Wind Power to the Grid

EPE Joint Wind Energy and T&D Chapters Seminar
Aalborg, Denmark
28, 29 June 2012

Programme

(v. 8, 12 June 2012)

General information: http://www.epe-association.org/epe/seminars/Wind2012/

Thursday 28 June 2012

8h15 – 9h00: Registration and coffee (Room)
Upload of presentation and full papers

9h00 – 9h30: Opening session (Room)
Chair: Remus Teodorescu
Co-chair: Philip Kjaer

Opening Addresses:
Opening address by the conference Chairpersons, Remus Teodorescu, Aalborg University and Philip Kjaer, Vestas
Presentation of Aalborg University by Stig-Munk Nielsen, Aalborg University
Opening address by Jean-Luc Thomas, Chairman of Wind Energy Chapter,
Opening address by Colin Oates, Chairman of T&D Chapter,
Opening address by Mr. Lidegaard, Minister of Environment

9h30 – 10h20: Lecture session 1: Keynotes (Room): HVDC technology
Chair: Remus Teodorescu, Aalborg University
Co-chair: Philip Kjaer, Vestas

Keynote 1: **The Skagerrak4 project – Connecting renewables with new technology between Denmark and Norway**, Søren Damsgaard Mikkelsen, Jens Peter Kjærgaard, Energinet.dk

Keynote 2: **Cable technology for offshore wind power collection and transmission – ac and dc**, Anders Jensen, nkt cables, Director Business Development Application

10h20 – 10h50: Coffee break in Foyer

10h50 – 12h30: Lecture session 2: (Room): Grid connection, compliance and control
Chair: Lars Helle, Vestas

1 **Generic 12-Bus Test system for Wind Power Integration Studies**, Andrzej Adamczyk, Mufit Altin, Ömer Göksu, Remus Teodorescu, Department of Energy Technology, Aalborg University, Aalborg; Florin Iov, Vestas Wind Systems A/S, Arhus, Denmark

24 **State Control of Modular Multilevel Converters Utilizing Pole Restraining**, Tim Schrader, Roman Bartelt and Carsten Heising, Avasition GmbH, Dortmund & Volker Staudt and Andreas Steimel, Ruhr-University Bochum

8 **An Overview of Grid Code Requirements for Wind Power Integration in Europe**, Constantinos Sourkounis and Pavlos Tourou, Enesys Reseach Group for Power System Technology and Power Mechatronics, Ruhr-University Bochum, Germany

30 **Introduction to off-shore wind farm project in Korea**, Chulsoo Suh, Power System Lab.□□Korea Electric Power Company(KEPCO) Research Institute(KEPRI)

44 **Inverter Based Test Setup for LVRT Verification of a Full-Scale 2 MW Wind power Converter**, A. Uphues⋆, K. No¨tzold⋆, R. Wegener⋆, K. Fink†, M. Bragard†, R. Griessel† S. Soter⋆
⋆Institute of Electrical Machines and Drives, University of Wuppertal
†Delta Energy Systems (Germany) Soest GmbH

12h30 – 14h00: Lunch (Room)

14h00 – 15h30: Dialogue session and Exhibition (Foyer)

Topic 1 : Wind Energy Conversion Technologies

13 **A Novel Wind Generator System with Six-Phase PMSG and Hybrid Rectifier for Large Offshore Turbines,** Shinji Kato, Keitaro Ueda, Masakazu Michihira, Kobe City College of Technology, Japan

23 **State Control of DFIG in Converter-Fixed Reference Frame for Wind-Energy Plants,** Matthias Seifert and Carsten Heising, Avasition GmbH, Dortmund, Germany, Volker Staudt and Andreas Steimel, Ruhr-University Bochum, Germany

25 **VIAvento – a Fast and Accurate Simulation Tool for Power-Electronic Systems,** Martin Richter and Christian Schilling, Avasition Software Solutions GmbH, Dortmund, Germany, Roman Bartelt, Stefan Menzner and Carsten Heising, Avasition GmbH, Dortmund, Germany

41 **Comparison of Offshore Power Transmission Technologies: a Multi-Objective Optimization Approach,** Silvio Rodrigues, Pavol Bauer, Technical University of Delft, Delft, The Netherlands; Jan Pierik, ECN, Petten, The Netherlands

