

13th Wind Integration Workshop

11 - 13 November 2014

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



Berlin, Germany

WIND PROGRAM

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Tuesday, 11 November 2014				Wednesday, 12 November 2014				Thursday, 13 November 2014			
Wind Workshop Day 1				Wind Workshop Day 2				Wind Workshop Day 3			
				8:00 – 10:15	Room ECC 2 SESSION 3a: Forecasting I	Room ECC 3 SESSION 3b: Power System Studies	Room ECC 1 SESSION 3c: Discussion Session – Offshore Grid Development	8:00 – 10:15	Room ECC 2 SESSION 7a: Forecasting II	Room ECC 3 SESSION 7b: Frequency Control Issues	Room ECC 1 SESSION 7c: AC and DC Offshore Connection Solutions
					Coffee Break (45min)				Coffee Break (30min)		
9:00 – 14:00	Estrel Festival Center (EFC)			11:00 – 13:00	Room ECC 2 SESSION 4a: Discussion Session – Grid Code Issues	Room ECC 3 SESSION 4b: Energy System Analysis	Room ECC 1 SESSION 4c: Offshore Wind Power Plants	10:45 – 12:45	Room ECC 2 SESSION 8a: Wind Power Plants in Low and Medium Voltage Networks	Room ECC 3 SESSION 8b: Inertia Issues	Room ECC 1 SESSION 8c: Stability Studies
	Lunch 11:00 – 14:00				Lunch 13:00 – 14:00				Lunch 13:00 – 14:00		
14:00 – 16:00	Room ECC 1 WELCOME & SESSION 1: Keynote Session – The German Energiewende: The Power System Perspective			14:00 – 16:00	Room ECC 2 SESSION 5a: Wind Turbine Modelling	Room ECC 3 SESSION 5b: Discussion Session – Ancillary Services from Wind Power Plants	Room ECC 1 SESSION 5c: HVDC Technology & Offshore Wind Power Plants	14:00 – 15:15	Room ECC 2 SESSION 9a: Grid Code Issues and Tools	Room ECC 3 SESSION 9b: Storage Options and Studies	Room ECC 1 SESSION 9c: Market Design
	Coffee Break (30min)				Coffee Break (30min)				Break (10min)		
16:30 – 18:45	Room ECC 2 SESSION 2a: Power System Flexibility	Room ECC 3 SESSION 2b: Int'l Grid Integration Solutions & Experiences	Room ECC 1 SESSION 2c: Offshore Collector Systems	16:30 – 18:45	Room ECC 2 SESSION 6a: Wind Power Plant Modelling	Room ECC 3 SESSION 6b: Reserve Issues	Room ECC 1 SESSION 6c: HVDC Technology & Wind Power Plants	15:25 – 16:30	Room ECC 1 SESSION 10: Closing Session – Podium Discussion		
18:45	Wind Poster Reception			20:00	Wind Dinner Restaurant "Wasserwerk"						

TUESDAY, 11 NOVEMBER 2014

- 09:00 – 14:00 **Registration**
14:00 – 14:10 **Opening: Welcome and Introduction – Thomas Ackermann (Energynautics, Germany)**

14:10 – 16:00	SESSION 1: KEYNOTE SESSION – THE GERMAN ENERGIEWENDE: THE POWER SYSTEM PERSPECTIVE
> Session Chair	Thomas Ackermann (Energynautics, Germany)
14:10 – 15:40	Presentations (18 min. each)
	<ul style="list-style-type: none">• German Energy Transition – The Role of Wind Energy and Grid Integration S. Ropenus (Agora Energiewende, Germany)• BNetzA's Role in Electricity Grid Development - The Contribution of Wind Energy for the "Energiewende" J. Patt (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway [Bundesnetzagentur - BNetzA], Germany)• Integration of Wind Power into the Electricity System O. Feix (50Hertz Transmission, Germany)• 70% Renewables - Experiences and Solutions of a Large DSO in Northern Germany E. Wieben (EWE NETZ, Germany)• The Future Interaction of Conventional and Renewable Energies L. Eigenmann (EnBW, Germany)
15:40 – 16:00	Discussion

16:00 – 16:30 **Coffee Break**

16:30 – 18:45	SESSION 2A: POWER SYSTEM FLEXIBILITY
> Session Chair	Nicholas Miller (GE Energy, USA)
16:30 – 18:18	Presentations (18 min. each)
	<ul style="list-style-type: none">• An Objective Measure of Interconnection Usage for High Levels of Wind Integration Y. Yasuda (Kansai University, Japan), A. Estanqueiro (LNEG, Portugal), N. Cutululis (DTU, Denmark), E. Gómez-Lázaro (University of Castilla-La Mancha, Spain), J. Kondoh (Tokyo University of Science, Japan), M. Milligan (NREL, USA), H. Holttinen (VTT, Finland), A. Orths (Energinet.dk, Denmark), J. C. Smith (UVIG, USA) (WIW14-1227)• Analysis of Methods and Metrics for Flexibility Assessment A. Tuohy, E. Lannoye (EPRI, USA), L. Plano (Pacific Gas and Electric, USA) (WIW14-1130)• Can the Gas Sector Provide the Flexibility to the Power Sector for the Integration of Renewables? K. Schaber, H. Roth, M. Fallahnejad (Stadtwerke München/Municipal Energy Supplier Munich, Germany) (WIW14-1096)• Synergies between Wind and Solar Generation and Demand Response: An IEA Task 25 Collaboration S. Nolan, D. Burke, H. Wajahat Qazi, D. Flynn, M. O'Malley (UCD, Ireland), J. Kiviluoma (VTT, Finland), M. Hummon, B. Kirby, M. Milligan (NREL, USA) (WIW14-1179)• Scenario Based Evaluation of Different Flexibility Options in the German Electricity System from 2020 to 2050 Part 1: The Grid / Part 2: Supply, Demand and Storage E. Tröster, S. Langanke (Energynautics, Germany) (WIW14-3007) / C. Heinemann, D. Bauknecht, R. O. Harthan, M. Koch, D. Ritter (Öko-Institute, Germany) (WIW14-3008)• Effects of Integrating Large Amounts of Wind and Solar Energy on Conventional Power Plants and Optimisation Strategies for this New Challenge M. Huebel, C. Gierow, M. Richter, J. Nocke, E. Hassel, C. Ziems, A. Berndt, H. Weber (University of Rostock, Germany) (WIW14-1064)
18:18 – 18:45	Discussion

