Socio-political acceptance of wind energy in Europe: Reconfiguring EU-National regimes for a more collaborative energy transition

Pons-Seres de Brauwer, C., PhD Student, Department of Wind Energy
Clausen, N., Main Supervisor
Tolnov Clausen, L., Supervisor
01/09/2019 → 31/08/2022
Project: PhD

Multi-scale turbulence modeling for CFD wake simulations

Baungaard, M. C., PhD Student, Department of Wind Energy
Kelly, M. C., Main Supervisor
van der Laan, P., Supervisor
01/09/2019 → 31/08/2022
Project: PhD

HYBRIDize: Project Optimized Design and Operation of Hybrid Power Plant

The vision of HYBRIDize is to create new knowledge, methods and tools for large grid-connected renewable hybrid power plant (HPP) to provide value not only to the project partners but also to the society in large, after completion of the project. HYBRIDize is an Indo-Danish project aiming toward design and operation of large grid-connected HPP consisting of wind turbines (WT), solar photovoltaic (PV) and battery energy storage systems (BESS).

Objectives of HYBRIDize are
i) minimize levelized cost of energy (LCOE) and levelized cost of storage (LCOS);
ii) maximize profit for HPP.

HYBRIDize is funded by Innovation Fund Denmark (IFT) and the Indian Department of Science and Technology (DST)
Serensen, P. E., Project Manager, Integration & Planning, Department of Wind Energy
Das, K., Project Coordinator, Integration & Planning, Department of Wind Energy
Cavar, D., Project Participant, Resource Assessment Modelling, Department of Wind Energy
Hansen, A. D., Project Participant, Integration & Planning, Department of Wind Energy

Contract ID: IFD 8127-00015B
01/05/2019 → 30/04/2022
Keywords: Hybrid power plant, wind, solar, storage
Nature of activity type: Research

IEC 61400-50-3: Nacelle mounted lidar for wind measurements

Wagner, R., Project Coordinator, Department of Wind Energy
01/09/2017 → 31/12/2020
Keywords: nacelle lidars, standard, calibration, classification, uncertainty
Nature of activity type: Other

PowerKey - Enhanced Wind Turbine Control for Optimized Wind Power Plant Operation

Lu, L., Project Participant, Integration & Planning, Department of Wind Energy
01/01/2018 → 30/06/2020
Nature of activity type: Research

Determination of site specific remaining life of wind turbines

Mozafari, S., PhD Student, Department of Wind Energy
Natarajan, A., Main Supervisor
Stolpe, M., Supervisor
01/05/2019 → 30/04/2022
Project: PhD

Estimation of wind resources in complex terrain based on short scanning lidar time series and meterological modeling

Svensson, E., PhD Student, Department of Wind Energy
Wagner, R., Main Supervisor
WindScanner: WindScanner.eu - The European WindScanner Research Infrastructure

WindScanner is a distributed Research Infrastructure for atmospheric boundary-layer experimental research in wind and turbulence fields for wind energy.

WindScanner builds upon recent advances in remote-sensing-based technology developed on ground-based scanning wind lidars, able to measure and quantify the atmospheric wind fields and turbulence aloft. As well as being deployed onshore, the infrastructure can be operated offshore from stable and floating platforms or by doing measurement of near-coastal wind farms. WindScanner provides unique services for the scientific community and wind industry, a one-point of entry and a joint access programme, joint R&D development activities, joint training and educational programme, stable and effective management and a strategic approach for planning and implementing measurement campaigns in Europe. In the ESFRI Roadmap since 2010, WindScanner is in the Interim Phase and has indicated the European Research Infrastructures Consortium (ERIC) as the legal form for the future.

Mikkelsen, T. K., PI, Department of Wind Energy, Meteorology & Remote Sensing
01/06/2010 → 01/03/2020
Project: Research

3D Shape and Aero-elastic Optimization of Wind Turbine Rotors
Dicholkar, A. C., PhD Student, Department of Wind Energy
Zahle, F., Main Supervisor
McWilliam, M., Supervisor
Sørensen, N. N., Supervisor
01/01/2019 → 31/12/2021
Project: PhD

Positioning of Danish offshore wind farms until 2030 – using Levelized Cost of Energy (LCoE)

An investigation on how to rank new offshore wind farm positions in Danish waters until 2030 has been undertaken at the Department of Wind Energy.

The metric for ranking the offshore wind farms is the Levelized Cost of Energy and a model has been formulated to use transparent input cost information from the offshore wind energy sector.

The study was done as a master project with Gyde Liane Ohlsen as principle investigator and Senior Researcher Niels-Erik Clausen and Senior Researcher Asger Bech Abrahamsen as main and co-supervisor respectively.

Abrahamsen, A. B., Supervisor, Wind Turbine Structures and Component Design, Department of Wind Energy
Clausen, N., Main Supervisor, Integration & Planning, Department of Wind Energy
Ohlsen, G. L., PI
28/08/2018 → 07/02/2019
Keywords: Offshore wind energy, Denmark, Levelised cost of energy, LCoE, Period 2019-2030
Nature of activity type: Dissertation project
Documents:
MScThesisDefense_GydeOhlsen_revised_03-2019
MScThesisReport_GydeOhlsen_revised_03-2019
LCoEMapDanishWaters_FID2021_Vestas8MW_Ohlsen2018
DevelopmentLCoEDanishWatersUntil2030_Ohlsen2018
DevelopmentLCoEDanishWatersUntil2030AndElectricityPricePrediction_Ohlsen2018
Project: Research

MEWA: Multi-scale and model-scale evaluation of wind atlases

MEWA has two main research-specific objectives: a) to investigate how to best couple meso- and micro-scale models for improving predictions of wind resources and b) to investigate the impact of climate variability and changes in surface characteristics and land cover on wind resources.

MEWA aims at establishing a verified methodology for the coupling of meso- and micro-scale models that provides accurate and precise estimates of wind resources over complex topographies and climatographies. Further, MEWA aims, for the first time, at estimating the impact of climate variability on wind resources using multi-scale modelling. The results of MEWA will be implemented in tools for wind resource mapping that are used and developed by DTU Wind Energy for
wind turbine siting all over the world. Lastly, MEWA aims at strengthening the relations between research centers in Denmark and Mexico, and their research capacity.

The project began on 01.04.2018 and will run for three years until 31.03.2021
Peña, A., PI, Department of Wind Energy, Meteorology & Remote Sensing
Hahmann, A. N., Project Participant, Resource Assessment Modelling , Department of Wind Energy
Floors, R. R., Project Participant, Resource Assessment Modelling , Department of Wind Energy
01/04/2018 → 31/03/2021
Keywords: Climate change, Coupling, Mesoscale, Microscale, Wind Resources
Nature of activity type: Research
Collaborators: Tecnologico de Monterrey, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada
Documents:
Inventory of datasets of atmospheric flow simulations and observations
Inventory of models employed in the simulation of mean wind patterns and their variability
Project: Research

Development of the next-generation engineering aerodynamic models for wind turbine rotors
Li, A., PhD Student, Department of Wind Energy
Gaunaa, M., Main Supervisor
Aagaard Madsen , H., Supervisor
Pirrung, G., Supervisor
01/01/2019 → 31/12/2021
Project: PhD

Structural Damage Prediction of Full-Scale Wind Turbine Blades Under Fatigue Loading
Erives Anchondo, R. I., PhD Student, Department of Wind Energy
Branner, K., Main Supervisor
Castro Ardila, O. G., Supervisor
15/01/2019 → 14/01/2022
Project: PhD

TrueWind: TrueWind
The project objective is to increase the accuracy in wind measurements of cup anemometry using state-of-the-art remote-sensing technology in wind tunnel and free field environments. TrueWind will contribute to three significant commercial exploitations and a technological achievement:

Very short range wind lidar (lidic) calibration capability installed in the wind tunnels of Svend Ole Hansen ApS, and studies on tunnel boundary and turbulence influence on calibration holds potential for a substantial reduction in measurement uncertainty resulting in an increased global calibration market share, partly in Danish wind tunnels, partly in US based wind tunnels.

Improvement of WindSensor ApS cup anemometers, will ensure world's best classification for wind resource assessment and power performance verification and will result in increased global market share.

Commercialisation of lidic wind measurement equipment for wind tunnel applications by Dantec Dynamics A/S, will supplement a world leading LDA portfolio for wind tunnel measurement equipment and maintain global leadership in accurate wind tunnel measurement equipment.

An open field calibration facility at DTU Risø campus, based on a short range wind scanner with 3 lidic’s, will be developed to verify and improve a cup anemometer model used in the IEC61400-12-1 standard classification, and demonstration of the free field calibration facility capabilities will maintain technological leadership in DTU lidar technology.

Wagner, R., Project Manager, Meteorology & Remote Sensing, Department of Wind Energy
Courtney, M., Project Participant, Test and Measurements, Department of Wind Energy
Pedersen, T. F., Project Participant, Department of Wind Energy
Rolighed Thorsen, G., Project Participant, Test and Measurements, Department of Wind Energy
Pedersen, A. T., Project Participant, Test and Measurements, Department of Wind Energy
Dellwik, E., Project Participant, Meteorology & Remote Sensing, Department of Wind Energy
Mikkelsen, T. K., Project Participant, Meteorology & Remote Sensing, Department of Wind Energy
Sjöholm, M., Project Participant, Meteorology & Remote Sensing, Department of Wind Energy
01/01/2016 → 31/10/2019
Keywords: cup anemometer, lidar, LDA, wind tunnel
Nature of activity type: Research
Project: Research
Advanced Integrated Supervisory and Wind Turbine Control for Optimal Operation of Large Wind Power Plants

TotalControl is a project led by DTU within the Horizon2020 framework funded by the European Union, project number 727 680. The total budget is 4876482.5 EUR.

The ambition of the TotalControl project is to develop the next generation of wind power plant (WPP) control tools, improving both WPP control itself and the collaboration between wind turbine (WT) and WPP control. To do this, TotalControl will use high-fidelity simulation and design environments that include detailed time resolved flow field modelling, nonlinear flexible multi-body representations of turbines, and detailed power grid models.

Lu, L., Project Participant, Integration & Planning, Department of Wind Energy
01/01/2018 → 31/12/2021
Project: Research

VirtuelGalathea 3 Jubilee
E-learning material at www.virtuelgalathea3.dk

The material is based on the global research ship expedition Galathea 3 during years 2006 and 2007. Experienced teachers have produced the learning material in close contact with the researchers from 50 research projects and made it into 100 educational projects. The material is mainly cross-disciplinary with natural and technical sciences involved. The material is freely available since year 2008.

At the time of writing 920,000 users have used the educational material. The success criterium for the VirtuelGalathea3 Jubilee is to reach 1,000,000 users.

The VirtuelGalathea3 Jubilee builds on novel research results obtained by the Galathea researcher in the years following the expedition.

Previous Fundings include Egmont Fonden, Udlodningsmidler from Ministry of Education and funding from the Danish Galathea 3 expedition.

Hasager, C. B., PI, Department of Wind Energy, Meteorology & Remote Sensing
01/01/2018 → 30/06/2020
Nature of activity type: Teaching
Project: Research

EROSION - Wind Turbine Blade Erosion: Reducing the largest uncertainties

The objective of EROSION is to enable longer lifetime of wind turbine blades at multi-MW machines. To achieve the objective we will investigate leading edge erosion at wind turbine blades using rain erosion tester for selected blades and different rain input. Furthermore the rain in real atmosphere will be investigated from ground-based instruments (distrometers), modelling of rain based on radar data for new understanding of rain erosion climatology at relevant sites. Finally a new prototype instrument will be developed in order to measure rain at wind turbines for making decision on control, to set ‘erosion safe mode’ with regulation of turbines based on the assumption that lower tip speed during heavy rain event will enable much longer lifetime of wind turbine blades at multi-MW machines.

Hasager, C. B., Project Manager, Meteorology & Remote Sensing, Department of Wind Energy
Sørensen, B. F., PI, Composite Mechanics and Structures, Department of Wind Energy
Bech, J. I., Project Participant, Composite Materials, Department of Wind Energy
Kusano, Y., Project Participant, Composite Materials, Department of Wind Energy
Bak, C., Project Participant, Aerodynamic design, Department of Wind Energy
Skrzypinski, W. R., Project Participant, Aerodynamic design, Department of Wind Energy
Mikkelsen, T. K., Project Participant, Meteorology & Remote Sensing, Department of Wind Energy
Sjöholm, M., Project Participant, Meteorology & Remote Sensing, Department of Wind Energy
Faesser, S., Project Participant, Composite Mechanics and Structures, Department of Wind Energy
Mishnaevsky, L., Project Participant, Composite Mechanics and Structures, Department of Wind Energy
Nielsen, M., Project Participant, Resource Assessment Modelling, Department of Wind Energy
Tilg, A., Project Participant, Meteorology & Remote Sensing, Department of Wind Energy
01/04/2017 → 31/03/2020
Keywords: Rain erosion of wind turbine blade, life extension
Nature of activity type: Research
Project: Research
DIVOST-COM: Improved diurnal variability forecast of ocean surface temperature through community model development
Karagali, I., PI, Department of Wind Energy, Meteorology & Remote Sensing
01/04/2018 → 31/03/2020
Collaborators: Danish Meteorological Institute
Project: Research

Damage Tolerant Composite Materials for Wind Turbine Blades
Hottentot Cederløf, D. J., PhD Student, Department of Wind Energy
Serensen, B. F., Main Supervisor
Goutianos, S., Supervisor
McGugan, M., Supervisor
15/09/2018 → 14/09/2021
Project: PhD

Advanced modelling of floating wind turbine response
Madsen, F. J., PhD Student, Department of Wind Energy
Bredmose, H., Main Supervisor
Pegalajar-Jurado, A., Supervisor
01/11/2018 → 31/10/2021
Project: PhD

Advanced methods for blade MOnitoring UNder full-scale Testing (AMOUNT)
Belloni, F., PhD Student, Department of Wind Energy
Branner, K., Main Supervisor
Kann, J., Supervisor
Chen, X., Supervisor
01/09/2018 → 31/08/2021
Project: PhD

V52 Tower Top analysis and Wheatstone Bridge Signal Recreation
Meseguer Urban, A., PI, Department of Wind Energy, Wind turbine loads & control
Hansen, A. M., PI, Wind turbine loads & control, Department of Wind Energy
01/11/2017 → 20/12/2018
Documents:
V52_Tower_Top_Wheatstone Bridge
Project: Research

Advanced Test Methods and Generic Models for Wind Energy
Nouri, B., PhD Student, Department of Wind Energy
Serensen, P. E., Main Supervisor
Göksu, Ö., Supervisor
Offentlig finansiering
15/08/2018 → 14/08/2021
Award relations: Advanced Test Methods and Generic Models for Wind Energy
Project: PhD

Cluster supervisory control of large offshore wind power plants
Kavimandan, A., PhD Student, Department of Wind Energy
Cutululis, N. A., Main Supervisor
Das, K., Supervisor
Hansen, A. D., Supervisor
Marie Curie (EU-stipendium)
01/08/2019 → 31/07/2021
Award relations: Cluster supervisory control of large offshore wind power plants
Project: PhD

Enhanced Frequency Control Capabilities from Wind Turbine and Plant
Lu, L., PhD Student, Department of Wind Energy
NEWA : New European Wind Atlas

a New European Wind Atlas will be developed to be used as a standard for site assessment. The new Atlas, based on improved modelling competencies on atmospheric flow, together with the guidelines and best practices for the use of data, should become a key tool not only for manufacturers and developers, but also for public authorities and decision-makers, by reducing overall uncertainties in determining wind conditions.

Karagali, I., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Badger, M., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Vasiljevic, N., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Dellwik, E., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Menke, R., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Hahmann, A. N., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Badger, J., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Olsen, B. T., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Volker, P., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Davis, N., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Mann, J., Project Manager, Department of Wind Energy, Meteorology & Remote Sensing
De Azevedo Santos, P. A., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing

CEASELESS: Copernicus Evolution and Applications with Sentinel Enhancements and Land Effluents for Shores and Seas

H2020 project
Badger, M., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Larsen, X. G., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Du, J., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Karagali, I., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing

MARINET2: MARINET2

H2020 project
Badger, M., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Karagali, I., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Sempreviva, A. M., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Mikkelsen, T. K., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Bredmose, H., Project Participant, Department of Wind Energy, Fluid Mechanics
Madsen, F. J., Project Participant, Department of Wind Energy, Fluid Mechanics
Vasiljevic, N., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Svensson, E., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Salsnaja, A., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing

InnoWind: innovation for Global Wind Energy Exploitation on Land using Satellites

Funded by Innovation Fund Denmark
Badger, M., Project Manager, Department of Wind Energy, Meteorology & Remote Sensing
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Karagali, I., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Dellwik, E., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
**WASA3: Wind Atlas for South Africa (Phase 3)**

Capacity development and research cooperation through the development of wind resource mapping for the remaining parts of the Northern Cape Province and for the rest of South Africa.

- Phase 1 of the project ended in 2014.
- Phase 2 of the project ended in 2018.

**NESA: New Satellite Products for Wind Energy**

Karagali, I., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing

- Project Manager, Department of Wind Energy, Integration & Planning
- Project Participant, Department of Wind Energy, Meteorology & Remote Sensing

**WWAt: Satellite Wind and Wave Atlas**

The objective of WWAtlas is to create a service for quick and easy distribution of satellite-based wind and wave atlases using the existing Global Wind Atlas (GWA) map server and web interface.

**Advanced Wind Turbine Converter Control in HVDC-Connected Wind Power Plants**

Arasteh, A., PhD Student, Department of Wind Energy

- Cutululis, N. A., Main Supervisor
- Göksu, Ö., Supervisor

**DIVOST-COM: Improved Diurnal Variability of Ocean Surface Temperature through Community Modelling**

One of the 18 successful Copernicus Marine Service Evolution Call 2. The aim is to support and advance the provision of products from earth observation to the European citizens and support activities related to climate monitoring, risk and disaster management and mitigation.

- Project Participant, Department of Wind Energy, Meteorology & Remote Sensing

**Award relations:**

Advanced Wind Turbine Converter Control in HVDC-Connected Wind Power Plants

**Project:** PhD
Superconducting thin-film neutron detector
Jonas Bertelsen
Wulff, A. C., Project Participant, Department of Energy Conversion and Storage, Electrofunctional materials
Bertelsen, J. L., Project Participant, Technical University of Denmark
Abrahamsen, A. B., Project Participant, Department of Wind Energy, Wind Turbine Structures and Component Design
Kuhn, L. T., Project Participant, Department of Energy Conversion and Storage, Imaging and Structural Analysis
02/01/2018 → 20/06/2018
Keywords: Neutron detector, Superconducting thin film, Coated conductor, Thermal properties
Collaborators: Technical University of Denmark
Project: Research

LindebjergCO2: Lindebjergskolens CO2 fodaftryk
Projektet ”Lindebjergskolens CO2 fodaftryk” har som formål at skabe et undervisningsmateriale, der kan bruges i folkeskolen til at undervise i hvorfor CO2 er klades en drivhusgas og om de mulige løsninger på klimaudfordringerne med CO2 fra energiforsyning.
Forfatterne håber at materialer kan give inspiration til elever og lærer på Lindebjergskolen samt andre skoler i Roskilde kommune, som vil prøve at udregne deres CO2 fodaftryk. Vi modtager gerne CO2 fodaftryk udregninger som kan sammenlignes med Lindebjergskolens.
Abrahamsen, A. B., Project Participant, Department of Wind Energy, Wind Turbine Structures and Component Design
Thingstrup, T., Project Participant, Lindebjergskolen
Christensen, A., Project Participant, Lindebjergskolen
External Project ID: Klimafonden i Roskilde Kommune
01/10/2016 → 01/08/2017
Collaborators: Gundsølillehallen A.m.b.a, Lindebjergskolen
Documents:
LindebjergCO2fodaftryk_Abrahamsen_19April2018
Lindebjergskolens_CO2_fodaftryk_ABAbrahamsen25Sep2016_Opdateret_5Marts2018
LindebjergskolensCO2Fodaftryk_Energi_ForbrugSolVind&Varme_8Aug2016
EnergiFraVindMelleVedLindebjergskolen_SWP25kW_6Marts2018
Invitation LegDigKlog 18.4. 2018
Project: Research

Verification of Structural Properties for Bend-Twist Coupled Wind Turbine Blades
Tiedemann, M. M., PhD Student, Department of Wind Energy
Branner, K., Main Supervisor
Bode, J., Supervisor
Chen, X., Supervisor
Industrial PhD
01/03/2018 → 28/02/2021
Award relations: Verification of Structural Properties for Bend-Twist Coupled Wind Turbine Blades
Project: PhD

RECAST: RECAST: Reduced Assessment Time
Every wind farm project requires accurate resource assessments to evaluate the energy yield and profitability, but for projects in hilly, mountainous or forested areas the measurement campaigns can be lengthy and expensive. For such projects, RECAST aims to reduce the measurement time by up to 50%, increase the bankability through increased accuracy and improve the annual energy production through optimised wind farm layout design. RECAST will reach these goals by use of modern but presently commercially immature scanning lidars (WindScanner) instead of conventional met masts. By combining lidar measurements with numerical flow models, RECAST will reduce measurement time without sacrificing accuracy, or if desired instead, achieve higher accuracy for the same campaign duration.
RECAST has the following objectives:
1. to increase the technology readiness level of the WindScanner system to a user-friendly instrument;
2. to integrate multi-point measurements in the WASP microscale flow model;
3. to develop a decision tool that helps the wind farm developer choose the measurement campaign that best suits his needs.
At the end of the project, the RECAST method, combining all three items, will have been proven and demonstrated at a new wind farm site and is expected to be ready for commercialisation shortly after that.
Bechmann, A., Project Manager, Department of Wind Energy, Resource Assessment Modelling
Réthoré, P., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Badger, J., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Floors, R. R., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Nielsen, M., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Hahmann, A. N., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Vasiljevic, N., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Courtney, M., Project Participant, Department of Wind Energy, Test and Measurements
Vignaroli, A., Project Participant, Department of Wind Energy, Test and Measurements
Zamanbin, A., Project Participant, Department of Wind Energy, Test and Measurements
Peña, A., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
De Azevedo Santos, P. A., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Wagner, R., Project Manager, Department of Wind Energy, Meteorology & Remote Sensing
Svensson, E., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
01/02/2018 → 01/03/2020
Project: Research

Blackstart and Islanding Capabilities of Wind Turbines
Jain, A., PhD Student, Department of Wind Energy
Cutululis, N. A., Main Supervisor
Das, K., Supervisor
Göksu, Ö., Supervisor
Marie Curie (EU-stipendium)
01/02/2018 → 31/01/2021
Award relations: Blackstart and Islanding Capabilities of Wind Turbines
Project: PhD

CASMaT: Villum Center for Advanced Structural and Material Testing
Stang, H., Project Manager, Department of Civil Engineering, Section for Structural Engineering
Kleis, C., Project Participant, Department of Civil Engineering
Mikkelsen, L. P., Project Participant, Department of Wind Energy
Serensen, B. F., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Toftegaard, H. L., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Berggreen, C., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Branner, K., Project Participant, Department of Wind Energy, Wind Turbine Structures and Component Design
Michel, A., Project Participant, Department of Civil Engineering, Section for Structural Engineering
Andreassen, M. J., Project Participant, Department of Civil Engineering, Section for Structural Engineering
Luczak, M., Project Participant, Department of Wind Energy, Wind Turbine Structures and Component Design
Chen, X., Project Participant, Department of Wind Energy, Wind Turbine Structures and Component Design
Bjørnbak-Hansen, J., Project Participant, Department of Civil Engineering, Section for Structural Engineering
Legarth, B. N., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Waldbjørn, J. P., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Bangaru, A. K., PhD Student, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Money, A., PhD Student, Department of Mechanical Engineering, Solid Mechanics
Quinlan, A., PhD Student, Department of Civil Engineering, Section for Structural Engineering
07/11/2017 → …
Project: Research

Fluid Structure Interaction for Wind Turbines in Atmospheric Flow
Grinderslev, C., PhD Student, Department of Wind Energy
Sørensen, N. N., Main Supervisor
Horcas, S. G., Supervisor
Hansen, A. M., Supervisor
Technical University of Denmark
01/01/2018 → 31/12/2020
Award relations: Fluid Structure Interaction for Wind Turbines in Atmospheric Flow
Project: PhD

Wind turbine load validation under wake conditions using Doppler lidar
Conti, D., PhD Student, Department of Wind Energy
Dimitrov, N. K., Main Supervisor
Peña, A., Supervisor
New industrial paradigm for design of wind turbine blades - tip and root optimization for increasing power performance

Industrial PhD
Bak, C., Main Supervisor, Department of Wind Energy, Aerodynamic design
Zahle, F., Supervisor, Department of Wind Energy, Aerodynamic design
15/09/2017 → 14/09/2020

MaRINET2: Marine Renewable Infrastructure Network for Enhancing Technologies 2
Integrating activities planned under MaRINET 2 build upon the achievements of the advanced community created in MaRINET FP7. MaRINET 2 will ensure the continued integration and enhancement of all leading European research infrastructure and facilities specialising in research, development and testing of offshore renewable energy systems including electrical sub systems and grid integration through a range of TRLs (1-7).

IRPWIND: Integrated Research Programme in Wind Energy
X-WiWa: Extreme winds and waves for offshore turbines - Coupling atmosphere and wave modeling for design and operation in coastal zones

X-WiWa project was motivated by Denmark's long term vision for offshore wind energy and the many technical and scientific challenges in existing methodologies for assessing the design parameters, for both winds and waves. X-WiWa succeeded in developing a most up-to-date modeling system for wind modeling for offshore wind farms. This modeling system consists of the atmospheric Weather Research and Forecasting (WRF) model, the wave model SWAN and an interface the Wave Boundary Layer Model WBLM, within the framework of coupled-ocean-atmosphere-wave-sediment transport modeling system COAWST (Hereinafter the WRF-WBLM-SWAN model). WBLM is implemented in SWAN, and it calculates stress and kinetic energy budgets in the lowest atmospheric layer where the wave-induced stress is introduced to the atmospheric modeling. WBLM ensures consistent calculation of stress for both the atmospheric and wave modeling, which was considered a major improvement to previous attempts in the literature. This methodology thus provides an option to avoid the parametrization of an often used interface parameter, the roughness length. Many parametrization schemes for the roughness length have brought diverse estimates and associated uncertainties to the modelled wind speed. Data validation using measurements from the Baltic Sea and North Sea around Denmark suggests that the coupled modeling system WRF-WBLM-SWAN outperforms the non-coupled, no-wave, WRF modeling of wind; an improvement by 10% or more is present at strong winds, which can affect the choice of the offshore wind turbine type. X-WiWa examined various methodologies for wave modeling. The offline coupling system using atmospheric data such as WRF or global reanalysis wind field to the MIKE 21 SW model has been improved with considerations of stability, air density, currents and new wind drag relations. X-WiWa suggests that, implementation of an online coupling technology does not necessarily provide better estimation of the waves, if the physics have not been properly described. This is supported by the comparisons of the modeled wave data between offline MIKE 21 SW modeling and the WRF-WBLM-SWAN modeling. The two provide comparably good wave calculations for coastal areas but the latter underestimates the wave height for far offshore areas, which is speculated to be related to the dissipation description in the wave source functions, where further improvement is seen necessary.

