

Sixth International Workshop on Large-Scale Integration of Wind Power and Transmission Networks for Offshore Wind Farms

26–28 October 2006, Delft, the Netherlands

Workshop Program

The Sixth Workshop is organized by:



The Sixth Workshop is financially supported by:



NørdzeeWind



Tennet 



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Wednesday 25 October 2006

- 09:00 – 17:00 Workshop on Best Practise in the Use of Short-term
Forecasting of Wind Power
organized by RISØ National Laboratory
contact person: Gregor Giebel (Gregor.Giebel@risoe.dk)
- 17:30 – 19:00 Reception, registration and snacks at Delft Town Hall
Markt 87
2611 GS Delft.

Thursday 26 October 2006

- 08:00 – 09:00 Registration
- 09:00 – 09:20 Opening
- 09:00 – 09:10 Welcome from Delft University of Technology, Prof.dr.ir. J.T. Fokkema, rector magnificus, Delft University of Technology
- 09:10 – 09:15 Welcome and introduction, Thomas Ackermann (Energynautics, Germany and Royal Institute of Technology, Sweden)
- 09:15 – 09:20 Structure of the workshop
- 09:20 – 11:05 Session 1: Keynote session
- 09:20 – 10:45 Presentations (20 minutes each):
- *Overview of System Integration of Wind Power in the Netherlands*, B.C. Ummels, R.L. Hendriks, M. Gibescu, W.L. Kling, G.A.M. van Kuik (Delft University of Technology, the Netherlands)
 - *Integrating wind power into a single European electricity grid*, Frans Van Hulle (EWEA, Belgium)
 - *Offshore Wind Park Egmond aan Zee*, Huub Den Rooijen (NoordzeeWind, the Netherlands)
 - *The role of industry cooperation in offshore development: the Dutch We@Sea initiative*, Jos Beurskens (We@Sea, the Netherlands)
 - *Integrating wind energy in the European electricity grid*, Ronnie Belmans (Katholieke Universteit Leuven and ELIA TSO, Belgium)
- 10:45 – 11:05 Discussions, discussion leader: Gijs van Kuik (Delft University of Technology, the Netherlands)
- 11:05 – 11:25 Coffee break and poster session
- 11:25 – 13:00 Session 2a: Market integration of wind power
- 11:25 – 12:45 Presentations (20 minutes each):
- *Comparison of Support Schemes and Market Designs for Wind Power*, K. Verhaegen (KU Leuven, Belgium), B.C. Ummels (Delft University of Technology, the Netherlands), R.J.M. Belmans (KU Leuven, Belgium), W.L. Kling, (Delft University of Technology, the Netherlands)
 - *The value of wind power from a market perspective*, C. Kleinschmidt, F. Verheij, H. Cleijne, N. Moldovan (KEMA, the Netherlands)
 - *Integration of 18 GW Wind Energy into the Energy Market – Practical Experiences in Germany*, C. Krauß, B. Graeber (EnBW Trading GmbH, Germany), M. Lange, U. Focken (energy & meteo systems GmbH, Germany)
 - *Limits in the integration of Wind Farms in the Spanish wholesale electrical market*, J. Rivier Abbad, V.H. Méndez Quezada, T. Gómez San Román (Universidad Pontificia Comillas, Spain)
- 12:45 – 13:00 Discussions, discussion leader: Madeleine Gibescu (Delft University of Technology, the Netherlands)

11:25 – 13:00

Session 2b: Offshore wind farms

11:25 – 12:45

Presentations (20 minutes each):

- *Comparison of Different Techniques for Offshore Wind Farm Reliability Assessment*, N. Barberis Negra (Elsam Engineering A/S, Denmark), O. Holmstrøm (Elsam Engineering A/S, Denmark), B. Bak-Jensen (Aalborg University, Denmark), P. Sørensen (RISØ National Laboratory, Denmark)
- *Steady-State Performance Analysis of Collector System Designs for Large-scale Offshore Wind Farms*, G. Quinonez-Varela, G.W. Ault, J.R. McDonald (University of Strathclyde, United Kingdom)
- *On Some Aspects of Design and Operation of Large Offshore Wind Parks*, A. Sannino, L. Liljestrånd, H. Breder (ABB Corporate Research, Sweden), E. Koldby (ABB A/S, Denmark)
- *Condition Monitoring based Maintenance Strategies for Operating Offshore Wind Farms*, H. Hinrichs (Projekt GmbH, Germany)