16:30 – 18:30	SESSION 2B: INTERNATIONAL GRID INTEGRATION SOLUTIONS AND EXPERIENCES
> Session Chair	Hannele Holttinen (VTT, Finland)
16:30 – 17:50	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Advanced EMS Wind Dispatch Tools for the Power System of Ireland and Northern Ireland M. Burke, M. Gallagher (EirGrid, Ireland), C. Martin, R. Lopez (Alstom Grid, France) (WIW14-1080) • System Analysis 2014 of German TSOs on Demand for Reserve Generation Capacity S. Gröninger, R. Pfeiffer, B. Homburg, M. Rogge (Amprion, Germany) (WIW14-1047) • TSO Experience in Introduction of Dynamic Models of Wind Power Plants to Transmission Network Planning Model I. Luukkonen, A. Harjula, A.-J. Nikkilä (Fingrid Oyj, Finland) (WIW14-1133) • The Impact of Distributed Wind on Bulk Power System Operations in ISO-NE C. Brancucci Martínez-Anido, B.-M. Hodge, D. Palchak (NREL, USA), J. Miettinen (VTT, Finland) (WIW14-1037)
17:50 – 18:30	Discussion

16:30 – 18:45	SESSION 2C: OFFSHORE COLLECTOR SYSTEMS
> Session Chair	Jens Fortmann (Senvion, Germany)
16:30 – 18:18	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Technical and Economical Evaluation of Distributed AC Power Collection for Off-Shore Wind Power Plants F. de la Fuente, J. Martín (ABB, Spain), P. Skarby (ABB, Switzerland), P. Sandeberg (ABB, Sweden) (WIW14-1212) • The Use of 66kV Technology for Offshore Wind Demonstration Sites M. J. Mulroy, A. P. Neumann, C Ebdon (Offshore Renewable Energy Catapult, United Kingdom) (WIW14-1116) • Control and Stability of Series-DC Collection Systems for Offshore Wind Power Plants J. Sun (Rensselaer Polytechnic Institute, USA) (WIW14-1132) • Fault Analysis and Protection of Series-DC Collection Systems for Offshore Wind Power Plants S. Shah, H. Guo, J. Sun (Rensselaer Polytechnic Institute, USA) (WIW14-1141) • Decision Making Tool: Optimum Power Rating for Substation Transformers in Offshore Power Plants M. Almiray, I. Arana (DONG Energy, Denmark), P. Sørensen, I. Kozine, (DTU, Denmark) (WIW14-1099) • Impact of Large-Scale Offshore Wind Power Plant on Transmission System Operations in the Midwestern United States A. Sajadi, K. A. Loparo (Case Western Reserve University, USA), S. Barnes (GE Energy, USA) (WIW14-3011)
18:18 – 18:45	Discussion

18:45 – 20:00 **Poster Reception**

WEDNESDAY, 12 NOVEMBER 2014

08:00 – 10:15	SESSION 3A: FORECASTING I
> Session Chair	Corinna Möhrten (Weprog, Germany)
08:00 – 09:40	Presentations (20 min. each)
	<ul style="list-style-type: none">• Ways to Obtain Reliable Wind Power Forecasts from Ensemble Weather Forecasts S. Späth, L. von Bremen, C. Junk (Carl von Ossietzky University Oldenburg, Germany) (WIW14-1022)• Observations and Forecasts for Wind Plants M. Marquis, J. Wilczak, S. Benjamin, J. Olson, I. Djalalova, J. Carley, L. Bianco, E. James, R. Banta, Y. Pichugina (National Oceanic and Atmospheric Administration, USA), J. Cline (Department of Energy, USA) (WIW14-1211)• Probabilistic Wind Power Forecasts Based on the COSMO-DE-EPS Weather Model M. Siefert, J. Dobschinski, S. Otterson, T. Kanefendt (Fraunhofer IWES, Germany), K. Lundgren (German Weather Service, Germany), D. Ernst (TenneT TSO, Germany), M. Zirkelbach (50Hertz Transmission, Germany), A. Bergmann-Dick (Amprion, Germany) (WIW14-1117)• A Hybrid Wind Speed Prediction Model Using Spatial Correlation N. Chen (ABB, China), Z. Qian (Beihang University, China) (WIW14-1059)• Error Reduction of Regional Wind Power Forecast by Integrating Spatio-temporal Information into an Artificial Intelligence Model A. Braun, J. Dobschinski (Fraunhofer IWES, Germany) (WIW14-1131)
09:40 – 10:15	Discussion