X-WiWa puts modeling efforts on storms that are defined to be contributors to the extreme wind and extreme significant wave height through the annual maximum method. Thus for 23 years from 1994 to 2016, 429 storm days are simulated for the extreme wind, and for 1994 to 2014, 932 storm days are simulated for the extreme significant wave height. The 50-year winds at 10 m, 50 m and 100 m over the waters around Denmark are calculated and validated and agreement is satisfactory. The 50-year significant wave height for the Danish waters and surrounding North Sea and Baltic Sea are presented from the online and offline systems. The modeling systems, data, analysis, results and publications are introduced and provided on www.xwiwa.dk. These outputs are expected to be useful for general offshore wind and wave applications such as Operation and Maintenance, Forecasting, and Design.

Larsen, X. G., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Du, J., Project Participant, Department of Wind Energy, Resource Assessment Modelling
OffshoreWake: Large scale offshore wake impact on the Danish power system
ForskEL project from 2017: Offshore wind farm clusters are expanding. Considering the expected capacity on the order of 1 – 2 GW, it is important to understand wind power variability caused by neighbouring large wind farm wake (WFW) impact. Here we integrate calculation of WFW and important sea surface conditions to one modeling system to dynamically calculate the flow inside and around the wind farm clusters, as input to power calculation. The outputs serve farm planning and forecasting.

Kenya Miniwind: Supporting sustainable mini-grid development and local production of wind turbines using the case of Kenya
With the long-term objective to reduce poverty, stimulate economic growth and increased sustainable energy supply, the project aims to develop a market for low-cost, partly locally produced kW wind turbines for rural electrification. The project will demonstrate the technical, social and economic feasibility of integrating a kW wind turbine into a smart solar-powered mini-grid in Kenya, and aims to develop this concept into a viable business for the private companies involved, having the technical, economic and management capacity to exploit it.

The expected long term impact of the project are (i) local jobs in production, installation, O&M of low cost kW turbines in mini-grids; and (ii) reduced cost of electricity provided by minigrids, benefitting disadvantaged communities. The project will bring together communities, public institutions and commercial companies.


**TENTRANS: Tendering sustainable energy transitions**

The overall objective of the project is to contribute to a transition toward sustainability in the energy sector of emerging economies, including sustainable development of local communities and local industries. The project will analyse the developmental implications of the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) implemented in South Africa (SA) with a focus on the effects of wind power projects on local industrial development and socioeconomic development in local communities. The project will contribute to enhance the research capacity of the younger researchers involved. It will build upon and contribute to significantly advance the literature on sustainability transitions in developing countries through an innovative combination of complementary perspectives on institutional change, global value chains and infant industry development. It will draw on in-depth fieldwork carried out in SA based on qualitative research methods, such as interviews, documents, direct observations and project inventories. Through direct engagement with key policy makers and stakeholders, the project will seek to ensure that local developmental impacts are prioritized and ensured in renewable energy tendering schemes currently being implemented in SA, other countries in Sub-Saharan Africa (SSA) and internationally.

The project will contribute to socially inclusive models of implementation by private companies involved in large-scale wind power projects by cooperating with the wind industry associations in Denmark and SA and through direct consultations. Finally, the project serves as a pilot research for a subsequent five year research programme, which will be up-scaled to include solar PV, concentrated solar power (CSP) and hydro-power, and additional countries in SSA, such as Ethiopia, Kenya, Ghana and Malawi.

**WFCT: Wind Farm Control Trials**

Offshore demonstration project of wind farm control optimisation (induction & wake steering)

Simon, E., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology & Remote Sensing
Giebel, G., Project Participant, Department of Wind Energy, Integration & Planning
Kazda, J., Project Participant, Department of Wind Energy, Integration & Planning
Cutululis, N. A., Project Participant, Department of Wind Energy, Test and Measurements

Keywords: wake steering, windfarm control, scanning lidar, optimization

Project: Research

**Fatigue behaviour of polymer matrix at the microstructural scale**

Bangaru, A. K., PhD Student, Department of Wind Energy
Sørensen, B. F., Main Supervisor
Legarth, B. N., Supervisor
Michel, A., Supervisor
Mikkelsen, L. P., Supervisor
Technical University of Denmark

01/11/2017 → 31/10/2020

Award relations: Fatigue behaviour of polymer matrix at the microstructural scale
Project: PhD

**Large scale atmospheric stuctures in space-time over flat terrain**

Alcayaga Román, L. A., PhD Student, Department of Wind Energy
Larsen, G. C., Main Supervisor
Kelly, M. C., Supervisor
**SmartTip: Smart Tip**

We will design innovative rotor blade tips for wind turbines with the objectives to increase Annual Energy Production by 8% without exceeding the load envelope, reduce noise, reduce performance degradation, reduce costs and make turbines more adaptable for site-specific conditions. The goal is ambitious, yet looking at all the diversity in wing tip design in both aerospace and nature, it is obvious this area has a huge potential for innovation. The tip region for wind turbines produces the most energy, loads and noise. Yet, it has not received focused attention because the complex flow conditions require sophisticated high-fidelity simulations. DTU wind energy will apply high-fidelity surrogate based optimization, wind tunnel and mechanical testing to develop multiple innovations. Siemens will field test the most promising concept. The Siemens development pipeline for tip innovations will be primed. The new competencies created will allow Siemens to improve turbines for years to come.

Barlas, A., Project Manager, Department of Wind Energy, Aerodynamic design
McWilliam, M., Project Participant, Aerodynamic design, Department of Wind Energy
Horcas, S. G., Project Participant, Aerodynamic design, Department of Wind Energy
Zahle, F., Project Participant, Aerodynamic design, Department of Wind Energy
Verelst, D. R., Project Participant, Wind turbine loads & control, Department of Wind Energy
Pirrung, G., Project Participant, Wind turbine loads & control, Department of Wind Energy
Ramos Garcia, N., Project Participant, Fluid Mechanics, Department of Wind Energy
Castro Ardila, O. G., Project Participant, Wind Turbine Structures and Component Design, Department of Wind Energy
Løgstrup Andersen, T., Project Participant, Composite Materials, Department of Wind Energy

External Project ID: IFD Grand Solutions 7046-00023B
01/12/2017 → 30/11/2020

Keywords: wind turbine, tip extension, surrogate based optimization, high fidelity aeroelastic modelling

Collaborators: Siemens A/S

Documents:
Press release
Project: Research

**INDUFLAP2: Full scale demonstration of an active flap system for wind turbines**

The overall objective of the project is to demonstrate the system integration, the functioning, the performance and the value of an active flap system by full scale turbine tests. A further objective is to establish a detailed risk assessment of the system and a well described business case for the application of the system.

Aagaard Madsen, H., Project Manager, Department of Wind Energy, Aerodynamic design
Barlas, A., Project Participant, Department of Wind Energy, Aerodynamic design

External Project ID: EUDP J.nr. 64015-0069
01/07/2015 → 30/06/2018

Project: Research

**Rain climate and erosion of wind turbine blades**

Tilg, A., PhD Student, Department of Wind Energy
Hasager, C. B., Main Supervisor
Veien, F., Supervisor
Technical University of Denmark
15/10/2017 → 14/10/2020

Award relations: Rain climate and erosion of wind turbine blades
Project: PhD

**VVMPlus: Offentlig accept af VE teknologier (public acceptance of RE Technologies)**

Backup from the local communities is essential for the expansion of renewable energy (RE) in Denmark – a key condition for the country to reach its climate goals.

Although the Danes generally support the green transition, actual plans to establish RE facilities are often met with local resistance, resulting in project delays. Local communities are often worried about how the new facility will impact their local area.

Environmental Impact Assessments (EIA) – a central instrument

In Denmark, the EIA is an important and well-established tool for evaluating and reducing environmental and social risks of larger construction projects. EIAs include technical analyses as well as public hearings in the local community.

However, there is a need to change the way social impacts are evaluated and discussed in the context of RE projects. Researchers and practitioners agree that this may often be vital in facilitating local communities to embrace RE.
Key project objectives
The project's direct objective is to develop knowledge and tools enabling professionals to:
1) Elucidate and address social impact of RE facilities, and
2) Facilitate a constructive dialogue with local citizens about possible social impacts.
A thorough and systematic elucidation of social impacts will provide a better basis for constructive dialogue with the local communities.
For example, this will enable the professional team to integrate approaches that minimize or compensate for negative impacts early in the planning process. In addition, developers and consultants will have better options for highlighting and strengthening positive social impacts.
Our thesis is that a systematic and proactive approach to social impacts in the planning phase will lead to enhanced local support to RE projects.
Clausen, N., Project Participant, Department of Wind Energy, Integration & Planning
Rudolph, D. P., Project Participant, Department of Wind Energy
Project ID: ForskEl
01/04/2016 → 31/12/2017
Keywords: Social impact assessment, EIA process, Renewable energy
Collaborators: Aalborg University, Nordic folkecenter for renewable energy
Project: Research

Performance optimization of wind farms using model-based data analysis
Schröder, L., PhD Student, Department of Wind Energy
Dimitrov, N. K., Main Supervisor
Mirzaei, M., Supervisor
Sørensen, J. A., Supervisor
Verelst, D. R., Supervisor
Technical University of Denmark
01/10/2017 → 30/09/2020
Award relations: Performance optimization of wind farms using model-based data analysis
Project: PhD

Characterization of wind turbine siting parameters in complex terrain using remote sensing
De Azevedo Santos, P. A., PhD Student, Department of Wind Energy
Mann, J., Main Supervisor
Vasiljevic, N., Supervisor
Samfinansierede - Virksomhed
01/10/2017 → 30/09/2020
Award relations: Characterization of wind turbine siting parameters in complex terrain using remote sensing
Project: PhD

New industrial paradigm for design of wind turbine blades - tip and root optimization for increasing power performance
Lønbæk, K., PhD Student
Bak, C., Main Supervisor, Department of Wind Energy
Madsen, J. I., Supervisor
Zahle, F., Supervisor, Department of Wind Energy
Lenięk, K., PhD Student, Department of Wind Energy
Industrial PhD
15/09/2017 → 14/09/2020
Award relations: New industrial paradigm for design of wind turbine blades - tip and root optimization for increasing power performance
Project: PhD

Advanced meteorological modeling across scales
Imberger, M., PhD Student, Department of Wind Energy
Larsen, X. G., Main Supervisor
Davis, N., Supervisor
Samfinansieret - Andet
15/09/2017 → 14/09/2020
Award relations: Advanced meteorological modeling across scales
Project: PhD

High Reynolds Number Rotor Aerodynamics and Design
Kiefer, J., PhD Student, Department of Wind Energy
Hansen, M. O. L., Main Supervisor
Bak, C., Supervisor
Hultmark, M., Supervisor
Technical University of Denmark
01/09/2017 → 05/10/2020
Award relations: High Reynolds Number Rotor Aerodynamics and Design
Project: PhD

Design and optimization of electrical infrastructures in offshore wind power clusters
Pérez-Rúa, J., PhD Student, Department of Wind Energy
Cutilulis, N. A., Main Supervisor
Das, K., Supervisor
Sørensen, P. E., Supervisor
Stolpe, M., Supervisor
Forskningsrådssfinansiering
15/05/2017 → 14/05/2020
Award relations: Design and optimization of electrical infrastructures in offshore wind power clusters
Project: PhD

SARP: Security Assessment of Renewable Power Systems
Jóhannsson, H., Project Coordinator, Department of Electrical Engineering, Center for Electric Power and Energy, Electric Power Systems
Sørensen, P. E., Project Participant, Department of Wind Energy, Integration & Planning
Karatas, B. C., PhD Student, Department of Electrical Engineering, Center for Electric Power and Energy, Electric Power Systems
Sarkar, M., PhD Student, Department of Wind Energy, Integration & Planning
Jørgensen, C. H. L., PhD Student, Department of Electrical Engineering, Center for Electric Power and Energy, Electric Power Systems
01/04/2016 → 31/03/2020
Project: Research

An experimental assessment of how trees affect the wind field
Angelou, N., PhD Student, Department of Wind Energy
Dellwik, E., Main Supervisor
Mann, J., Supervisor
01/04/2017 → 31/03/2020
Award relations: An experimental assessment of how trees affect the wind field
Project: PhD

Ground clearance and power performance v2
The influence of the hub height on the power of a wind turbine and wind farm is investigated using Computational Fluid Dynamics
van der Laan, P., Project Participant, Department of Wind Energy, Aerodynamic design
01/11/2016 → 17/03/2017
Collaborators: Ørsted A/S
Documents:
Report_Groud_Clearance_public_2017-08-31
Project: Research

VIROS: Vind i ROSkilde
Vind i ROSkilde (VIROS) projektet vil undersøge om man kan benytte en vindkraftstrategi, som er baseret på mellemstørrelses møller under 100 m totalhøjde og som dermed kan opstilles i mange flere områder end 125-150 m møller tidligere undersøgt for Roskilde kommune. Samtidigt undersøges det, om vindmøllerne via placering og udformning kan bruges som en ”grøn” kunst installation på lige fod med forbrændingsanlægget for derved at signalere Roskildes grønne aftryk og udvikling. VIROS kommer med tre forslag til, hvorledes lokalt placeret vindkraft kan bidrage til energiforsyningen og dermed til reduktionen af CO2-udledningen i Roskilde kommune. 1) Mellemstore møller nær infrastruktur, hvor eksempelvis 10 møller placeres langs kommunens infrastruktur i form af motorvej, jernbane eller industri, 2) Erstatning af gamle møller med mellemstore møller (repowering) og 3) Mellemstore møller placeret i landzoner. Disse forslag er i overensstemmelse med Roskilde kommunes strategiske energiplan for 2015-2020 med overvejelser for vindkraft med børgerne i centrum. For at øge medejerskabet af møllerne vil der blive arrangeret en informationsmøde i samarbejde med Roskilde Festival og Musicon, hvor interesserede partnere i kommunen vil blive inviteret. Projektet vil til sidst evaluere om en vindstrategi baseret på møller af mellemstørrelse er en mulighed for Roskilde og skitserer hvordan
den i givet fald kan implementeres
Aabrahamsen, A. B., Project Manager, Department of Wind Energy
Dellwik, E., Project Manager, Department of Wind Energy, Meteorology & Remote Sensing
Kock, C. W., Project Participant, Department of Wind Energy, Test and Measurements
Claussen, N., Project Participant, Department of Wind Energy, Integration & Planning
Kjaer, T., Project Participant, Roskilde University
Sander, M., Project Participant, Foreningen Roskilde Festival
Hermansen, S., Project Participant, Energiakademiet
Klimafonden Roskilde Kommune: DKK110,000.00
01/11/2016 → 31/01/2018
Collaborators: Foreningen Roskilde Festival, EMD International A/S, Roskilde University, Musicon, Energiakademiet
Award relations: Vind i ROSkilde
Documents:
Rapport_Vind_I_Roskilde_anbefalinger_til_en_vind_energi_strategi_for_Roskilde_Kommune_8Maj2018
Klima- og Miljøudvalget_RoskildeKommune_08-05-2018 kl800_VIROSPunkt73
VindROSkiilde_dk_Abrahamsen_1marts2017_Endelig_kort
VindROSkiilde_Abrahamsen_KMU_4April2017_kort
VindROSkiilde_KlimarådetRoskildeKommune_Abrahamsen_2November2017_omdeling
VindROSkiilde_KlimaOgMiljøUdvalget_Abrahamsen_5Dec2017_omdeling
Report_group_8_Roskilde
Report_Group11_RoskildeMunicipality
Invitation_infomøde_VindIROskilde_ByensHus_23Jan2018
EfterVindIROskilde_Abrahamsen_12June2018
Project: Research

Advanced Accurate and Computationally Efficient Numerical Methods for Wind Turbine Rotor Blade Design
Bertolini, P., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor
Eder, M. A., Supervisor
Lindby, T., Supervisor
Industrial PhD
15/02/2017 → 14/02/2020
Award relations: Advanced Accurate and Computationally Efficient Numerical Methods for Wind Turbine Rotor Blade Design
Project: PhD

FarmOpt: Wind Farm Layout Optimization in Complex Terrain
The overall objective of the project is to develop and provide new reliable tools for designing wind farms located in complex terrain through full scale measurements in wind farms. For wind farms located in flat terrain, the performance of the wind turbines is significantly influenced by the upstream wind turbines and slightly influenced by the ground. For wind farms located in complex terrain the ground effects are relatively more pronounced, as such effects may bend the wakes created by the upstream turbines significantly. The goal of the present Sino-Danish project is to further develop Danish wind farm technology by using measured wind farm data from complex terrain wind farms in China, which is convenient, as Denmark does not have complex terrain that can be used for developing/validating such technology. To improve the wind turbines’ performance within wind farms in complex terrain, there are basically three important steps: (1) develop reliable CFD tools for predicting flow in complex terrain with and without wind turbines; (2) develop simplified flow models for predicting wind turbine performance in complex terrain; and (3) design high efficiency wind turbine parks in complex terrain.
Shen, W. Z., Project Coordinator, Department of Wind Energy, Fluid Mechanics
Zhu, W. J., Project Manager, Department of Wind Energy
Hansen, K. S., Project Manager, Department of Wind Energy, Fluid Mechanics
Bechmann, A., Project Manager, Department of Wind Energy, Resource Assessment Modelling
Larsen, G. C., Project Manager, Department of Wind Energy, Wind turbine loads & control
Feng, J., Project Manager, Department of Wind Energy, Fluid Mechanics
Project ID: EUDP-64013-0405
01/04/2014 → 31/12/2017
Keywords: Wind Farms
Collaborators: EMD International A/S
Project: Research
OffWindChina: Research and Development of optimal Wind turbine rotors under offshore wind conditions in China

The scientific objectives of the project are to develop new aerodynamic and structural design tools, and control techniques for optimizing wind turbine rotors for offshore wind energy applications in China. During the past five years, DTU has established a strong research collaboration network with Chinese universities and research institutes in the area of wind energy. The present proposal will further strengthen the collaboration. To develop wind technology under offshore wind conditions in China, it demands the insights of the physics of wind turbine flows under local wind conditions and the development of novel computational techniques that are capable to design and predict the performance of wind turbines. The goal is to make offshore wind energy production more competitive through fundamental insights into the interaction between atmospheric turbulence and wind turbines. Further, wind turbines under offshore conditions in China can be operated optimally through the design of efficient control systems.

Shen, W. Z., Project Coordinator, Department of Wind Energy, Fluid Mechanics
Zhu, W. J., Project Manager, Department of Wind Energy
Aagaard Madsen, H., Project Manager, Department of Wind Energy, Aerodynamic design
Serensen, J. N., Project Manager, Department of Wind Energy, Fluid Mechanics

Project ID: IFD-0603-00506B
01/04/2012 → 30/06/2017
Project: Research

Aero-acoustic wind tunnel tests

Lylloff, O. A., PhD Student, Department of Wind Energy
Fischer, A., Main Supervisor
Bak, C., Supervisor
Fernandez Grande, E., Supervisor
Technical University of Denmark
01/02/2017 → 19/06/2020
Award relations: Aero-acoustic wind tunnel tests
Project: PhD

Wind turbine dynamics

Gözcü, O., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor
Hansen, A. M., Supervisor
Technical University of Denmark
01/01/2017 → 31/12/2019
Award relations: Wind turbine dynamics
Project: PhD

Conceptual research of a multi megawatt downwind turbine

Wanke, G., PhD Student
Larsen, T. J., Main Supervisor, Department of Wind Energy
Buhl, T., Supervisor, Department of Wind Energy
Hansen, M. H., Supervisor, Department of Wind Energy
Madsen, J. I., Supervisor
Wanke, G., PhD Student, Department of Wind Energy
Zahle, F., Main Supervisor
Verelst, D. R., Supervisor
Industrial PhD
15/12/2016 → 14/12/2019
Award relations: Conceptual research of a multi megawatt downwind turbine
Project: PhD

Bio4Self

Beauson, J., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Mikkelsen, L. P., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Madsen, B., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Christensen, J., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Mishnaevsky, L., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics

Project ID: H2020
External Project ID: 685614
01/03/2016 → …
Project: Research
**Transition Modeling for Wind Turbine Rotors/TRMOD**
Ozçakmak, O. S., PhD Student, Department of Wind Energy
Serensen, N. N., Main Supervisor
Aagaard Madsen, H., Supervisor
Serensen, J. N., Supervisor
Technical University of Denmark
01/11/2016 → 31/10/2019
Award relations: Transition Modeling for Wind Turbine Rotors/TRMOD
Project: PhD

**Modelling of renewable energy under stressed power system stability conditions**
Sarkar, M., PhD Student, Department of Wind Energy
Serensen, P. E., Main Supervisor
Hansen, A. D., Supervisor
Jóhannsson, H., Supervisor
Altin, M., Supervisor
Samfinansieret - Andet
15/11/2016 → 14/11/2019
Award relations: Modelling of renewable energy under stressed power system stability conditions
Project: PhD

**Intelligent Quality Assessment of Railway Switches and Crossings (INTELLISWITCH)**
Thyregod, C., Project Participant, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
Esbild, B. K., Project Participant, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
Juul Jensen, D., Project Manager, Department of Wind Energy, Materials science and characterization
Innovation Fund Denmark: DKK12.70
01/03/2015 → 31/12/2019
Collaborators: Banedanmark
Award relations: Intelligent Quality Assessment of Railway Switches and Crossings (INTELLISWITCH)
Project: Research

**Baltic InteGrid: Integrated Baltic offshore wind electricity grid development**
The offshore wind energy sector in the Baltic Sea requires coordinated transnational grid planning to realise its full growth potential. Baltic InteGrid promotes the meshed grid approach by creating a professional network for the exchange of expertise and state of the art interdisciplinary research.
Pade, L., Project Participant, Department of Management Engineering, Energy Economics and Regulation
Bergaentzlé, C., Project Participant, Department of Management Engineering, Energy Economics and Regulation
Boscán Flores, L. R., Project Participant, Department of Management Engineering, Energy Economics and Regulation
Cutululis, N. A., Project Participant, Department of Wind Energy, Integration & Planning
Das, K., Project Participant, Department of Wind Energy, Integration & Planning
01/03/2016 → 30/09/2019
Project: Research

**Doppler lidar scanning of flow over complex terrain**
Menke, R., PhD Student, Department of Wind Energy
Vasiljevic, N., Supervisor
Mann, J., Main Supervisor
Technical University of Denmark
01/10/2016 → 01/12/2019
Award relations: Doppler lidar scanning of flow over complex terrain
Project: PhD

**NetVind: The use of wind power capabilities to improve the operation of the distribution network**
NetVind aims toward the green transition in Denmark, by rethinking the way of using wind power plants in distribution systems. NetVind analyses and demonstrates in a large experimental facility, which technical and financial potentials exist to improve the operation of distribution systems by using wind power plants support control capabilities.
The goal of NetVind is to improve the operation of distribution systems with high wind power penetration by using the wind power plants grid support capabilities. This is accomplished through:

- Digitizing the communication between grid devices (i.e. wind turbine’s inverter) and the net monitoring system in relation to IEC 61850.
• Minimizing grid losses in MV distribution systems with high wind power penetration by optimizing the reactive power flow.
• Making optimal use of the existing net and obtain a benefit of the green transition by using regulation rather than to reinforce the net.
• Exploring which business model can be applied between players.
• Testing the IT security infrastructure for data communication in accordance with IEC 62351.
• Building up know-how on modelling the condition of the MV net.
• Contributing to improvement and qualification of future technical regulations which are under preparation at Energinet.dk and which should bind together the political, technical and financial interests.

The project seeks to achieve effective integration of renewable energy, considering the overall system security by optimizing the wind power transmission upwards in the system so that unnecessary losses due to new production/consumption scenarios are minimized and optimized by using the control capabilities of power electronics in wind turbines.

Hansen, A. D., Project Participant, Department of Wind Energy, Integration & Planning
Thybo, G. W., Project Manager, EnergiMidt A/S
Serensen, P. E., Project Participant, Department of Wind Energy, Integration & Planning
Das, K., Project Participant, Department of Wind Energy, Integration & Planning
Altin, M., Project Participant, Department of Wind Energy, Integration & Planning
01/03/2016 → 01/10/2018
Collaborators: EnergiMidt A/S
Project: Research

Control and operation of offshore wind power plants connected via HVDC
Saborío-Romano, O., PhD Student, Department of Wind Energy
Cutululis, N. A., Main Supervisor
Göksu, Ö., Supervisor
Serensen, P. E., Supervisor
Zeni, L., Supervisor
Samfinansieret - Andet
01/09/2016 → 30/11/2019
Award relations: Control and operation of offshore wind power plants connected via HVDC
Project: PhD

Design af bæredygtige energisystemer i Grønland
Jakobsen, K. R., PhD Student, Department of Wind Energy
Hansen, M. O. L., Main Supervisor
Vincent, C. L., Supervisor
Abrahamsen, A. B., Examiner
Ivanell, S. S. A., Examiner
Walløe Hansen, A., Examiner
Technical University of Denmark
01/04/2010 → 28/04/2016
Award relations: Design af bæredygtige energisystemer i Grønland
Project: PhD

Integreret Aeroservoelastisk Analyse og Design af Vindmøller
Sønderby, I. B., PhD Student, Department of Wind Energy
Hansen, M. H., Main Supervisor
Poulsen, N. K., Examiner
Kanev, S., Examiner
Riziotis, V. A., Examiner
Institut, samfinansiering
01/09/2009 → 20/09/2013
Award relations: Integreret Aeroservoelastisk Analyse og Design af Vindmøller
Project: PhD

Strukturel modellering af vindmølleblade med passiv kontrol
Fedoroiv, V., PhD Student, Department of Wind Energy
Berggreen, C., Main Supervisor
Branner, K., Supervisor
Krenk, S., Supervisor
Jensen, J. J., Examiner
Hayman, B., Examiner
Thybo Thomsen, O., Examiner
High Fidelity CFD-based Shape Optimization of Wind Turbine Blades
Madsen, M. H. A., PhD Student, Department of Wind Energy
Zahle, F., Main Supervisor
Andersen, S. J., Supervisor
Sørensen, N. N., Supervisor
Technical University of Denmark
15/09/2016 → 14/12/2019
Award relations: High Fidelity CFD-based Shape Optimization of Wind Turbine Blades
Project: PhD

PROMOTiON: PROgress on Meshed HVDC Offshore Transmission Networks
The goal of the PROMOTiON project is to develop and demonstrate three key Technologies: diode rectifier offshore converters; multi-vendor high-voltage direct current (HVDC) grid protection system and the full power testing of HVDC circuit breakers. Furthermore, a regulatory and financial framework will be developed for the coordinated planning, construction and operation of integrated offshore infrastructures, including an offshore grid deployment plan (roadmap) for the future offshore grid system in Europe.

DTU is mainly involved in R&D on the first technology using diode rectifiers as offshore converters. DTU leads a work package on Wind turbine - converter interaction studies and a work package on harmonization towards standards and best practices. DTU is also involved in several other work packages.

Cutululis, N. A., Project Participant, Department of Wind Energy, Integration & Planning
Sørensen, P. E., Project Participant, Department of Wind Energy, Integration & Planning
Göksu, Ö., Project Participant, Department of Wind Energy, Integration & Planning
Altin, M., Project Participant, Department of Wind Energy, Integration & Planning
Saborío-Romano, O., PhD Student, Department of Wind Energy, Integration & Planning
Bidadfar, A., PhD Student, Department of Wind Energy, Integration & Planning

Project ID: H2020 Grant Agreement-691714
01/01/2016 → 31/12/2019
Project: Research

NSON-DK: North Sea Offshore Network - Denmark
The focal point of the NSON-DK project is how the future massive offshore wind power and the associated offshore grid development will affect the Danish power system in the transition towards a future sustainable energy system. NSON-DK is a Danish part of the North Sea Offshore and Storage Network (NSON) project framework, which has emerged from the European Energy Research Alliance (EERA) as a pioneer project framework joining nationally funded research according to the European Commission’s Berlin model.

