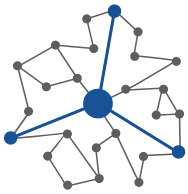

IRPWind

Integrated Research Programme on Wind Energy

Project acronym: **IRPWIND**
Grant agreement n° 609795
Collaborative project
Start date: 01st December 2013
Duration: 4 years

Annual event for all EERA JP Wind P1
Work Package 4 - Deliverable number 4.01

Version 2

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1	13 Oct 2014	Initial version			
2	15 Aug 2015	Overall text revision Described trend in presentations Added list of presenters Added abstracts for posters			
			Prepared by	**Reviewed by**	**Approved by**
		Name	Van Roermund	Eecen	Damgaard

Definitions

Acronym	Description
EERA	European Energy Research Alliance
JP	Joint Programme
IRPWind	Integrated Research Programme

Contents

Executive Summary

The first edition of the IRPWind Conference in September 2014 was well received by the participants that mainly came from the research community. In the two day event, presentations were held in several sessions, reporting on progress and results of national and European research projects on offshore wind energy. Although the conference itself has been perceived as valuable, improvement points can be: increased participation of industry, timing of the conference, time management of the sessions and more focus on plenary sessions.
Moreover the light in which the conference is organised should bare more focus. All presentation should be aligned with the ultimate goal of the IRPWind project: integration of activities, sharing of data and facilities and reinforcing the relationship with the industry. Future editions will reflect these lessons learned.

Supported by:

Introduction

The IRPWind conference (deliverable 4.1) is organised as an annual dissemination event between EERA JP Wind partners. Both EERA JP Wind projects are presented as well as outcome of national projects. The event aims to share knowledge, also across sub-programmes and provide an opportunity for all EERA JP Wind members to network and discuss offshore wind related research topics.
The ultimate goal of work package 4, "transfer of knowledge" is to disseminate and exploit developed knowledge, further equalizing the level of knowledge on wind energy across the European wind sector. This includes both the research community, the industry, national program agencies as well as the European Commission.

The event is not open to the public. EERA JP Wind management board has targeted specific persons that are not part of the EERA JP Wind community to attend the 2014 edition. Appendix A shows a complete list of attendees.

1. IRPWind conference 2014

On the 25th and 26th of September, 105 people attended the IRPWind Conference in Amsterdam. During the 2 day event, workshops were organised by the different EERA JP Wind sub-programmes, which were interspersed with plenary sessions. The conference programme can be found in Appendix B.

The common thread through all presentation was reduction of cost of offshore wind energy. The topics of integration and sharing of activities and facilities we mainly covered in the plenary sessions.

Highlights of the 2014 edition were:

- Keynote speech by Mauro Villanueva from Gamesa
- Attendance of the workshops was very well distributed
- Lots of discussion during these workshops: hard to keep track of time
- Networking event on the first day and joining dinner
- Poster session on the second day
- Plenary discussion on the visions and scenarios for IRPWIND.

The plenary discussion had the following participants:

- Mauro Villanueva, Gamesa
- Peter Hauge Madsen, DTU
- Matthijs Soede, European Commission
- Fort Felker, NREL
- Vilma Radvilaite, EWEA

All non-EERA attendees were:

- Aeolis
- DNV GL
- DONG Energy
- EU-Japan Centre for Industrial Cooperation
- Institute of Fluid Flow Machinery PAS
- Institute of Power Engineering
- Japanese Mission of Japan
- Offshore Renewable Energy Catapult
- Tulipower BV

Feedback was provided through a questionnaire distributed at the registration desk. 15 questionnaires were returned (14%). The conference was overall well received (average 4 out of 5). Improvement suggestions include increased participation of industry, timing of the conference, time management of the sessions and more focus on plenary sessions. Moreover, it was suggested to do peer-reviews on the poster presentations. This last suggestion will be implemented from 2016 onwards as the feedback was provided late during the organisation of the 2015 edition.