43 **Dc-link voltage selection for a 5 MW PMSG-equipped generating system – Maximum torque per ampere control versus minimum dc-link voltage,** T. Thiringer, P. Roshanfekr & S. Lundmark, Chalmers University of Technology, Göteborg, Sweden

Topic 2: Control of wind power plants and their transmission solutions

3 **Modular Multilevel Converter Modeling, Control and Analysis under Grid Frequency Deviations,** Rodrigo Da Silva, Department of Energy Technology, Aalborg University, Aalborg; Lorenzo Zeni, Vestas Wind Systems A/S, Arhus, Denmark; Michal Sztykiel, Department of Energy Technology, Aalborg University, Aalborg, Denmark

16 **Simulation model Efficiency Comparison of Phase-Displaced Modulation of Modular Multilevel Converter,** P.C. Kjaer*, L. Helle*, S.K.Chaudhary**
* Vestas Wind Systems A/S, Denmark ** Aalborg University, Denmark

27 **Low Voltage Fault Ride through for offshore wind farms with MMC-HVDC Connection,** S. K. Chaudhary*, U. Gnanarathna**, R. Teodorescu*, A. M. Gole**
*Department of Energy Technology, Aalborg University, Aalborg, Denmark
**University of Manitoba, Winnipeg, Canada

Topic 4: Grid connection and compliance of wind power

10 **The Comparison of Polish Grid Codes to Certain European Standards and resultant Differences for WPP Requirements,** Wojciech Jarzyna, and Piotr Lipnicki, Department of Electrical Drive Systems and Electrical Machines, Lublin University of Technology, Poland

22 **Assessment-Based Flux Trajectory Optimization for Offshore Line-Side and Machine-Side Converters,** Daniel Meyer and Carsten Heising, Avasition GmbH, Dortmund, Volker Staudt and Andreas Steimel, Ruhr-University Bochum

37 **Flexible Arrangement of Static Converters for Grid Connected Wind Energy Conversion Systems,** Felipe B. Grigoletto and Humberto Pinheiro, Power Electronics and Control Research Group, Federal University of Santa Maria, RS, Brazil

38 **The Transition Process of Wind Turbine Based on a Squirrel-Cage Induction Generator When Voltage Sag And Its Low Voltage Ride-Through Method,** Xiangwu Yan, Zheng Chen, Liming Yang, Yuzhao Liang, State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University

39 **Grid Code Compliance in MTDC Networks,** R. Teixeira Pinto, P. Bauer, Technische Universiteit Delft, The Netherlands

Topic 5: Reliability of the Electrical Parts of Wind Energy Systems

2 **Modelling lifetime of high power press-pack IGBTs used in wind turbines,** Cristian Busca, Remus Teodorescu, Dept of Energy Technology, Aalborg University, Denmark

11 **Reliability Evaluation on Wind Farm considering Electrical and Transmission system Layouts**, Je Seok Shin, Seung Tae Cha and Jin O Kim, Hanyang University, Seoul, Korea

34 **Optimal Maintenance Strategy for Wind Turbine Considering Fault Tree Analysis and Maintenance Cost,** Yun Seong Lee, Seung Tae Cha and Jin O Kim, Hanyang University, Seoul, Korea

Topic 7: Energy storage for wind power integration

4 **Integration of an Energy Storage System into a Wind Energy Conversion System,** S. Grunau and F.W. Fuchs, Institute for Power Electronics and Electrical Drives, Christian-Albrechts-University of Kiel, Germany

9 **Li-Ion Energy Storage – SIESTORAGE,** Karsten Rechenberg, Peter Eckert, Jean-Philippe Macary, Infrastructure & Cities Low & Medium Voltage Solutions, Siemens AG

17 **Characterization of LifePO_4, batteries for dynamical and lifetime modeling using EIS technique,** Daniel-Ioan Stroe, Maciej Swierczynski, Ana-Irina Stan, Remus Teodorescu, Dept of Energy Technology, Aalborg University

Topic 8: Future Trends of Wind Energy Conversion and Power Electronic Applications

21 **Environmental impacts of intermittent wind energy systems,** S. Rangaraju, M. Messagie, J. Sanfélix, N. Sergeant, J. Van Mierlo, Mobility Logistics and Automotive Technology Research Centre (MOBI), Vrije Universiteit Brussel, Belgium