The objective of the NSON-DK project is to study how the future massive offshore wind power and the associated offshore grid development will affect the Danish power system on short term, medium term and long term towards of the transition towards a future sustainable energy system.

The following research questions will have special attention in the project:
- How will the offshore wind power development affect the variability and uncertainty of variable renewable generation in the Danish power system and neighboring systems?
- How will this increased variability and uncertainty from the offshore wind power development together with onshore renewable generation development influence the balancing and need for reserves in the Danish power system?
- How will the offshore wind power and offshore grid development influence the electricity markets in future systems with large scale energy storage and coordination of the electricity system with other energy systems (mainly heat and transport)?
- How will the scale and architecture of the offshore grid development influence the adequacy and security of supply in the Danish power system?
- Which policy instruments should be applied to support an effective and cost-efficient transition of the Danish power system combining the offshore development with energy storage and coordination between energy systems?

Sørensen, P. E., Project Coordinator, Department of Wind Energy, Integration & Planning
Das, K., Project Participant, Department of Wind Energy, Integration & Planning
Koivisto, M. J., Project Participant, Department of Wind Energy, Integration & Planning
Pade, L., Project Participant, Department of Management Engineering, Energy Economics and Regulation
Skytte, K., Project Participant, Department of Management Engineering, Energy Economics and Regulation
Gea-Bermudez, J., Project Participant, Integration & Planning, Systems Analysis, Department of Management Engineering
Papakonstantinou, A., Project Participant, Systems Analysis, Department of Management Engineering
Boscán Flores, L. R., Project Participant
Process Parameters and Fatigue Properties of High Modulus Composites
Mortensen, U. A., PhD Student, Department of Wind Energy
Mikkelsen, L. P., Main Supervisor
Legstrup Andersen, T., Supervisor
Hansen, B. M., Supervisor
Hattel, J. H., Examiner
Jakobsen, J., Examiner
Swolfs, Y., Examiner
Samfinansieret - Andet
01/05/2016 → 30/09/2019
Award relations: Process Parameters and Fatigue Properties of High Modulus Composites
Project: PhD

Multi-objective wind farm control
Kazda, J., PhD Student, Department of Wind Energy
Cutululis, N. A., Main Supervisor
Courtney, M., Supervisor
Serensen, P. E., Examiner
Bottasso, C. L., Examiner
Meyers, J., Examiner
Giebel, G., Supervisor
Technical University of Denmark
15/12/2015 → 02/05/2019
Award relations: Multi-objective wind farm control
Project: PhD

Lidar detection of wakes for wind turbine and farm control
Held, D. P., PhD Student, Department of Wind Energy
Hu, Q., Supervisor, Optical Sensor Technology, Department of Photonics Engineering
Mirzaei, M., Supervisor, Department of Wind Energy
Mikkelsen, T. K., Examiner, Meteorology & Remote Sensing, Department of Wind Energy
Mann, J., Main Supervisor
Harris, M., Examiner
Schlipf, D., Examiner
Held, D. P., PhD Student, Department of Wind Energy
Mikkelsen, T. K., Examiner
Harris, M., Examiner
Schlipf, D., Examiner
Mann, J., Main Supervisor
Industrial PhD
01/01/2016 → 04/04/2019
Award relations: Lidar detection of wakes for wind turbine and farm control
Project: PhD

Wave Load Response on Offshore Wind Turbine Structures
Wang, S., PhD Student, Department of Wind Energy
Larsen, T. J., Main Supervisor
Bredmose, H., Supervisor
Kim, T., Supervisor
Muskulus, M., Examiner
Vabbersgaard Andersen, L., Examiner
Stolpe, M., Examiner
Samfinansieret - Andet
15/12/2015 → 12/09/2019
Award relations: Wave Load Response on Offshore Wind Turbine Structures
Project: PhD
**Microstructure and Fatigue Properties of Railway Steels for Switches and Crossings**

Dhar, S., PhD Student, Department of Wind Energy
Danielsen, H. K., Main Supervisor
Juul Jensen, D., Supervisor
Eder, M. A., Examiner
Pickering, E. J., Examiner
Steenbergen, M., Examiner
Samfinansieret - Andet
15/12/2015 → 02/05/2019
Award relations: Microstructure and Fatigue Properties of Railway Steels for Switches and Crossings
Project: PhD

**Experimental and modelling study of the composite piltrusion process for manufacturing of pre-fabricated elements for wind turbine blades**

Miranda Maduro, M. A., PhD Student, Department of Wind Energy
Madsen, B., Main Supervisor
Almdal, K., Supervisor
Legstrup Andersen, T., Supervisor
Grundforskningsfonden
01/12/2015 → 30/11/2019
Award relations: Experimental and modelling study of the composite piltrusion process for manufacturing of pre-fabricated elements for wind turbine blades
Project: PhD

**Coastal Offshore Winds, Ocean Waves and Current using Remote Sensing**

Ahsbahs, T. T., PhD Student, Department of Wind Energy
Badger, M., Main Supervisor
Karagali, I., Supervisor
Kim, S. Y., Supervisor
Larsén, X. G., Supervisor
Giebel, G., Examiner
Rugaard Furevik, B., Examiner
Jacobsen, S., Examiner
Samfinansieret - Andet
01/11/2015 → 04/04/2019
Award relations: Coastal Offshore Winds, Ocean Waves and Current using Remote Sensing
Project: PhD

**Development of an Applied Measurement System for Short Term Power Forecasting and Gust/Ramp Prediction**

Simon, E., PhD Student, Department of Wind Energy
Courtney, M., Main Supervisor
Cutululis, N. A., Supervisor
Wagner, R., Examiner
Landberg, L., Examiner
Holtinen, H. K., Examiner
Technical University of Denmark
15/11/2015 → 12/09/2019
Award relations: Development of an Applied Measurement System for Short Term Power Forecasting and Gust/Ramp Prediction
Project: PhD

**Advanced CFD computation of breaking wave loads on offshore wind turbine structures**

Ghadirian, A., PhD Student, Department of Wind Energy
Bredmose, H., Main Supervisor
Fuhrman, D. R., Examiner
Haver, S. K., Examiner
Ferrant, P., Examiner
Samfinansieret - Andet
01/11/2015 → 14/02/2019
Award relations: Advanced CFD computation of breaking wave loads on offshore wind turbine structures
**Quantifying leading edge roughness on wind turbine blades**
Bak, C., Main Supervisor, Department of Wind Energy
Bentzen, T. R., Supervisor
Sørensen, N. N., Supervisor, Department of Wind Energy
Kruse, E. K., PhD Student, Department of Wind Energy
Ansat eksternt
01/10/2015 → 30/10/2019
Award relations: Quantifying leading edge roughness on wind turbine blades
Project: PhD

**Cascaded design tools for 10MW offshore wind turbine floaters**
Pegalajar-Jurado, A., PhD Student, Department of Wind Energy
Bredmose, H., Main Supervisor
Borg, M., Supervisor, Department of Wind Energy
Mikkelsen, R. F., Supervisor
Larsen, T. J., Examiner
Berthelsen, P. A., Examiner
Anders Nygaard, T., Examiner
Samfinansieret - Andet
15/09/2015 → 10/01/2019
Award relations: Cascaded design tools for 10MW offshore wind turbine floaters
Project: PhD

**Cost-effective strategies for Wind farm O&M**
Colone, L., PhD Student, Department of Wind Energy
Natarajan, A., Main Supervisor
Dimitrov, N. K., Supervisor
Larsen, G. C., Examiner
Cheng, P. W., Examiner
Manuel, L., Examiner
Marie Curie (EU-stipendium)
01/07/2015 → 30/09/2019
Award relations: Cost-effective strategies for Wind farm O&M
Project: PhD

**Fatigue strength of composite wind turbine blade structures**
Castro Ardila, O. G., PhD Student, Department of Wind Energy
Branner, K., Main Supervisor
Brøndsted, P., Supervisor
Mikkelsen, L. P., Examiner
Burchardt, C., Examiner
Varna, J., Examiner
Forskningsrådsfinansiering
01/01/2015 → 08/06/2018
Award relations: Fatigue strength of composite wind turbine blade structures
Project: PhD

**Inflow Characterization based on Remote Sensing using Pitot Tubes**
Pedersen, M. M., PhD Student, Department of Wind Energy
Larsen, T. J., Main Supervisor
Larsen, G. C., Supervisor
Aagaard Madsen , H., Supervisor
Schmidt Paulsen, U., Supervisor
Dellwik, E., Examiner
Kråg, K. A., Examiner
Riziotis, V. A., Examiner
Technical University of Denmark
01/02/2015 → 08/06/2018
Award relations: Inflow Characterization based on Remote Sensing using Pitot Tubes
Project: PhD
Impact of wind power uncertainty on electric power system reliability
Nuño Martinez, E., PhD Student, Department of Wind Energy
Cutululis, N. A., Main Supervisor
Sørensen, P. E., Supervisor
Giebel, G., Examiner
Van Hertem, D., Examiner
Karinotakis, G., Examiner
Samfinansieret - Andet
15/11/2014 → 06/09/2018
Award relations: Impact of wind power uncertainty on electric power system reliability
Project: PhD

More accurate mesoscale to microscale downscaling for determining wind conditions at complicated sites
Olsen, B. T., PhD Student, Department of Wind Energy
Badger, J., Main Supervisor
Cavar, D., Supervisor
Hahmann, A. N., Supervisor
Sørensen, N. N., Examiner
Lundquist, J. K., Examiner
Wilson, C., Examiner
Mann, J., Supervisor
Samfinansieret - Andet
15/12/2014 → 08/11/2018
Award relations: More accurate mesoscale to microscale downscaling for determining wind conditions at complicated sites
Project: PhD

Probabilistic Design of Wind Turbines Structures
NJOMO WANDJI, W., PhD Student, Department of Wind Energy
Natarajan, A., Main Supervisor
Buhl, T., Supervisor
Dimitrov, N. K., Supervisor
Bredmose, H., Examiner
Muskulus, M., Examiner
Bhattacharya, S., Examiner
Samfinansieret - Andet
15/11/2014 → 16/04/2018
Award relations: Probabilistic Design of Wind Turbines Structures
Project: PhD

Fracture mechanics approach to probabilistic inspection planning of offshore foundation structures for wind turbines
Ruiz Munoz, G. A., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor, Department of Wind Energy
Eder, M. A., Supervisor, Department of Wind Energy
Niordson, C. F., Supervisor, Department of Mechanical Engineering
Sørensen, J. D., Supervisor, Department of Wind Energy
Østergaard, T., Supervisor
Mikkelsen, L. P., Examiner, Department of Wind Energy
Gao, Z., Examiner
Skallerud, B. H., Examiner
Ruiz Munoz, G. A., PhD Student, Department of Wind Energy
Gao, Z., Examiner
Ansat eksternt
01/11/2014 → 08/06/2018
Award relations: Fracture mechanics approach to probabilistic inspection planning of offshore foundation structures for wind turbines
Project: PhD

Development of an advanced noise propagation model for noise optimization in wind farm
Barlas, E., PhD Student, Department of Wind Energy
Shen, W. Z., Main Supervisor
Sørensen, J. N., Supervisor
Zhu, W. J., Supervisor
Aagaard Madsen, H., Examiner
Burdisso, R., Examiner
Sandegaard, B., Examiner
Samfinansieret - Andet
01/11/2014 → 06/03/2018
Award relations: Development of an advanced noise propagation model for noise optimization in wind farm
Project: PhD

Scholarship associated with DSF project UniTTe
Meyer Forsting, A., PhD Student, Department of Wind Energy
Troldborg, N., Main Supervisor
Bechmann, A., Supervisor
Aagaard Madsen, H., Supervisor
Réthoré, P., Supervisor
Serensen, J. N., Examiner
Barthelmie, R. J., Examiner
Schlipf, D., Examiner
Forskningsrådsfinansiering
01/09/2014 → 07/12/2017
Award relations: Scholarship associated with DSF project UniTTe
Project: PhD

Adhesive Joints in Wind Turbine Blades
Jørgensen, J. B., PhD Student, Department of Wind Energy
Serensen, B. F., Main Supervisor
Kildegaard, C., Supervisor
Mikkelsen, L. P., Examiner
Jensen, H. M., Examiner
Caro, A. B., Examiner
Industrial PhD
01/09/2014 → 06/03/2018
Award relations: Adhesive Joints in Wind Turbine Blades
Project: PhD

Using nacelle-mounted lidars in wind turbine power and load measurements
Borraccino, A., PhD Student, Department of Wind Energy
Courtney, M., Main Supervisor
Wagner, R., Supervisor
Hansen, K. S., Examiner
Gottschall, J., Examiner
Clifton, A. J., Examiner
Forskningsrådsfinansiering
01/06/2014 → 21/09/2017
Award relations: Using nacelle-mounted lidars in wind turbine power and load measurements
Project: PhD

Design Optimization of Jacket Structures for Mass Production
Sandal, K., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor
Bredmose, H., Supervisor
Pedersen, N. L., Examiner
Duysinx, P., Examiner
Rolfes, R., Examiner
Samfinansieret - Andet
01/08/2014 → 02/11/2017
Award relations: Design Optimization of Jacket Structures for Mass Production
Project: PhD

Nucleation of recrystallization at selected sites in deformed fcc metals
Xu, C., PhD Student
Juul Jensen, D., Main Supervisor
Zhang, Y., Supervisor
Huang, X., Examiner
Xu, C., PhD Student, Department of Wind Energy
Quey, R., Examiner
Wu, G., Supervisor
Zhang, H., Examiner
Stipendie fra udlandet
01/01/2014 → 20/04/2017
Award relations: Nucleation of recrystallization at selected sites in deformed fcc metals
Project: PhD

**Coupling atmospheric and wave models for storm conditions**
Du, J., PhD Student, Department of Wind Energy
Larsén, X. G., Main Supervisor
Kelly, M. C., Supervisor
Bredmose, H., Examiner
Bidlot, J. R., Examiner
Rutgersson, A., Examiner
Larsen, S. E., Supervisor
Samfinansieret - Andet
15/04/2014 → 07/09/2017
Award relations: Coupling atmospheric and wave models for storm conditions
Project: PhD

**Fatigue damage evolution in fibre composites for wind turbine blades**
Jespersen, K. M., PhD Student, Department of Wind Energy
Mikkelsen, L. P., Main Supervisor
Hansen, J. Z., Supervisor
Mishnaevsky, L., Supervisor
Niordson, C. F., Examiner
Asp, L. E., Examiner
Spearing, S. M., Examiner
Offentlig finansiering
15/04/2014 → 07/09/2017
Award relations: Fatigue damage evolution in fibre composites for wind turbine blades
Project: PhD

**Probabilistic wind characterization and wind turbine design**
Hannesdóttir, Á., PhD Student, Department of Wind Energy
Kelly, M. C., Main Supervisor
Natarajan, A., Supervisor
Mann, J., Supervisor
Nielsen, M., Examiner
Bierbooms, W., Examiner
Bossanyi, E. A., Examiner
Technical University of Denmark
01/04/2014 → 14/02/2019
Award relations: Probabilistic wind characterization and wind turbine design
Project: PhD

**Coordinated control of wind power plants in offshore HVDC grids**
Sakamuri, J. N., PhD Student, Department of Wind Energy
Cutululis, N. A., Main Supervisor
Hansen, A. D., Supervisor
Serensen, P. E., Supervisor
Nielsen, A. H., Examiner
Liang, J., Examiner
Uhlen, K., Examiner
Marie Curie (EU-stipendium)
15/03/2014 → 06/03/2018
Award relations: Coordinated control of wind power plants in offshore HVDC grids
Project: PhD
Mechanical properties of stone wool products after chemical and mechanical ageing
Chapelle, L., PhD Student, Department of Wind Energy
Brøndsted, P., Main Supervisor
Kusano, Y., Supervisor
Larsen, D., Supervisor
Madsen, B., Examiner
Neagu, C., Examiner
Gamstedt, K., Examiner
ErhvervsPhD-ordningen VTU
01/05/2013 → 30/09/2016
Award relations: Mechanical properties of stone wool products after chemical and mechanical ageing
Project: PhD

Combinatorial Optimization over Second-Order and Industrial Applications
Friberg, H. A., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor
Andersen, K. H., Supervisor
Andersen, E. D., Supervisor
Andersen, M. S., Examiner
Pataki, G., Examiner
Treflak, T., Examiner
ErhvervsPhD-ordningen VTU
01/10/2012 → 04/07/2016
Award relations: Combinatorial Optimization over Second-Order and Industrial Applications
Project: PhD

Offshore Wind Turbine Foundation Design
Passon, P. A., PhD Student
Branner, K., Main Supervisor, Department of Wind Energy
Larsen, S. E., Supervisor, Department of Wind Energy
Rasmussen, J. H., Supervisor
Bredmose, H., Examiner, Department of Wind Energy
Muskulus, M., Examiner
Tarp-Johansen, N. J., Examiner
ErhvervsPhD-ordningen VTU
01/10/2011 → 22/06/2015
Award relations: Offshore Wind Turbine Foundation Design
Project: PhD

The effects of fibre architecture on fatigue life-time of composite materials
Hansen, J. Z., PhD Student, Department of Wind Energy
Brøndsted, P., Main Supervisor
Østergaard, R. C., Supervisor
Mikkelsen, L. P., Examiner
Adolphs, G., Examiner
Varna, J., Examiner
ErhvervsPhD-ordningen VTU
15/04/2010 → 30/09/2013
Award relations: The effects of fibre architecture on fatigue life-time of composite materials
Project: PhD

Dynamic wake model for load calculations of wind turbines
Keck, R., PhD Student
Aagaard Madsen, H., Main Supervisor
Larsen, G. C., Supervisor
Hansen, M. O. L., Examiner
Madsen, J. I., Examiner
Riziotis, V. A., Examiner
Keck, R. H. J., PhD Student, Department of Wind Energy
ErhvervsPhD-ordningen VTU
01/11/2009 → 27/05/2013
Award relations: Dynamic wake model for load calculations of wind turbines
Project: PhD

**Computationally Efficient Methods for Reliability Based Design of Wind Turbine Blades**
Dimitrov, N. K., PhD Student, Department of Wind Energy
Berggreen, C., Main Supervisor
Friis-Hansen, P., Supervisor
Staerdahl, J., Supervisor
Nishijima, K., Examiner
Sraub, D., Examiner
Sørensen, J. D., Examiner
ErhvervsPhD-ordningen VTU
01/09/2009 → 27/08/2013
Award relations: Computationally Efficient Methods for Reliability Based Design of Wind Turbine Blades
Project: PhD

**Unsteady Flow Modeling and Experimental Verification of Active Flow Control Concepts for Wind Turbine Blades**
Bæk, P., PhD Student
Gaunaa, M., Main Supervisor, Department of Wind Energy
Korsgaard, J., Supervisor
Hansen, M. O. L., Examiner, Department of Wind Energy
Bottasso, C. L., Examiner
van Kuik, G. A. M., Examiner
ErhvervsPhD-ordningen VTU
01/12/2008 → 02/05/2012
Award relations: Unsteady Flow Modeling and Experimental Verification of Active Flow Control Concepts for Wind Turbine Blades
Project: PhD

**Characterization and modelling of wood fibre composites**
Aslan, M., PhD Student, Department of Wind Energy
Sørensen, B. F., Main Supervisor
Madsen, B., Supervisor
Horsewell, A., Examiner
Burgert, I., Examiner
Risø (Lørn)
15/10/2008 → 20/09/2012
Award relations: Characterization and modelling of wood fibre composites
Project: PhD

**Recovery and recrystallisation of nanostructured metals - mechanisms and kinetics**
Yu, T., PhD Student, Department of Wind Energy
Huang, X., Main Supervisor
Winther, G., Supervisor
Pantleon, W., Examiner
Doherty, R. D., Examiner
Driver, J. H., Examiner
Risø (Lørn)
01/08/2008 → 23/05/2012
Award relations: Recovery and recrystallisation of nanostructured metals - mechanisms and kinetics
Project: PhD

**Optimal design of adaptive wind turbine blades**
Stäblein, A., PhD Student, Department of Wind Energy
Hansen, M. H., Main Supervisor
Branner, K., Supervisor
Kim, T., Supervisor
Hansen, M. O. L., Examiner
Riziotis, V. A., Examiner
Nielsen, S. R. K., Examiner
Marie Curie (EU-stipendium)
15/05/2013 → 16/02/2017
Award relations: Optimal design of adaptive wind turbine blades
Project: PhD

Reliabilities of composite materials for wind turbine blades
Pereira, G. F., PhD Student, Department of Wind Energy
Mikkelsen, L. P., Main Supervisor
McGugan, M., Supervisor
Serensen, B. F., Supervisor
Legarth, B. N., Examiner
Güemes, A., Examiner
Ogin, S. L., Examiner
Marie Curie (EU-stipendium)
01/04/2013 → 04/07/2016
Award relations: Reliabilities of composite materials for wind turbine blades
Project: PhD

Boundary-layer wind profile, measurements and theory
Floors, R. R., PhD Student, Department of Wind Energy
Gryning, S., Main Supervisor
Peña, A., Supervisor
Larsen, S. E., Examiner
Wilczak, J. M., Examiner
Gulstad, L., Examiner
Marie Curie (EU-stipendium)
15/09/2010 → 27/01/2014
Award relations: Boundary-layer wind profile, measurements and theory
Project: PhD

Wake effects of large offshore wind farms - a study of mesoscale atmosphere and ocean feedbacks
Volker, P., PhD Student, Department of Wind Energy
Hahmann, A. N., Main Supervisor
Badger, J., Supervisor
Réthoré, P., Examiner
Barstad, I., Examiner
Nygaard, N. G., Examiner
Marie Curie (EU-stipendium)
01/10/2010 → 28/04/2014
Award relations: Wake effects of large offshore wind farms - a study of mesoscale atmosphere and ocean feedbacks
Project: PhD

Aerodynamic modelling
Guntur, S., PhD Student, Department of Wind Energy
Serensen, N. N., Main Supervisor
Hansen, M. O. L., Examiner
Johansen, J., Examiner
Echarri, X. M., Examiner
Marie Curie (EU-stipendium)
15/09/2010 → 27/01/2014
Award relations: Aerodynamic modelling
Project: PhD

CFD Modelling of non-Neutral ABL Conditions
Koblitz, T., PhD Student, Department of Wind Energy
Serensen, N. N., Main Supervisor
Bechmann, A., Supervisor
Sogachev, A., Supervisor
Hahmann, A. N., Examiner
Madsen, J. I., Examiner
Palma, J. M. L. M., Examiner
Marie Curie (EU-stipendium)
01/06/2010 → 12/12/2013
Award relations: CFD Modelling of non-Neutral ABL Conditions
**Highly flexible wind turbine rotor design**

Vereist, D. R., PhD Student, Department of Wind Energy  
Larsen, T. J., Main Supervisor  
Aagaard Madsen, H., Supervisor  
van Wingerden, J., Supervisor  
Bak, C., Examiner  
Schepers, G., Examiner  
Bottasso, C. L., Examiner  
Marie Curie (EU-stipendium)  
01/04/2010 → 30/09/2013  
Award relations: Highly flexible wind turbine rotor design  
Project: PhD

**Flow measurements in complex terrain using a 3D LIDAR Windscanner**

Vasiljevic, N., PhD Student, Department of Wind Energy  
Courtney, M., Main Supervisor  
Mann, J., Supervisor  
Ejsing Jørgensen, H., Examiner  
Margulis, M. S., Examiner  
Rankers, A. M., Examiner  
Marie Curie (EU-stipendium)  
01/06/2010 → 30/09/2014  
Award relations: Flow measurements in complex terrain using a 3D LIDAR Windscanner  
Project: PhD

**Integration of wind power and other renewables in power system defence plans**

Das, K., PhD Student, Department of Wind Energy  
Sørensen, P. E., Main Supervisor  
Abildgaard, H., Supervisor  
Hansen, A. D., Supervisor  
Margaris, I., Supervisor  
Nielsen, A. H., Examiner  
Uhlen, K., Examiner  
Iov, F., Examiner  
EU-finansieret  
01/04/2013 → 04/07/2016  
Award relations: Integration of wind power and other renewables in power system defence plans  
Project: PhD

**Structure and mechanical properties of aligned natural fibre composites**

Rask, M., PhD Student, Department of Wind Energy  
Sørensen, B. F., Main Supervisor  
Lauridsen, E. M., Supervisor  
Madsen, B., Supervisor  
Mikkelsen, L. P., Examiner  
Spearing, S. M., Examiner  
EU-finansieret  
01/04/2009 → 31/01/2013  
Award relations: Structure and mechanical properties of aligned natural fibre composites  
Project: PhD

**Development of Large Eddy Simulation Tools for Simulation of Atmospheric Boundary Layers in Wind Farms**

Dag, K. O., PhD Student, Department of Wind Energy  
Sørensen, J. N., Main Supervisor  
Shen, W. Z., Supervisor  
Sørensen, N. N., Supervisor  
Berg, J., Examiner  
Churchfield, M. J., Examiner  
Meyers, J., Examiner  
Offentlig finansiering
Development of Large Eddy Simulation Tools for Simulation of Atmospheric Boundary Layers in Wind Farms
Project: PhD

Possible Power of Downregulated Offshore Wind power plants
Göçmen, T., PhD Student, Department of Wind Energy
Giebel, G., Main Supervisor
Poulsen, N. K., Supervisor
Sørensen, P. E., Supervisor
Sørensen, J. N., Examiner
Apt, J., Examiner
Johansen, K., Examiner
Offentlig finansiering
15/12/2012 → 07/04/2016
Award relations: Possible Power of Downregulated Offshore Wind power plants
Project: PhD

Wind Power Plant System Services
Basit, A., PhD Student, Department of Wind Energy
Hansen, A. D., Main Supervisor
Sørensen, P. E., Supervisor
Cutululis, N. A., Examiner
Molina-Garcia, A., Examiner
Chen, Z., Examiner
Altin, M., Supervisor
Offentlig finansiering
15/12/2011 → 19/03/2015
Award relations: Wind Power Plant System Services
Project: PhD

Validated loads prediction models for offshore wind turbines for enhanced component reliability
Koukoura, C., PhD Student, Department of Wind Energy
Natarajan, A., Main Supervisor
Branner, K., Supervisor
Hansen, K. S., Examiner
Bossanyi, E. A., Examiner
Ibsen, L. B., Examiner
Offentlig finansiering
15/09/2011 → 19/12/2014
Award relations: Validated loads prediction models for offshore wind turbines for enhanced component reliability
Project: PhD

Flow over complex forested terrain
Boudreault, L., PhD Student, Department of Wind Energy
Dellwik, E., Main Supervisor
Bechmann, A., Supervisor
Mann, J., Examiner
Edward Garrett, P., Examiner
Neil Ross, A., Examiner
Offentlig finansiering
15/10/2011 → 24/08/2015
Award relations: Flow over complex forested terrain
Project: PhD