2. Available material

The complete list of presentations can be found in Appendix C. The PDF versions of the presentations of the conference have been uploaded to the Sharepoint site of IRPWind:

https://share.dtu.dk/sites/IRPWIND_28300/_layouts/15/start.aspx#/Work%20package%204/Forms/AllItems.aspx?RootFolder=%2Fsites%2FIRPWIND%5F28300%2FWork%20package%204%2FAnnual%20events%2FAnnual%20event%202014&FolderCTID=0x0120007B9628E565B1C14F99A554BBF2AF345C&View=%7BE02E43DD%2D7915%2D41FD%2D93CB%2D11647BFC2A0F%7D

Or: IRPWind Sharepoint -> WP4 Knowledge transf. -> Annual events -> Annual event 2014

The presentations have been shared with the non-IRPWind EERA JP Wind attendees through SURFfilesender.

3. Conclusions

Looking back at a successful first edition of the IRPWind conference, the next editions will require more focus on the overall goal of the IRPWind project: integration of activities, sharing of knowledge and data, reinforcing the relation with the industry and identifying exploitable project results. The presenters will be informed on these improvement points and more specific goal of the IRPWind conference.

The organisation of the conference can make the success of the conference more measurable by pro-actively approaching registered persons. Asking the participants about the goals and objectives of IRPWind prior and after the conference can give us insight on how well the IRPWind targets are being communicated.

Furthermore, providing easy access to data presented at the conference will help disseminating high quality knowledge and pave the way to open data sharing; the biggest hurdle to overcome.

All of these actions undoubtedly lead to an even more successful IRPWind conference in the coming years.

Figure 1. Peter Hauge Madsen, IRPWind coordinator, opening the conference

Appendix A. List of attendees IRPWind conference 2014

	LastName	Organisation
1	Sørensen	Aalborg University
2	Chen	Aalborg University
3	van Noort	AEOLIS
4	Devriendt	BERA / OWI-Lab / VUB
5	Orhan	Borusan EnBW Energy
6	Frère	Cenaero - BERA
7	Ugarte	CENER
8	Amezqueta	CENER
9	Avia Aranda	CENER
10	Moya	CENER
11	Gancarski	CENER
12	Cruz	CIEMAT
13	Arsuaga	CIRCE
14	Frøysa	CMR
15	Dessi	CNR
16	Calidonna	CNR ISAC
17	Di Piazza	CNR - ISSIA
18	Muir	Coastal and Marine Union (EUCC)
19	Lekou	CRES
20	Sieros	CRES
21	Chaviaropoulos	CRES
22	Rodriguez	CTC
23	Rodríguez	CTC
24	Simao Ferreira	Delft University of Technology
25	Künneke	Delft University of Technology
26	Tessmer	DLR - German Aerospace Center
27	Gerz	DLR-Institute of Atmospheric Physics
28	Landberg	DNV GL
29	Holm	DONG Energy
30	Damgaard	DTU
31	Andersson	DTU
32	Sorensen	DTU
33	Morthorst	DTU
34	Knudsen	DTU
35	Buhl	DTU
36	Larsén	DTU
37	Skytte	DTU Management Engineering
38	Sempreviva	DTU Wind
39	Hasager	DTU Wind Energy

	LastName	Organisation
40	Rasmussen	DTU Wind Energy
41	Giebel	DTU Wind Energy
42	Clausen	DTU Wind Energy
43	Vasiljevic	DTU Wind Energy
44	Jensen	DTU Wind Energy
45	Madsen	DTU Wind Energy
46	Faester	DTU Wind Energy
47	Ram	DTU Wind/USA
48	Brand	ECN
49	Savenije	ECN
50	Schepers	ECN
51	Braam	ECN
52	van Roermund	ECN
53	Eecen	ECN
54	Veum	Energy Research Centre of the Netherlands
55	Chokani	ETH Zürich
56	Matsumoto	EU-Japan Centre for Industrial Cooperation
57	Soede	European Commission
58	Radvilaite	EWEA
59	von Bremen	ForWind
60	Kühn	ForWind - University of Oldenburg
61	Friedrichs	ForWind Oldenburg
62	Groke	ForWind-Bremen
63	Rolfes	ForWind-Hannover
64	van Wingerde	Fraunhofer IWES
65	Lange	Fraunhofer IWES
66	Rohrig	Fraunhofer IWES
67	Durstewitz	Fraunhofer IWES
68	Härtel	Fraunhofer IWES
69	Bofinger	Fraunhofer IWES
70	Hennig	Fraunhofer IWES
71	Villanueva	GAMESA
72	Davis	IC3
73	Luczak	Institute of Fluid Flow Machinery PAS
74	Bajor	Institute of Power Engineering
75	Benveniste	IREC
76	Domínguez-García	IREC
77	Tomàs	IREC
78	Takahama	Japanese Mission of Japan
79	Martinez	KIC InnoEnergy
80	Couto	LNEG

