **Survey and Case Studies of Transmission Level PV Integration Assessments Utilizing Generation Forecasts and Innovative Flexibility Resources**

K. Ogimoto (University of Tokyo, Japan), A. Marinopoulos (ABB, Sweden), K. Clark, B. Mather (NREL, USA), K. Asano, K. Ohbayashi, (NEDO, Japan), K. Frederiksen (Kenergy, Denmark), I. McGill (University of New South Wales, Australia), A. Iaria (RSE, Italy), M. Kraiczy (Fraunhofer IWES, Germany), P. Vingerhoets (KU Leuven, Belgium), C. Mayr, R. Bründlinger (AIT – Austrian Institute of Technology, Austria)

### **IEA Wind Task 25 – Summary of Experiences and Studies for Wind Integration**

H. Holttinen (VTT, Finland)

## Session 7C: Forecasting II

525

09:00 – 10:20 / 17 November 2016 / Room Grand Waterfront 3 / Session chair: TBA

### **Spatio-Temporal Modelling of Wind Power Forecast Errors in Transmission Grids**

R. Becker, C. Weber (University of Duisburg-Essen, Germany)

### **Use of Forecast Uncertainties in the Power Sector: State-of-the-Art of Business Practices**

C. Möhrlen (WEPROG, Germany), R. J. Bessa (INESC TEC, Portugal), M. Barthod (Meteoswift, France), G. Goretti (Dublin Institute of Technology, Ireland), M. Siefert (Fraunhofer IWES, Germany)

### **About the Challenge to Fulfil Different Customer Needs Concerning the Real-Time Projection of Actual Wind Power Production of a Region or Portfolio**

O. Steinert, J. Rosenkranz, U. Focken, M. Lange (energy & meteo systems, Germany)

## Session 8A: Integration Studies

543

10:50 – 12:50 / 17 November 2016 / Room Grand Waterfront 1 / Session chair: Aidan Tuohy  
(EPRI, United States)

### **Assessment on Interregional Grid Management for Renewable Energy Integration in Japan**

T. Wakeyama (Renewable Energy Institute, Japan)

### **Sector Coupling in a Highly Renewable European Energy System**

T. Brown, D. Schlachtberger, A. Kies (Frankfurt Institute of Advanced Studies, Germany), M. Greiner (Aarhus University, Denmark)

### **Does Variable Renewable Energy Promote Grid Expansion?**

Y. Yasuda (Kyoto University, Japan)

### **Spatial Scale Dependence in Joint Optimisation of Generation and Transmission for Highly Renewable Scenarios**

J. Hörsch, T. Brown, S. Schramm (Frankfurt Institute for Advanced Studies [FIAS], Germany)

### **Assessing Capacity Value of Wind Power**

H. Holttinen, J. Kiviluoma (VTT, Finland), M. Milligan, B. Frew (NREL, USA), L. Söder (KTH Royal Institute of Technology, Sweden)

## Session 8B: Grid Connection of Offshore Wind Power Plants

579

10:50 – 12:50 / 17 November 2016 / Room Grand Waterfront 2 / Session chair: TBA

### **FixReF: A Current Control Strategy for Offshore Wind Turbines Connected to Different Types of HVDC Transmission**

C. Prignitz, H.-G. Eckel (Rostock University, Germany), S. Achenbach (Siemens, Germany)

### **Future North Sea Infrastructure Based on Dogger Bank Modular Island**

M. van der Meijden (Delft University of Technology | TenneT TSO, Netherlands)

### **Simultaneous Connection of Type-3 and Type-4 Off-share Wind Farms to HVDC Diode Rectifier Units**

R. Vidal-Albalate (University Jaume I de Castelló, Spain), R. Pena (University of Concepción, Chile), E. Belenguer (University Jaume I de Castelló, Spain), S. Añó-Villalba, S. Bernal-Perez, R. Blasco-Gimenez (Polytechnical University of Valencia, Spain)

### **A Configuration of Offshore HVDC Grid Considering Reliability Standard and Scalability**

K. Sano (CRIEPI, Japan)

### **Modelling of the Diode-Rectifier Based HVDC Transmission Solution for Large Offshore Wind Power Plants Grid Access**

S. Seman, N. T. Trinh, R. Zurowski, S. Kreplin (Siemens, Germany)

## Session 8C: Integration Aspects II

611

10:50 – 12:50 / 17 November 2016 / Room Grand Waterfront 3 / Session chair: TBA

### **Impact of Large-Scale Wind & Solar Integration on Existing Fossil Generation in United States**

N. Kumar, M. Gascon, M. C. Liu, F. G. Faham (Intertek, USA), P. Besuner (Component Reliability Consultants, USA)

### **Power System Restoration: How Could Wind Energy Generators be Included into Today's Restoration Plans?**

H. Becker, D. Mende, T. Hennig, A. Akbulut, L. Hofmann (Fraunhofer IWES, Germany)

### **Improved Feed-in Management with Wind Turbines**

C. Jauch, A. Gloe (Flensburg University of Applied Sciences, Germany)

### **Overplanting in Offshore Wind Power Plants in Different Regulatory Regimes**

C. Wolter, H. K. Jacobsen (DTU, Denmark), G. Rogdakis, L. Zeni (DONG, Denmark), N. Cutululis (DTU, Denmark)

### **Cost Efficient Large Scale Onshore Wind Integration**

G. F. W. Brauner (Vienna University of Technology, Austria)

### **Uncertainty Quantification of the Real-Time Reserves for Offshore Wind Power Plants**

T. Göçmen, G. Giebel, P.-E. Réthoré, J. P. Murcia Leon (DTU, Denmark)

## Session 9A: Frequency Control Considerations

651

14:00 – 15:20 / 17 November 2016 / Room Grand Waterfront 1 / Session chair: Julija Matevosjana (ERCOT, USA)