29 **Distributed Power Flow Control based Petri Nets for Micro Wind Generation,** Harold Rene Chamorro Vera, Universidad de los Andes, Bogota, Colombia

15h30 – 16h00: Coffee break in Foyer

16h00 – 17h40: Lecture session 3: (Room): Reliability

Chair: TBD

51 **Reliability Target's Setting and Follow up on Field Failures,** Mr. Peter de Place Rimmen, Reliability Specialist, Danfoss Power Electronics A/S, Denmark

6 **Nonlinear Damage Accumulation for Inverter Lifetime Prediction**, Hui Huang, School of Engineering, University of Warwick, Coventry, UK

15 **Power Electronics for Wind Turbines – Designing for reliability**, L. Helle, T. Abeyasekera, T. Lundgren, P. C. Kjaer Vestas Wind Systems A/S, Denmark

33 **Life Assessment Methodology for Wind Turbine Power Conversion Building Blocks**, Peter Hansen, Sr. Mechanical Engineer, Victor Donescu, Chief Specialist Converter Development, Vestas Technology R&D Americas Inc., USA, & Lars Helle, Specialist Energy Systems Vestas Technology R&D, Denmark

35 **Transformers internal voltage stress during current interruption in wind farm collection grids**, Tarik Abdulahovic & Torbjörn Thiringer , Chalmers University of Technology, Gothenburg, Sweden

18h00 – … : Gala Evening

Friday 29 June 2012

9h00 – 9h40: Lecture session 4: Keynote (Room): TBD

Chair: Colin Oates, Alstom Grid
Co-chair: Philip Kjaer, Vestas

Keynote 3: **Offshore wind + DC**, Jef Beerten / Phillipe Adam, Secretary of CIGRE WG B4-58 / University of Leuven, Convenor of WG B4-56/ RTE

Keynote 4: **MMC for HVDC**, Claes Scheibe, ALSTOM Grid Vice President of Strategy, Innovation and Development

9h40 – 11h00: Lecture session 5: (Room): Wind energy conversion

Chair: Torbjörn Thiringer, Chalmers University of Technology, Göteborg, Sweden

7 **A New High Power Multiphase Permanent Magnet Generator for Offshore Wind Turbine Applications Supplied by PWM Converters**, Julien Sauter, Régis Peron, Stéphane Mouty, Abdollah Mirzaïan, Franck Terrien, GE Energy Power Conversion, France

18 **Dead-beat control strategy of circuiting-current in three-phase PWM converter of parallel connection**, Zhang xueguang & Xu Dianguo School of Electrical and Engineering in Harbin Institute of Technology, Harbin,China

26 **An Innovative Bidirectional Isolated Multi-Port Converter with Multi-Phase AC Ports and DC Ports**, F. Jauch, J. Biela, Laboratory for High Power Electronic Systems, ETH Zurich, Switzerland

31 **High Reliable Multilevel Converter Topologies for a 10 MW, 100 kV Transformer-less Modular Offshore Wind Generator system**, Tore Martin Iversen, Sverre S. Gjerde, Tore Undeland, Norwegian University of Science & Technology, Trondheim, Norway

11h00 – 11h30: Coffee break (Foyer)

11h30 – 12h10: Lecture session 6: (Room): Energy Storage & Power Plants

Chair: Sarath Tennakoon, Stafford University of Technology, UK

19 **Selection and impedance based model of a lithium ion battery technology for integration with Virtual Power Plant**, Maciej Swierczynski*, Daniel–Ioan Stroe*, Ana-Irina Stan*, Remus Teodorescu*, Henrik Vikelgaard**
*Department of Energy Technology, Aalborg University, Denmark
** Vestas Wind Systems A/S, Denmark

14 **Lem Kær Demonstrator - A view on Virtual Power Plant Concept**, Florin Iov, Philip Carne Kjær, Vestas Wind Systems A/S

12h10 – 12h30: Closing session (Room):

Chair: Remus Teodorescu
Co-chair: Philip Kjaer

12h30 - 14h00: Lunch (Room)

14h00 - 17h00: Tutorial

Multilevel Converter Technology for HVDC applications, Staffan Norrga, KTH, Stockholm, Sweden and Lennart Harnefors, ABB, Sweden

12h30 – 17h30: Technical visit

Chair: Lars Helle
Visit to Vestas