	LastName	Organisation
81	Lopes	LNEG
82	Coker	METU Center for Wind Energy (METUWIND)
83	Uzol	METU Center for Wind Energy (METUWIND)
84	Yavrucuk	METUWIND
85	Tuncer	METUWIND
86	Braakhuis	N.A.
87	Stathopoulos	National and Kapodistrian University of Athens (NKUA)
88	Wang	NOWITECH/CeSOS
89	Felker	NREL
90	Muskulus	NTNU
91	Marti	Offshore Renewable Energy Catapult
92	Ng	ORE Catapult
93	Lee	ORE Catapult
94	Gaudiosi	OWEMES Association
95	Serri	RSE S.p.A.
96	Beurskens	SET Analysis
97	Jørgensen	SINTEF
98	Tande	SINTEF
99	Bolstad	SINTEF Energy
100	Farahmand	SINTEF Energy Research
101	Merz	SINTEF Energy Research
102	Milis	Sirris OWI-Lab
103	Gorenstein Dedecca	TBM/TU Delft
104	Badger	Technical University of Denmark
105	Perez	TECNALIA
106	Zarouchas	TU Delft
107	Terciyanlı	TÜBİTAK MRC
108	Duivenvoorden	Tulipower BV
109	RIGO	UNiv of Liege
110	Anaya-Lara	University of Strathclyde
111	Leithead	University of Strathclyde
112	Stergiannis	Vrije Universiteit Brussel/von Karman Institute for Fluid Dynamics/3E S.A.
113	Bluemink	VTT
114	Nijssen	WMC

Appendix B. Conference programme 2014

Programme Thursday, September 25th

Time	Topic	Organisation	Name	Subject
9:00 AM	Welcome	ECN	Peter Eecen	
9:15 AM	EERA projects:	DTU	Peter Hauge Madsen	A short overview: InnWind, Avatar, NSON, EERA-DTOC, IRPWind
10:00 AM	SP aerodynamics	ECN CRES	Peter Eecen Takis Chaviaropoulos	General / Innwind Avatar reference blade
11:00 AM		DTU ECN	Charlotte Bay Hasager Gerard Schepers	EERA DTOC wakes New Mexico experiment
12:00 AM		ECN	Peter Eecen	SP meeting
10:00 AM	SP grid connections	Fh. IWES UoS	Kurt Rohrig Olimpo Anaya-Lara	Results of SP work WPP Capabilities
11:00 AM		DTU SINTEF	Poul Sorensen Leif Warland	Grid Planning and Operation Energy and Power Management
12:00 AM		Fh. IWES	Kurt Rohrig	SP meeting
10:00 AM	EERA EU projects	DTU	Peter Hjuler Jensen	Innwind
11:00 AM		ECN Fh. IWES	Feike Savenije Philipp Härtel	Avatar NSON
12:00 AM		DTU DTU ECN UoS	Charlotte Hasager Gregor Giebel Gerard Schepers Olimpo Anaya-Lara	EERA-DTOC
1:00 PM	Lunch			
2:00 PM	SP off shore wind	SINTEF Fh. IWES ECN	John Olav Tande Bernhard Lange Arno Brand	Intro and overview of SP activities and results Selected research results from Alpha Ventus wind farm (RAVE) Selected research results from "Egmond aan Zee" wind farm
3:00 PM		CRES DTU NTNU	Giorgos Sieros Thomas Buhl Kai Wang	Aeroelastic modelling of offshore bottom mounted and floating WTs with results from a Greek national project Selected research results from Danish offshore wind farms A comparison of floating wind turbine concepts
4:00 PM		SINTEF	John Olav Tande	SP offshore wind & IRPwind WP6 meeting for status update and planning
2:00 PM	SP wind conditions	DTU DTU DTU	Hans Ejsing Jørgensen Anne Maria Semreviva Hans Ejsing Jørgensen	Introduction of the Wind conditions strategy Introduction to the Meso-scale exercise followed by discussion The ERANETplus Windatlas
3:00 PM		NORCOWE DTU DTU	Kristin Guldbrandsen Xaioli Larsen Mike Courtney	A presentation on the Norcowe findings specific on wind Methods for calculating extremes based on mesoscale models and time series Windscanner
4:00 PM		DTU	Hans Ejsing Jørgensen	SP meeting
2:00 PM	EERA EU projects	DTU	Peter Hjuler Jensen	Innwind
3:00 PM		ECN Fh. IWES	Feike Savenije Philipp Härtel	Avatar NSON
4:00 PM		DTU DTU ECN UoS	Charlotte Hasager Gregor Giebel Gerard Schepers Olimpo Anaya-Lara	EERA-DTOC
5:00 PM	Closing first day + drinks	ECN	Peter Eecen	
6:00 PM	Dinner			