08:00 – 10:15	SESSION 3B: POWER SYSTEM STUDIES
> Session Chair	Aidan Tuohy (EPRI, USA)
08:00 – 09:48	Presentations (18 min. each)
	<ul style="list-style-type: none">• Large-Scale Integration of Fluctuating Renewables in Europe and the US S. Becker, S. Schramm (Frankfurt University, Germany), R. A. Rodríguez, G. B. Andresen, M. Greiner (Aarhus University, Denmark), B. A. Frew, M. Z. Jacobson (Stanford University, USA) (WIW14-1204)• Optimising the European Transmission System for 77% Renewables by 2030 T. Brown, P.-P. Schierhorn, E. Tröster, T. Ackermann (Energynautics, Germany) (WIW14-3006)• Impacts of Restricted Transmission Grid Expansion in a 2030 Perspective in Germany C. Nabe (Ecofys, Germany) (WIW14-1169)• Wind Power in a 100% Renewables Scenario for Rhineland-Palatinate N. Martensen, E. Tröster, T. Brown, T. Ackermann, S. Geidel, S. Langanke (Energynautics, Germany) (WIW14-3003)• Aggregated Representation of Distribution Network Models for Large-Scale Transmission Network Simulations Ö. Göksu, M. Altin, P. Sørensen (DTU, Denmark) (WIW14-1149)• The Potential of Renewable Energy in the Swedish Distribution Networks M. Hansson (Power Circle, Sweden), F. Carlsson (Vattenfall R&D, Sweden) (WIW14-1071)
09:48 – 10:15	Discussion

08:00 – 10:15	SESSION 3C: DISCUSSION SESSION – OFFSHORE GRID DEVELOPMENT
> Session Chair	Antje Orths (Energinet.dk, Denmark)
08:00 – 09:00	Presentations (20 min. each)
	<ul style="list-style-type: none"> • AC and DC Offshore Wind Connections – Technical Challenges and Lessons Larned R. Görner (ABB, Germany), M. Callavik (ABB, Sweden) (WIW14-1230) • Challenges Towards the Deployment of Offshore Grids: the OffshoreDC Project N. A. Cutululis (DTU, Denmark), L. Zeni (DTU/DONG Energy Wind, Denmark), W. Z. El-Khatib, J. Holbøll, P. Sørensen (DTU, Denmark), G. Stamatiou, O. Carlson (Chalmers University, Sweden), V. C. Tai, K. Uhlen (NTNU, Norway), J. Kiviluoma (VTT, Finland), T. Lund (Energinet.dk, Denmark), K. Uhlen (WIW14-1188) • Electrical Integration of North Sea Wind Power Plants Using Interconnecting Links J. Kester, E. Wiggelinkhuizen (ECN, the Netherlands), M. Ars (NUON/Vattenfall, the Netherlands), E. Kontos, P. Bauer (Delft University of Technology, the Netherlands), J. Gazendam (University of Groningen, the Netherlands), F. Nieuwenhout (ECN, the Netherlands) (WIW14-1032)
09:00 – 10:15	Discussion

10:15 – 11:00 Coffee Break

11:00 – 13:00	SESSION 4A: DISCUSSION SESSION – GRID CODE ISSUES
> Session Chair	Eckard Quitmann (Enercon, Germany)
11:00 – 12:20	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Final Draft International Standard IEC 61400-27-1 P. Sørensen (DTU, Denmark), J. Fortmann (Senvion, Germany), F. J. Buendía (Gamesa, Spain), J. Bech (Siemens Wind Power, Denmark), A. Morales (DigSILENT Ibérica, Spain), C. Ivanov (ENTSO-E, Belgium) (WIW14-1184) • Modular Verification of Grid Code Compliance (GCC-Services) T. Gehlhaar (DNV GL Energy, Germany), P. Gardner (DNV GL - Energy, United Kingdom) (WIW14-1122) • Grid Code Compliance in a Changing Environment - Experiences and Lessons from Large Scale Retrofit Programmes K. Burges, M. Doering, R. Kuwahata (Ecofys Germany, Germany) (WIW14-1107) • Medium-Term Dynamic Studies for a Large Island Power System with High Levels of Wind L. McMullan, P. Horan, T. Gallery (EirGrid, Ireland), D. Lewis, K. Creighton (SONI, United Kingdom) (WIW14-1111)
12:20 – 13:00	Discussion

11:00 – 13:00	SESSION 4B: ENERGY SYSTEM ANALYSIS
> Session Chair	Stephan Wachtel (GE Wind, Germany)
11:00 – 12:30	Presentations (18 min. each)
	<ul style="list-style-type: none"> • The Big Picture - Representing the System Integration Challenge of Wind and Solar in Integrated Assessment Models R. Pietzcker, F. Ueckerdt, G. Luderer (Potsdam Institute for Climate Impact Research, Germany) (WIW14-1196) • Where to Install Wind Capacities? Optimal Deployment from an Energy System Perspective H. Hobbie, D. Möst (TU Dresden, Germany) (WIW14-1231) • Fast Transition to Renewable Energy with Local Integration of Large-Scale Wind Power in Denmark G. B. Olesen (Sustainable Energy, Denmark) (WIW14-3010) • Estimating the Reduction of Generating System CO₂ Emissions Resulting from Significant Wind Energy Penetration H. Holttinen, J. Kiviluoma (VTT, Finland), J. McCann, M. Clancy (SEAI, Ireland), I. Pineda (EWEA, Belgium), M. Milligan (NREL, USA) (WIW14-1114) • Impacts of North African Concentrated Solar Power and Norwegian Hydro Power on Storage Needs in a European Energy System Dominated by Renewables A. Kies, L. von Bremen, D. Heinemann (ForWind/University of Oldenburg, Germany), K. Nag, E. Lorenz (University of Oldenburg, Germany) (WIW14-1167)
12:30 – 13:00	Discussion