12:45 – 13:00

Discussions, discussion leader: Jaap Olthoff (NoordzeeWind, the Netherlands)

13:00 – 14:00

Lunch

14:00 – 16:00

Session 3a: Power system balancing and its cost

14:00 – 15:40

Presentations (20 minutes each):

- *Potentials to optimize the integration of wind energy into the German interconnected system*, P. Siemes, H.-J. Haubrich (RWTH Aachen University), H. Vennegeerts (FGH e.V. Mannheim/Aachen, Germany), S. Ohrem (RTWH Aachen University, Germany)
- *Power System Balancing with Large Scale Wind Power Integration*, A. Suwannarat, B. Bak-Jensen, Z. Chen (Aalborg University, Denmark)
- *Prediction Errors and Balancing Costs for Wind Power Production in Finland*, H. Holttinen (VTT Technical Research Centre of Finland, Finland), P. Saarikivi (Foreca Ltd, Finland), S. Repo (Cybersoft, Finland), J. Ikäheimo, G. Koreneff (VTT Technical Research Centre of Finland, Finland)
- *Balancing Costs for Large Wind Farms: The Influence of Short-term Forecasting and the Regulatory Framework*, A. Woyte, G. Palmers, L. Dewilde (3E sa, Belgium)
- *Estimation of System Balancing Requirements due to the Integration of Large-Scale Wind Energy*, M. Gibescu (Delft University of Technology, the Netherlands), A.J. Brand (ECN, the Netherlands)

15:40 – 16:00

Discussions, discussion leader: Thomas Ackermann (Energynautics, Germany and Royal Institute of Technology, Sweden)

- 14:00 – 16:00 **Session 3b: Integration and control of offshore wind farms**
- 14:00 – 15:40 Presentations (20 minutes each):
- *Dynamic voltage control of offshore wind turbines by using a SVC*, S.B. Nielsen, C.O. Jensen, N. Andersen (SEAS-NVE, Denmark), J. Megos, M. Claus (Siemens AG, Germany)
 - *Sizing Statcom for the Interconnection of Offshore Wind Farms with HVdc and HVac Technology*, D. Giannoccaro, A. Rehman, T. Ackermann (Royal Institute of Technology, Sweden)
 - *Development of a Multiterminal VSC Transmission Scheme for Use with Offshore Wind Power*, R.L. Hendriks, G.C. Paap, W.L. Kling (Delft University of Technology, the Netherlands)
 - *Quasi steady-state time simulations – a powerful tool for evaluation of grid connection in relation to offshore wind farms*, J. Hjerrild, O. Holmstrøm (DONG Energy, Denmark)
 - *Bipolar transmission systems with XLPE HVAC submarine cables*, H. Brakelmann (University of Duisburg-Essen, Germany) K. Burges (Ecofys, Germany), M. Jensen (GEO-mbH, Germany), T. Schütte (Rejlers Ingenjörer AB, Sweden)
- 15:40 – 16:00 Discussions, discussion leader: Peter Christensen (Scandinavian HVDC Consulting, Denmark)
- 16:00 – 16:20 **Coffee break and poster session**
- 16:20 – 18:00 **Session 4a: Modeling and wind farm control**
- 16:00 – 17:40 Presentations (20 minutes each):
- *A reduced wind power grid model for research and education*, V. Akhmatov (Energinet.dk, Denmark), T. Lund (RISØ National Laboratory, Denmark), A.D. Hansen, P. Sørensen, A. Hejde Nielsen, (Technical University of Denmark, Denmark)
 - *Scalable Integration of Wind Power on Transmission Systems using Grid Computing*, G.A. Taylor, M.R. Irving, C. Axon, P.R. Hobson (Brunel University, United Kingdom)
 - *Advanced Operating Control for Wind Farm Clusters*, M. Wolff, R. Mackensen, G. Füller, B. Lange, K. Rohrig (Institut für Solare Energieversorgungstechnik e. V., Germany), F. Fischer (Enercon GmbH, Germany), L. Hofmann (E.ON Netz GmbH, Germany), S. Heier, B. Valov (Kassel University, Germany)
 - *Advanced Wind Plant Controls to Enhance Grid Integration*, R. Walling, N. Miller, M. Cardinal (GE Energy, USA)
- 17:40 – 18:00 Discussions, discussion leader: Sigrid Bolik (Vestas, Australia)

16:20 – 18:00 Session 4b: Frequency support and cabling issues

16:20 – 17:40

Presentations (20 minutes each):