Programme Friday, September 26th

Time	Topic	Organisation	Name	Subject
9:00 AM	Opening Day 2	ECN	Peter Eecen	
9:10 AM	Keynote speech	Gamesa	Mauro Villanueva	
9:30 AM	SP research infrastructures	CENER DTU	Pawel Gancarski Merete Badger	"Windbench.eu" to share data in a controlled and structured way as IT Virtual communities for wind energy research
10:30 AM		ForWind-Hannover Catapult/NAREC	Raimund Rolfes Ignacio Marti	Use of lab for Substructures Use of Drivetrains for Nacelles
11:30 AM		CENER	Antonio Ugarte, Félix Avia Aranda	SP meeting
9:30 AM	SP socio economics	DTU ECN CRES	Klaus Skytte Karina Veum Takis Chaviaropoulos	Economic support mechanisms and design of markets Allocating costs and benefits of a combined offshore wind park and interconnector Key Performance Indicators and target values for large offshore WTs
10:30 AM		Fh. IWES UoD/DTU	Stefan Bofinger Bonnie Ram	The importance of offshore wind energy in the energy sector and for the German „Energiewende" Public Engagement Strategies for Wind Energy: Are We on the Right Track?
11:30 AM		DTU	Poul Erik Morthorst	SP meeting
9:30 AM	SP structural design and materials	CRES CENER AAU	Denja Lekou C. Amezqueta J. D. Sørensen	Introduction & Overview of SP activities and Results CENER activities within the SP (including results of InnWind.Eu and IRPWIND) Probabilistic Design of wind turbine structural components
10:30 AM		WMC SINTEF ULG-BERA	R. Nijssen J.K. Jørgensen P. Rigo	The Pre-Preg Mini Project Results & Plans – R. Nijssen Testing of Coatings for wind turbine blades and support structures SHM and predictive maintenance for WT components
11:30 AM		CRES	Denja Lekou	SP meeting
12:30 PM	Lunch + poster session		14 posters	Abstracts, see booklet
2:00 PM	Plenary discussion	DTU EC Gamesa NREL EWEA EERA/SPc's	Peter Hauge Madsen Matthijs Soede Mauro Villanueva Fort Felker Vilma Radvilaite Peter Eecen	Short personal introduction, including the personal vision on InCo. Plenary discussion on the visions and scenarios for IRPWIND. *What would we like to achieve during the next 4 years at European level?* *How can we improve collaboration between research community and industry?* *International cooperation?*
3:30 PM	Closing conference	ECN	Peter Eecen	