11:00 – 13:00	SESSION 4C: OFFSHORE WIND POWER PLANTS
> Session Chair	Slavomir Seman (Siemens, Germany)
11:00 – 12:30	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Parametric Variation for Detailed Model of External Grid in Offshore Wind Power Plants V. Myagkov, L. Petersen, S. Burutxaga Laza (Aalborg University, Denmark), Ł. H. Kocewiak (DONG Energy, Denmark), F. Iov (Aalborg University, Denmark) (WIW14-1220) • Improvement of Grid Harmonic Distortions by an Offshore Wind Power Plant E. Lidström, F. Carlsson (Vattenfall, Sweden), N. Ullah, J. Rasmussen, A. Omanovic (Solvina, Sweden) (WIW14-1100) • Active Filtering Application in Large Offshore Wind Power Plants Ł. H. Kocewiak, O. Holmstrøm, B. Laudal Øhlenschläger Kramer (DONG Energy, Denmark), K. H. Jensen, L. Shuai (Siemens Wind Power, Denmark) (WIW14-1053) • New Requirements for Offshore HVDC A. Mason (TNEI Services, United Kingdom), C. Cresswell (Senvion, Germany) (WIW14-1225) • Evaluation of Power Quality Monitoring Systems in Offshore Wind Power Plants Ł. H. Kocewiak (DONG Energy, Denmark), A. Baloi (Polytechnic University of Timisoara, Romania) (WIW14-1145)
12:30 – 13:00	Discussion

13:00 – 14:00 Lunch

14:00 – 16:00 **SESSION 5A: WIND TURBINE MODELLING**
> Session Chair **Charles-Éric Langlois (Hydro-Québec, Canada)**

14:00 – 15:36	Presentations (16 min. each)
	<ul style="list-style-type: none"> • Considerations on the Level of Detail in the Modelling and Simulation of Subsynchronous Resonance in DFIG Based Wind Power Plants W. Belkacemi, M. Laubrock (Nordex Energy, Germany), A. Genius (Woodward Kempen, Germany) (WIW14-1060) • Characterization of a Power Electronic Grid Simulator for Wind Turbine Generator Compliance Testing J. Glasdam (DONG Energy Wind Power, Denmark), V. Gevorgian (NREL, USA), R. Wallen (NREL, USA), C. L. Bak (Aalborg University), Ł. H. Kocewiak, J. Hjerrild (DONG Energy Wind Power, Denmark) (WIW14-1092) • Practical Approach for Representing WT DFIG Machines for IEC6909 Based Short Circuit Studies S. Bolik (Senvion, United Kingdom), C. Cresswell (Senvion, Germany) (WIW14-1112) • Short-Circuit Currents of Wind Turbines with Doubly-Fed Induction Generators M. Ruben, M. Laubrock (Nordex Energy, Germany) (WIW14-1129) • Loss of Synchronism of Wind Turbine Converters during Low Voltage Grid Faults Ö. Göksu, P. Sørensen (DTU Wind Energy, Denmark), F. Iov, C. L. Bak, R. Teodorescu (Aalborg University, Denmark), P. C. Kjær (Vestas, Denmark) (WIW14-1151) • High Voltage Ride-Through Capability of DFIG-based Wind Parks with FACTS U. Karaagac, J. Mahseredjian (Polytechnical School of Montréal, Canada), L.-J. Cai (Senvion, Germany) (WIW14-1177)
15:36 – 16:00	Discussion

14:00 – 16:00 **SESSION 5B: DISCUSSION SESSIONS – ANCILLARY SERVICES FROM WIND POWER PLANTS**
> Session Chair **J. Charles Smith (UVIG, USA)**

14:00 – 15:20	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Results from the Wide-area Voltage and Secondary Frequency Control Performed by Wind Power Plants in the TWENTIES Project I. Azpiri, C. Combarros, J. C. Pérez, R. Veguillas (Iberdrola, Spain) (WIW14-1017) • Economic Grid Support from Variable Renewables: REservices Project Summary F. Van Hulle (XP Wind, Belgium), F. Chapalain (EDSO 4SG, Belgium), N. Cutululis (DTU, Denmark), H. Holttinen, J. Kiviluoma (VTT, Finland), L. M. Faiella (Fraunhofer IWES, Germany), I. Pineda (EWEA, Belgium), M. Rekinge (EPIA, Belgium) (WIW14-1127) • Opportunities for GB On and Offshore Wind Power Plants to the System Operator A. Ferguson, R. Hodges (TNEI Services, United Kingdom) (WIW14-1224) • Control Reserve Provision with Wind Power Plants M. Jansen, D. Jost, M. Widdel, M. Siefert (Fraunhofer IWES, Germany) (WIW14-3015)
15:20 – 16:00	Discussion

14:00 – 16:00 **SESSION 5C: HVDC TECHNOLOGY AND OFFSHORE WIND POWER PLANTS I**
> Session Chair **Bo Hesselbaek (Dong Energy, Denmark)**

14:00 – 15:20	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Study on Key Technologies of VSC-HVDC and Application in Offshore Wind Power Plant in China Z. Wang, H. Lin, B. Jiang, J. Wu, G. Wang (Shanghai Jiao Tong University, China) (WIW14-1186) • Comparison of Converter-Near Controls for HVDC-connected Offshore Wind Power Plants Focussing on the Dynamic Performance R. Bartelt, C. Heising, D. Meyer (Avasition, Germany), V. Staudt (Ruhr-University Bochum, Germany) (WIW14-1180) • Multi-Infeed Control of VSC-HVDC Transmission System for Offshore Wind Power Plant Integration M. Raza, O. Gomis Bellument (Technical University of Catalunya, Spain) (WIW14-1101) • Offshore Grid Development in the Netherlands — the AC Solution P. van de Rijt, A. Croes (Tennet TSO, the Netherlands) (WIW14-3012)
15:20 – 16:00	Discussion