- *Capacity of a variable speed wind turbine to participate in primary frequency control*, V. Courtecuisse, B. Robyns (Laboratory of Electrotechnics and Power Electronics of Lille, France), S. Plumel (Supélec, France), B. François (Ecole Centrale de Lille, France), J. Deuse (Suez-Tractebel, Belgium)
- *Contribution Of DFIG Based Wind Plants To Voltage and Frequency Recovery Following System Disturbances*, M. Kayıkçı, J.D. Milanović (University of Manchester, United Kingdom)
- *Thermal analysis of cable groups for wind power transmission*, H. Brakelmann (University of Duisburg-Essen, Germany)
- *Overloading Possibilities for HVAC Offshore Transmission Cables*, X. Zhang, T. Ackermann (Royal Institute of Technology, Sweden)

17:40 – 18:00

Discussions, discussion leader: Kees Jansen (TenneT TSO, the Netherlands)

19:00

Bus travel to conference dinner

Buses will leave in front of the Aula Congressentrum.

20:00

Conference dinner at Kurhaus Hotel

Steinberger Kurhaus Hotel
Gevers Deynootplein 30
2586 CK Den Haag

Dinner sponsor:



Dinner entertainment: The Green Street Jazz Quartet

Daniël Vree – Piano
Remy van der Meer – Guitar
Wouter Rijkee – Double bass
Maarten van Reeuwijk – Drums

Bus travel back to Delft

Buses back to Delft will leave after the workshop dinner and go directly to the Delft Railway Station.

Friday 27 October 2006

09:00 – 10:40 Session 5a: Grid connection and integration issues

09:00 – 10:20

Presentations (20 minutes each):

- *Design and Operation of Power Systems with Large Amounts of Wind Power, first results of IEA collaboration*, H. Holttinen (VTT Technical Research Centre of Finland), P. Meibom (Risø National Laboratory, Denmark), A. Orths (Energinet.dk, Denmark), F. Van Hulle (EWEA, Belgium), C. Ensslin (ISET, Germany), L. Hofmann (E.ON Netz, Germany), J. McCann (SEI, Ireland), J. Pierik (ECN, the Netherlands), J.O. Tande (SINTEF, Norway), A. Estanqueiro (INETI, Portugal), L. Söder (Royal Institute of Technology, Sweden), G. Strbac (Centre of Distributed Generation and Sustainable Electrical Energy, United Kingdom), B. Parsons (NREL, USA), J.C. Smith (UWIG, USA), B. Lemström (VTT Technical Research Centre of Finland)
- *Grid Connection of Wind Turbines – The Never Ending Story?*, S.M. Bolik (Vestas, Australia)
- *Status quo of RES-E grid connection practises in Europe, future trends and recommendations for policy improvements*, W. Prügler, H. Auer, C. Obersteiner, L. Weissensteiner (Vienna University of Technology, Austria)
- *Advanced Grid Requirements for the Integration of Wind Turbines into the German Transmission System*, U. Bachmann (Vattenfall Europe Transmission, Germany), I. Erlich (University of Duisburg-Essen, Germany), W. Winter (E.ON Netz, Germany)

10:20 – 10:40

Discussions, discussion leader: Han Slootweg (Essent Network, the Netherlands)

09:00 – 10:40 Session 5b: Wind forecasting

09:00 – 10:20

Presentations (20 minutes each):

- *Optimal Combination of Different Numerical Weather Models for Improved Wind Power Predictions*, M. Lange, U. Focken, R. Meyer (Energy & Meteo Systems GmbH, Germany), M. Denhardt, (Deutscher Wetterdienst, Germany), B. Ernst, F. Berster (RWE Transportnetz Strom GmbH, Germany)
- *Confidence in Large-scale offshore wind farming: Wind Power Predictability and stable Grid Integration of 25 GW German Wind Power*, L. von Bremen, J. Tambke, N. Saleck, D. Heinemann (University of Oldenburg, Germany)
- *POW'WOW – Virtual Laboratories and Best Practice Guides for the Prediction Of Waves, Wakes and Offshore Wind*, G. Giebel, R. Barthelmie (RISØ National Laboratory, Denmark), T.S. Nielsen (Technical University of Denmark), G. Kariniotakis (Armines), I. Martí Perez (CENER), I. Sanchez, J. Usaola (Universidad Carlos III de Madrid), L. von Bremen, A. Sood, J. Tambke (University of Oldenburg, Germany), U. Focken, M. Lange (Energy & Meteo Systems, Germany), B. Lange (ISET, Germany), G. Kallos (IASA), T. Pontes (INETI), K. Michalowska (ECBREC), A. Sempreviva, (CNR-ISAC)
- *Optimal Linkage of different NWP models with Neural Networks for Offshore Wind Power Predictions*, L. von Bremen (University of Oldenburg, Germany)