Appendix C. List of presentations

00. DTU - P. Hauge Madsen - A short overview InnWind_Avatar_NSON_EERA-DTOC_IRPWind
02. CRES - T. Chaviaropoulos - AVATAR Rotor
03. DTU - C. Bay Hasager - EERA DTOC wakes
04. ECN - G. Schepers - Mexico
07. UoS - O. Anaya-Lara - WPP Capabilities
08. DTU - P. Sorensen - Grid Planning and Operation
09. SINTEF - Hossein Farahmand - Energy and Power Management
10. Fh.-IWES - K. Rohrig - SP Grid Connections meeting
12. ECN - F. Savenije - AVATAR
13. Fh.-IWES - P. Haertel - North Sea Offshore Network (NSON)
14. DTU - C. Bay Hasager - EERA DTOC
15. DTU - G. Giebel - EERA-DTOC
16. ECN - G. Schepers - EERA DTOC
17. UoS - O. Anaya-Lara - EERA DTOC
18. SINTEF - J.O. Tande - Intro and overview of SP Offshore activities and results
19. Fh.-IWES - B. Lange - Selected research results from Alpha Ventus wind farm (RAVE)
20. ECN - A. Brand - Selected research results from Egmond aan Zee wind farm (OWEZ)
21. CRES - G. Sieros - Aeroelastic modelling of offshore bottom mounted and floating WTs
22. DTU - T. Buhl - Selected research results from Danish offshore wind farms
23. NTNU - Kai Wang - A comparison of floating wind turbine concepts
25. DTU - H. E. Jorgensen - Introduction of the Wind conditions strategy
26. DTU - A. M. Sempreviva - Introduction to the Meso-scale exercise
27. DTU - H. E. Jorgensen - The ERANETplus Windatlas
28. NORCOWE - K. Guldbrandsen - A presentation on the Norcowe findings specific on wind
29. DTU - X. Larsen - Methods for calculating extremes based on mesoscale models and Time
30. DTU - N. Vasiljevic - WindScanner systems
32. Gamesa - Mauro Villanueva - Keynote speech
33. CENER - P. Gancarski - "Windbench.eu" to share data
33. CENER - P. Gancarski - WP6.2 Design of offshore windfarms
34. DTU - M. Badger - Virtual communities for wind energy research
35. ForWind-H - R. Rolfes - Use of lab for Substructures (movie)
35. ForWind-H - R. Rolfes - Use of lab for Substructures
36. Catapult_NAREC - I. Marti - Use of Drivetrains for Nacelles
37. CENER - F. A. Aranda - SP Research Infrastructures meeting
38. DTU - K. Skytte - Economic support mechanisms and design of markets
40. CRES - T. Chaviaropoulos - KPI's and target values for large offshore WT's
41. Fh.-IWES - S. Bofinger - The importance of offshore wind energy in the energy sector
42. UoD_DTU - B. Ram - Public Engagement Strategies for Wind Energy
44. CRES - D. Lekou - Introduction + Overview of SP activities and Results
45. CENER - C. Amezqueta - CENER activities within the SP Structural Design and Materials
46. AAU - J. D. Sorensem - Probabilistic Design of wind turbine structural components
47. WMC - R. Nijssen - The Pre-Preg Mini Project Results & Plans
48. SINTEF - J.K. Jorgensen - Testing of Coatings for WT blades and support structures
50. ULG-BERA - P. Rigo - SHM and predictive maintenance for WT components

Appendix D. Poster abstracts

1. Development of the Marine Corrosion Test Site "El Bocal"
D. Fernandez, R. Rodríguez, A. Rodríguez, B. Santos
Fundación Centro Technológico de Componentes, CTC

The offshore wind turbines and the ocean energy converters operate in a corrosive marine environment, making necessary to investigate several strategies to mitigate corrosion and marine fouling and to study the interactions between materials and real marine environment as well. For testing these new developments in a realistic manner, a real marine exposure test site is essential. In this poster, a brand new Marine Corrosion Test Site is presented.

This new installation is located at the shoreline of the Cantabrian Sea coast, few kilometres away from Santander city in an idoneus location and with an easy access for installation and monitoring activities. In this infrastructure three different corrosive environments are present: splash, tidal and submerged. The supporting frames for the probes has been built in steel and the framework has been anchored to a concrete vertical wall, where different galvanized frames support the tested specimens. The location selected is a first class place for testing new coatings and components under realistic marine conditions. This facility has been funded under the ECOMAR national project.

2. Experimental Investigation of Active Tip Vortex Control Using Tip Injection in Horizontal Axis Wind Turbines
Anas Abdulrahim, Ezgi Anık, Yashar Ostovan, Oğuz Uzol
METU Center for Wind Energy (METUWIND), Ankara, Turkey