16:00 – 16:30 Coffee Break

16:30 – 18:45	SESSION 6A: WIND POWER PLANT MODELLING
> Session Chair	Bernd Weise (DlG SILENT, Germany)
16:30 – 18:18	Presentations (18 min. each)
	<ul style="list-style-type: none">• Analysis of Highly Wind Power Integrated Power System Model Performance During Critical Weather Conditions A. Basit, A. Hansen, P. Sørensen, M. Altin (DTU Wind Energy, Denmark) (WIW14-1057)• Steady-State Grid Calculations for Offshore Wind-Power Plants R. Bartelt, C. Heising, D. Meyer (Avasition, Germany), V. Staudt (Ruhr-University Bochum, Germany), T. J. Lebioda (TenneT Offshore, Germany) (WIW14-1164)• Wind Power Plant Model Collection Network Representation in an Aggregated Wind Power Plant Model S. Uski (VTT, Finland) (WIW14-1226)• Wind Farm Aggregation Method for Dynamic Active Power Studies G. Rousi, A. D. Hansen, N. A. Cutululis (DTU Wind Energy, Denmark) (WIW14-1020)• Simulation Models Based on Firmware A. Leike, G. Geisberger, C. Neugebauer, F. Schwimbeck (Siemens, Germany) (WIW14-1039)• Topologies for Series-Connected Large-Scale Wind Power Plants Without Increasing System Voltage Level S. Nishikata, K. Suzuki, F. Tatsuta (Tokyo Denki University, Japan) (WIW14-1091)
18:18 – 18:45	Discussion

16:30 – 18:45	SESSION 6B: RESERVE ISSUES
> Session Chair	Ralph Pfeiffer (Amprion, Germany)
16:30 – 18:10	Presentations (20min. each)
	<ul style="list-style-type: none">• Reserve Evaluation: Planning Forward by Looking Backward N. Menemenlis, M. Huneault, G. Ratel (IREQ/Hydro-Québec, Canada) (WIW14-1159)• Comparing Resource Adequacy Metrics E. Ibanez, M. Milligan (NREL, USA) (WIW14-1063)• Estimation and Experimental Validation of the Available Power of a Downregulated Offshore Wind Power Plant G. Giebel, T. Göçmen Bozkurt, P. Sørensen (DTU Wind Energy, Denmark), M. Mirzaei, N. K. Poulsen (DTU, Denmark), M. R. Skjelmoose, J. R. Kristoffersen (Vattenfall, Denmark) (WIW14-1215)• Sizing Control Reserves with a New Dynamic Method Considering Wind Power and Photovoltaic Forecasts D. Jost, A. Braun, R. Fritz (Fraunhofer IWES, Germany) (WIW14-1165)• Efficient Importance Sampling Technique for Estimating Operating Risks in Power Systems with Large Amounts of Wind Power C. Hamon, M. Perninge, L. Söder (KTH Royal Institute of Technology, Sweden) (WIW14-1052)
18:10 – 18:45	Discussion

16:30 – 18:45 **SESSION 6C: HVDC TECHNOLOGY AND WIND POWER PLANTS**

> Session Chair **Peter W. Christensen (Vestas, Denmark)**

16:30 – 18:10 **Presentations (20 min. each)**

- **Stability of VSC HVDC Connected Offshore Wind Power Plant at Low SCR**
W. Kuehn, D. Mueller (Frankfurt University of Applied Sciences, Germany) (WIW14-1086)
- **Development of a DC Facility to Simulate Offshore Multiterminal HVDC Grids and their Interaction with Wind Generators**
R. Veguillas, I. Azpiri (Iberdrola, Spain) (WIW14-1018)
- **An Alternative Protection Philosophy for Multi-Terminal HVDC**
F. Page, S. Finney, L. Xu (University of Strathclyde, United Kingdom) (WIW14-1209)
- **Doubly-Fed Induction Generator Wind Turbine with VSC-HVDC Grid Connection Interaction Analyses**
L. J. Cai (Senvion, Germany), U. Karaagac, J. Mahseredjian (Polytechnical School of Montréal, Canada) (WIW14-1200)
- **Optimization of Reactive Power Compensation of HVAC Cable in Off-shore Wind Power Plant**
G. Zhu, X. Dui, C. Zhang (Tsinghua University, China) (WIW14-1208)

18:10 – 18:45 **Discussion**

19:30 – 22:30 **Wind Dinner**

THURSDAY, 13 NOVEMBER 2014

08:00 – 10:15	SESSION 7A: FORECASTING II
> Session Chair	Gregor Giebel (DTU, Denmark)
08:00 – 09:48	Presentations (18 min. each)
	<ul style="list-style-type: none">• Physical and Data-Based Model to Improve the Power Forecast of a Wind Power Plant F. Jung (University of Bremen, Germany), M. Siefert (Fraunhofer IWES, Germany), C. Büskens (University of Bremen, Germany) (WIW14-1176)• High-Quality Wind Power Scenario Forecasts for Decision-Making under Uncertainty in Power Systems S. Delikaraoglou, P. Pinson (DTU, Denmark) (WIW14-1081)• Nordic Wind Power Forecast Errors: Benefits of Aggregation and Impact to Balancing Market Volumes J. Miettinen (VTT/LUT, Finland), H. Holttinen (VTT, Finland), G. Giebel (DTU Wind Energy, Denmark) (WIW14-1126)• A New Metric for Quantifying Wind Forecast Value in the Energy Markets C. Collier (DNV GL, United Kingdom), J. Schipper (DNV GL, Germany), J. Collins (DNV GL, United Kingdom) (WIW14-1061)• Reserve Forecasting for Enhanced Renewable Energy Management C. Möhrlein (WEPROG, Germany), J. U. Jørgensen (WEPROG, Denmark) (WIW14-1035)• How Good is my Forecast? Comparability of Wind Power Forecast Errors J. Dobschinski (Fraunhofer IWES, Germany) (WIW14-1074)
09:48 – 10:15	Discussion