Integrated Wind Power Planning Tool
Rosgaard, M. H., PhD Student, Department of Wind Energy
Hahmann, A. N., Main Supervisor
Madsen, H., Supervisor
Pinson, P., Examiner
Nissen, J. N., Examiner
Wilson, C. G., Examiner
Sensor Design and Control Algorithm for Flaps on Wind Turbine Blades
Castaignet, D. B., PhD Student, Department of Wind Energy
Buhl, T., Main Supervisor
Poulsen, N. K., Supervisor
Wedel-Heinen, J. J., Supervisor
Knudsen, T., Examiner
van Dam, C. P., Examiner
Ansat eksternt
01/12/2008 → 23/05/2012
Award relations: Sensor Design and Control Algorithm for Flaps on Wind Turbine Blades
Project: PhD

Mathematical programming methods for large-scale structural topology optimization
Rojas Labanda, S., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor
Sigmund, O., Supervisor
Jensen, J. S., Examiner
Evgrafov, A., Examiner
Stingl, M. W., Examiner
Eksternt finansieret virksomhed
01/09/2012 → 28/01/2016
Award relations: Mathematical programming methods for large-scale structural topology optimization
Project: PhD

Wind Turbine Aerodynamics and Aeroelasticity using Vortex Based Methods
Branlard, E. S. P., PhD Student, Department of Wind Energy
Gaunaa, M., Main Supervisor
Sørensen, J. N., Examiner
Hjort, S., Examiner
van Kuik, G. A. M., Examiner
Eksternt finansieret virksomhed
01/04/2012 → 22/06/2015
Award relations: Wind Turbine Aerodynamics and Aeroelasticity using Vortex Based Methods
Project: PhD

Forecasting Wind Turbine Lcing Conditions
Davis, N., PhD Student, Department of Wind Energy
Hahmann, A. N., Main Supervisor
Clausen, N., Supervisor
Zagar, M., Supervisor
Giebel, G., Examiner
Andersson, A., Examiner
Haupt, S. E., Examiner
Eksternt finansieret virksomhed
01/06/2011 → 05/11/2014
Award relations: Forecasting Wind Turbine Lcing Conditions
Project: PhD

Structural and textural control in high strength dual phase steels
Azuma, M., PhD Student, Department of Wind Energy
Huang, X., Main Supervisor
Winther, G., Supervisor
Juul Jensen, D., Examiner
Furuhara, T., Examiner
Withers, P. J., Examiner
Eksternt finansieret virksomhed
01/09/2009 → 24/04/2013
Award relations: Structural and textural control in high strength dual phase steels
Project: PhD

**Floating offshore wind turbines - 3D hydrodynamics coupled to an advanced aero-elastic code**
Kumari Ramachandran, G. K. V., PhD Student, Department of Wind Energy
Sørensen, J. N., Main Supervisor
Bredmose, H., Supervisor
Jensen, J. J., Supervisor
Bingham, H. B., Examiner
Nielsen, F. G., Examiner
Veldkamp, D., Examiner
Eksternt finansieret virksomhed
01/02/2009 → 27/05/2013
Award relations: Floating offshore wind turbines - 3D hydrodynamics coupled to an advanced aero-elastic code
Project: PhD

**Statistical characterization of metal microstructures**
Sun, J., PhD Student, Department of Wind Energy
Juul Jensen, D., Main Supervisor
Zhang, Y., Supervisor
Fæster, S., Examiner
Lauridsen, E. M., Examiner
Moelans, N., Examiner
Grundforskningsfonden
01/09/2013 → 09/12/2016
Award relations: Statistical characterization of metal microstructures
Project: PhD

**Kinetics of coarsening during annealing**
Lin, F., PhD Student, Department of Wind Energy
Juul Jensen, D., Main Supervisor
Pantleon, W., Supervisor
Huang, X., Examiner
Delannay, L., Examiner
Rollett, A. D., Examiner
Grundforskningsfonden
01/12/2009 → 24/04/2013
Award relations: Kinetics of coarsening during annealing
Project: PhD

**Nanostructuring of oxide dispersion strengthened ferritic steels by plastic deformation**
Zhang, Z., PhD Student, Department of Wind Energy
Pantleon, W., Main Supervisor
Mishin, O., Supervisor
Tao, N., Supervisor
Danielsen, H. K., Examiner
Petrov, R. H., Examiner
Sauvage, X., Examiner
Programbevilling
01/10/2011 → 24/04/2015
Award relations: Nanostructuring of oxide dispersion strengthened ferritic steels by plastic deformation
Project: PhD

**Electromechanical Drivetrain Simulation**
Gallego Calderon, J. F., PhD Student, Department of Wind Energy
Natarajan, A., Main Supervisor
Branner, K., Supervisor
Cutululis, N. A., Supervisor
Hansen, J. M., Supervisor
Juul Jensen, D., Examiner
Muljadi, E., Examiner
Bottasso, C. L., Examiner
Micro-Scale Experiments and Models for Composite Materials with Materials Research
Zike, S., PhD Student, Department of Wind Energy
Mikkelsen, L. P., Main Supervisor
Sørensen, B. F., Supervisor
Tvergaard, V., Supervisor
Legarth, B. N., Examiner
Jensen, H. M., Examiner
Thouless, M., Examiner
Forskningsrådsfinansiering
01/01/2012 → 30/10/2015
Award relations: Micro-Scale Experiments and Models for Composite Materials with Materials Research
Project: PhD

Multiple Turbine Wakes
Machefaux, E., PhD Student, Department of Wind Energy
Larsen, G. C., Main Supervisor
Aagaard Madsen, H., Supervisor
Mann, J., Supervisor
Sørensen, J. N., Examiner
Ivanell, S. S. A., Examiner
Voutsinas, S., Examiner
Forskningsrådsfinansiering
01/11/2011 → 24/08/2015
Award relations: Multiple Turbine Wakes
Project: PhD

Optimal Design of Composite Structures under Manufacturing Constraints
Marmaras, K., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor
Mikkelsen, L. P., Supervisor
Branner, K., Examiner
Duysinx, P., Examiner
Klarbring, A., Examiner
Lund, E., Supervisor
Forskningsrådsfinansiering
01/08/2011 → 05/11/2014
Award relations: Optimal Design of Composite Structures under Manufacturing Constraints
Project: PhD

Meso-scale modelling with focus on the water vapour profile
Nielsen, J. R., PhD Student, Department of Wind Energy
Dellwik, E., Main Supervisor
Boegh, E., Supervisor
Hahmann, A. N., Supervisor
Badger, J., Examiner
Nielsen, N. W., Examiner
Verhoef, A., Examiner
Forskningsrådsfinansiering
01/10/2009 → 20/09/2013
Award relations: Meso-scale modelling with focus on the water vapour profile
Project: PhD

Performance of biodegradable polymers used in mechanically loaded implants
Andersen, L. U., PhD Student, Department of Wind Energy
Brændsted, P., Main Supervisor
Lauritzen, J. B., Supervisor
Madsen, B., Examiner
Design of Large wind turbines using fluid-structure coupling technique
Sessarego, M., PhD Student, Department of Wind Energy
Shen, W. Z., Main Supervisor
Ramos Garcia, N., Supervisor
Sørensen, J. N., Supervisor
Aagaard Madsen, H., Examiner
Madsen, J., Examiner
Scheppers, G., Examiner
Samfinansieret - Andet
01/11/2013 → 16/02/2017
Award relations: Design of Large wind turbines using fluid-structure coupling technique
Project: PhD

Numerical modelling of the boundary-layer wind profile
Pedersen, J. G., PhD Student, Department of Wind Energy
Gryning, S., Main Supervisor
Kelly, M. C., Supervisor
Larsen, S. E., Examiner
Rutgersson, A., Examiner
Zagar, M., Examiner
Institut, samfinansiering
15/10/2010 → 21/02/2014
Award relations: Numerical modelling of the boundary-layer wind profile
Project: PhD

Studies of 3D microscale damage evolution in composites materials for wind turbines
Martyniuk, K., PhD Student, Department of Wind Energy
Sørensen, B. F., Main Supervisor
Lauridsen, E. M., Supervisor
Madsen, B., Examiner
Carballo, F. P., Examiner
Gamstedt, K., Examiner
Institut, samfinansiering
01/04/2010 → 27/01/2014
Award relations: Studies of 3D microscale damage evolution in composites materials for wind turbines
Project: PhD

Performance enhancement and load reduction on wind turbines using inflow measurements
Kragh, K. A., PhD Student, Department of Wind Energy
Hansen, M. H., Main Supervisor
Larsen, T. J., Supervisor
Mikkelsen, T. K., Supervisor
Poulsen, N. K., Examiner
Riziotis, V. A., Examiner
Bossanyi, E. A., Examiner
Institut, samfinansiering
01/03/2010 → 25/06/2013
Award relations: Performance enhancement and load reduction on wind turbines using inflow measurements
Project: PhD

Yield point phenomenon and formability of nanometals
Kidmose, J., PhD Student, Department of Wind Energy
Huang, X., Main Supervisor
Winther, G., Supervisor
Mikkelsen, L. P., Examiner
Tsuji, N., Examiner
Nielsen, K. B., Examiner
Institut, samfinansiering
01/01/2010 → 20/06/2014
Award relations: Yield point phenomenon and formability of nanometals
Project: PhD

Atmospheric turbulence and wind energy
Chougule, A. S., PhD Student, Department of Wind Energy
Mann, J., Main Supervisor
Kelly, M. C., Supervisor
Sørensen, J. N., Examiner
Cheng, P. W., Examiner
Institut, samfinansiering
15/04/2010 → 20/09/2013
Award relations: Atmospheric turbulence and wind energy
Project: PhD

Coupling of a CFD Solver with a Multibody Structural Model Applied to Trailing Edge Flaps
Heinz, J. C., PhD Student, Department of Wind Energy
Sørensen, N. N., Main Supervisor
Zahle, F., Supervisor
Mikkelsen, R. F., Examiner
Johansen, J., Examiner
Voutsinas, S., Examiner
Institut, samfinansiering
01/10/2009 → 27/08/2013
Award relations: Coupling of a CFD Solver with a Multibody Structural Model Applied to Trailing Edge Flaps
Project: PhD

Offshore Wind Energy: Wind and Sea Surface Temperature from Satellite Observations
Karagali, I., PhD Student, Department of Wind Energy
Hasager, C. B., Main Supervisor
Badger, M., Supervisor
Larsen, S. E., Examiner
Fensholt, R., Examiner
Rugaard Furevik, B., Examiner
Hoeyer, J. L., Supervisor
Institut, samfinansiering
01/03/2009 → 24/08/2012
Award relations: Offshore Wind Energy: Wind and Sea Surface Temperature from Satellite Observations
Project: PhD

Analysis and modeling of unsteady aerodynamics with application to wind turbine blade vibration at standstill conditions
Skrzypinski, W. R., PhD Student, Department of Wind Energy
Gaunaa, M., Main Supervisor
Bak, C., Supervisor
Bertagnolio, F., Supervisor
Mikkelsen, R. F., Examiner
Riziotis, V. A., Examiner
Wedel-Heinen, J. J., Examiner
Institut, samfinansiering
15/12/2008 → 23/05/2012
Award relations: Analysis and modeling of unsteady aerodynamics with application to wind turbine blade vibration at standstill conditions
Project: PhD

New data assimilation techniques for short-term wind energy forecast models with a rapid update cycle
Draxl, C., PhD Student, Department of Wind Energy
Giebel, G., Main Supervisor
Hahmann, A. N., Supervisor
delle Monache, L., Supervisor
PhD scholarship in Turbulent Atmospheric Flow with Relevance for Wind Energy
Lange, J., PhD Student, Department of Wind Energy
Mann, J., Main Supervisor
Berg, J., Supervisor
Larsen, G. C., Examiner
Porté-Agel, F., Examiner
Aubrun, S., Examiner
1/3 FUU, 1/3 inst 1/3 Andet
01/03/2013 → 29/09/2016
Award relations: PhD scholarship in Turbulent Atmospheric Flow with Relevance for Wind Energy
Project: PhD

Simulation and prediction of wakes and wake interaction in wind farms
Andersen, S. J., PhD Student, Department of Wind Energy
Sørensen, J. N., Main Supervisor
Mikkelsen, R. F., Supervisor
Shen, W. Z., Supervisor
Mann, J., Examiner
Meyers, J., Examiner
Ivanell, S. S. A., Examiner
1/3 FUU, 1/3 inst 1/3 Andet
01/06/2010 → 27/01/2014
Award relations: Simulation and prediction of wakes and wake interaction in wind farms
Project: PhD

The impact of non-neutral atmosphere on offshore wind turbines
de Mare, M. T., PhD Student, Department of Wind Energy
Mann, J., Main Supervisor
Larsen, G. C., Supervisor
Veldkamp, D., Supervisor
Berg, J., Examiner
Bossanyi, E. A., Examiner
George, W. K., Examiner
ErhvervsPhD-ordningen VTU
15/03/2011 → 24/09/2015
Award relations: The impact of non-neutral atmosphere on offshore wind turbines
Project: PhD

Development of Efficient Turbulence Models for CFD Wake Simulations
van der Laan, P., PhD Student, Department of Wind Energy
Serensen, N. N., Main Supervisor
Kelly, M. C., Supervisor
Réthoré, P., Supervisor
Mann, J., Supervisor
Mikkelsen, R. F., Examiner
Madsen, J. I., Examiner
Masson, C., Examiner
Technical University of Denmark
15/12/2011 → 24/04/2015
Award relations: Development of Efficient Turbulence Models for CFD Wake Simulations
Project: PhD

Aeroservoelastic modeling and stability of wind turbine blades
Pirrung, G., PhD Student, Department of Wind Energy
Aagaard Madsen, H., Main Supervisor
Kim, T., Supervisor
Hansen, M. O. L., Examiner
van Busseel, G. J. W., Examiner
Kallesøe, B. S., Examiner
Technical University of Denmark
01/11/2011 → 23/02/2015
Award relations: Aeroservoelastic modeling and stability of wind turbine blades
Project: PhD

Concurrent aero-servo-elastic design and optimization of wind turbines
Tibaldi, C., PhD Student, Department of Wind Energy
Bak, C., Main Supervisor
Henriksen, L. C., Supervisor
Stolpe, M., Examiner
Riziotis, V. A., Examiner
Winther Stærdahl, J., Examiner
Technical University of Denmark
01/11/2011 → 21/05/2015
Award relations: Concurrent aero-servo-elastic design and optimization of wind turbines
Project: PhD

Two-dimensional rotor plane wind data retrieval - HTF Wind Lidar
Foroughi Abari, F., PhD Student, Department of Wind Energy
Mann, J., Main Supervisor
Sjöholm, M., Supervisor
Courtney, M., Examiner
Cariou, J., Examiner
Water, W. V. D., Examiner
Technical University of Denmark
15/12/2011 → 24/09/2015
Award relations: Two-dimensional rotor plane wind data retrieval - HTF Wind Lidar
Project: PhD

Simulation of flows past a wind turbine with wind shear using Navier-Stokes based sliding mesh technique
Kolmogorov, D., PhD Student, Department of Wind Energy
Shen, W. Z., Main Supervisor
Sørensen, J. N., Supervisor
Zhu, W. J., Supervisor
Zahle, F., Examiner
Madsen, J. I., Examiner
Bijl, H., Examiner
Technical University of Denmark
01/02/2011 → 29/09/2014
Award relations: Simulation of flows past a wind turbine with wind shear using Navier-Stokes based sliding mesh technique
Project: PhD

Simulation and Modelling of Wakes and Wake Interaction in Offshore Wind Farms
Sarlak Chivaee, H., PhD Student, Department of Wind Energy
Sørensen, J. N., Main Supervisor
Mikkelsen, R. F., Supervisor
Shen, W. Z., Supervisor
Walther, J. H., Examiner
Davidson, L., Examiner
Olesen, N. A., Examiner
Technical University of Denmark
01/01/2011 → 25/08/2014
Award relations: Simulation and Modelling of Wakes and Wake Interaction in Offshore Wind Farms
Project: PhD
Icing Problems of Wind Turbine Blades in Cold Climates
Hudecz, A., PhD Student, Department of Wind Energy
Hansen, M. O. L., Main Supervisor
Battisti, L., Supervisor
Villumsen, A., Supervisor
Meyer, K. E., Examiner
Johansen, J., Examiner
Oleskiw, M. M., Examiner
Technical University of Denmark
15/11/2010 → 26/05/2014
Award relations: Icing Problems of Wind Turbine Blades in Cold Climates
Project: PhD

Performance Measurements with the use of Spinner Anemometry
Demurtas, G., PhD Student, Department of Wind Energy
Pedersen, T. F., Main Supervisor
Mouritsen, S., Supervisor
Wagner, R., Supervisor
Hansen, K. S., Examiner
Gottschall, J., Examiner
Eecen, P. J., Examiner
1/3 FUU, 1/3 inst 1/3 Andet
01/10/2013 → 25/11/2016
Award relations: Performance Measurements with the use of Spinner Anemometry
Project: PhD

Free Material Optimization of Wind Turbine Blades
Weldeyesus, A. G., PhD Student, Department of Wind Energy
Stolpe, M., Main Supervisor
Mikkelsen, L. P., Examiner
Stingl, M. W., Examiner
Kocvara, M., Examiner
Lund, E., Supervisor
Forskningsrådsfinansiering
15/12/2010 → 03/12/2014
Award relations: Free Material Optimization of Wind Turbine Blades
Project: PhD

Integrated design of wind power systems
Barahona Garzón, B., PhD Student, Department of Wind Energy
Sørensen, P. E., Main Supervisor
Cutululis, N. A., Supervisor
Hansen, A. M., Supervisor
Hansen, A. D., Supervisor
Larsen, G. C., Examiner
Carlson, O., Examiner
Iov, F., Examiner
Institut, samfinansiering
01/02/2009 → 18/06/2012
Award relations: Integrated design of wind power systems
Project: PhD

Communication and control in clusters of wind power plants connected to HVDC offshore grids
Zeni, L., PhD Student, Department of Wind Energy
Sørensen, P. E., Main Supervisor
Hansen, A. D., Supervisor
Rasmussen, T. W., Examiner
Liang, J., Examiner
Pettersson, A., Examiner
Kjaer, P. C., Supervisor
Ansæt eksternt
01/10/2011 → 22/06/2015
Award relations: Communication and control in clusters of wind power plants connected to HVDC offshore grids
Assessment of extreme design loads for modern wind turbines using the probabilistic approach
Abdallah, I., PhD Student, Department of Wind Energy
Natarajan, A., Main Supervisor
Serensen, J. D., Supervisor
Larsen, G. C., Examiner
Manuel, L., Examiner
Riziotis, V. A., Examiner
ErhvervsPhD-ordningen VTU
01/05/2012 → 24/08/2015
Award relations: Assessment of extreme design loads for modern wind turbines using the probabilistic approach
Project: PhD

Ultimate strength of wind turbine blade structures under multi axial loading
Haselbach, P. U., PhD Student, Department of Wind Energy
Branner, K., Main Supervisor
Berggreen, C., Supervisor
Bitsche, R., Supervisor
Mikkelsen, L. P., Examiner
Lindgaard, E., Examiner
Nijsen, R., Examiner
1/3 FUU, 1/3 inst 1/3 Andet
01/05/2012 → 25/02/2016
Award relations: Ultimate strength of wind turbine blade structures under multi axial loading
Project: PhD

Experimental Stereo Vision Studies of Flow and Structural Effects on Wind Turbines
Najafi, N., PhD Student, Department of Wind Energy
Schmidt Paulsen, U., Main Supervisor
Sjöholm, M., Supervisor
Mann, J., Supervisor
Georgakis, C. T., Examiner
Tcherniak, D., Examiner
Griffith, D. T., Examiner
Centerfinansieret
01/03/2012 → 30/11/2015
Award relations: Experimental Stereo Vision Studies of Flow and Structural Effects on Wind Turbines
Project: PhD

Light Weight Rotor Design - Combined passive and active control methods
Pavese, C., PhD Student, Department of Wind Energy
Kim, T., Main Supervisor
Henriksen, L. C., Supervisor
Larsen, T. J., Supervisor
Bak, C., Examiner
Kallese, B. S., Examiner
Palacios, R., Examiner
Samfinansieret - Andet
15/12/2013 → 20/04/2017
Award relations: Light Weight Rotor Design - Combined passive and active control methods
Project: PhD

Uncertainty Quantification of Wind Farm Flow Models
Murcia Leon, J. P., PhD Student, Department of Wind Energy
Réthoré, P., Main Supervisor
Natarajan, A., Supervisor
Serensen, J. D., Supervisor
Larsen, G. C., Examiner
Barthelmie, R. J., Examiner
Manuel, L., Examiner
Samfinansieret - Andet
Adaptive Trailing Edge Flap, control for enhanced load alleviation
Bergami, L., PhD Student, Department of Wind Energy
Gaunaa, M., Main Supervisor
Buhl, T., Supervisor
Poulsen, N. K., Supervisor
Mikkelsen, R. F., Examiner
Schepers, G., Examiner
Bossanyi, E. A., Examiner
Institut, samfinansiering
01/01/2010 → 27/08/2013
Award relations: Adaptive Trailing Edge Flap, control for enhanced load alleviation
Project: PhD

Fatique and extreme wave loads on bottom fixed offshore wind turbines
Schløer, S., PhD Student, Department of Wind Energy
Bredmose, H., Main Supervisor
Mikkelsen, R. F., Supervisor
Aagaard Madsen, H., Examiner
Krokstad, J. R., Examiner
Manuel, L., Examiner
Technical University of Denmark
01/05/2010 → 12/12/2013
Award relations: Fatique and extreme wave loads on bottom fixed offshore wind turbines
Project: PhD

Windprosper: Nationwide accurate wind prospecting models for Denmark & Turkey
To develop a new wind modelling concept and apply it nationwide to Denmark and Turkey. These nationwide models are proofs-of-concept and allow prediction of accurate long-term wind climate series and associated uncertainties any place in Denmark or Turkey. The model concept integrates three existing model components in a novel setup including large amounts of observational data; production data from >4000 wind turbines in Denmark and wind measurements from hundreds of masts in Turkey.
Bechmann, A., Project Manager, Department of Wind Energy, Resource Assessment Modelling
Sogachev, A., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Kelly, M. C., Project Participant, Department of Wind Energy, Resource Assessment Modelling
Cavar, D., Project Participant, Department of Wind Energy, Resource Assessment Modelling
van der Laan, P., Project Participant, Department of Wind Energy, Aerodynamic design
01/07/2016 → 01/06/2018
Keywords: Windprosper, wind resources, Wind turbine, CFD
Collaborators: EMD International A/S, Üstün Energy Engineering LLC
Project: Research

SANEDI: System adequacy and reserve margins with increasing levels of variable generation
The project aims at investigating system adequacy and reserve margins with increasing levels of variable generation (wind and photovoltaic mainly) in South Africa
Sørensen, P. E., Project Participant, Department of Wind Energy, Wind Energy Systems
Marinelli, M., Project Participant, Department of Electrical Engineering, Center for Electric Power and Energy, Distributed Energy Resources
Litong-Palima, M., Project Participant, Department of Wind Energy, Wind Energy Systems
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
01/07/2015 → 31/08/2016
Keywords: wind power, Photovoltaic, large scale
Collaborators: EA Energy Analysis A/S
Project: Research

Flex4RES: Flexible Nordic Energy Systems
The Flex4RES project investigates how an intensified interaction between coupled energy markets, supported by coherent regulatory frameworks, can facilitate the integration of variable renewable energy (VRE) in turn ensuring stable, sustainable and cost-efficient Nordic energy systems.
The primary objective of Flex4RES is to identify and assess regulatory and technical pathways towards coherent Nordic energy systems in 2050 based on strong interaction between different energy markets that ensure resilience, sustainability and efficiency.