This study is part of an on-going experimental research campaign conducted at METU Center for Wind Energy that focuses on the active control of the tip leakage/vortex characteristics of a model horizontal axis wind turbine rotor using tip injection. Experiments have been performed to investigate the effects of tip injection on the aerodynamic loads, near tip flow field, as well as the wake characteristics of a model wind turbine. The experiments are conducted by placing a specially designed 3-bladed model wind turbine at the exit of a 1.7 m diameter open-jet wind tunnel facility. The rotor blades are non-linearly twisted and tapered with NREL S826 airfoil profile all along the span. The nacelle, hub and the blades are specifically designed to allow pressurized air to pass through and get injected from the blade tips while the rotor is rotating. Results show that injection does influence the power and thrust coefficients variations in comparison to the baseline data, especially at Tip Speed Ratio (TSR) values higher than the maximum CP TSR. Moreover, the flow field near the tip as well as the wake flow structure is significantly influenced due to tip injection. The jets exiting from the blade tips generate a highly turbulent zone that occupies a wider region as one move downstream as well as a new flow structure occupied by two counter-rotating vortices. The wake characteristics in the injection case show a tip flow region that is radially pushed outwards with increased levels of turbulence occupying wider areas compared to the baseline case. Within the wake zone, it's observed that the boundary between the wake and the freestream gets wider, more diffused and turbulence levels increase due to tip injection.

3. A New Large Scale Multi-Purpose Wind Tunnel for Wind Energy Research

Yashar Ostovan, Tan Atuk, Oğuz Uzol
METU Center for Wind Energy (METUWIND), Ankara, Turkey

The new Large Scale Multi-purpose Wind Tunnel of METU Center for Wind Energy (METUWIND) is a closed loop atmospheric wind tunnel facility with interchangeable test sections. On one side of the loop there is the highspeed test section, which has a 2.5 m x 2.5 m cross-section and is 10 m long and wind speeds up to 80 m/s can be obtained. On the other side of the loop there is the low-speed boundary layer type test section with a 3 m x 7 m cross-section and is 20 m long, and can reach wind speeds up to 26 m/s. Both test sections have turntables for model installation and the one in the boundary layer test section has a diameter of 6.4 m. The high-speed test section sits on an air-bearing/guide rail system, which is used to move the test section in and out of the plenum room. When it's moved out a 3 m diameter open-jet is created, which is designed to be used for aerodynamic measurements of rotating systems such as model wind turbines and helicopter rotors as well as propellers. The tunnel is of steel construction with multiple honeycombs and screens for high flow quality. It is driven by a 2x3 axial fan array of 1.9 MW power in total. Its temperature control is achieved by a 750 kW heat exchanger that is connected to a cooling tower outside the building.

4. Research Achievements on Wind Power Generation at CNR ISSIA

Maria Carmela Di Piazza, PhD, Researcher
CNR ISSIA UOS Palermo, via Dante , 12, 90141 Palermo, ITALY;
e-mail: dipiazza@pa.issia.cnr.it

The main research results achieved at CNR ISSIA on issues related to wind power generation are summarized in the poster.
Several high performance, high efficiency control techniques, including neural-based MPPTs (Maximum Power Point Tracking), developed at CNR ISSIA, are presented for both wind and micro-wind power generation systems. In particular, as for medium/high wind power generation, novel control strategies for squirrel cage induction machine-based wind generators connected to the power grid by an AC-DC-AC (back-to-back) power converter are shown. As for micro-wind power generation, a simple, low cost, yet reliable sensorless architecture, patented by CNR ISSIA and based on a PMSM generator is presented.
The forecasting of meteorological time series has been explored as an effective tool for the planning and management of the power grid, aiming at improving its overall efficiency and performance. In detail, Artificial Neural Network (ANN)-based wind speed forecasting techniques, developed at CNR ISSIA, are presented. They exploit time series coming from gauge stations in different geographical regions (Northern Italy, Southern Italy), both at daily and hourly scales and give accurate results.
Issues related to the integration of wind power generation systems with other energy sources have been analysed and presented, as well.
The ongoing projects, including current proposals within H2020 with EERA JPWind are finally listed.

5. Monitoring vertical wind profiles at a coastal area using a lidar Doppler for wind energy applications

Claudia R. Calidonna[1], Daniel Gulli[1], Anna M. Sempreviva[2,1], L. Tiriolo[1]
[1] Institute of Atmospheric Sciences and Climate – National Research Council (ISAC-CNR), Lamezia Terme, Italy.
[2] Danish Technical University, Department of Wind Energy, Frederiksborgvej 399, 4000 Roskilde, Denmark.