08:00 – 10:15	SESSION 7B: FREQUENCY CONTROL ISSUES
> Session Chair	Poul Sørensen (DTU, Denmark)
08:00 – 09:48	Presentations (18 min. each)
	<ul style="list-style-type: none">• Index for Wind Power Variability J. Kiviluoma, H. Holttinen (VTT, Finland), R. Scharff (KTH Royal Institute of Technology, Sweden), D. E. Weir (Norwegian Water Resources and Energy Directorate, Norway), N. Cutululis, M. Litong-Palima (DTU Wind Energy, Denmark), M. Milligan (NREL, USA) (WIW14-1154)• Characterization of Wind Power Fluctuations from Frequency Measurement Data F. Milano (University College Dublin, Ireland), R. Zárate-Miñano (University of Castilla-La Mancha, Spain), F. M. Mele (University College Dublin, Ireland) (WIW14-1108)• Controlling Wind Turbines for Secondary Frequency Regulation: An Analysis of AGC Capabilities Under New Performance Based Compensation Policy J. Aho, L. Y. Pao (University of Colorado Boulder, USA), P. Fleming, E. Ela (NREL, USA) (WIW14-1087)• Impact of High Penetration of Wind and PV Generation on Frequency Dynamics in the Continental Europe Interconnected System Y. Wang, V. Silva (EDF R&D, France), A. Winckels (ENSTA ParisTech, France) (WIW14-1102)• Transient Stability and Frequency Response of the US Western Interconnection under conditions of High Wind and Solar Generation N. Miller, M. Shao, S. Pajic, R. D'Aquila (General Electric, USA), K. Clark (NREL, USA) (WIW14-1034)• Exploring Wake Interaction for Frequency Control in Wind Farms A. Shabir Ahmadyar, G. Verbič (University of Sydney, Australia) (WIW14-1067)
09:48 – 10:15	Discussion

08:00 – 10:15	SESSION 7C: AC AND DC OFFSHORE CONNECTION SOLUTIONS
> Session Chair	Anna Ferguson (TNEI Services, United Kingdom)
08:00 – 09:48	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Low Frequency AC Transmission on Large Scale Offshore Wind Power Plants - Achieving the Best from Two Worlds? E. Olsen (Nexans Norway, Norway), U. Axelsson(Vattenfall, Sweden), A. Canelhas (HVDC Tech, United Kingdom) (WIW14-1085) • Technical and Economic Assessment of Offshore AC Hubs Operating at Non-standard Frequencies J. L. Domínguez-García, M. De Prada-Gil (Catalonia Institute on Energy Research, Spain), O. Gomis-Bellmunt, A. Sumper (Catalonia Institute on Energy Research/CITCEA-UPC, Spain) (WIW14-1223) • Low Frequency AC Transmission for Grid Integration of Offshore Wind Power M. Jafar, Y. Yang (DNV GL, Norway), A. Yanushkevich (DNV GL, the Netherlands) (WIW14-1009) • Grid Connection Design for Gargano Sud Offshore Wind Power Plant J. Fodiak, N. Scott, M. Hird (Xero Energy Limited, United Kingdom) (WIW14-1195) • DC Connection of Offshore Wind Power Plants without Platform J. Pan, S. Bala (ABB Corporate Research, USA), M. Callavik, P. Sandeberg (ABB Grid Systems, Sweden) (WIW14-1125) • Voltage Balancing and Control of Series-DC Collection Systems for Offshore Wind Power Plants R. Hassan, J. Sun (Rensselaer Polytechnic Institute, USA) (WIW14-1232)
09:48 – 10:15	Discussion

10:15 – 10:45 Coffee Break

10:45 – 12:45	SESSION 8A: WIND POWER PLANTS IN LOW AND MEDIUM VOLTAGE NETWORKS
> Session Chair	Eckehard Tröster (Energynautics, Germany)
10:45 – 12:33	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Wind Power Plants for Weak Grids based on Type IV Wind Energy Converters V. Diedrichs (Jade University of Applied Sciences, Germany), A. Beekmann, E. Quitmann, S. Nikolai (Enercon, Germany) (WIW14-1120) • Advanced Wind Plant Control Providing Grid Voltage Flicker Reduction J. Fortmann, M. Seidel, V. Schulz (Senvion, Germany) (WIW14-1143) • Advanced Open Loop Control Strategies for Voltage Control in Medium Voltage Systems with a High Penetration of Wind Power Generation E. Wieben (EWE Netz, Germany), S. Nikolai, A. Beekmann (Enercon, Germany) (WIW14-1121) • Meeting Grid Code Requirements of Decentralized Power Generators and Plants by Using Voltage Regulating Distribution Transformers as Cost-efficient Component J. Langstädtler, J. Döll, M. Brennecke, (FGH, Germany), T. Smolka, M. Sojer, T. Schlegel, T. Funk (Maschinenfabrik Reinhausen, Germany) (WIW14-1119) • Fakken Wind Power Plant: a Case of Weak Grid Connection J. Martinez Garcia (Vestas, Denmark), S. Thyraug (Troms Kraft, Norway), M. Obad (Vestas, Denmark) (WIW14-1069) • Wind Integration with Active Network Management (ANM): Learning from Deployment Projects and Future Directions G. Ault, R. MacDonald, R. Currie, N. McNeill, A. Gooding, C. Foote, (Smarter Grid Solutions, United Kingdom) (WIW14-1144)
12:33 – 13:00	Discussion