10:20 – 10:40

Discussions, discussion leader: Gregor Giebel (Risø National Laboratory, Denmark)

10:40 – 11:00

Coffee break and poster session

11:00 – 13:00	Session 6a: Wind turbine generators
11:00 – 12:40	Presentations (20 minutes each): <ul style="list-style-type: none"> ▪ <i>The Variable-Capacitance Machine for Off-shore Wind Generation</i>, R. O'Donnell, N. Schofield, A.C. Smith (University of Manchester, United Kingdom), J. Cullen (Rolls-Royce plc, United Kingdom) ▪ <i>Grid Compatibility of Variable Speed Wind Turbines with Directly Coupled Synchronous Generator and Hydro-Dynamically Controlled Gearbox</i>, H. Müller, M. Pöller (DIgSILENT GmbH, Germany), A. Basteck, J. Pfister (Voith Turbo GmbH & Co. KG, Germany) ▪ <i>Modelling of squirrel cage turbine for voltage dips studies</i>, M.P. Comech, S. Martín, J. Mur, I. Franco, M. García-Gracia (Universidad de Zaragoza, Spain) ▪ <i>Optimization of the fault ride through strategy of a wind farm</i>, D.T. Johnsen, W. Christiansen, A.H. Nielsen (Technical University of Denmark, Denmark), K.H. Jensen, J.N. Nielsen (Siemens Wind Power, Denmark), T. Sørensen (DONG Energy, Denmark)
12:40 – 13:00	Discussions, discussion leader: Henk Polinder (Delft University of Technology, the Netherlands)
11:00 – 13:00	Session 6b: Integrated (storage) systems
11:00 – 12:20	Presentations (20 minutes each): <ul style="list-style-type: none"> ▪ <i>Benefits of Energy Storage device for a Wind Farm</i>, M. Aten (EON UK, United Kingdom), J. Barton (Bryte Energy, United Kingdom), R. Hair (EON UK, United Kingdom) ▪ <i>The Application of Batteries as a Backup of Large Wind Farms</i>, E. Spahić, G. Balzer (Technische Universität Darmstadt, Germany) ▪ <i>Adiabatic Compressed Air Energy Storage for the Grid Integration of Wind Power</i>, S. Zunft (DLR, Germany), C. Jakiel (MAN TURBO AG, Germany), M. Koller (ALSTOM Power, Switzerland), C. Bullough (ALSTOM Power Technology Centre, United Kingdom) ▪ <i>Dimensioning a Hybrid System with Energy Storage to Balance the Power from Large-Scale Wind Parks - Selected Topics</i>, A. Lebioda, Z. Styczynski (Otto-von-Guericke University Magdeburg, Germany), R. Völzke (Siemens AG, Germany)
12:20 – 13:00	Discussions, discussion leader: Jos Beurskens (Energy research Centre of the Netherlands)
13:00 – 14:00	Lunch
14:00 – 15:40	Session 7a: Wind farm planning and control
14:00 – 15:20	Presentations (20 minutes each): <ul style="list-style-type: none"> ▪ <i>The Changes of the Power System Control in Case of Large Wind Penetration</i>, E. Spahić, G. Balzer (Technische Universität Darmstadt, Germany) ▪ <i>Combination of a Geographical Spreading and an Optimal Choice of the Speed Control Characteristic for the Active Power Smoothing of a Wind Farm: Application to Asynchronous Doubly-Fed Wind Generators</i>, F. Vallée, J. Lobry, O. Deblecker (Faculté Polytechnique de Mons, Belgium) ▪ <i>Reactive Power Injection Strategies for Wind Energy Regarding its Statistical Nature</i>, J. Mur Amada, M^a Paz Comech Moreno (Zaragoza University, Spain) ▪ <i>Wind Farm Planning</i>, T. Smieja, K. Rudion, Z.A. Styczynski, O. Rühle, A. Lebioda, R. Völzke (Otto-von-Guericke University Magdeburg, Germany)
15:20 – 15:40	Discussions, discussion leader: Wil Kling (Delft Univeristy of Technology, Eindhoven University of Technology and TenneT TSO, the Netherlands)