A suitable coastal area model for wind energy applications requires high spatial resolution to better describing the flow induced by the coastal discontinuity in the surface properties. At the meantime, coastal high quality databases are needed for testing new models or formulating new parameterizations. Ground-based remote sensing devices such as lidars are functional for studying the evolution of the vertical wind structure of the coastal atmospheric boundary layer. We present a database from a site located in the Italian Calabria Region, Central Mediterranean, 60om from the Thyrrenian coastline. Here, a Lidar Doppler, ZephIr (ZephIr ltd) has been operative since July 2013 monitoring wind vertical profiles from 10m up to 300m at 10 vertical levels at 10 minute average, and is supported by other instruments providing: Atmospheric Pressure, Solar Radiation, Number of Particles by size (Optical Particle Counter, OPC), Precipitation, Relative Humidity, Temperature, Wind Speed and Direction at 10m. The poster shows the evolution of wind profiles during transition periods night/day/night and yearly statistics on the Weibull distribution parameters. The site infrastructure is funded within the Project "Infrastructure of High Technology for Environmental and Climate Monitoring" (I-AMICA) by the Italian National Operative Program and European Regional Development Fund. Real-time data are show on http://www.i-amica.it/i-amica/?page_id=1122.

6. Future R&D agenda on wind power in Finland

Esa Peltola, Hannele Holttinen, Geert-Jan Bluemink
VTT Technical Research Centre of Finland
Correspondence: geert-jan.bluemink@vtt.fi

As part of national activities, Finland has been active in several international projects in the EU, Nordic, and IEA frameworks. The themes of collaboration have included wind integration from energy system planning to grid integration, wind power technology for and production in cold climates both onshore and offshore, and operation and maintenance. The active research units in this area include VTT, Lappeenranta University of Technology (LUT), Tampere University of Technology (TUT) and Aalto University.
In future the r&d activities on wind power are planned to be included as parts in national research programmes in the areas of Flexible and low carbon energy systems, Arctic seas, Big data, Internet of things and Additive manufacturing. The following themes are in planning:

Energy system design for renewables	Wind farm development	Wind technology	Grid and market integration	Operation and maintenance
• System flexibility (power to gas, thermal plants, storage) • DC transmission links in the Baltic/North sea	• Ice risk assessment • Offshore wind and ice conditions • Noise	• Blade anti-icing technology and assessment • Drive train technology • Offshore technology and services for ice-infested seas	• Wind power forecasting • Grid compatibility	• Big data to O&M support • Internet of things

7. Large-eddy simulation of an offshore wind turbine wake in real conditions

Umberto Rizza[1], Anna M. Sempreviva[2], Riccardo Broglia[1], Mario M. Miglietta[1]
[1]National Research Council of Italy, Institute of Atmospheric Sciences and Climate – (CNR-ISAC), Lecce, Italy [2], Danish Technical University - Roskilde, Denmark, [3] CNR-INSEAN, Roma, Italy

Accurate prediction of the marine boundary layer (MABL) flow and its interactions with wind turbines is of great importance for optimizing the planning and design conditions of offshore wind farm projects. Today large offshore wind turbines may reach heights up to 200 meters, making measurements almost prohibitive and numerical simulations a valid alternative.
In this context, Large-eddy simulation (LES) can potentially provide the kind of high-resolution spatial and temporal information for both vertical mean wind profiles and profile of turbulence needed to maximize wind energy production and minimize fatigue loads in offshore wind farms.
We show results from LES runs performed on "real" cases for forecasting vertical wind profiles. Furthermore, a turbine is simulated by a set of local sinks of momentum distributed across the rotor disk, without reproducing the blade details, and is placed in an offshore environment with turbulence properties similar to the ones of the real marine atmosphere.
The results presented here, indicate that this LES model is a very promising prospective tool to simulate spatial variation of wind profiles and turbulent characteristics of offshore wakes during real cases.

8. Delamination in highly curved thick composite laminates under quasi-static loading

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In wind energy and aerospace industries, new advances in composite manufacturing technology enable to produce primary load carrying elements as composite materials in wide variety of shapes large such as an L-shape. However, due to the geometry, Interlaminar Normal Stresses (ILNS) are induced once a moderately thick laminate takes highly curved shape. In the curved part of the L-shaped structure, the development of ILNS promotes mode-I type of delamination propagation which is the weakest fracture mode. This is a problem that has recently risen to the forefront in in-service new composite civil aircrafts. This study focuses on experimental and computational investigation of dynamic delamination in a 12-layered woven L-shaped CFRP laminates subjected to quasi-static shear loading. Delamination initiation and propagation processes were captured with a million fps high speed camera. A single delamination is found to initiate in the curved region at the 5th interface during a single drop in the load. The delamination is then observed to propagate at intersonic speed of 2200m/s. The experiments are simulated using cohesive elements by implementing bilinear cohesive model into ABAQUS/Explicit. The experiments and computations are found to be in good agreement, at the macroscale in terms of load-displacement behaviour and the failure load, and at the mesoscale in terms of the location of delamination nucleation and delamination crack tip speeds. Shear Mach waves emanating from the crack tips are also observed in the simulations during intersonic crack propagation.