Skytte, K., Project Manager, Energy Economics and Regulation, Department of Management Engineering, Systems Analysis

Kitzing, L., Project Participant, Energy Economics and Regulation, Department of Management Engineering, Systems Analysis

Karlsson, K. B., Project Participant, Department of Management Engineering, Systems Analysis, Energy Systems Analysis

Pizarro Alonso, A. R., Project Participant, Department of Management Engineering, Systems Analysis, Energy Systems Analysis

Balyk, O., Project Participant, Department of Management Engineering, Systems Analysis, Energy Systems Analysis

Bolvig, S., Project Participant, Department of Management Engineering, Systems Analysis, DTU Climate Centre, Energy Systems Analysis

Pade, L., Project Participant, Department of Management Engineering, Systems Analysis, Energy Systems Analysis

Soysal, E. R., Project Participant, Department of Management Engineering, Systems Analysis, Energy Economics and Regulation

Katz, J., Project Participant, Energy Economics and Regulation, Department of Management Engineering, Systems Analysis

Olsen, O. J., Project Participant, Department of Management Engineering, Energy Economics and Regulation, Systems Analysis

Bergaentzlé, C., Project Participant, Energy Economics and Regulation, Department of Management Engineering, Systems Analysis

Sneum, D. M., Project Participant, Energy Economics and Regulation, Department of Management Engineering, Systems Analysis

Vasileiou, T., PhD Student, Department of Management Engineering, Systems Analysis, Energy Economics and Regulation

Ravn, H. V., Project Participant, Rise National Laboratory for Sustainable Energy

Boscán Flores, L. R., Project Participant, Energy Economics and Regulation

Koivisto, M. J., Project Participant, Department of Wind Energy, Integration & Planning

Sørensen, P. E., Project Participant, Department of Wind Energy, Integration & Planning

Jensen, I. G., Project Participant, Department of Management Engineering, Systems Analysis, Energy Economics and Regulation

Project ID: 82511
External Project ID: NER 76084
01/10/2015 → 30/09/2019
Keywords: Flexibility, Renewable energy, Integrated energy systems, Energy market designs, Energy policy, regulatory framework conditions, Coherent Energy Systems, Regulatory pathways, Nordic countries, Nordic Energy Research

Collaborators: Aalto University, Norwegian University of Life Sciences, RAM-løse edb, NIFU Nordic Institute for Studies in Innovation, Research and Education, KTH - Royal Institute of Technology, Nordic Energy Research

Project: Research

RUNE: Reducing uncertainty of near-shore wind resource estimates using onshore lidars

RUNE aims at reducing the uncertainty of near-shore wind resource estimates by using onshore scanning lidar technology combined with ocean and satellite information

Peña, A., Project Coordinator, Department of Wind Energy, Meteorology

Courtney, M., Project Participant, Department of Wind Energy, Test and Measurements

Vasiljevic, N., Project Participant, Department of Wind Energy, Test and Measurements

Lea, G., Project Participant, Department of Wind Energy, Test and Measurements

Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology

Hummelshøj, P., Project Participant, Department of Wind Energy, Test and Measurements

Floors, R. R., Project Participant, Department of Wind Energy, Meteorology

Ejsing Jørgensen, H., Project Participant, Department of Wind Energy, Meteorology

Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology

Mann, J., Project Participant, Department of Wind Energy, Meteorology

Badger, M., Project Participant, Department of Wind Energy, Meteorology

Hansen, K. S., Project Participant, Department of Wind Energy, Test and Measurements

Karagali, I., Project Participant, Department of Wind Energy, Meteorology

Project ID: 12263

ForskEL
01/02/2015 → 30/09/2016
Collaborators: Ørsted A/S, DHI Water - Environment - Health, Fraunhofer Institute for Wind Energy and Energy System Technology

Award relations: Reducing uncertainty of near-shore wind resource estimates using onshore lidars

Documents:

D1p1_final
Optimization of vortex generators on wind turbine blades
Experimental/theoretical optimization and model construction for the wake induced by vortex generators.
Velte, C. M., Project Participant, Department of Mechanical Engineering, Fluid Mechanics, Coastal and Maritime Engineering
Hansen, M. O. L., Project Participant, Department of Wind Energy, Fluid Mechanics
Okulov, V., Project Participant, Department of Wind Energy, Fluid Mechanics
Sørensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
Fuglsang, P., Project Participant
Project ID: 76031
01/02/2010 → 31/07/2013
Collaborators: LM Glasfiber A/S
Project: Research

INTELLISWITCH: Intelligent Quality Assessment of Railway Switches and Crossings
This project aims at significantly improving the safety, reliability and operational lifetime of the 3500 switches and crossings (S&Cs) in the Danish railway network.
The project is a close cooperation between the Technical University of Denmark (DTU), the Danish rail infrastructure provider Rail Net Denmark and four affiliated European partners with significant expertise within this field. An interdisciplinary scientific effort is employed to obtain enhanced rail transport reliability and regularity simultaneously with significant savings in S&Cs maintenance costs.
The project results will make maintenance based on intelligent fault prediction tools, instead of the presently used regular planned inspections, and it will provide sophisticated tools to prevent hidden faults from developing to failure in the future. In a novel approach, the project will install state-of-the-art sensor technology in selected S&Cs and correlate dynamic parameters during train passage with static geometry data from conventional measurement vehicles. Monitoring of the dynamic responses will provide diagnosis of patterns that indicate when components or ballast begin to deviate from fully functional conditions. Modelling of dynamics will identify root causes to signs of degradation. Damage assessment of components identified by anomalous readings will be done by metallurgical examinations. Data and results will be processed by a holistic model that can produce Maintenance Performance Indicators (MPI) for the S&C condition.
The correlation of sensor data to measuring vehicle data will allow existing data to be used reliably as input for the MPI model. It is expected that this project will enable optimisation of maintenance procedures, by which appropriate maintenance can be predicted in advance, thus avoiding unscheduled repairs and delays in the railway traffic.
Juul Jensen, D., Project Manager, Department of Wind Energy, Materials science and characterization
Galeazzi, R., Project Participant, Department of Electrical Engineering, Automation and Control
Blanke, M., Project Participant, Department of Electrical Engineering, Automation and Control
Hansen, S., Project Participant, Department of Electrical Engineering, Automation and Control
Barkhordari, P., Project Participant, Department of Electrical Engineering, Automation and Control
Asadzadeh, S. M., Project Participant, Department of Electrical Engineering, Automation and Control
Santos, I., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Tejada, A. D. M., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Danielsen, H. K., Project Participant, Department of Wind Energy, Materials science and characterization
Dhar, S., Project Participant, Department of Wind Energy, Materials science and characterization
Ersbøll, B. K., Project Participant, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
Kulahci, M., Project Participant, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
Thyregod, C., Project Participant, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
Innovationsfonden: DKK12,700,000.00
01/03/2015 → 28/02/2019
Collaborators: Banedanmark
Award relations: Intelligent Quality Assessment of Railway Switches and Crossings
Project: Research
Measuring Turbulence using Commercial Wind Lidars
Sathe, A., Project Participant, Department of Wind Energy, Test and Measurements
Vignaroli, A., Project Participant, Department of Wind Energy, Test and Measurements
Carbon Trust: DKK508,636.00
21/11/2014 → 11/11/2015
Award relations: Measuring Turbulence using Commercial Wind Lidars
Project: Research

ECOWindS: European Clusters for Offshore Wind Servicing
ECOWindS’ objective is to pave the way for new research and knowledge of how the costs of offshore wind energy can be driven down through better services. The objective is reached by establishing cross-regional cooperation, intensifying the relationship between research, the European offshore wind servicing (OWS) sector and the offshore wind industry. The actions in the project include mapping of regional capabilities, search of RDI projects and building a Joint Action Plan for regional and international co-operation. ECOWindS is funded from the EU FP7.
Piirainen, K. A., Project Participant, Department of Management Engineering, Technology and Innovation Management
Andersen, P. D., Project Participant, Department of Management Engineering, Technology and Innovation Management
Clausen, N., Project Participant, Department of Wind Energy, Wind Energy Systems
Buhl, T., Project Participant, Department of Wind Energy, Wind Turbines
Cronin, T., Project Participant, Department of Wind Energy, Wind Energy Systems
FP7 Contract ID: 320042
01/11/2013 → 31/10/2015
Keywords: Offshore wind, Roadmap, Foresight, Offshore wind services
Collaborators: Offshoreenergy.dk
Project: Research

REWIND: REWIND - Knowledge based engineering for improved reliability of critical wind turbine components
Hattel, J. H., Project Manager, Department of Mechanical Engineering, Manufacturing Engineering
Tvergaard, V., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Somers, M. A. J., Project Participant, Department of Mechanical Engineering, Materials and Surface Engineering
Fæster, S., Project Participant, Department of Wind Energy, Materials science and characterization
Natarajan, A., Project Participant, Department of Wind Energy, Wind Turbines
Klit, P., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Project ID: 76142
External Project ID: 10-093966
01/01/2011 → 31/12/2016
Collaborators: MAGMA Giessereitechnologie GmbH, Michigan State University, Aalborg University
Project: Research

PhD: Modeling of Wind Turbine Inflow
The overall aim of the project is to numerically model the wind turbine inflow in any kind of terrain. Therefore a thorough understanding of the upstream flow modification through the presence of a wind turbine is needed. This will be achieved by applying various numerical simulation methods, ranging from simple potential flow over to computational fluid dynamics, to various wind turbine designs with different control algorithms. In this context the influence of aeroelasticity will also be examined. All numerical methods will be supported and validated through extensive lidar measurement data, that will be acquired during various measurement campaigns.
The project can be split into three major milestones:
- Modelling the blockage effect of the rotor in flat terrain
- Accessing the impact of the topography on the inflow
- Relate the near flow field to the free wind speed
Meyer Forsting, A., PhD Student, Department of Wind Energy, Aeroelastic Design
Troldborg, N., Main Supervisor, Department of Wind Energy, Aeroelastic Design
Réthoré, P., Supervisor, Department of Wind Energy, Aeroelastic Design
Bechmann, A., Supervisor, Department of Wind Energy, Meteorology
Project ID: 1305-00024B
Innovation Fund Denmark
01/09/2014 → 31/08/2017
Keywords: CFD, lidar, UniTTe, WindScanner, nacelle lidars, power performance, loads assessment, inflow, induction, Uncertainty Quantification
Award relations: Modeling of Wind Turbine Inflow
Project: Research
Advancing Materials
DTU Wind Energy’s cross sectional project called Advancing Materials within a special task on Using the Right Materials focusing on material identification to use in structural optimization
Weldeyesus, A. G., Project Participant, Department of Wind Energy, Wind Turbines
14/01/2015 → …
Project: Research

PECD: Pan European Climate Data
ENTSO-E funded project aimed at evaluating photovoltaic and wind hourly production on regional scale in the whole Europe
Marinelli, M., Project Participant, Department of Electrical Engineering, Center for Electric Power and Energy, Distributed Energy Resources
Cutululis, N. A., Project Participant, Department of Wind Energy, Wind Energy Systems
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
01/11/2012 → 31/07/2014
Keywords: Photovoltaic, Wind Energy
Project: Research

Design Optimization of Jacket Structures for Mass Production
Sandal, K., Project Participant, Department of Wind Energy, Wind Turbines
01/08/2014 → …
Project: Research

Cost-Effective mass production of Universal Foundations for large offshore wind park
Weldeyesus, A. G., Project Participant, Department of Wind Energy, Wind Turbines
09/08/2014 → …
Project: Research

ESA ResGrow: ESA ResGrow
RESGrow (ESA: Ongoing) is a collaborative project funded by European Space Agency. Techworks Marine Ltd. are responsible for the overall project management and are also responsible for the Wave and Tidal Energy sector. The aim of the RESGrow project is the provision of statistical information on environmental conditions to support the planning of new renewable energy infrastructure as well as the provision of nowcast and forecast information to optimise short- to medium-term operations planning. Within the context of this activity, renewable energy refers to the following sectors:
In Phase 1:
Offshore wind energy
Hydropower
Solar Energy
Tidal and wave energy
Biomass
In Phase 2:
Offshore wind energy
Solar Energy
Tidal and wave energy
The main goal of the project is expanding the market for earth observation based information services in renewable energy sector.
Project in two phases 1 and 2.
Hasager, C. B., Project Manager, Department of Wind Energy, Meteorology
Astrup, P., Project Participant, Department of Wind Energy, Meteorology
Badger, M., Project Participant, Department of Wind Energy, Meteorology
Giebel, G., Project Participant, Department of Wind Energy, Wind Energy Systems
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
External Project ID: ESA project
07/02/2013 → 30/09/2015
Collaborators: German Aerospace Center, TechWorks Marine, Transvalor S.A.
Project: Research

ORES: Sino-Danish project: ORES: Study on offshore wind resource assessment based on satellite data and modelling
Objective: To develop a practical, reliable and robust method for offshore wind resource assessment that can be applied for other potential offshore wind farm sites in China and elsewhere.
Hasager, C. B., Project Manager, Department of Wind Energy, Meteorology
Badger, M., Project Participant, Department of Wind Energy, Meteorology
Great Lakes 3D: DOE Great Lakes: An integrated approach to offshore wind energy assessment: Great Lakes 3D wind experiment

Project Goals: The datasets to be collected within the project will be (i) linked to existing resource estimates, (ii) used in a closure (instrument inter-comparison) analysis based in part on the in situ observations, (iii) used to evaluate meteorological and wind farm models (iv) analyzed to characterize meteorological conditions in the coastal Great Lakes region where highly resolved observations are currently lacking, and (v) used to develop best-practice strategies and documentation for each measurement type focused on its application to wind energy.

Principal Investigator: R.J. Bartheimie, Croll Fellow and Professor Indiana University/Cornell University.

HTF-CEUF: Cost-Effective mass production of Universal Foundations for large offshore wind park

RePlan: Ancillary services from renewable power plants

RePlan project is a frontrunner for the integration of large share of renewable energy in the Danish power system. RePlan aims at rethinking the way of using generation resources, as it focuses on enabling a resilient power system by providing ancillary services in a jointly coordinated manner.

The overall objective of this project is to contribute to the integration of large share of renewable energy in the Danish power system and thus to enable a resilient power system in the future by developing technical solutions for the provision of ancillary services by renewable power plants. RePlan focuses on WP and PV plants since they are expected to jointly produce the lion’s share of renewable energy generation capacity needed to reach the Danish government 2050 targets.

With respect to renewable generation (ReGen) plants, investigation of ancillary services, coordinated control, fast communication and forecast of available power are crucial step stones on the route toward a future resilient power system.

The ability to provide ancillary services from ReGen plants depends on the communication and the forecast of availability power. In this respect, RePlan develops controllers for the delivery of ancillary services, incorporating communication properties in the control loops of the ReGen plant model and using state-of-the-art methods for simulation of renewable generation patterns and wind power forecast methods. Based on both simulation models and verification in laboratory facilities, this project intends to address this challenge: What is the impact of communication and power availability forecast error in providing coordination and ancillary services from ReGen plants?

The novelty of RePlan consists in the investigation and verification of the ancillary services provision from wind and photovoltaic power plants and of the suitability to coordinate their services provision to power system operator. In this respect, RePlan strives to identify and analyze the strengths and limitations of WP and PV plants, anticipating new challenges and exploring some of the more complex issues and uncertainties related to the coordination of their ancillary services. The services with great concerns in the future include: voltage, frequency and rotor angular stability support.

Hansen, A. D., Project Manager, Department of Wind Energy, Wind Energy Systems

44525-4610: National Wind Tunnel

To design and establish a national Wind tunnel, which is a national research infrastructure able mainly to test 2D airfoils up to Re=7 mio aerodynamically and aero-acoustically and in a later phase be able to measure model rotors and wakes.

Bak, C., Project Manager, Department of Wind Energy, Aeroelastic Design

Fischer, A., Project Participant, Department of Wind Energy, Aeroelastic Design

Gaunaa, M., Project Participant, Department of Wind Energy, Aeroelastic Design

Mikkelsen, R. F., Project Participant, Department of Wind Energy, Fluid Mechanics
Mann, J., Project Participant, Department of Wind Energy, Meteorology
Barlas, A., Project Participant, Department of Wind Energy, Aeroelastic Design
15/08/2012 → 31/12/2016
Project: Research

43193-4610: Windtrust
The project aims to improve the competitiveness of the Wind energy by enhancing the reliability of key components of 2MW size Wind turbines and by reducing noise emission of this turbines class with blade add-ons.
Bak, C., Project Manager, Department of Wind Energy, Aeroelastic Design
Fischer, A., Project Manager, Department of Wind Energy, Aeroelastic Design
Bertagnolio, F., Project Participant, Department of Wind Energy, Aeroelastic Design
01/09/2013 → 31/08/2016
Collaborators: National Renewable Energy Center, LM Wind Power, University of Southampton
Project: Research

43176-4610: Power Pack
The project will develop standardized aerodynamic devices, e.g. vortex generators and Gurney flaps, called Power Packs, to improve wind turbine blades and thereby increase power production by up to 6%.
Bak, C., Project Manager, Department of Wind Energy, Aeroelastic Design
Gaunaa, M., Project Participant, Department of Wind Energy, Aeroelastic Design
Skrzypinski, W. R., Project Participant, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Sørensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
01/01/2013 → 31/12/2015
Project: Research

43144-4610: IEA Wind 29 Mexnext-II
The purpose of participation in the IEA Annex 29 Mexnext II is to validate and improve a variety of aerodynamic and aeroelastic calculation models used in both research institutions and industry.
Aagaard Madsen, H., Project Manager, Department of Wind Energy, Aeroelastic Design
Sørensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
01/08/2012 → 31/12/2014
Project: Research

43195: Blade Dragon 2.0
Analyze & improve Liftra's Blade Dragon single blade installation system to be able to do single blade installation in higher Wind speeds than today's approx. 8m/s.
Gaunaa, M., Project Participant, Department of Wind Energy, Aeroelastic Design
Bergami, L., Project Participant, Department of Wind Energy, Aeroelastic Design
Hansen, A. M., Project Participant, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Hansen, A. D., Project Participant, Department of Wind Energy, Wind Energy Systems
Barlas, A., Project Participant, Department of Wind Energy, Aeroelastic Design
01/07/2013 → 30/06/2016
Collaborators: Liftra ApS
Project: Research

43109: WTopt
Design and testing of thick airfoils, 3D correction of airfoil data, 360 degree airfoil data standstill vibration, design of blades with bend twist coupling.
Zahle, F., Project Manager, Department of Wind Energy, Aeroelastic Design
Troldborg, N., Project Participant, Department of Wind Energy, Aeroelastic Design
Kim, T., Project Participant, Department of Wind Energy, Aeroelastic Design
Skrzypinski, W. R., Project Participant, Department of Wind Energy, Aeroelastic Design
Fischer, A., Project Participant, Department of Wind Energy, Aeroelastic Design
Sørensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
Heinz, J. C., Project Participant, Department of Wind Energy, Aeroelastic Design
01/01/2011 → 30/06/2014
Project: Research
43199: EUDP LEX
To clarify the reason of leading edge blade damages and demonstrate efficient solutions to the problem.
Larsen, T. J., Project Manager, Department of Wind Energy, Aeroelastic Design
Hansen, A. M., Project Participant, Department of Wind Energy, Aeroelastic Design
08/07/2012 → 30/06/2016
Project: Research

43028 4610: Light Rotor
The project seeks to create an Integrated design process composed of: Advanced airfoil design taking into account both aerodynamic and structural objectives/constraints, Aero-servo-elastic blade optimization etc.
Bak, C., Project Manager, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Kim, T., Project Participant, Department of Wind Energy, Aeroelastic Design
Yde, A., Project Participant, Department of Wind Energy, Aeroelastic Design
Sørensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
Gaunaa, M., Project Participant, Department of Wind Energy, Aeroelastic Design
Skrzypinski, W. R., Project Participant, Department of Wind Energy, Aeroelastic Design
01/10/2010 → 31/05/2014
Project: Research

43118 4610: EUDP Envision PP2B
To demonstrate the cost saving potential of the Partial Pitch 2-bladed wind turbine technology and through a measurements campaign to verify analysis and development tools for the technology.
Kim, T., Project Manager, Department of Wind Energy, Aeroelastic Design
Larsen, T. J., Project Participant, Department of Wind Energy, Aeroelastic Design
Yde, A., Project Participant, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Sørensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
01/01/2012 → 31/12/2014
Project: Research

43031-4610: INDUFLAP
To transfer a flap technology, tested in the laboratory, to an industrial manufacturing process and test the flap system in a real atmospheric environment on a rotating test rig.
Aagaard Madsen, H., Project Manager, Department of Wind Energy, Aeroelastic Design
Bergami, L., Project Participant, Department of Wind Energy, Aeroelastic Design
Rasmussen, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Barlas, A., Project Participant, Department of Wind Energy, Aeroelastic Design
01/11/2011 → 30/06/2014
Project: Research

43033-4610: TURBOPT
The project aims to develop the calculation of energy production and loads on wind turbines by develop and optimize Integrated models, which is able to handle the multi-scale phenomena in complex terrain.
Aagaard Madsen, H., Project Manager, Department of Wind Energy, Aeroelastic Design
Henriksen, L. C., Project Participant
Fischer, A., Project Participant, Department of Wind Energy, Aeroelastic Design
Shen, W. Z., Project Participant, Department of Wind Energy, Fluid Mechanics
01/04/2011 → 30/06/2014
Collaborators: Chinese Academy of Sciences
Project: Research

AVATAR
The overall objective of the AVATAR project is to evaluate, improve and validate aerodynamic and aeroelastic tools to ensure applicability for large optimized Wind turbines.
Sørensen, N. N., Project Manager, Department of Wind Energy, Aeroelastic Design
Aagaard Madsen, H., Project Manager, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Rasmussen, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Heinz, J. C., Project Participant, Department of Wind Energy, Aeroelastic Design
The project concerns the mutual interaction between wind turbine aerodynamics, turbine wakes, terrain affected flow and atmospheric turbulence, which is not accounted for in state of the art modelling.

**43114-4610: WAsP CFD**

The objective is to reach international consensus and establish guidelines on operation of wind farm flow models through a collaborative research work.

**43026 4610-PSO: Nysted 2, Wakes**

The objective of this project is to use simple turbine measurements in a wind farm to identify, model and verify the basic mechanisms driving the increased loading experienced by turbines operating in offshore wind farms.

**43032 4610-EUDP: Wind Farm**

The project will develop a model that describes the turbine wake and how it affects downwind turbines. The model can provide a better basis for determining relative positions of turbines, and thereby optimize production.

Collaborators: EMD International A/S, Vattenfall
Project: Research

Collaborators: Ørsted A/S, Vestas Wind Systems AS
Project: Research
MARINA is a European project dedicated to bringing offshore renewable energy applications closer to the market by creating new infrastructures for both offshore wind and ocean energy converters.

The project combines deep-water engineering experience from European oil & gas developments during the last 40 years, state-of-the-art concepts for offshore wind energy, and the most promising concepts in today’s R&D pipeline on wave energy and other marine renewables. The MARINA project is designed to capitalise on the vast body of proven marine technological knowledge gained in one of the world’s most hostile off-shore operating environments: the Northern European seas.

MARINA will bolt this practical technology skill set onto the research base of the emerging but still marginal EU MRE industry and ensure its continued world-leading role. The MARINA project is therefore of major strategic significance for Europe.

The total project is 12.8 million euro. The European Union has granted 8.7 million euro. Grant 241402.

Charlotte Bay Hasager, Xiaoli Guo Larsén and Ioanna Karagali are responsible for site conditions wind and waves for combined wind-wave energy converters.

Hansen, A. M., Project Manager, Department of Wind Energy, Aeroelastic Design
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
Larsén, X. G., Project Participant, Department of Wind Energy, Meteorology
Astrup, P., Project Participant, Department of Wind Energy, Meteorology
Peña, A., Project Participant, Department of Wind Energy, Meteorology
Floors, R. R., Project Participant, Department of Wind Energy, Meteorology
Gryning, S., Project Participant, Department of Wind Energy, Meteorology
Yde, A., Project Participant, Department of Wind Energy, Aeroelastic Design
Kallesøe, B. S., Project Participant

Collaborators: Ørsted A/S, University of Edinburgh, National Technical University of Athens, Equinor ASA, Fraunhofer-Gesellschaft

Project: Research

To further develop the concept of a floating platform that combines both wave and Wind energy with focus of basin test of a scale model of P-80.

Yde, A., Project Participant, Department of Wind Energy, Aeroelastic Design
Larsen, T. J., Project Participant, Department of Wind Energy, Aeroelastic Design
Verelst, D. R., Project Participant, Department of Wind Energy, Aeroelastic Design

Collaborators: Floating Power Plant A/S

Project: Research

Wind2050: Controversies on wind power

Borch, K., Project Manager, Department of Management Engineering, Technology and Innovation Management
Nyborg, S., Project Participant, Department of Management Engineering, Technology and Innovation Management
Klinge Jacobsen, H., Project Participant, Department of Management Engineering, Systems Analysis, Energy Systems Analysis
**UniTTe: Unified testing procedures for wind turbines through inflow characterisation using nacelle lidars**

UniTTe addresses the question of how best to characterise the wind when measuring the power and loads on modern wind turbines. Current international standards require us to measure the wind from a mast, far in-front of the rotor and at the rotor centre height (hub-height). UniTTe proposes a radical change so that in the future we will measure with a lidar (laser anemometer) mounted on the nacelle, measure quite close to the rotor and measure over a range of heights. The advantages will be significant: avoiding erecting high masts (hugely expensive offshore), getting better correlation between the wind and the power and loads and achieving universal procedures that work equally well both offshore and in mountains.

**Wind turbine tip-loss corrections**

The focus of this study is the use of a lifting-line free wake vortex code to derive tip-loss corrections that could be implemented in Blade Element Momentum (BEM) codes. The different theories and three dimensional effects that are related to tip-losses are progressively introduced: lifting-line concepts, wake dynamics and its vortex modeling, far-wake analysis. The different tip-loss corrections found in the literature are reviewed with a focus on the main theories, namely the work of Betz, Prandtl, Goldstein and Theodorsen, and the different implementations in BEM codes found in the literature are presented. The method of Okulov to compute Goldstein’s factor at a reasonable computational cost is provided with details. The computation of Goldstein’s factor being accessible, a method to use this factor in the BEM method is presented. Various form of Prandtl’s tip-loss factor are also listed for reference. Tip-losses are investigated using a free wake vortex code and with Computational Fluid Dynamics (CFD), and results from both approaches are compared and discussed. For the use of CFD data, the question of definition of the local induction factor on the blade is risen and different method to define it are investigated. The author introduces the naming of “performance tip-loss” factor, which is a correction to the airfoil coefficients due to the tri-dimensionality of the flow at the tip. A preliminary model for the performance tip-loss function is introduced. For the representation of various circulation shapes, a new method using the formulation of Bézier curves is described and developed. Such method can be widely used to describe curves such as lift, circulation or chord distribution. Last, a method to determine tip-losses using a vortex code is described and implemented. From this method, a new tip-loss model is implemented in a BEM code in order to reproduce the 3D effects inherently present in a vortex code.

**Grid-connected Wind Farm Extension Project in Cape Verde**

Under contract with Electra S.A. and the Programa Energia, Água e Saneamento of the Republic of Cape Verde.

**Documents:**

- Branlard-2011-TipLosses_MscThesis_Public
- Branlard-2011-TipLosses_MscThesis_Private

**Project:** Research
Wind Atlas for Egypt
Under contract with Danida, Danish Ministry of Foreign Affairs, Danida.
Hansen, J. C., Project Manager, Department of Wind Energy, Wind Energy Systems
Mortensen, N. G., Project Participant, Department of Wind Energy, Meteorology
01/01/1997 → 31/12/2006
Project: Research

43030 46-PSO: PSO Poseidon 2
Yde, A., Project Manager, Department of Wind Energy, Aeroelastic Design
Larsen, T. J., Project Participant, Department of Wind Energy, Aeroelastic Design
Hansen, A. M., Project Participant, Department of Wind Energy, Aeroelastic Design
Pedersen, M. K., Project Participant
Clemmensen, K., Project Participant, Department of Wind Energy, Test and Measurements
01/10/2010 → 31/12/2013
Collaborators: Ørsted A/S, Contech Automatic, Floating Power Plant A/S
Project: Research

Mesoscale and microscale modelling in China (CMA component)
Capacity building and research cooperation through development of wind resource mapping for northwestern China (Dongbei). Sustainable use of wind energy through knowledge transfer and capacity building at central level and in the three North-eastern provinces of Heilongjiang, Jilin and Liaoning. Implemented as a twinning arrangement between CMA and Risø DTU and divided in four main projects:
1) mesoscale modelling
2) measurements
3) microscale modelling
4) guidelines for application
(Under construction!)
Hansen, J. C., Project Manager, Department of Wind Energy, Wind Energy Systems
Mortensen, N. G., Project Manager, Department of Wind Energy, Meteorology
Badger, J., Project Participant, Department of Wind Energy, Meteorology
Larsen, X. G., Project Participant, Department of Wind Energy, Meteorology
Rathmann, O. S., Project Participant, Department of Wind Energy, Meteorology
Nielsen, M., Project Participant, Department of Wind Energy, Meteorology
Hummelshøj, P., Project Participant, Department of Wind Energy, Test and Measurements
Enevoldsen, K., Project Participant, Department of Wind Energy, Test and Measurements
01/12/2007 → 31/07/2010
Project: Research

WAsP development and support
Hansen, B. O., Project Manager, Department of Wind Energy, Meteorology
Mortensen, N. G., ProjectParticipant, Department of Wind Energy, Meteorology
Rathmann, O. S., Project Participant, Department of Wind Energy, Meteorology
Troen, I., Project Participant, Department of Wind Energy, Meteorology
Kelly, M. C., Project Participant, Department of Wind Energy, Meteorology
Nielsen, M., Project Participant, Department of Wind Energy, Meteorology
Lundtang Petersen, E., Project Participant, Department of Wind Energy, Meteorology
Bechmann, A., Project Participant, Department of Wind Energy, Aeroelastic Design
23/07/1987 → 31/12/2019
Project: Research

WASA2: Wind Atlas for South Africa (Phase 2)
Capacity development and research cooperation through the development of wind resource mapping for the remaining parts of the Eastern Cape, KwaZulu-Natal and parts of the Free State Province.
Phase 1 of the project ended in 2014.
Hansen, J. C., Project Manager, Department of Wind Energy, Wind Energy Systems
Mortensen, N. G., Project Participant, Department of Wind Energy, Meteorology
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
Badger, J., Project Participant, Department of Wind Energy, Meteorology
Volker, P., Project Participant, Department of Wind Energy, Meteorology
Larsen, X. G., Project Participant, Department of Wind Energy, Meteorology
Enevoldsen, K., Project Participant, Department of Wind Energy, Test and Measurements
Sørensen, S. A., Project Participant, Department of Wind Energy, Test and Measurements
Cronin, T., Project Participant, Department of Wind Energy, Wind Energy Systems
01/04/2014 → 31/12/2018
Collaborators: Council for Scientific and Industrial Research, South African National Energy Development Institute, University of Cape Town, South African Weather Service
Project: Research

**WAsP e-learning courses**

Development and teaching of on-line WAsP e-learning courses. The 9-week course is intended for engineers, scientists and others, primarily working within the field of wind energy, who require a working knowledge of the WAsP program. Aspects of the theories underlying the program are presented, but the course stresses practical experience and examples on the use of WAsP.