- 14:00 – 15:40** **Session 7b: Advanced solutions for balancing**
- 14:00 – 15:20 Presentations (20 minutes each):
- *A novel integrated wind and natural gas energy system*, K. Hemmes (Delft University of Technology, the Netherlands)
 - *Short Term Hydro Power Planning Coordinated with Wind Power in Areas with Congestion Problems*, J. Matevosyan, M. Olsson, L. Söder (Royal Institute of Technology, Sweden)
 - *Wind Turbines and Heat Pumps - Balancing wind power fluctuations using flexible demand*, C.J. Warmer, M.P.F. Hommelberg, I.G. Kamphuis (Energy research Centre of the Netherlands, the Netherlands), Z. Derzsi, J.K. Kok (Free University Amsterdam, the Netherlands)
 - *Balancing of Fluctuating Wind by DSM of Heating Systems*, G.F. Brauner, G. Pöppl (Vienna University of Technology, Austria)
- 15:20 – 15:40 Discussions, discussion leader: Lou van der Sluis (Delft University of Technology, the Netherlands)
- 15:40 – 16:00** **Coffee break and poster session**
- 16:00 – 16:45** **Session 8: Closing session**
- 16:00 – 16:40 Podium discussions, participants:
- Wil Kling (Delft University of Technology, Eindhoven University of Technology and TenneT TSO, the Netherlands) (confirmed)
 - Sigrid Bolik (Vestas, Australia) (confirmed)
 - Karsten Burges (Ecofys, Germany) (confirmed)
 - Reigh Walling (GE Energy, USA) (confirmed)
 - Antje Orths (Energinet.dk, Denmark) (invited)
 - Bettina Lemström (VTT Technical Research Centre of Finland) (invited)
 - Frans Van Hulle (EWEA, Belgium) (invited)
- Discussion leaders: Thomas Ackermann (Energynautics, Germany and Royal Institute of Technology, Sweden) and Paul Gardner (Garrad Hassan, United Kingdom)
- 16:40 – 16:45 Closing remarks

Accepted poster presentations

- *Offshore Wind Power Impact on the Loading of the Belgian High Voltage Grid*, P. Souto Pérez, J. Soens, J. Driesen, R. Belmans (Katholieke Universiteit Leuven, Belgium)
- *Preliminary Evaluation of Wind Energy Utilization on Margarita Island, Venezuela*, F. González-Longatt, J. Mendez, R. Villasana, C. Peraza (Universidad Nacional Experimental Politécnica de la Fuerza Armada, Venezuela)
- *Effects over Distribution Feeder of High Penetration Level WECS based on Induction Generators*, F. González-Longatt, E. Gavoskis, M. Bolivar (Universidad Nacional Experimental Politécnica de la Fuerza Armada, Venezuela)
- *Optioneering on Offshore Wind Farm Collection Systems*, M. Scutariu (Mott MacDonald, United Kingdom)
- *AC-DC-AC/AC-AC Grid Connection by Star-Delta Converters*, O. Ustun, M. Bagriyanik, P. Ali-Zade (Istanbul Technical University, Turkey), K. Radjabli (Kema Consulting, USA), G. Mamedov (Azerbaijan Technical University, Azerbaijan)
- *Modelling of wind turbines*, D. Spacil, P. Santarius (Technical University of Ostrava, Czech Republic), M. Dobrucký (University of Žilina, Slovak Republic)
- *Wind Park and Grid Integration Issues*, Y. Zhou, (Delft University of Technology, the Netherlands), J. Pierik (Energy Research Centre of the Netherlands, the Netherlands), P. Bauer, J.A. Ferreira (Delft University of Technology, the Netherlands)
- *System Modelling and Online Optimal Management of MicroGrid*, F.A. Mohamed, H.N. Koivo (Helsinki University of Technology, Finland)

Saturday 28 October 2006

09:00 – 18:00 Field trip

09:00 – 10:15 Delft–Santpoort, Bus travel. Buses will leave in front of the Aula
Congrescentrum, make sure to be there on time.

10:15 – 11:30 Santpoort, visit to Dutch wind mill “De Zandhaas”

12:00 – 16:30 IJmuiden Harbour–North Sea, Boat trip to Egmond aan Zee Offshore Wind
Farm, Lunch and presentations on board

16:45 – 18:00 IJmuiden–Delft, Bus travel. The exact time of arrival is dependent on traffic.

At least one bus will stop also halfway at Schiphol Airport (Amsterdam) at
approximately 17:15 for those who want to catch a late flight. You could leave
your luggage in a locked compartment of the bus during the field trip.