### **The Value of Frequency Keeping and Governor Response to New Zealand**

J. Shipper, A. Wood, A. Miller (University of Canterbury, New Zealand), C. Edwards (Transpower, New Zealand)

### **Performance of df/dt-based Inertia Control during Emergency Islanding**

D. Duckwitz (Fraunhofer IWES, Germany)

### **Power System Frequency Stability Control Strategy by Means of VSC-HVDC**

L. Cai, X. Lei (GEIRI Europe, Germany), U. Karaagac, J. Mahseredjian (Polytechnical School of Montreal, Canada)

## Session 9C: Grid Codes

671

14:00 – 15:20 / 17 November 2016 / Room Grand Waterfront 3 / Session chair: Hanna Emanuel (Enercon, Germany)

### **New Revisions of FGW Power Quality Guidelines**

J. Rauch, I. Athamna, M. Mühlberg, S. Laurus (FGW – Federation of German Windpower and other Renewable Energies, Germany), J. Fortmann (HTWBerlin, Germany), J. Möller (M.O.E. Moeller Operating Engineering, Germany), F. Santjer (UL International [DEWI], Germany), M. Meuser, (FGH Certification, Germany)

### **The Upcoming European Network Code and its Impact on Commissioning and Operation of Distributed Generation**

F. Kalverkamp, J. Langstädter, M. Meuser (FGH Certification, Germany)

### **What Shall I Do with a Conventional UVRT-Test Rig to Carry out OVRT-Tests and other Tests Required for a Full Model Validation**

R. Klosse, K. Küch (WindGuard Certification, Germany), F. Loh (GE Renewable Energy, Germany)

## Session 10: Closing Session – Podiums Discussions

689

15:30– 16:30 / 17 November 2016 / Room Grand Waterfront 1 – 3

**The contributions and discussions of this session are not part of the proceedings.**

**Connection of Wind Power Plants at Brazilian Integrated Power Grid**

G. Doyle de Doile (ANEEL – Brazilian National Electricity Agency, Brazil)

**Connection of OWPPs to HVDC Networks Using VSCs and Diode Rectifiers: an Overview**

O. Saborio-Romano, A. Bidadfar, Ö. Göksu, M. Altin, N. A. Cutululis, P. E. Sørensen (DTU, Denmark)

**The Capacity Value in Systems with Multiple Regions and Technologies**

A. Knaut (EWI – Institute of Energy Economics, Germany), S. Hagspiel (University of Cologne, Germany), J. Peter (EWI – Institute of Energy Economics, Germany)

**Basic Characteristics of Synchronous-Compensator-Commutated Inverter (SCI) / HVDC System for Wind Power Plants with Series-Connected Wind Turbine Generators**

S. Nishikata, F. Tatsuta (Tokyo Denki University, Japan)

**System Connection of Small Vertical Axis Wind Turbine Under Strong Wind Condition**

H. Matayoshi, T. Senju (University of the Ryukyus, Japan), T. Funabashi, T. Kato (Nagoya University), A. M. Howlader (University of Hawaii, Hawaii)

**Integrated Electromagnetic-Mechanical Design Method for Optimized Superconducting DC Wind Generators**

Y. Liu, M. Noe, J. Ou (Karlsruhe Institute of Technology, Germany)

**Improvement of Transient Stability of Power Systems by Output Power Control of PMSG-based Wind Power Plant**

N. Patari (Indian Institute of Technology Kharagpur, India), A. Mitra (Visvesvaraya National Institute of Technology Nagpur, India), D. Chatterjee (Indian Institute of Technology Kharagpur, India)

**Enhanced Short-Term Wind Power Forecast using the Augmented Time Series Model for Power Grid Integration**

D. Kim, J. Hur, H. Han (Sangmyung University, Korea)

**Estimation of Potential Wind Power Plant Energy Production Losses Caused by Curtailments Due to Power System Security Issues: Polish Case**

M. Bajor (IEn – Institute of Power Engineering, Poland)

**Possible Improvements for Present Wind Farm Models Used in Optimal Wind Farm Controllers**

J. Kazda, T. Göçmen, G. Giebel, N. A. Cutululis (DTU, Denmark)

**Grid Frequency Analysis for Assessing the Stress on Wind Turbines**

A. Gloe, H. Thiesen, C. Jauch (Flensburg University of Applied Science, Germany)

**Integrating the Excellent Wind Resources in North-West Eurasia for a Sustainable Energy Supply in Europe**

D. Bogdanov, C. Breyer (Lappeenranta University of Technology, Finland)

**Incorporation of Flow-Based Grid Modelling in Multinational Transmission Expansion Planning**

L. Åmellem, M. Korpås, M. Kristiansen (Norwegian University of Science and Technology, Norway)

**Reliability Study of Two Offshore Wind Farm Topologies**

O. Giesecke, R. Karlsson, K. Morozovska, P. Hilber (KTH Royal Institute of Technology, Sweden)

**Power Sharing Control and Transient Stability in AC/DC Systems**

W. Kuehn (Frankfurt UAS, Germany)

**Modelling of Grid-Connected VSCs for Power System Small-Signal Stability Analysis in DVC Timescale**

H. Yuan, J. Hu (Huazhong University of Science and Technology, China) (Submission-ID WIW16-275)