PROCEEDINGS

13th 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

11 - 13 November 2014 | Berlin, Germany

Edited by Uta Betancourt / Thomas Ackermann

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Welcome to…

the 13th International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants

We have the great pleasure to welcome you to the **13th edition of the International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants** in Berlin, Germany.

While the first edition of the workshop was held 14½ years ago at the Royal Institute of Technology, Stockholm, Sweden in March 2000 with 4 sessions in total, this year we received again such a large number of outstanding abstracts that we can offer now a two-and-a-half day program with 26 sessions, one session more than last year.

While the focus of the first workshop was on HVDC transmission technology, including HVDC transmission networks, the key topics have changed continuously over the past years, reflecting the shifting focuses in the area of wind integration: modelling issues, national grid integration experience, market issues as well as grid code issues were key topics of previous workshops. This year, grid connection of wind power plants using HVDC technology is again a major topic, together with reserve and frequency control issues as well ancillary services from wind turbines. This way, the workshop has developed into a renowned international platform for discussing the subject of grid integration of wind power into existing power systems.

The general purpose of this workshop, however, has not changed over the past years: It is to get researchers, economists and practicing engineers from different fields relating to wind power and transmission systems to exchange their knowledge and discuss their experience in the area of large-scale integration of wind power into power systems and transmission networks for offshore wind farms. The emphasis of this workshop is again on both theoretical discussion and practical applications.

Because of the high interest in the workshop proceedings, we will again submit this year's proceedings to international libraries and organisations who operate citation index systems such as the (i) FIZ - Fach Informations Zentrum Karlsruhe, (ii) Elsevier, (iii) ETDE, (iV) Reuters, (V) Compendex, (Vi) ThomsonCitationIndex so that the proceedings are more easily available for academia and industry world-wide.

The **13th Wind Integration Workshop** forms the anchor workshop for related events such as the **4th International Workshop on Integration of Solar Power into Power Systems** (November 10-11, 2014), **Tutorials for the Wind Integration Workshop** (November 10, 2014), the **Study trip** (November 14, 2014) and the **Workshop Dinner** (November 12, 2014).

This workshop would not be possible without our sponsors and we would like to thank them for their support. Our **Tera Sponsors** this year are: the wind turbine manufacturers **Enercon** (Germany) and **Siemens Wind Power** (Denmark), our **Giga Sponsors**: the power technology developer **ABB** (Switzerland), the consulting and software company **DIgSILENT** (Germany), the technology research company **DNV GL** (Norway) the energy group **DONG energy** (Denmark) and the wind turbine manufacturer **Vestas** (Denmark).
In addition, the workshop is supported by the **IET Digital Library** (United Kingdom), the **Renewables Grid Initiative** (Germany), the **Utility Variable Generation Integration Group UVIG** (USA) and the media partner **Sun&Wind Energy** (Germany).

We would also like to thank all those who supported the organizers of this workshop: all the member of the International Advisory Committee as well as Uta Betancourt, Ines Drewianka and Katharina Fischer (all Energynautics, Germany).

Enjoy some inspiring days in Berlin and seize the numerous networking possibilities!

Thomas Ackermann
Energynautics

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Podium discussions

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

Poster Session Papers

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)