Mortensen, N. G., Project Participant, Department of Wind Energy, Meteorology
Rathmann, O. S., Project Participant, Department of Wind Energy, Meteorology
Nielsen, M., Project Participant, Department of Wind Energy, Meteorology
Kelly, M. C., Project Participant, Department of Wind Energy, Meteorology
Gryning, S., Project Participant, Department of Wind Energy, Meteorology
Troen, I., Project Participant, Department of Wind Energy, Meteorology
Lundtang Petersen, E., Project Participant, Department of Wind Energy, Meteorology
Peña, A., Project Participant, Department of Wind Energy, Meteorology
Hansen, B. O., Project Participant, Department of Wind Energy, Meteorology
Larsen, S. E., Project Participant, Department of Wind Energy, Meteorology

10/02/2014 → 31/12/2019
Project: Research

**WAsP courses and certification**

Development and teaching of standard on-site WAsP courses. The 3-day WAsP course is intended for engineers, scientists and others, primarily working within the field of wind energy, who require a working knowledge of the WAsP program. Aspects of the theories underlying the program are presented, but the course stresses practical experience and examples on the use of WAsP. The WAsP course teachers also develop and carry out WAsP certification examinations.

Mortensen, N. G., Project Participant, Department of Wind Energy, Meteorology
Rathmann, O. S., Project Participant, Department of Wind Energy, Meteorology
Nielsen, M., Project Participant, Department of Wind Energy, Meteorology
Kelly, M. C., Project Participant, Department of Wind Energy, Meteorology
Gryning, S., Project Participant, Department of Wind Energy, Meteorology
Troen, I., Project Participant, Department of Wind Energy, Meteorology
Lundtang Petersen, E., Project Participant, Department of Wind Energy, Meteorology
Peña, A., Project Participant, Department of Wind Energy, Meteorology
Hansen, B. O., Project Participant, Department of Wind Energy, Meteorology
Larsen, S. E., Project Participant, Department of Wind Energy, Meteorology

01/01/1991 → 31/12/2017
Project: Research

**WASA: Wind Atlas for South Africa (Phase 1)**

Capacity development and research cooperation through development of wind resource mapping for the Western Cape and areas of Northern and Eastern Cape. Phase 2 of the project starts in 2014.

Hansen, J. C., Project Manager, Department of Wind Energy, Wind Energy Systems
Mortensen, N. G., Project Participant, Department of Wind Energy, Meteorology
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
Badger, J., Project Participant, Department of Wind Energy, Meteorology
Volker, P., Project Participant, Department of Wind Energy, Meteorology
Larsén, X. G., Project Participant, Department of Wind Energy, Meteorology
Kelly, M. C., Project Participant, Department of Wind Energy, Meteorology
Enevoldsen, K., Project Participant, Department of Wind Energy, Test and Measurements
Sørensen, S. A., Project Participant, Department of Wind Energy, Test and Measurements
Cronin, T., Project Participant, Department of Wind Energy, Wind Energy Systems

01/11/2008 → 31/03/2014
Collaborators: Council for Scientific and Industrial Research, South African National Energy Development Institute, University of Cape Town, South African Weather Service
Project: Research
CINEMA: Alliance for Imaging and Modelling of Energy Applications

The CINEMA research alliance will develop unique 3D micro-structural characterization methods, which make it possible to investigate components under realistic conditions and in real time. This will enable correlation between performance and local changes in the microstructure.

Andreasen, J. W., Project Manager, Department of Energy Conversion and Storage, Imaging and Structural Analysis
Poulsen, H. F., Project Coordinator, Department of Physics, Neutrons and X-rays for Materials Physics
Mikkelsen, L. P., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Serensen, B. F., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Bowen, J. R., Project Participant, Department of Energy Conversion and Storage, Imaging and Structural Analysis
Kuhn, L. T., Project Participant, Department of Energy Conversion and Storage, Imaging and Structural Analysis
Larsen, R., Project Participant, Department of Applied Mathematics and Computer Science, Image Analysis & Computer Graphics
Hansen, P. C., Project Participant, Department of Applied Mathematics and Computer Science, Scientific Computing
Frandsen, H. L., Project Participant, Department of Energy Conversion and Storage, Mixed Conductors
Gundlach, C., Project Participant, Department of Physics, Neutrons and X-rays for Materials Physics
Dahl, A. B., Project Participant, Department of Applied Mathematics and Computer Science, Image Analysis & Computer Graphics
Jespersen, K. M., PhD Student, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Beil, J., PhD Student, NBI/HTAS
Andersen, M., PhD Student, Department of Applied Mathematics and Computer Science, Scientific Computing
Emerson, M. J., PhD Student, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
De Angelis, S., PhD Student, Imaging and Structural Analysis
Yang, S., Project Participant
Poulsen, S. O., Project Participant, Department of Energy Conversion and Storage, Neutrons and X-rays for Materials Physics
Lyckegaard, A., Project Participant
Birkelund, K., PhD Student, Norges Byggeforskningsinstitutt
Jacobsen, H. S., PhD Student
Frandsen, H. L., Supervisor, Department of Energy Conversion and Storage
Sørensen, H., Project Manager, Department of Physics, Neutrons and X-rays for Materials Physics
Chapelle, L., PhD Student
Lauridsen, E. M., Project Participant
Sørensen, H. O., Project Participant, University of Copenhagen
01/01/2014 → 31/12/2018

Collaborators: Rockwool International, MaxLab, Haldor Topsoe AS, University of Manchester, University of Copenhagen, Norges Byggeforskningsinstitutt, Amminex Emissions Technology A/S, NBI/HTAS, Northwestern University, LM Wind Power, Xnovo Technology ApS

Project: Research

Online WAsP

The objective of the project is to develop an inexpensive and user-friendly tool for energy yield calculations of small wind turbines

Bechmann, A., Project Coordinator, Department of Wind Energy, Aeroelastic Design
Troen, I., Project Participant, Department of Wind Energy, Meteorology
Hansen, B. O., Project Participant, Department of Wind Energy, Meteorology
Peña, A., Project Participant, Department of Wind Energy, Meteorology
Sørensen, S. A., Project Participant, Department of Wind Energy, Test and Measurements
Maule, P., Project Participant, Department of Wind Energy, Wind Energy Systems
Friis, P., Project Participant, Department of Wind Energy, Wind Turbines
Rathmann, O. S., Project Participant, Department of Wind Energy, Meteorology
Kelly, M. C., Project Participant, Department of Wind Energy, Meteorology
Nielsen, R. A., Project Participant, Department of Wind Energy, Meteorology
Ejsing Jørgensen, H., Project Participant, Department of Wind Energy, Meteorology
Astrup, P., Project Participant, Department of Wind Energy, Meteorology
Mortensen, N. G., Project Participant, Department of Wind Energy, Meteorology
Nielsen, M., Project Participant, Department of Wind Energy, Meteorology
01/01/2013 → 31/12/2015

Keywords: WAsP, wind resources, urban, small wind turbine

Collaborators: EMD International A/S

Project: Research

Parallelization of vortex methods

Parallelization of vortex methods using GPU, openMP, MPI, AVX vectorization.

Branlard, E. S. P., Project Participant, Department of Wind Energy, Aeroelastic Design
Some of the most critical components of a wind turbine are the rotor blades, which are usually made of polymer matrix composites and are the largest rotating components of a wind turbine. Different types of damage can develop at different length scales in wind turbine rotor blades. Therefore, the Danish Centre for Composite Structures and Materials for Wind Turbines (DCCSM) aims to develop a coherent, multiscale-based understanding of the mechanical behaviour of composite materials and structures for wind turbine blades. The length scale goes from nano- and microscale (materials) to product scale (the whole blade, which currently can be more than 60 meters in length), and covers manufacturing, materials design, damage detection, modelling and prediction of damage evolution in wind turbine blades. A coherent multiscale understanding of composite materials and structures will enable full optimisation, viz., optimisation at all length scales.

The Centre aims for the creation of new knowledge (e.g. material models), new experimental methods and new modeling methods. The Centre spans wide thematically and disciplinarily. The specific PhD, Post Doc and research projects funded by DCCSM (Core and Shell activities) are focused at smaller, well-defined topics. Therefore, the Centre will coordinate the research activities in Denmark in the area of composite structures and materials for wind turbines. That includes the Core and Shell activities of DCCSM and research projects that are not funded by the DSF funds but are thematically covered by the Centre. Such projects are called "Crust" projects.

DSF Strategic Research Centre (sags. nr. 09-067212).

Sørensen, B. F., Approving Authority, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Almdal, K., Project Participant, Department of Micro- and Nanotechnology, Amphiphilic Polymers in Biological Sensing
Mikkelsen, L. P., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Branner, K., Project Participant, Department of Wind Energy, Wind Turbines
Mishnaevsky, L., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Zike, S., PhD Student, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Hansen, J. Z., PhD Student
Ashouri Vajari, D., PhD Student, Solid Mechanics, Department of Wind Energy
Legarth, B. N., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Berggreen, C., Project Participant, Department of Mechanical Engineering, Solid Mechanics
Stang, H., Project Participant, Department of Civil Engineering, Section for Structural Engineering

External Project ID: 09-067212
01/04/2010 → 31/03/2017
Project: Research

Demonstration PP-2B: Demonstration of Partial Pitch 2-bladed Wind Turbine
Kim, T., Project Manager, Department of Wind Energy, Aeroelastic Design
Larsen, T. J., Project Participant, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Sørensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
Yde, A., Project Participant, Department of Wind Energy, Aeroelastic Design
Pedersen, M. M., Project Participant, Department of Wind Energy, Aeroelastic Design
Kock, C. W., Project Participant, Department of Wind Energy, Test and Measurements
Verelst, D. R., Project Participant, Department of Wind Energy, Aeroelastic Design
Trolldborg, N., Project Participant, Department of Wind Energy, Aeroelastic Design
01/01/2012 → 31/12/2014
Collaborators: Envision Energy ApS
Project: Research

INNWIND.EU: Innovative wind conversion systems (10-20MW) for offshore applications
This is the largest ongoing wind energy research project in Europe with 27 participating organizations and coordinated by DTU Wind Energy.

The objectives of the Innwind.EU project are high performance innovative design of beyond-state-of-the-art 10-20MW
offshore wind turbines and hardware demonstrators of its critical components.

Natarajan, A., Project Participant, Department of Wind Energy, Wind Turbines
Jensen, P. H., Project Participant, Department of Wind Energy
Buhl, T., Project Participant, Department of Wind Energy
Abrahamsen, A. B., Project Participant, Department of Wind Energy, Wind Energy Systems
Hans, T., Project Participant, Department of Wind Energy, Wind Turbines
Stolpe, M., Project Participant, Department of Wind Energy, Wind Turbines
Sørensen, J. N., Project Participant, Department of Wind Energy, Fluid Mechanics
Barlas, A., Project Participant, Department of Wind Energy, Aeroelastic Design
FP7 Contract ID: 308974
01/11/2012 → 31/10/2017
Keywords: Innovative offshore wind turbines
Project: Research

ABYSS: ABYSS: Advancing BeYond Shallow waterS - Optimal design of offshore wind turbine support structures

ABYSS is a four year research project funded by the Danish Council for Strategic Research. ABYSS develops novel mathematical models, reliable numerical optimization techniques and software for optimal design of cost effective bottom-fixed offshore wind turbine support structures for all relevant water depths including deep waters in excess of 50m.

Stolpe, M., Project Coordinator, Department of Wind Energy, Wind Turbines
Buhl, T., Project Participant, Department of Wind Energy, Wind Turbines
Bredmose, H., Project Participant, Department of Wind Energy, Fluid Mechanics
Zania, V., Project Participant, Department of Civil Engineering, Section for Geotechnics and Geology
Natarajan, A., Project Participant, Department of Wind Energy, Wind Turbines
Schlee, S., Project Participant, Department of Wind Energy, Fluid Mechanics
Sørensen, J. D., Project Participant, Department of Wind Energy
Det Strategiske Forskningsråd: DKK21,600,000.00
01/01/2014 → 31/12/2017
Keywords: structural optimization, wind energy, offshore support structures
Collaborators: Ørsted A/S, FE-Design GmbH, SINTEF, Universal Foundation A/S, Norwegian University of Science and Technology, Aalborg University
Award relations: ABYSS: Advancing BeYond Shallow waterS - Optimal design of offshore wind turbine support structures
Project: Research

Optimizing wind energy: Investigation of atmospheric turbulence using lidars

Sathe, A., Project Participant, Risø National Laboratory for Sustainable Energy, Department of Wind Energy, Test and Measurements
01/04/2012 → 31/03/2015
Project: Research

Test Facility for grid connection characteristics of wind power plants - Phase 1

Requirements to wind turbines aiming to support the integration of wind power plants into power systems are becoming increasingly important in R&D and design of new wind turbines. As a consequence, there is a growing need for test and validation of the interaction between wind turbines and grid. This project deals with test facilities, i.e. equipment which can be applied to emulate specific grid conditions on the terminals of a wind turbine in order to test the wind turbine response to such conditions.

Dedicated tests of wind turbines Low Voltage Ride Through (LVRT) capabilities have been common practice for several years, and are required in most grid codes. Such tests are also included in the wind turbine power quality test standard IEC 61400-21. However, the standard LVRT test equipment using impedances to provide voltage dips at the turbine terminals is dedicated to this specific type of test, but there are many other grid conditions which are relevant to test. A power converter test facility offers a very high degree of freedom in terms of possible grid conditions to emmulate. The present report mainly considers these two options for test equipment, but also discusses other options.

The aim of the project was to find the right technical solution for the test facility, together with an establishment and operational budget. Furthermore, the possible funding options and operational organisations were to be investigated, culminating in implementation plan.

Sørensen, P. E., Project Coordinator, Risø National Laboratory for Sustainable Energy, Department of Wind Energy, Wind Energy Systems
Cronin, T., Project Participant, Department of Wind Energy, Wind Energy Systems
Power Fluctuations from Large Offshore Wind Farms

The project has developed and verified simulation and prediction models for power fluctuations in large wind farms. The verification is based on extensive measurements in the two large offshore wind farms in Denmark: Horns Rev and Nysted. The models can also be applied to simulation of wind power fluctuations from wind turbines distributed over a larger area than a wind farm. The advantage of the prediction models is that they can be applied in the operation, but these models require a training period before they work in a new system. On the other hand, the simulation model can simulate power fluctuations with possible future wind power developments, based on information about size and location of the individual wind turbines. Thus, the simulation model is a planning tool.

Sørensen, P. E., Project Manager, Department of Wind Energy, Wind Energy Systems, Risø National Laboratory for Sustainable Energy
Cutululis, N. A., Project Participant, Department of Wind Energy, Wind Energy Systems, Risø National Laboratory for Sustainable Energy
Madsen, H., Project Participant, Department of Applied Mathematics and Computer Science
Pinson, P., Project Participant, Department of Applied Mathematics and Computer Science

Pre-standardisation of wind power modelling

The purpose of the project is to support the standardisation work in IEC Technical Committee 88 (TC88) Working Group 27 (WG27) on electrical simulation models for wind power generation. This work is done in cooperation between DTU and industry partners. The role of DTU has been to implement the IEC models in Power Factory, and in cooperation with industry to parametrise and validate the models against test results.

Sørensen, P. E., Project Manager, Department of Wind Energy, Wind Energy Systems
Margaris, I., Project Participant, Department of Wind Energy, Wind Energy Systems
Hansen, A. D., Project Participant, Department of Wind Energy, Wind Energy Systems
Wu, Q., Project Participant, Department of Electrical Engineering, Center for Electric Power and Energy

EASEWIND: Enhanced Ancillary Services from Wind Power Plants

The project vision is to provide wind power with similar grid system interaction characteristics as the conventional generation units. The new technical solutions developed in this project will expand the global wind power market, as they will assist in integrating more wind power in high voltage grids. Bringing wind power technology to this level will assist Vestas in remaining both technology and market leader in the global wind industry.

We pursue the vision by developing and demonstrating control features for primary, secondary and tertiary reserve and response provided by wind power plants. In this way the capability of wind farms to provide system services and thus their ability to actively support the power system in a similar way as the conventional power plants is increased. With these new control features the grid operators can allow a large scale penetration of wind power into the power system while increasing the security and reliability of power supply during the transition period from fossil to renewable based power production.

Cutululis, N. A., Project Participant, Risø National Laboratory for Sustainable Energy, Department of Wind Energy, Wind Energy Systems
Hansen, A. D., Project Participant, Department of Wind Energy, Wind Energy Systems
Altin, M., Project Participant, Department of Wind Energy, Wind Energy Systems

EERA-DTOC: EERA DTOC: European Energy Research Alliance Design Tools for Offshore wind farm Clusters

The project is funded by the EU – Seventh Framework Programme (FP7) – and runs from January 2012 to June 2015. It is coordinated by the Technical University of Denmark - DTU Wind Energy.

The EERA-DTOC project combines expertise to develop a multidisciplinary integrated software tool for an optimized design of offshore wind farms and clusters of wind farms. Charlotte Bay Hasager is the daily manager of the project.
Peter Hauge Madsen is coordinator.
Madsen, P. H., Project Coordinator, Department of Wind Energy
GARPUR: Generally Accepted Reliability Principle with Uncertainty modelling and through probabilistic Risk assessment

Power system reliability management aims to maintain power system performance at a desired level, while minimizing the socio-economic costs of keeping the power system at that performance level. Historically in Europe, network reliability management has been relying on the so-called “N-1” criterion: in case of fault of one relevant element (e.g. one transmission system element, one significant generation element or one significant distribution network element), the elements remaining in operation must be capable of accommodating the new operational situation without violating the network’s operational security limits.

Today, the increasing uncertainty of generation due to intermittent energy sources, combined with the opportunities provided e.g. by demand-side management and energy storage, call for imagining new reliability criteria with a better balance between reliability and costs. The GARPUR project designs, develops, assesses and evaluates such new reliability criteria to be progressively implemented over the next decades at a pan-European level, while maximising social welfare.

Cutululis, N. A., Project Participant, Rise National Laboratory for Sustainable Energy, Department of Wind Energy, Wind Energy Systems

TWENTIES: Transmission system operation with large penetration of Wind and other renewable Electricity sources in Networks by means of innovative Tools and Integrated Energy Solutions

A group of 6 Transmission System Operators (Belgium, Denmark, France, Germany, The Netherlands and Spain) with 2 generator companies, 5 manufacturers and research organisations, propose 6 demonstration projects to remove, in 3 years, several barriers which prevent the electric system from welcoming more wind electricity, and wind electricity from contributing more to the electric system. The full scale demonstrations aim at proving the benefits of novel technologies (most of them available from manufacturers) coupled with innovative system management approaches. The contribution of wind energy to the system will show how aggregated wind farms can provide system services (voltage and frequency control) in Spain. The aggregation of wind farms with flexible generation and loads will be demonstrated in Denmark using a scalable IT platform developed by a generator. Increasing the flexibility of transmission networks will be tested in Belgium (existing sensors and coordinated power flow control devices avoiding possible large scale instabilities induced by wind farms in the CWE region) and in Spain (dynamic wind power evacuation capacity using real-time computations based on short-term generation forecasts and use of a mobile Overload Line Controller). Off-shore wind farms are addressed from a security viewpoint. Secure HVDC meshed networks will be validated in France using simulations and full scale experiments of two different HVDC circuit breaker technologies. Off-shore wind farm shut downs under stormy conditions will be demonstrated in Denmark using the world largest off-shore wind farm with balancing power provided by the Norwegian hydro capacities through a HVDC link. The experimental results will be integrated into European impact analyses to show the scalability of the solutions: routes for replication will be provided with benefits for the pan European transmission network and the European electricity market as soon as 2014, in line with the SET plan objectives.

Sørensen, P. E., Project Participant, Department of Wind Energy, Wind Energy Systems
Cutululis, N. A., Project Participant, Rise National Laboratory for Sustainable Energy, Department of Wind Energy, Wind Energy Systems
Maule, P., Project Participant, Department of Wind Energy, Wind Energy Systems
Litong-Palima, M., Project Participant, Department of Wind Energy, Wind Energy Systems
SIMBA: Simulation of balancing
SimBa is based on Danish principles for balancing. Simba models the power system analytically and can therefore model a future power system. SimBa is expected to be able to investigate other market structures for ancillary services. Gives valuable information on how to balance the system in the future.
Sørensen, P. E., Project Participant, Department of Wind Energy, Wind Energy Systems, Risø National Laboratory for Sustainable Energy
Cutululis, N. A., Project Participant, Risø National Laboratory for Sustainable Energy, Department of Wind Energy, Wind Energy Systems
Litong-Palima, M., Project Participant, Department of Wind Energy, Wind Energy Systems
Maule, P., Project Participant, Department of Wind Energy, Wind Energy Systems
01/01/2010 → 31/12/2014
Keywords: Balancing, Power system, Wind, Forecast errors
Collaborators: Energinet.dk
Project: Research

REServiceS: Economic grid support from variable renewables
REServiceS (Economic grid support from variable renewables) is the first study to investigate wind and solar based grid support services at EU level. It will provide technical and economic guidelines and recommendations for the design of a European market for ancillary services, as well as for future network codes within the Third Liberalisation Package.
Cutululis, N. A., Project Participant, Risø National Laboratory for Sustainable Energy, Department of Wind Energy, Wind Energy Systems
01/04/2012 → 01/10/2014
Keywords: Ancillary services, Renewable, Wind, PV, Economic, Grid support
Collaborators: University College Dublin, European Wind Energy Association, Acciona, 3E, Mainstream Renewable Power, EPIA, GE Deutschland, VTT - Technical Research Centre of Finland, Fraunhofer Institute for Wind Energy and Energy System Technology
Award relations: Economic grid support from variable renewables
Project: Research

MEDOW: Multi-terminal DC grid for offshore wind
A DC grid based on multi-terminal voltage-source converters is a newly emerging technology, which is particularly suitable for the connection of offshore wind farms. The achievements from the project will contribute to integrating offshore wind power into the onshore AC grids in European countries and for the European offshore grid. The MEDOW network will share complementary expertise, infrastructure and facilities for the training of the next generation of top-quality researchers in this field. 
Cutululis, N. A., Project Participant, Department of Wind Energy, Wind Energy Systems, Risø National Laboratory for Sustainable Energy
FP7 Contract ID: 317221
FP7-PEOPLE
01/05/2013 → 31/03/2017
Keywords: Offshore grids, HVDC, wind power, Control System
Collaborators: Polytechnic University of Catalonia, Elia (TSO Belgium), Stichting Katholieke Universiteit, Alstom Wind SAS, Cardiff University, University of Porto
Award relations: Multi-terminal DC grid for offshore wind
Project: Research

iTesla: Innovative Tools for Electrical System Security within Large Areas
The purpose of the iTESLA project is to develop a toolbox which will support the future operation of the pan-European electricity transmission network. This toolbox shall bring forward a major innovation: carry out operational dynamic simulations in the frame of a full probabilistic approach, thus going further that the current “N-1” approach and optimizing the transit capacities of the grid at different spatial (national, regional, Pan-European) and time (two-days ahead, day-ahead, intra-day, real-time) scales.

The iTesla project is lead by RTE (the French TSO). The total iTesla budget is M€ 19.5. DTUs total budget is M€ 1.1.
The main roles of DTU in iTesla are

- Work Package Leader of WP6: Defence and Restoration (Poul Sørensen)

- PhD in Integration of wind power and other renewables in power system defence plans (Kaushik Das, see related projects)

- Task Leader for Task 3.4. Aggregated dynamic models of variable generation sources (PV and Wind farms) and loads.

Sørensen, P. E., Project Participant, Department of Wind Energy, Wind Energy Systems
Altin, M., Project Participant, Department of Wind Energy, Wind Energy Systems
Das, K., PhD Student, Department of Wind Energy, Wind Energy Systems
Hansen, A. D., Project Participant, Department of Wind Energy, Wind Energy Systems
Göksu, Ö., Project Participant, Department of Wind Energy, Wind Energy Systems

Collaborators: Imperial College London, Independent Power Transmission Operator, Regional coordination service center, Tractebel Engineering, Statnett SF, KTH - Royal Institute of Technology, Instituto de Engenharia de Sistemas e Computadores do Porto, AIA, RTE (TSO France), Artlys, Ricerca Sistema Energetico SpA, Elia (TSO Belgium), Bull SAS, NGC (TSO UK), PEPITe S.A., Stichting Katholieke Universiteit, REN (TSO Portugal), Quinary ApS

Award relations: iTesla - Innovative Tools for Electrical System Security within Large Areas

Project: Research

TWENTIES: Transmission system operation with large penetration of Wind and other renewable Electricity sources in Networks by means of Innovative Tools and Integrated Energy Solutions

A group of Transmission System Operators from Belgium, Denmark, France, Germany, Spain, The Netherlands, have linked with two generator companies, three power technology manufacturers, two wind turbine manufacturers and research and development organisations, in order to bring answers by 2015 to the following questions:

What are the valuable contributions that intermittent generation and flexible load can bring to system services?

What should the network operators implement to allow for off-shore wind development?

How to give more flexibility to the transmission grid?

Overall: how scalable and replicable are the results within the entire pan-European electricity system?

These four intertwined overarching goals have been split into a set of 6 high level demonstration objectives, two replication objectives and one dissemination objective.

Litong-Palima, M., Project Participant, Department of Wind Energy, Wind Energy Systems

Project: Research

VCH: Virtual Campus Hub

Four technical universities in Europe work together in this EU-funded project to lower the barriers for collaboration across borders.

Universities have an increasing number of and increasingly diverse relations with the outside world but Information and Communications Technology (ICT) is still inward looking. Virtual Campus Hub aims to support a number of activities that are common today for international cooperation in the field of education, research and innovation.

Project partners:

Technical University of Denmark (DTU)
Kungliga Tekniska högskolan, Sweden (KTH)
Politecnico di Torino, Italy (Polito)
Eindhoven University of Technology, Netherlands (TU/e)

Badger, M., Project Manager, Department of Wind Energy, Meteorology
Karagali, I., Project Participant, Department of Wind Energy, Meteorology
Larsen, S. E., Project Participant, Department of Wind Energy, Meteorology
Satellite Eye for Galathea 3

A Living Atlas showing the highly dynamical processes in the marine, atmospheric and coastal environment along the route of the Galathea 3 expedition ship.

The project is supported by Egmont Fonden with approximately 3.9 mio. DKK over two years from 2006 to 2008.

Goal
The goal of the project 'Satellite Eye for Galathea 3' is to contribute with a Living Atlas based on satellite images recorded along the sailing track for Galathea 3. The highly dynamical processes in the marine, atmospheric and coastal environment will be quantified from satellite images and published - in a professionally-based way and in near-real-time - to scientists, students, pupils, the public and to the crew on-board the Galathea 3.

It is a technological challenge to download, archive and distribute the immense amount of data. It is at the same time compelling to order the high-resolution images from the European satellite Envisat’s many instruments well in advance. In agreement with the European Space Agency (ESA), we have in this project secured an agreement with Eduspace/ESA, such that we ensure an optimal use of Envisat in relationship with Galathea 3 as from other satellites. Eduspace will publish web-based teaching on satellites and Galathea 3 from upper secondary schools. Galathea 3 is a sailing laboratory with instruments on-board that observes a long list of similar parameters as the satellites observe. It is a unique option of international quality to compare and combine the different parameter values. Some will be investigated within this project, others in parallel projects. A close cooperation with scientists from other projects is being established, such that an optimal collection of satellite images will be achieved.