9. Modelling approaches for supporting wind power plant operations

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The widespread growth of wind power installations and the further penetration of energy yield in the grid, reveal the importance of accurate modelling tools, design of sophisticated forecasting algorithms and the need for continuous update of market requirements. In the framework of IRPWIND project, the task 8.2 "Forecasting Tools for Wind power plant operation" aims to cover the aforementioned challenges. The Atmospheric Modelling and Weather Forecasting Group (AM&WFG) of the National and Kapodistrian University of Athens (NKUA) contributes in the activities of the project with a number of atmospheric and wave modelling applications.
Specifically, subtask 8.2.1 is focused on the study of marine boundary layer and the simulation of offshore and coastal phenomena. The main objective is the development of an online high resolution coupling methodology based on the combination of atmospheric and wave models. The goal is to show that such MBL coupling improves hub height wind forecasts, including phenomena like wind profiles. To this end, different coupling methodologies will be developed and evaluated-compared by the partners through test cases over the Atlantic and Mediterranean shoreline.
Additionally, in order to quantify the uncertainties stemming for typical deterministic predictions, implementation of probabilistic forecasting approaches is proposed. Currently, the AM&WFG is developing and using advanced statistical tools for supporting stochastic wind power modelling taking into account historical error distributions. Within the targets of the subtask is the fitting of such approaches to the actual operation of power plants in terms of energy potential, grid capabilities, and system requirements.

10. European Wind Energy Research Infrastructures

Antonio Ugarte, Félix Avia
CENER, Spain

The EERA participants have agreed to form a common research program in the field of Wind Energy. The agreement signifies a step forward from the well proven research project cooperation between the European research institutes as promoted by the European Commission through the Framework programs to a commitment of planning and implementing joint research programs including sharing and optimizing the use of human resources and research infrastructure. The development of agreements for access to research facilities, coordination of access and development of new joint research infrastructure is organized in the sub-program Research Infrastructures.
This poster summarize the objectives and targets of this subprogram of EERA Wind Joint Program, as well as the description of the work package 3 of the Integrated Research Project on Wind Energy (IRPWind) which general objective is promoting alignment plus focusing of national research activities through joint experiments carried out in European research facilities and its effective joint use.

11.On- and offshore multi-dimensional LiDAR measurements.
Martin Kühn, Wilm Friedrichs
ForWind - University of Oldenburg,

ForWind, the Center for Wind Energy Research of the Universities of Oldenburg, Hannover and Bremen, combines scientific know-how with research geared towards the industry. In the framework of several national and international research projects ForWind – University of Oldenburg deployed long-range scanning LiDAR systems for multi-dimensional wind measurements in complex terrain and offshore.
Within the German project GW-Wakes two units were installed at the offshore wind farm "alpha ventus" on the FINO1 platform, as well as another on the transformer platform. With this setup it was possible to perform dual-Doppler measurements of wind turbine wakes within the wind farm and to measure the inflow of the wind farm with the so-called virtual metmast approach. The results of the latter measurement campaign are further utilized in the EERA-DTOC project.
With the same devices, ForWind – University of Oldenburg participated in the demonstration experiment organized within the WindScanner.eu project in cooperation with DTU Wind Energy and Fraunhofer IWES. Here, for the first time, six long-range LiDARs were utilized to perform synchronized multi-dimensional measurements at a 200 m high meteorological mast in complex terrain. The project aims at establishing a distributed research infrastructure facility throughout Europe, providing new fundamental knowledge about the detailed three-dimensional atmospheric wind flow and turbulence around wind turbines.

12. Marcin Luczak, INSTITUTE OF FLUID-FLOW MACHINERY, Poland – no abstract received
13. Soeren Faester, DTU, Denmark – no abstract received
14. Kristin Guldbrandsen , CMR, Norway – no abstract received