10:45 – 12:45	SESSION 8B: INERTIA ISSUES
> Session Chair	Tobias Gehlhaar (DNV GL, Germany)
10:45 – 12:05	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Synchronous Inertia Control for Wind Turbines: Adaption of the Virtual Synchronous Machine to Wind Turbines for providing Distributed Contributions to Power System Inertia D. Duckwitz, M. Shan, B. Fischer (Fraunhofer IWES, Germany) (WIW14-1105) • Operational Experiences with Inertial Response Provided by Type 4 Wind Turbines M. Fischer (Enercon Canada, Canada), S. Engelken, N. Mihov, A. Mendonca (Enercon, Germany) (WIW14-1011) • Field Measurements for the Assessment of Inertial Response for Wind Power Plants based on Hydro-Québec TransÉnergie Requirements M. Asmine, C.-É. Langlois (Hydro-Québec, Canada) (WIW14-1038) • Hydraulic-Pneumatic Energy Storage in a Wind Turbine for Enhancing the Power System Inertia S. Hippel, C. Jauch (Flensburg University of Applied Sciences, Germany) (WIW14-1044)
12:05 – 13:00	Discussion

10:45 – 12:45	SESSION 8C: STABILITY STUDIES
> Session Chair	Jian Sun (Rensselaer Polytechnic Institute, USA)
10:45 – 12:15	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Grid Stability in a 100% Renewable Electricity Supply System Interactions between a High Installed Capacity of Wind Power and the System B. Zimmermann, K. Knorr (Fraunhofer IWES, Germany), F. Steinke, P. Wolfrum (Siemens, Germany), T. Leveringhaus (University of Hannover, Germany) (WIW14-1166) • Transient Stability Assessment of the GB Transmission System with High Penetrations of Wind Power K. Johnstone, R. Tumilty, K. Bell, C. Booth (University of Strathclyde, United Kingdom) (WIW14-1084) • Transient Stability Analysis in Japanese Power System Considering Controllability of Wind Turbines T. Tsuji, K. Kawamata, T. Oyama (Yokohama National University, Japan), K. Uchida (Waseda University, Japan) (WIW14-1228) • Study on the New Urgent-Current-Control Coordination Requirements in Grid Codes for Concentrated-Integration Wind Power from a Perspective of Transient Stability D. Zhang, X. Yuan, J. Hu (Huazhong University of Science and Technology, China), Q. Zhou, N. Wang (Gansu Electric Power Corporation, China) (WIW14-1137)
12:15 – 12:45	Discussion

13:00 – 14:00 Lunch

14:00 – 15:15	SESSION 9A: GRID CODE ISSUES AND TOOLS
> Session Chair	Magnus Callavik (ABB, Sweden)
14:00 – 14:54	Presentations (18 min. each)
	<ul style="list-style-type: none"> • European Reactive Current Rise Time Requirements during Fault-Ride-Through from a Full-Converter Wind Turbine Perspective M. Curzi, R. Sharma, F. Martin (Siemens Wind Power, Denmark) (WIW14-1079) • Power Plant Controller to Manage Network Codes and Contribute to the Network Stability J. Brun, C. Durand (Schneider Electric, France) (WIW14-3005) • Open Systems for Optimal Integration of Renewable Energy S. Ruin (Consultant for TERO and LonMark Ambassador, Sweden/USA) (WIW14-3009)
14:54 – 15:15	Discussion

14:00 – 15:15	SESSION 9B: STORAGE OPTIONS AND STUDIES
> Session Chair	Barbara O'Neill (NREL, USA)
14:00 – 14:54	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Wind Curtailment - Assessment of Storage Options for Reduction of Yield Losses M. Doering, K. Burges, R. Kuwahata (Ecofys Germany, Germany) (WIW14-1106) • Flexible Storage Operation in a Market Environment C. O'Dwyer, D. Flynn (University College Dublin, Ireland) (WIW14-1128) • The GE Hybrid Wind Turbine with Integrated Battery Energy Storage: Concept, Implementation and First Field Test Results N. Miller (GE Energy, USA), S. Wachtel (GE Energy, Germany), K. Longtin, J. Sabrsula (GE Renewables, USA) R. Burra (GE GRC, USA) (WIW14-1008)
14:54 – 15:15	Discussion

14:00 – 15:15	SESSION 9C: MARKET DESIGN
> Session Chair	Nickie Menemenlis (IREQ / Hydro Québec, Canada)
14:00 – 14:54	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Towards Electricity Markets Accommodating Uncertain Offers A. Papakonstantinou, P. Pinson (DTU, Denmark) (WIW14-1072) • Simulation Tool for Integrating Demand Side Response into the Regulating Power Market M. Gamst, H. K. Støchkel, P. B. Eriksen, (Energinet.dk, Denmark) (WIW14-1193) • Analysis of the Impact of Wind Power Participating in Both Energy and Ancillary Services Markets: The Danish Case T. Soares, H. Morais, P. Pinson (DTU, Denmark) (WIW14-1153)
14:54 – 15:15	Discussion

15:25 – 16:30	SESSION 10: CLOSING SESSION
> Session Chair	Hannele Holttinen (VTT, Finland)
15:25 – 16:25	Podium Discussion
	<ul style="list-style-type: none"> • Participants: TBA
16:25 – 16:30	Closing Remarks