The fantastic development in Earth Observation from satellites is one of the greatest technological advances since Galathea 1 and 2. It is seen as very important to optimized the collection, archiving and publishing these satellite images for the future generations.

Rise National Laboratory, Wind Energy Department Charlotte Bay Hasager (coordinator), Merete Bruun Christiansen, Ioanna Karagali
DRC-DTU Leif Toudal Pedersen, Ole Balthazar Andersen
DMI Jacob L. Heyer, Peter Viskum Jørgensen
Niels Bohr Institute at University of Copenhagen Niels Kristian Højerslev, Rune Midjord Nielsen
Institute of Geography at University of Copenhagen Michael Schultz Rasmussen
Eduspace Peter Brøgger Sørensen
ESA consultant Jürg Lichtenegger

See http://www.satelliteeye.dk

The educational material and satellite data have later been moved to www.virtuelgalathea3.dk (vg3.dk)
Satellite data see also http://galathea.dtu.dk/index_e.html (DTU Space)
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
Badger, M., Project Participant, Department of Wind Energy, Meteorology
Karagali, I., Project Participant, Department of Wind Energy, Meteorology

External Project ID: Egmont Fonden
01/03/2006 → 28/02/2009

Project: Research
Offshore wind energy has enormous potential, and its production is highly cost efficient compared to other renewable energy sources. The European Commission has therefore identified offshore wind energy to be of strategic importance with regard to the EU energy targets and reducing dependence on energy imports.

The project is part-financed by the EU European Regional Development Fund and the South Baltic Programme. With the worldwide energy and climate challenge becoming more acute than ever, the importance of renewable energy resources has risen to a new level. In recent years offshore wind energy (OWE) has become a competitive alternative to fossil fuel, and the European Commission has consequently identified OWE to be of strategic importance for meeting the demands of the Kyoto protocol while reducing dependence on energy imports and ensuring long-term energy security.

The South Baltic Region with its favourable natural and geographical setting, economic preconditions and workforce potential has the unique chance to position itself as one of the EU’s premier OWE regions. However, if the South Baltic Region wants to become a major player in OWE, it is crucial to overcome existing bottlenecks in the supply chain as well as legislative and societal barriers. Public awareness and acceptance of OWE must be raised, and skills development in the sector needs improvement.

Ten partners from Denmark, Germany, Poland, Lithuania and Sweden will tackle these challenges within the “South Baltic OFF.E.R” project by building up a vital network to promote coherence of policies. Moreover, the project will develop standard-setting approaches in order to increase efficiency and to speed up the development of a highly competitive offshore wind industry in the South Baltic Region. The Rostock Business and Technology Development mbH (Germany) as “Lead Beneficiary” is the responsible partner for the overall project management and public relations.

There will be a close cooperation with the “sister projects” POWER cluster (direct successor of POWER project) dealing with offshore wind energy in the North Sea Region and WEBSR 2 dealing with wind energy in the Baltic Sea Region. The project runs between 1st March 2010 and 28th February 2013 within the framework of the South Baltic Cross-border Cooperation Programme 2007-2013 and is part-financed by the European Union (European Regional Development Fund).

Niels-Erik Clausen is coordinating the contribution from DTU Wind Energy that includes a wind atlas for South Baltic and promotional and educational activities including a summer school in 2011. Charlotte Bay Hasager is project participant and has coordinated the wind atlas task.


Clausen, N., Project Participant, Office for Study Programmes and Student Affairs, Department of Wind Energy, Wind Energy Systems

Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
Badger, J., Project Participant, Department of Wind Energy, Meteorology
Peña, A., Project Participant, Department of Wind Energy, Meteorology
Karagali, I., Project Participant, Department of Wind Energy, Meteorology
Bingöl, F., Project Participant, Department of Wind Energy, Meteorology

01/03/2010 → 28/02/2013

Documents:
South_Baltic_OFFER.pdf

Project: Research

EU ORECCA: EU ORECCA: Off-shore Renewable Energy Conversion platforms – Coordination Action

The goals of the ORECCA project (Off-shore Renewable Energy Conversion platforms – Coordination Action) are to create a framework for knowledge sharing and to develop a roadmap for research activities in the context of offshore renewable energy that are a relatively new and challenging field of interest. In particular, the project will stimulate collaboration in research activities leading towards innovative, cost efficient and environmentally benign offshore renewable energy conversion platforms for wind, wave and other ocean energy resources, for their combined use as well as for the complementary use such as aquaculture e.g. biomass and fishes and monitoring of the sea environment e.g. marine mammals, fish and bird life. The objectives of the ORECCA project are to:

1. improve the information exchange and promotion of specific research cooperation in this field between academia and industry, public and private actors;
2. create an efficient and focused framework for knowledge sharing;
3. involve and stimulate all the relevant stakeholder groups in Europe to define the framework for future exploitation of renewable energy sources in the offshore;
4. develop roadmap studies for the research, deployment and regulatory activities in the field of offshore renewable energy.

Karagali, I., Project Participant, Department of Wind Energy, Meteorology
Sempreviva, A. M., Project Participant, Department of Wind Energy, Meteorology

01/03/2010 → 31/08/2011

Project: Research
EU NORSEWInD: Northern Seas Wind Index database
In August 2008 the European project "Northern Seas Wind Index Database" (NORSEWInD) started within the seventh framework programme of the European Union http://www.norsewind.eu/public/index.html.

The aim of the project is to quantify the wind resource for offshore wind power utilisation. In order to truly understand the quality of the wind resource available, the wind regime will be captured using instrumentation installed at offshore locations in the Baltic, Irish and North Seas. Furthermore a small validation area is selected off Portugal in the Atlantic Ocean.

A combination of ground-based remote sensing, satellite-based remote sensing, meteorological masts, computational modelling and forecasting is used in the project. NORSEWInD takes a multi-disciplinary, multi-industrial sector approach to achieve a thorough understanding of offshore wind conditions.

The end-product of the project is a comprehensive wind resource database and an offshore wind atlas for (pre-) feasibility, as well as a suite of techniques that can be translated to any offshore location in the world.

One part of the NORSEWInD project was to collect remote sensing observations from space on ocean surface winds in near-real-time (NRT). The overall aim is to provide new offshore wind climatology map for the entire area of interest based on satellite remote sensing.

Charlotte Bay Hasager coordinated the work at DTU Wind Energy. (and was WP-leader)
Participants: Torben Mikkelsen (WP-leader), Mike Courtney, Alfredo Peña, Merete Badger, Ferhat Bingöl, Andrea Hahmann, Jake Badger, Morten Nielsen, Ioanna Karagali, Sven-Erik Gryning, Ameya Sathe, Caroline Draxl, Julia Lange

Hasager, C. B., Project Manager, Department of Wind Energy, Meteorology
Mikkelsen, T. K., Project Participant, Department of Wind Energy, Test and Measurements
Courtney, M., Project Participant, Department of Wind Energy, Test and Measurements
Peña, A., Project Participant, Department of Wind Energy, Meteorology
Badger, M., Project Participant, Department of Wind Energy, Meteorology
Badger, J., Project Participant, Department of Wind Energy, Meteorology
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
Karagali, I., Project Participant, Department of Wind Energy, Meteorology
Bingöl, F., Project Participant, Department of Wind Energy, Meteorology
Nielsen, M., Project Participant, Department of Wind Energy, Meteorology
Astrup, P., Project Participant, Department of Wind Energy, Meteorology
Gryning, S., Project Participant, Department of Wind Energy, Meteorology
Sathe, A., Project Participant, Department of Wind Energy, Test and Measurements
Lange, J., Project Participant, Department of Wind Energy, Meteorology

01/08/2008 → 31/07/2012
Project: Research

Development of commercially viable wind power system in Nepal
Mishnaevsky, L., Project Manager, Department of Wind Energy, Composites Mechanics and Materials Mechanics
31/05/2011 → 30/06/2013
Project: Research

3D virtual testing of composites for wind energy applications: Computational mesomechanics approach
Mishnaevsky, L., Project Coordinator, Department of Wind Energy, Composites Mechanics and Materials Mechanics
01/05/2009 → 31/05/2011
Project: Research

Development of wind energy technologies in Nepal on the basis of natural materials
Mishnaevsky, L., Project Manager, Department of Wind Energy, Composites Mechanics and Materials Mechanics
01/11/2007 → 31/08/2011
Project: Research

High reliability of large wind turbines via computational micromechanics based enhancement of materials performances
(Danish Council for Strategic Research, in collaboration with the Ministry of Science and Technology of China)
Mishnaevsky, L., Project Manager, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Dai, G., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
01/05/2011 → 31/07/2015
Project: Research

VINAT (Virtual Nanotitanium): Theoretical analysis, design and virtual testing of biocompatibility and mechanical properties of titanium-based nanomaterials
EU FP7 Project Coordinator “Virtual Nanotitanium” (Theoretical analysis, design and virtual testing of biocompatibility and mechanical properties of titanium-based nanomaterials) Collaborative Project in Nanosciences NMP
New optimal design tools for future wind turbine blades

The object of this project is to develop and study new methods for optimal structural and aerodynamic design of wind turbine blades based on high-fidelity beam models and topology optimization techniques. The ability to reduce the cost of wind energy through an increase in the size of wind turbine rotor blades has motivated the ongoing trend of "bigger is better". However, as the size of wind turbine blades increases, new structural and aerodynamic design challenges emerge, such as, self-weight and gravity induced fatigue damage. Addressing these issues has become a cornerstone for the realization of larger wind turbine blades. This project suggests the development of new numerical optimization tools for wind turbine blade design to specifically tackle these new challenges. Achieving to do so will render the design of larger wind turbine blades feasible and consequently allow for the continuing reduction in the cost of wind energy.

Blasques, J. P. A. A., Project Participant, Department of Wind Energy, Wind Turbines
01/06/2013 → 31/05/2015
Project: Research

SSTDV: REX - IMAM: Sea Surface Temperature Diurnal Variability: Regional Extent - Implications in Atmospheric Modelling

Postdoctoral Research Project funded from the European Space Agency (ESA) - Support to Science Element (STSE)
Karagali, I., Project Applicant, Department of Wind Energy, Meteorology
Hasager, C. B., Contact Person, Department of Wind Energy, Meteorology
15/01/2013 → 15/01/2015
Keywords: Satellite remote sensing, Sea Surface Temperature, Atmospheric Modelling
Collaborators: Danish Meteorological Institute, European Space Agency - ESA
Documents:
ESA Support to Science Element Project proposal
Project: Research

PowerPack: Standardiserede Power Packs til forbedret aerodynamik i vindmøller - PowerPack
Bak, C., Project Participant, Department of Wind Energy, Aeroelastic Design
Gaunaa, M., Project Participant, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
01/01/2013 → 31/12/2015
Project: Research

DANAERO MW II: DANAERO MW II: Indflydelse af atmosfære- og kølvandsturbulens på MW møllers ydeevne, last og stabilitet
Bak, C., Project Participant, Department of Wind Energy, Aeroelastic Design
Aagaard Madsen , H., Project Participant, Department of Wind Energy, Aeroelastic Design
Trolborg, N., Project Participant, Department of Wind Energy, Aeroelastic Design
Bertagnolio, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Serensen, S. A., Project Participant, Department of Wind Energy, Test and Measurements
01/01/2010 → 31/12/2012
Collaborators: Siemens A/S, LM Wind Power, Vestas Wind Systems AS
Project: Research

Light Rotor: Light Rotor
Bak, C., Project Participant, Department of Wind Energy, Aeroelastic Design
Zahle, F., Project Participant, Department of Wind Energy, Aeroelastic Design
Kim, T., Project Participant, Department of Wind Energy, Aeroelastic Design
Gaunaa, M., Project Participant, Department of Wind Energy, Aeroelastic Design
Serensen, N. N., Project Participant, Department of Wind Energy, Aeroelastic Design
Hansen, M. H., Project Participant, Department of Wind Energy, Aeroelastic Design
Bitsche, R., Project Participant, Department of Wind Energy, Wind Turbines
Blasques, J. P. A. A., Project Participant, Department of Wind Energy, Wind Turbines
01/10/2010 → 30/09/2013
Collaborators: Vestas Wind Systems AS
Project: Research
DEEPWIND: Future Deep Sea Wind Turbine Technologies
DeepWind is a 4 year project, funded by FP7 - Future Emerging Technologies, and runs from 1 October 2010 to 30 September 2014.
Offshore wind energy will play a steadily increasing role and calls for dedicated technology rather than being based on onshore technology that in principle just is transported to sea environments. The hypothesis of this project is that a new wind turbine concept developed specifically for offshore application has potentials for better cost efficiency than existing offshore technology. Based on this hypothesis the project has the overall objective to explore the technologies needed for development of a new and simple floating offshore concept with a vertical axis rotor and a floating and rotating foundation. Additionally, the objective is to develop calculation and design tools for development and evaluation of very large wind turbines based on this concept.

Schmidt Paulsen, U., Project Coordinator, Department of Electrical Engineering, Department of Wind Energy, Test and Measurements, Risø National Laboratory for Sustainable Energy, Wind Energy Division
FP7 Contract ID: 256769
01/10/2010 → 30/09/2014
Project: Research

Future Technologies for Wind Energy: Blade materials, Turbine reliability, Computation tools, and Experimental methods
International Network Programme - USA & India
Raghavalu Thirumalai, D. P., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Sørensen, B. F., Project Participant, Department of Electrical Engineering, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Mishnaevsky, L., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Project ID: 12-132723
01/01/2013 → 31/12/2013
Keywords: Wind Energy
Project: Research

VirtuelGalathea3: VirtuelGalathea3 e-learning (vg3.dk og galathea3.dk)
The VirtuelGalathea3 project provides educational material to pupils in Danish schools from 14 years to 20 years of age about mainly physical and natural sciences. The material is based on the Galathea 3 expedition (1996-1997).

Charlotte Bay Hasager coordinates the project.

The homepage www.virtuelgalathea3.dk or vg3.dk has had more than 1/4 unique visitors since 2008. The monthly visits are above 10,000 people per month.


Formål
Formålet med VirtuelGalathea3 e-learning er at tilbyde et solidt fagligt funderet undervisningsmateriale, der varigt sikrer danske elever web-baseret online adgang til de mange spændende observationer og resultater fra Galathea 3 projekterne til brug i undervisningen i fagene fysik, kemi, matematik, biologi, naturgeografi og historie niveau-delt til klasser i folkeskole og ungdomsuddannelser.

Projektdeltagerne er

Risa DTU Charlotte Bay Hasager (koordinator), Merete Bruun Christiansen, Michael Ole Olsen, Kristian Frederiksen, Lone Als Egebo, Helle Houkjær, Lone Skafte Jespersen
Kort om VirtuelGalathea3 e-learning

Projektet bygges op på hjemmesiden www.virtuelgalathea3.dk i samarbejde med forskningsprojekterne og skoleprojekter på Galathea 3. Erfaringerne fra Dansk Ekspeditionsfond, EMU og medierne vil der blive linket til i bredt omfang, således at det tilgængelige materiale for Galathea 3 kan blive anvendt i videst muligt omfang i de danske skoler i de kommende år. Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology

External Project ID: UVM Tips og Lotto samt VTU kontrakt
01/01/2007 → 31/12/2015

Project: Research

12 MW: 12 MW wind turbines: the scientific basis for their operational 70 to 270 m height offshore

Improvement of offshore winds and turbulence predictions based on available remote sensing equipment, wind and turbulence quantification, and modelling.

12 MW wind turbines: the scientific basis for their operational 70 to 270 m height offshore. The 12MW project runs in years 2005 and 2009 with funding from the Danish Research Agency, The Strategic Research Council, Program for Energy and Environment

Background

Wind turbine dimensions have evolved from rapidly 1980 to now. At the moment turbines up to 8 MW can be tested at Høvsøre Test Station, Risø. The size of commercial wind turbine design may grow to 12 MW. The very large turbines will be used offshore. This development puts a strong demand on our understanding of the atmospheric flow and turbulence characteristics at very high heights offshore.

Small turbines operate in the lower part of the atmospheric boundary layer. Here the logarithmic wind profile is valid and turbulence statistics are well known from offshore and coastal masts. Higher up winds are largely unknown due to severe practical offshore measurement difficulties.

The challenge is to improve our knowledge on offshore wind and turbulence characteristics for the next generation of multi-MW wind turbines that will come to operate at heights ranging from 70 to 270 m above sea level.

In the 12MW project we will improve offshore winds and turbulence prediction capabilities at these heights based on available new and proven remote sensing equipment, wind and turbulence quantification, and modelling.

Goal
The goal of the project is to experimentally investigate the wind and turbulence characteristics between 70 and 270 m above sea level and thereby establish the scientific basis relevant for the next generation of huge 12 MW wind turbines operating offshore. This will be done using state of the art remote sensing measurement techniques for data collection at an offshore wind farm site in Denmark.

The strategic aim is to supply the wind industry relevant results.

Objective

To establish new wind and turbulence design models for the next generation of 12 MW turbines operating in the offshore marine environment from 70 to 270 m’s height. The design models will be evaluated from observations from Doppler Laser LIDAR, SODAR, backscatter aerosol LIDAR, radiosondes, ceilometer and satellite.

Participants

Risø National Laboratory, Wind Energy Department
Charlotte Bay Hasager (coordinator),
Torben Mikkelsen, Ioannis Antoniou, Rebecca Barthelmie, Sven-Erik Gryning, Hans E. Jørgensen, Ph.D. student Alfredo Peña

Elsam Engineering: Paul Sørensen

Hasager, C. B., Project Manager, Department of Wind Energy, Meteorology
Peña, A., Project Participant, Department of Wind Energy, Meteorology
Mikkelsen, T. K., Project Participant, Department of Wind Energy, Test and Measurements
Courtney, M., Project Participant, Department of Wind Energy, Test and Measurements
Antoniou, I., Project Participant
Gryning, S., Project Participant, Department of Wind Energy, Meteorology
External Project ID: DSF Energy and Environment
01/10/2005 → 31/03/2009
Project: Research

EO-LAND-WATER: EO-LAND-WATER
EO-LAND-WATER: Implementing Earth observations, advanced satellite based atmospheric sounders and distributed temperature sensing for effective land surface representation in water resource modelling

In order to predict future freshwater availability and the vulnerability of ecosystems and society to floods and droughts, hydrological model tools are needed that are capable of accurately representing climate, land use and land cover at different spatial scales. The purpose of the current project is to develop model tools capable of quantifying the relative effects of site-specific land use change and climate variability at different scales.

Boegh, Eva (Project Coordinator)Dellwik, Ebba, Risø-DTU, Denmark (Project participant)Hasager, Charlotte, Risø-DTU, Denmark (Project participant)Hahmann, Andrea, Risø-DTU, Denmark (Project participant)Rosbjerg, Dan, DTU-Environment, Denmark (Project participant)Refslund Nielsen, Joakim, Risø-DTU, Denmark (Project participant)Karthikeyan, Matheswaran (Project participant)Environmental Dynamics

The Department of Environmental, Social and Spatial ChangeIn order to predict future freshwater availability and the vulnerability of ecosystems and society to floods and droughts, hydrological model tools are needed that are capable of
accurately representing climate, land use and land cover at different spatial scales. The purpose of the current project is to develop model tools capable of quantifying the relative effects of site-specific land use change and climate variability at different scales.

Status Current

Period 01-02-09 → 01-07-12

URL http://www.upscalehydrology.ruc.dk

Financing source Public research council

Research programme Forskningsrådet for Teknologi og Produktion (FTP)

Short description

Climate, land cover and land use are changing, thereby imposing changes to the hydrological cycle which are affecting the access to water resources and increasing the frequency of extreme hydrological events, such as floods and droughts. In order to predict future freshwater availability and the vulnerability of ecosystems and society to floods and droughts, hydrological model tools are needed that are capable of accurately representing climate, land use and land cover at different spatial scales.

The purpose of the current project is to develop model tools capable of quantifying the relative effects of site-specific land use change and climate variability at different scales.

Evaluating impacts of site-specific changes in land use and land cover on catchment processes is significantly complicated by spatial heterogeneity and the long and variable time lags between precipitation and the responses of soil, streams and groundwater. To address the research objectives, new data- and model-based technologies will be combined. This includes the use of a Distributed Temperature System (DTS) for measuring spatial variations in stream temperature. The DTS system uses a long (1-2 km) fiber-optic cable to provide temperature measurements with 1 meter resolution. The system will be used to identify and model lateral inflows to the stream in relation to the spatial characteristics of the upland contributing land areas which are represented as multiple (cumulative) sub-catchments. At the larger scales (all Sjælland), Earth observations will be used for land surface hydrology modeling, and effective land surface representation schemes will be developed. Impact of effective spatial land surface hydrology representation will be analyzed and verified using new satellite based atmospheric sounders (AIRS, IASI) which are providing high vertical resolution information of atmospheric properties (ie. air temperature, air humidity and CO2). For this purpose the land surface scheme will be used in a next-generation regional climate model. The impact of land surface hydrology and heterogeneity on the atmospheric boundary layer development will then be analyzed and verified using the (3-D) observed variations in atmospheric condition from AIRS and IASI.

Keywords Satellite data, land use, water resources, distributed temperature sensing, hydrological modelling

Dellwik, E., Project Manager, Department of Wind Energy, Meteorology
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
Sogachev, A., Project Participant, Department of Wind Energy, Meteorology
Nielsen, J. R., Project Participant

External Project ID: Danish Research Agency, FTP 274-08-0380.
01/02/2009 → 01/07/2012

Project: Research

EO-FLUX-BUDGET: Earth Observation data for upscaling carbon FLUX and water BUDGET at Zealand

Earth Observation data for upscaling carbon FLUX and water BUDGET at Zealand
A web page is available at www.geogr.ku.dk/projects/eoflux/ with more detailed information.

Measurements of CO2 emission and deposition at Zealand are collected at 5 sites representing major Danish biotypes. While these measurements provide information on the temporal variability of ecosystem fluxes and their longer term trends, EO-FLUX-BUDGET combines Earth Observation (EO) data and a GIS-based soil-vegetation-atmosphere transfer model (DaisyGIS) for the spatial upscaling of such data at Zealand. Spatial extrapolation of ground-based data is essential for the monitoring of regional, national and global biospheric processes. Because of the landscape heterogeneity, the surface conditions which are responsible for the atmospheric fluxes vary with the scale of modeling. In EO-FLUX-BUDGET, "effective" (or aggregate) surface variables are computed directly at the scale of interest using multiple-resolution EO data. The new-generation EO data are important for this purpose because they facilitate improved estimation of both vegetation quantity and chlorophyll contents which are particular important for evaluating the carbon sink (absorption) on Earth. Maps of CO2 exchange and evapotranspiration rates will be produced and validated in time and space using tower fluxes and air-borne flux measurements. The annual budgets of CO2 and water are calculated for Zealand in two climatologically different years.

Participants

Institute of Geography, University of Copenhagen: Henrik Søgaard (co-ordinator of the project), Eva Bøgh

Wind Energy Department, Risø National Laboratory: Charlotte Bay Hasager (co-ordinator of the Risø part), Niels Otto Jensen, Ebba Dellwik

Plant Research Department, Risø National Laboratory: Kim Pilegaard

Danish Hydraulic Institute (DHI) Water & Environment: Michael Butts, Mette Thorsen

Royal Veterinary and Agricultural University: Søren Hansen

Sponsor

The Danish Research Agency within the ESA følgesforsknings-programme for 1.1.2001- 1.1.2004

Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
External Project ID: Danish Research Agency ESA følgesforskning
01/01/2001 → 01/01/2004
Project: Research

SAT-WIND: SAT-WIND: Winds from satellites for offshore and coastal wind energy mapping and wind-indexing
Applicability of satellite wind maps derived from passive microwave, altimeter, scatterometer and imaging SAR technologies as tools for wind resources and wind-indexing.

Winds from satellites for offshore and coastal wind energy mapping and wind-indexing.

The SAT-WIND project runs in years 2004 and 2006 with funding from the Danish Technical Research Council (STVF) at the Danish Research Agency.

Background
Planning wind farms offshore are generally based on little knowledge of the wind speeds. It is due to the limited amount of offshore meteorological observations worldwide. This again has put a severe limitation to verification on offshore wind model results. Current practices on the modeling offshore winds therefore introduce significant uncertainties. For wind farm owners the wind power production may deviate from the prospected output and wind-indexing becomes a necessary tool in surveying on-going wind farm projects as well as in recommendations for new offshore wind farm initiatives.

Until now offshore wind observations from satellites have not been used for offshore wind energy purposes even though wind maps from various technologies such as passive microwave, altimeter, scatterometer and imaging synthetic aperture radar (SAR) are available for more than one decade. The two major reasons for not using satellite winds within offshore wind energy are

satellite wind mapping accuracy (absolute precision, mapping frequency, spatial scale)

technological methodologies to transfer satellite data to wind energy tools

For selection of the ‘right spots’ for planning offshore and coastal wind farms, just the relative offshore wind speeds would be of importance. In (pre)-feasibility studies where a large region typically is under investigation, a lower absolute accuracy on the wind estimate may be acceptable. The spatial wind variations mapped from satellites may be used for pointing out where to put up the relatively expensive offshore met-masts. In regard to wind-indexing continuous and frequent wind observations are necessary. This now can be provided by satellite wind observations.

Goal

The goal of the project is to verify the applicability of satellite wind maps derived from passive microwave, altimeter, scatterometer and imaging SAR technologies for wind energy tools for wind resources and wind-indexing.

Earth Observation data and study site

The satellite images under study are passive microwave data from SSM/I, scatterometer data from ERS-2 AMI Scat and Quikscat, altimeter data from TOPEX/Poseidon, and imaging synthetic aperture radar (SAR) data from ERS-2 SAR and ENVISAT ASAR covering the North Sea.

Participants

Risø National Laboratory, Wind Energy Department Charlotte Bay Hasager (coordinator), Rebecca Barthelmie, Morten Nielsen, Merete Christiansen, Jørgen Højstrup, Poul Astrup,

Energi- og Miljø data Per Nielsen

Elsam Engineering: Paul Sørensen

Acknowledgements

Satellite scenes are kindly granted at research cost through the ESA EO-1356 project. Charlotte Bay Hasager is the PI

Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
External Project ID: STVF/DSF energy and environment
01/04/2004 → 30/09/2006
Project: Research
SAR-WAKE: Offshore wake effect study from Earth Observation Synthetic Aperture Radar

The SAR-WAKE project runs in years 2003 and 2004 with funding from the Danish Technical Research Council (STVF) at the Danish Research Agency.

Background

One of the environmental effects of a large offshore wind farm is that it causes changes in the local wind climate. From theoretical work the effect of a large offshore wind farm is calculated to reach of the order of 5 to 15 km downstream. The wake effect is the shadowing (lee-effect) from one wind turbine to the next and much further downstream. It is known that the wind speed directly downwind of a turbine is decreased (up to 30 %) and the turbulence intensity is increased. A turbine placed downwind of another turbine produces less energy, typically 10-20 % less but in the worst cases where turbines are closely spaced up to 60% less. So far only very few meteorological observations behind single or few wind turbines in a row have been collected offshore. Wake effects at larger scales are poorly understood despite the possibility that higher turbine generated turbulence may impact air-sea interactions.

Goal

The goal of the project is to quantify the horizontal extent and intensity of the wake effect through analysis of Earth Observation (EO) data from Synthetic Aperture Radar (SAR).

Earth Observation data and study site

Observations from the ERS-2 SAR satellite and the ENVISAT ASAR satellite of the European Space Agency (ESA) and airborne ESAR data from German Aerospace Research Establishment (DLR) are collected at the Horns Rev site in the North. Here the world’s largest offshore wind farm consisting of 80 wind turbines covering an area of 20 km2 in the North Sea is in operation since 12 December 2002. The wind farm is positioned in a trapezoid-grid at a distance more than 16 km from the coastline.

Participants

Risø National Laboratory, Wind Energy Department
Charlotte Bay Hasager (coordinator), Rebecca Barthelmie, Merete Christiansen, Jørgen Højstrup

Ørsted -Denmark Technical University: Henning Skriver, Jørgen Dall

Elsam Engineering: Paul Sørensen

Visiting Post.doc. at Risø: Birgitte Furevik from NERSC
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology

External Project ID: STVF
01/02/2003 → 01/04/2006
Project: Research

EO-WINDFARM: Design and integration of an EO-based mapping service based on end-user demands for geo-information when planning, constructing and operating wind farms.

EO-based information service for WINDFARM management.

The EO-WINDFARM project runs in years 2003 and 2007 with funding from the European Space Agency (ESA), Earth Observation Market Development (EOMD) programme.

Objective
The overall objective of this study is to design and integrate an EO-based mapping service based on end-user demands for geo-information when planning, constructing and operating wind farms.

The service will benefit citizens of Europe, through improved cost-effectiveness pre-siting, constructing and operating wind farms. The service products will be GIS compatible, for easy inclusion in different customer applications.

The focus of this project is on providing an EO-based information service, aiding potential customers. The service will provide different products for different regions, e.g. for offshore sites EO wind mapping will be an important product, while for land sites other EO products such as roughness mapping will be more relevant.

Further information is available at www.nersc.no/EO-WINDFARM

Participants

NERSC, Nansen Environmental and Remote Sensing Center, Norway
Project manager, Ola M. Johannessen
Project co-ordinator, Lasse Pettersson
Risoe National Laboratory, Wind Energy Department, Denmark
Charlotte Bay Hasager (co-ordinator at Risø)
Morten Nielsen
Poul Astrup

Link to ESA news: http://www.eomd.esa.int/stories.php?id=190
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
External Project ID: ESA EOMD
01/01/2003 → 31/12/2006
Project: Research

The WEMSAR project runs from year 2000 to 2002. The project is funded from the European Union 5th Framework Programme on Research Technology Development and Demonstration within the Energy, Environment and Sustainable Development Programme.

Objective

To develop, validate and demonstrate the potential use of satellite-based Synthetic Aperture Radar (SAR), scatterometer and altimeter data combined with meteorological observations for the mapping of wind resources in off-shore and near-coastal regions.

Satellite SAR data

Currently satellite SAR data are retrieved by the European satellite ERS-2 SAR from the European Space Agency (ESA) and by the Canadian RADARSAT-1. From year 2000 Advanced Synthetic Aperture Radar (ASAR) data from ENVISAT and in year 2001 SAR data from RADARSAT-2 will become available. SAR data has a resolution of about 25 m in the horizontal domain. In the WEMSAR project the SAR data will be regridded to a 400 m resolution.

Satellite altimeter data
Altimeter data are available from ERS-2 Altimeter and TOPEX/POSEIDON from NASA. The footprint is approximately 7 km.

Satellite scatterometer data

Scatterometer data are available from ERS scatterometer from ESA, SeaWinds from QuikScat at the American satellite TITAN II from NASA, SeaWinds at the Japanese satellite ADEOS II and NSCAT at ADEOS I. Global near-real time observations of ocean winds are available from QuikScat. The horizontal resolution is 50 km.

Wind resource mapping

In the WEMSAR project the off-shore wind resources will be calculated at regional and local scale for three sites located in Norway, Denmark and Italy. For the regional scale calculations the Karlsruhe Atmospheric Mesoscale Model (KAMM) will be used and for the local scale calculations WAsP.

Charlotte Bay Hasager coordinated the work at Risø on mapping wind resources from SAR.

Partners

Nansen Remote Sensing Centre (NERSC) in Bergen, Norway (Prof. Ola Johannessen project co-ordinator; Dr. Stein Sandven, Dr. Heidi Espedal, Dr. Birgitte Furevik, Dr. Torill Hamre, Dr. Lasse Pettersson)

Risø National Laboratory, Wind Energy and Atmospheric Physics Dept. (Dr. Charlotte Bay Hasager, Dr. Bo Hoffmann Jørgensen, Dr. Morten Nielsen, Dr. Sara Pryor, Dr. Ole Rathmann, Dr. Rebecca Barthelmie, Dr. Poul Astrup)

NEG-Micon, Randers, Denmark (Lars E. Christensen)

ENEA, Italy (Dr. Gaetano Gaudiosi)

Terra Orbit AS, Norway (Geir Jevne)

Project web-pages at NERSC is available at http://www.nersc.no/main/index2.php
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
External Project ID: FP5 project
01/01/2000 → 31/12/2002
Project: Research

EU WATERMED: EU WATERMED: WATer use Efficiency in natural vegetation and agricultural areas by Remote sensing in the MEDiterranean basin
WATer use Efficiency in natural vegetation and agricultural areas by Remote sensing in the MEDiterranean basin

The WATERMED project runs from year 2000 to 2002. The project is funded from the European Union 5th Framework Programme within the INCOMED programme.

Objectives
The general objective of the WATERMED project is to develop a comprehensive method for the study of the water use and the resistance to the drought of the natural and irrigated vegetation in the Mediterranean Basin, by means of a combined historical and current space-based remote sensing database, vegetation models and field measurements. The general concept is to integrate all available data of the studied environments.

To carry out a climatology of the study area to distinguish the most fragile areas to the drought and the evolution of the ecozones. The study will map the land cover change in the time period chosen. The study will be made by using NOAA AVHRR satellite data, high resolution imagery, airborne remote sensing measurements and field measurements.

A study of water use efficiency in four specific test areas chosen in the following critical zones:

the Guadalentin Basin (SE Spain)
the Ouarzazate province and Marrakech (SE of Morocco)
the lower Rhone valley (SE France)
the northern region of the Sinai Peninsula in Egypt.

The contribution from Risø is focussed on the upscaling of surface heat and water vapour fluxes from point scale to a scale of 1 km * 1 km. This is the resolution the NOAA AVHRR satellite data. The study will be based on high resolution satellite data from selected sites. The surface flux modelling will be done with a new version of the microscale aggregation method. Further will the upscaling results be compared to other methodologies.

Charlotte Bay Hasager was partner in the project and contributed a non-linear aggregation model for calculation of surface fluxes based on satellite remote sensing maps for roughness and meteorological data.

Project web page with further details available.

Partners

University de Valencia, Faculty of Physics, Dept. of Thermodynamics, Spain (Dr. José A. Sobrino co-ordinator)

Institu National de la Recherche agronomique (INRA) of France (Dr. Albert Olioso)

Risø National Laboratory of Denmark (Dr. Charlotte Hasager, Dr. Niels Otto Jensen)

Centre Royal de Télédétection Spatial (CRTS) of Morocco

University of Marakkech, Faculty of Physics, Morocco

National Authority for Remote Sensing and Space (NARSS) of Egypt
The WATERMED general web pages are found at http://www.uv.es/~uvalen/eng/index.html

Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
External Project ID: FP5 INCOMED programme
01/01/2000 → 31/12/2002
Project: Research

This is a continuation (2001-2005) of a Danish project originally running from year 1996 to 2000 within "EARTH OBSERVATION" - an interdisciplinary research programme funded by three Danish Research Councils and the Danish Space Board Committee.

Objectives

Interactions between field and landscape scale Soil-Vegetation-Atmospheric Transport (SVAT) will be investigated from experimental field data combined with information from digital remote sensing images. Focus is on surface fluxes of water vapour, heat and CO2.

The cycles of water, heat and CO2 are important to crop simulation which is relevant for efficient land-use planning, crop management and yield predictions. Expertise on these matters are held by Research Centre Foulum where the field site is located.

The overall objective is to get a better understanding of the processes from the very fine scale (plant/canopy), over homogeneous fields, to landscape mosaics. Previously developed models from five Danish research institutions will be used jointly to pass relevant information from “point” to “area” with the goal of estimating the H2O and CO2 cycles.

Partners

The research project draws on experimental and theoretical expertise from five Danish research institutes. These are the Department of Agricultural Systems at Research Centre Foulum (Foulum) with Kirsten Schelde as project coordinator
the Hydrological Modelling Department (HMD) at the Danish Hydraulic Institute (DHI), the Wind Energy and Atmospheric Physics Department (VEA) at Rise National Laboratory (Rise), the Laboratory for Agrohydrology and Bioclimatology (AGSCI) at the Royal Veterinary and Agricultural University (KVL) and the Institute of Geography (GI) at the University of Copenhagen (KU).

Data

Field investigations on soil properties, vegetation state and local meteorological conditions are long-term research objectives at Research Centre Foulum. Likewise has digital remote sensing from airborne and satellite sensors been investigated. A huge database of field data and remote sensing images exists for the test site collected within among other projects, the DANish Multisensor Airborne Campaign project (DANMAC). These data are available for the current project.

New data will be collected during field campaigns to obtain contemporary datasets. Measurements will include for canopy: spectral reflectance, temperature, leaf angle distribution, cover fraction, leaf area index, biomass, light absorption and standard agronomic observations. Measurements for soil will include: water content, temperature and standard soil observations. Measurements for atmosphere will include: wind, temperature, radiation, humidity, rainfall and CO2. A tall meteorological mast will provide data relevant for landscape scale evaluation and smaller masts will provide data for field
scale use. At landscape scale digital remote sensing imagery will be obtained.

Analysis

As the data collected will have to be used by all participants a common data base will be created and maintained at Foulum.

Researchers at Foulum will analyse the relations between spectral data and canopy development as well as conduct inverse modelling of canopy conductance by SVAT-modelling. This demands a broad set of field scale information on soil, canopy and atmosphere. The processing of remote sensing data for larger scale model applications will be carried out by scientists involved in climatology and remote sensing research at Institute of Geography, KU.

The "plant/canopy-scale" soil/plant model DAISY developed at the Royal Veterinary and Agricultural University will be applied and modified by these researchers for use in conjunction with the "catchment scale" MIKE SHE hydrological model. The MIKE SHE model will be applied by researchers from the Danish Hydraulic Institute where this model was developed. The MIKE SHE "landscape scale" flux results will be compared to results from a microscale aggregation model developed at Risø. At Risø the microscale aggregation model is currently being developed from its present state of calculating land surface momentum flux to include scalar surface fluxes such as water vapour, sensible heat and CO2. Model inputs are remote sensing images as well as wind speed and wind direction, air humidity and temperature at one level.

The two "landscape scale" flux results from respectively, the combined DAISY/MIKE SHE model and the scalar microscale aggregation model, will be validated against fluxes of H2O and CO2 measured at a tall meteorological mast run by Risø.

Funding of the RS-project

The Danish Space Board Committee
The Danish Agricultural and Veterinary Research Council (SJVF)
The Danish Natural Science Research Council (SNF)
The Danish Technical Research Council (STVF)

Charlotte Bay Hasager is partner in the project.

Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
01/01/1996 → 31/12/2005
Project: Research

SAT-MAP-CLIMATE: SAT-MAP-CLIMATE: SATellite based bio-geophysical parameter MAPping and aggregation modelling for CLIMATE models
SATellite based bio-geophysical parameter MAPping and aggregation modelling for CLIMATE models

Charlotte Bay Hasager is coordinator of the project.

Global climate change and weather forecasting is modelled by the HIRLAM (HIgh Resolution Limited Area Model) atmospheric flow model. This model is developed at the Danish Meteorological Institute in collaboration with other Nordic
weather services. HIRLAM currently is used by weather services in many European countries. The exchanges of energy, water vapour and momentum between the land- and ocean surface and the large scale atmospheric circulation are very important dynamical processes in this type of model.

The SAT-MAP-CLIMATE project focus on development on parameterizations of the land surface fluxes mapped by Earth Observation data from satellites. The satellite information is used to cover the Danish land and sea with a high temporal and spatial resolution. Satellite based maps of land surface roughness, land- and sea surface temperatures and vegetation state will be area-averaged from a 30 m * 30 m resolution to the grid cell size of 5 km * 5 km in HIRLAM. The area-averaging is highly non-linear due to the turbulent physical processes involved. Thus the effective surface conditions cannot be obtained by simple averaging but only by a flow model taking horizontal advection into consideration.

Results of using improved surface boundary conditions in the HIRLAM model will be validated from wind and temperature data at synoptic weather stations and surface flux data from land- and ocean meteorological masts in Denmark. The possibility of surface flux climatology mapping will be evaluated. Further will a one-year climate prediction be carried out with the seasonal land surface effects included in the input conditions. This work is basic to improvements in global climate change predictions.

Participants

Wind Energy and Atmospheric Physics Department, Risø National Laboratory: Charlotte Bay Hasager (co-ordinator) and Niels Otto Jensen

Institute of Geography, University of Copenhagen: Henrik Søgaard, Eva Beogh, Michael Schultz Rasmussen

Danish Meteorological Institute: Niels Woetmann Nielsen and Jens Hesselbjerg Christensen

Sponsor

The Danish Research Agency within the ESA følgeforsknings-programme

References

Hasager, C.B. Nielsen, N.W., Jensen, N.O., Boegh, E., Christensen, J.H. Dellwik, E. and Soegaard, H., 2002 Effective roughness calculated from satellite-derived land cover maps and hedge information used in a weather forecasting model. Boundary-Layer Meteorology


Hasager, C.B., Nielsen, N.W., Soegaard, H., Boegh, E., Christensen, J.H., Jensen, N.O., Rasmussen, M.S., Astrup, P. and Dellwik, E. 2002 SAT-MAP-CLIMATE project results. Rise-R-1350(EN), Roskilde, Denmark. Available at risoe.dk pp. 72

Hasager, C.B., Soegaard, H., Nielsen, N.W., Christensen, J.H., Boegh, E., Jensen, N.O. 2002 Aggregation of satellite remote sensing-based land cover roughness applied to meteorological modelling. 34th COSPAR Assembly Scientific (Committee on Space Research). The second world space congress. Houston, Texas, USA, 10-19 October 2002. See abstract and slide show


Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
External Project ID: Danish Research Agency
01/01/1999 → 01/01/2001
Project: Research

ICEWIND: ICEWIND: Improved forecast of wind, waves and icing
ICEWIND: Improved forecast of wind, waves and icing The ICEWIND project is funded by The Nordic Top-level research program http://www.toppforskningsinitiativet.org/en/programmer-1/program-4/prosjekter/icewind/

• Overall budget 20.8 mill NOK
• Financial support TFI 12.3 mill NOK
• Ekstern finansiering 8.5 mill NOK
• Partners: 13
The project objectives address cold climate aspects and will include the production of icing atlas for Sweden and Iceland based on long term meteorological statistics.

A main issue is the development and validation of short-term forecast of icing by use of numerical weather prediction models and different cloud and hydrometeor-parameterization schemes and include offshore sea spray icing. The final objective is development of an engineering tool for production loss calculation of large wind turbine installations in northern latitudes.

The project objectives related to offshore wind include resource mapping near Iceland and improved land-wind resource map such that the following objectives can be achieved: Full-scale studies on the integration of hydro and wind power in Iceland. The objectives are to identify and enumerate several potential future location scenarios for wind farms and identify location specific cost - benefit measures regarding investment and operations cost with timing and expansion assumptions for these scenarios. Furthermore, to estimate wind energy production when integrated with other resources and to identify transmission capacity restrictions and transmission loss measures for the range of locations and finally to design a market driven short term simulation system using optimization models.

Large-scale integration of wind power objectives include improved forecasting for 1) each wind farm, 2) the entire grid on energy production data and wake loss, 3) icing loss, and 4) offshore operation and cost effective maintenance, tools for optimising the choice of vessel types in different wave climates and providing specialized forecasts for accessibility will be addressed. The site conditions and forecasting results will be combined in analysis of the implications to the power system in the Nordic countries assuming increased amount of cold climate and offshore wind farms.

The objectives of the ICEWIND project aim to support the European targets for the high amount of renewable integration of the power systems in 2020, with the inevitable move towards offshore waters. The project outcomes are expected to be relevant for other cold climate areas of the world.

Niels-Erik Clausen is coordinating the project.
Gregor Giebel is Work Package leader.
Charlotte Bay Hasager is project participant and contributes to the offshore wind atlas for Iceland.
Clausen, N., Project Manager, Office for Study Programmes and Student Affairs, Department of Wind Energy, Wind Energy Systems
Hasager, C. B., Project Participant, Department of Wind Energy, Meteorology
Hahmann, A. N., Project Participant, Department of Wind Energy, Meteorology
Davis, N., Project Participant, Department of Wind Energy, Meteorology
Badger, M., Project Participant, Department of Wind Energy, Meteorology
Giebel, G., Project Participant, Department of Wind Energy, Wind Energy Systems

External Project ID: TFI-PK int 01
01/09/2010 → 28/02/2015
Project: Research

**MERMAID: EU MERMAID: Innovative Multi-purpose offshore platforms: planning, design and operation**
In the near future, the European oceans will be subjected to a massive development of marine infrastructures. The most obvious structures include offshore wind farms, constructions for marine aquaculture and the exploitation of wave energy.

The development of these facilities will increase the need for marine infrastructures to support their installation and operation and will unavoidably exert environmental pressures on the oceans and marine ecosystems. It is therefore crucial that the economic costs, the use of marine space and the environmental impacts of these activities remain within
acceptable limits. Hence, offshore platforms that combine multiple functions within the same infrastructure offer significant economical and environmental benefits.

MERMAID will develop concepts for the next generation of offshore platforms which can be used for multiple purposes, including energy extraction, aquaculture and platform related transport. The project does not envisage building new platforms, but will theoretically examine new concepts, such as combining structures and building new structures on representative sites under different conditions.

The 28 partner institutes forming MERMAID are Universities (11), Research institutes (8), Industries (5) and Small and Medium Enterprises (4 SME’s), from many regions in EU. The group represents a broad range of expertise in hydraulics, wind engineering, aquaculture, renewable energy, marine environment, project management as well as socio-economics.

MERMAID is one of three EU-FP7 funded projects selected for funding in response to Ocean 2011 on multi-use offshore platforms (FP7-OCEAN.2011-1 “Multi-use offshore platforms”). This project shall have a cost of 7.4 million euro. The European Union has granted a financial contribution of 5.5 million euro.

MERMAID is lead by Professor Erik Damgaard Christensen at DTU MEK.

Charlotte Bay Hasager at DTU Wind Energy is responsible for the offshore wind assessment.

Hasager, C. B., Project Manager, Department of Wind Energy, Meteorology
Badger, M., Project Participant, Department of Wind Energy, Meteorology
Larsen, X. G., Project Participant, Department of Wind Energy, Meteorology
Bingol, F., Project Participant

FP7 Contract ID: 288710
External Project ID: FP7 OCEAN.2011-1 Grant Agreement no.: 288710
01/01/2012 → 31/05/2016
Project: Research

Project approved under "International Network Program" with India – 360,000DKK
Scientific Network Activities [planned jointly with Indian Universities]:
1. Indo-Danish Workshop on "Future Composites Technologies for Wind Turbine Blades" October 8-9, 2012, Indian Institute of Technology, New Delhi, India
http://indodanish.iltud.ac.in/
http://www.wemep2012.com/
Raghevalu Thirumalai, D. P., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Serensen, B. F., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
Mishnaevsky, L., Project Participant, Department of Wind Energy, Composites Mechanics and Materials Mechanics
01/02/2012 → 31/12/2012
Documents:
1. Indo-Danish Workshop on "Future Composites Technologies for Wind Turbine Blades", October 8-9, 2012, Indian Institute of Technology, New Delhi, India
International Conference on Wind Energy: Materials, Engineering, and Policies, BITS Pilani, Hyderabad Campus, Hyderabad, India
Project: Research

Low-cost semiconductor laser wind sensors
Our objective is to develop, demonstrate and validate prototype laser wind sensors that measure wind speed and direction based on low-cost, compact semiconductor lasers and new optical methods we have recently devised and patented. These wind sensor prototypes will represent the next-generation of compact, rugged and inexpensive laser-based wind sensors for wind energy research and turbine industry.
Rodrigo, P. J., Project Manager, Department of Photonics Engineering, Optical Sensor Technology
Pedersen, C., Project Participant, Department of Photonics Engineering, Optical Sensor Technology
Dellwik, E., Project Participant, Meteorology, Department of Wind Energy
Mann, J., Project Participant, Meteorology, Department of Wind Energy
Sjöholm, M., Project Participant, Department of Wind Energy, Test and Measurements

Project ID: 70720
Energiteknologisk Udviklings- og Demonstrationsprogram: DKK7,391,990.00
01/03/2012 → 28/02/2014
Collaborators: Windar Photonics A/S
Award relations: Low-cost semiconductor laser wind sensors
Project: Research

Agentbaserede styringsstrukturer i elsystemer med betydelig decentral produktion : PSO-projekt
Lind, M., Project Manager, Department of Electrical Engineering
Nielsen, A. H., Project Participant, Department of Electrical Engineering
Saleem, A., Project Participant, Department of Electrical Engineering
Bindner, H. W., Project Participant, Risø National Laboratory for Sustainable Energy, Wind Energy Division
Andreasen, J., Project Participant, Syd Energi Net A/S
Nielsen, L. B., Project Participant, NESA A/S

Project ID: 55388
Forskningsprojekter - Andre ministerier og styrelser: DKK2,003,000.00
01/03/2007 → 31/03/2010
Collaborators: NESA A/S, Syd Energi Net A/S
Award relations: Agentbaserede styringsstrukturer i elsystemer med betydelig decentral produktion : PSO-projekt
Project: Research

El til vejtransport, fleksible el-systemer og vindkraft
Nielsen, L. H., Project Manager, Risø National Laboratory for Sustainable Energy, Systems Analysis Division
Morthorst, P. E., Project Participant, Risø National Laboratory for Sustainable Energy, Systems Analysis Division
Jørgensen, K., Project Participant, Risø National Laboratory for Sustainable Energy, Systems Analysis Division
Meibom, P., Project Participant, Risø National Laboratory for Sustainable Energy, Systems Analysis Division
Andersen, N. J., Project Participant
Larsen, E., Contact Person, Department of Electrical Engineering, Electronics
Horstmann, J., Project Participant
Ravn, H. V., Project Participant
Andersen, A., Project Participant
Nørgaard, P. H., Project Participant, Risø National Laboratory for Sustainable Energy, Wind Energy Division
Hansen, A. B., Project Participant, Energinet.dk
Pedersen, J., Project Participant, Energinet.dk
Abildgaard, H., Project Participant, Energinet.dk
Hansen, L., Contact Person, Dansk Energi

Project ID: 55563
Miljøstyrelsen: DKK501,000.00
17/01/2008 → 31/12/2011
Collaborators: Energinet.dk, Dansk Energi, RAM-løse edb
Award relations: El til vejtransport, fleksible el-systemer og vindkraft
Documents:
ris-r-1804
Project: Research

Konvertering af danske vinddata til "Database on Wind Characteristics"
Formålet er at konvertere en række nye danske meteorologiske vinddata til "Database on Wind Characteristics" hvorved disse målinger bliver gjort generelt tilgængelig for en større kreds af brugere.
Hansen, K. S., Project Manager, Department of Energy Engineering

Ukendt: DKK675,000.00
01/01/2000 → 31/12/2001
Collaborators: NEG Micon, Elsam A/S
Award relations: Konvertering af danske vinddata til "Database on Wind Characteristics"
Project: Research

Cost efficient deep water foundation for large offshore wind turbines
Buhl, T., Project Manager, Risø National Laboratory for Sustainable Energy, Wind Energy Division, Wind Turbines

Forskningsprojekter - Andre ministerier og styrelser: DKK7,930,000.00
Development of a carbon neutral luminaire for the urban environment
Bluhme, N. C., Project Manager, Gate 21
Sandholt, H., Project Participant, Gate 21
Levholt, K., Project Participant, Gate 21
Lundgaard, J., Project Participant, Gate 21
Seerup, E., Project Manager, Arkitektfirmaet Ark-Unica
Dam-Hansen, C., Project Participant, Department of Photonics Engineering
Poulsen, P. B., Project Participant, Department of Photonics Engineering
Hansen, S. S., Project Participant, Department of Photonics Engineering
Jensen, P., Project Participant, Department of Photonics Engineering
Bak, C., Project Participant, Risø National Laboratory for Sustainable Energy, Wind Energy Division
Harboe, R. K., Project Participant, Factor3 A/S
Bentzen, B., Project Participant, Factor3 A/S
Kähler, R., Project Participant, Factor3 A/S
Falk, L., Project Participant, Philips Lighting A/S
Maare, T., Project Participant, Københavns Kommune
Halden, S., Project Participant, Københavns Kommune
Bluhme, N. C., Project Participant, Albertslund kommune
Fristørm, E., Project Participant, Egedal kommune
Thorseth, A., Project Participant, Department of Photonics Engineering, Diode Lasers and LED Systems
Project ID: 70673
Forsk. Private danske - Andre: DKK1,599,658.00
01/01/2011 → 31/12/2012
Award relations: Development of a carbon neutral luminaire for the urban environment
Project: Research

Aeroelastic optimization of MW turbines
Buhl, T., Project Manager, Risø National Laboratory for Sustainable Energy, Wind Energy Division, Aeroelastic Design
Project ID: 1110073-01
Ukendt: DKK6,112,768.00
01/09/2009 → 31/08/2011
Award relations: Aeroelastic optimization of MW turbines
Project: Research

ADAPWING2: Advanced Load Alleviation for Wind Turbines using Adaptive Trailing Edge Geometry : Sensoring and control
Buhl, T., Project Manager, Risø National Laboratory for Sustainable Energy, Wind Energy Division, Aeroelastic Design
Project ID: 1110050-01
Forskningsrådene - Andre: DKK2,740,050.00
01/06/2006 → 30/06/2009
Award relations: Advanced Load Alleviation for Wind Turbines using Adaptive Trailing Edge Geometry : Sensoring and control
Project: Research

EFP07-II, Program for Forskning i Anvendt Aeroelasticitet
Buhl, T., Project Manager, Risø National Laboratory for Sustainable Energy, Wind Energy Division, Aeroelastic Design
Project ID: 1110065-01
Miljøstyrelsen: DKK4,147,000.00
01/04/2008 → 31/03/2009
Award relations: EFP07-II, Program for Forskning i Anvendt Aeroelasticitet
Project: Research

Development of Adaptive Trailing Edge Flap (ATEF) system for Wind Turbines
Buhl, T., Project Manager, Risø National Laboratory for Sustainable Energy, Wind Energy Division, Aeroelastic Design
Project ID: 1110064-01
Forskningsprojekter - Andre ministerier og styrelser: DKK8,706,852.00
01/04/2008 → 31/12/2011
Award relations: Development of Adaptive Trailing Edge Flap (ATEF) system for Wind Turbines
Project: Research

ADAPWING: Adaptiv vingegeometri til reduktion af vindmøllelaster
Buhl, T., Project Manager, Risø National Laboratory for Sustainable Energy, Wind Energy Division, Aeroelastic Design
Project ID: 1110047-01
Statens Teknisk Videnskabelige Forskningsråd : DKK1,500,000.00
01/10/2003 → 30/09/2005
Award relations: Adaptiv vingegeometri til reduktion af vindmøllelaster
Project: Research