POSTER PRESENTATIONS

- **Decentralized & Adaptive Load-Frequency Control Scheme of Variable Speed Wind Turbines**
B. Hoseinzadeh, F. Faria Da Silva, C. L. Bak (Aalborg University, Denmark)
- **Operational Network Topology Changes as a Means of Reducing Power Curtailments of Wind Power Plants**
M. Bajor (Institute of Power Engineering Gdańsk Division, Poland)
- **The In-Depth Evaluation of Wind Power Forecasting Accuracy in Estonia: The Role of Technical Availability**
L. Ulm, I. Palu (Tallinn University of Technology, Estonia)
- **Wind Power Production Variations in the Swedish Power System – Case Study 2013**
F. Carlsson (Vattenfall R&D, Sweden)
- **Quantifying Variability – A Review of Metrics and a Case Study of Net Load Variability**
J. Olauson, D. Lingfors, M. Bergkvist, J. Widén (Uppsala University, Sweden)
- **Market Requirements for Pumped Storage Profitability**
K. Salevid, F. Carlsson (Vattenfall, Sweden)
- **Impact of Voltage Control of DFIG Based Wind Power Plants on Damping of Power System Oscillations**
Y. Xie, X. Yuan, W. He, J. Hu (Huazhong University of Science and Technology, China), K. Ding, N. Wang, (Gansu Electric Power Corporation, China)
- **Grid Voltage Measurement using Adaptive Parameter Estimation for Wind Power System**
C.-H. Yoo, I.-Y. Chung, S.-S. Hong (Kookmin University Seoul, South Korea), H.-J. Yoo (Samsung Heavy Industries, Korea)
- **MAProSy Comparing Analysis Strategies and their Error Influence for Local Wind Power and PV Forecasts**
A. Arnoldt (Fraunhofer IOSB-AST, Germany)
- **Influence of the Harmonic Distortion Due to Modern Wind Turbines on the Bandwidth Requirement for Flicker Measurement**
K. Redondo, A. Lazkano, J. J. Gutierrez (University of the Basque Country, Spain), C. Alvarez, E. Teixeira (E2Q, Spain)
- **A Technical Study of the Reactive Power Compensation of a Wind Power Plant to Comply with French Grid Code Requirements**
A. Teninge, X. Guillaud (L2EP, France), L. Ruiz Gomez (MAIA EOLIS, France), T. Prevost (RTE, France)
- **Influence of Fully Rated Converter Generator Models on Frequency Stability in Power Systems with High Wind Power Penetration**
G. Papaioannou, I. Talavera, H. Zimmer, J. Hanson (TU Darmstadt, Germany)
- **An Alternative Inertial Control Technology for Full-Converter Wind Turbines**
X. Xiong, X. Yuan, J. Hu, W. He (Huazhong University of Science and Technology, China), N. Chen, L. Zhu (CEPRI, China)
- **Modeling of DFIG-Based Wind Turbines for Power System Low Frequency Oscillation Studies**
F. Deng, X. Yuan, J. Hu, Y. Huang (Huazhong University of Science and Technology, China), K. Ding, N. Wang (Gansu Electric Power Corporation, China)
- **A Comparative Analysis of Wind Turbine Generator Technologies for Harsh Environments**
I. Davidson (University of KwaZulu-Natal, South Africa), N. K. Amaambo (University of Namibia, Namibia)
- **Grid Impedance Measurement Strategies for Evaluation of Grid Accesspoints at High-Voltage-Level**
T. T. Do, D. Schulz (Helmut-Schmidt-University, Germany)

- **Flexibility and Regulation Capability of Hydropower Systems to Balance Large Amounts of Wind Power**
J. Lönnberg, J. Bladh (Vattenfall, Sweden)
- **Improvement of NWP Based Short Term Wind Power Forecasts by Postprocessing Using Artificial Neural Networks and Regression**
M. Kratzenberg, H. H. Zürn (Federal University of Santa Catarina, Brazil), P. P. Revheim, H. G. Beyer (University of Agder, Norway)
- **Effective Wind Speed Estimation and Real-Time Wake Model Re-Calibration for Down-Regulated Turbines**
T. Göçmen Bozkurt, G. Giebel, P.-E. Réthoré (DTU Wind, Denmark), M. Mirzaei, N. K. Poulsen (DTU, Denmark)
- **Losses in Armoured Three-Phase Submarine Cables**
T. Ebdrup, F. Faria da Silva, C. L. Bak (Aalborg University, Denmark), C. Flytkjær Jensen (Energinet.dk, Denmark)
- **Wind Turbine Transformer Impedance Identification Based on Time-Domain Measurements**
R. Christoffersen (Balslev, Denmark), T. Wederberg Rasmussen (DTU, Denmark), I. Arana Aristi, L. H. Kocewiak (DONG Energy, Denmark)
- **Supply and Demand Balance Control of Power Systems with Wind Power Integration Based on Multi-Agent System**
H. Bae, T. Tsuji, T. Oyama (Yokohama National University, Japan)
- **Energisation of an MV Electric Boiler for Load Control in Power Systems with Large Share of Renewables**
F. Faria da Silva, C. L. Bak (Aalborg University, Denmark), T. Davidsen (InoPower, Denmark)
- **Coordination Between Offshore Transmission Assets A Third Way Approach**
F. Faria da Silva (Aalborg University, Denmark)
- **Rapid Fluctuations in Wind Power Production During Severe Storms – A Case Study**
A. L. Løvholm, E. Berge, R. E. Bredesen (Kjeller Vindteknikk, Norway)
- **Battery Storage System Size Optimization with Application of Statistical Distribution for Wind Power Forecast Error**
Z. Cai, J. Zhu, P. Stöcker, C. Bussar, L. Moraes Jr., M. Leuthold, D. U. Sauer (RWTH Aachen University, Germany)
- **Demand Side Response System Frequency Control using Temperature-Controlled Devices: Potentials and Requirements in Germany by 2020**
L. Wagner, E. Tröster (Energynautics, Germany)
- **Cycling Requirements for Conventional Power Plants at High Shares of Renewable Energy**
P.-P. Schierhorn, T. Brown, E. Tröster (Energynautics, Germany)
- **Low Frequency AC Transmission- A Valid Alternative for Offshore Wind Farm Connection**
P. Wyllie, Y. Tang, L. Ran (University of Warwick, United Kingdom), J. Yu (ScottishPower Energy Networks, United Kingdom)