June 2018

Final Programme of the Joint IEA Wind Task 32 and Task 36 Workshop on Very short-term forecasting of wind power

Date: June 12-13, 2018
Venue: Niels Bohr Auditorium, DTU Risø Campus, Roskilde, Denmark
Workshop leaders: Ines Würth (Uni Stuttgart), Laura Valldecabres (Uni Oldenburg), Elliot Simon (DTU Wind Energy), Mike Courtney (DTU Wind Energy)

Introduction to IEA Wind Task 32 and 36

The main objective of the Task 32 is to identify and mitigate barriers to the use of lidar technology in wind energy applications such as site assessment, power performance, loads & control, and complex flow. One yearly workshop is organized for each of the four applications focusing on one specific problem, and with a well-defined program and tangible outcome.
More details can be found on the task website.

The Task 36 is focused on improving the value of wind energy forecasts to the wind industry. There are three distinct areas of challenge in forecasting wind power: improve the representation of physical processes in forecast models through both improved initialization and improved parameterizations, the representation of uncertainty, the lack of uniform benchmark criteria and the lack of benchmarks or comparison datasets and the representation, communication, and use of these uncertainties to industry in forms that readily support decision-making in plant operations and electricity markets. This Task will facilitate coordination of efforts.
More details can be found on the task website.

Background to the Workshop

Due to the increasing penetration of renewable energy power systems into the grid, the demand for short-term wind power forecasting increases, as grid operators need to ensure grid stability in spite of the highly fluctuating power sources. These forecasts become even more important with increasing sizes of wind farms of over 100 GW. As state of the art forecasting techniques using Numerical Weather Prediction (NWP) models do not cover forecasting horizons in the minute range, different approaches have to be carried out. These techniques include statistical approaches, the use of remote sensing devices such as lidar or radar and also the use of turbine data information from surrounding wind parks.

Objective

This workshop will provide practitioners and end users of short term forecasting

- A definition of the forecasting horizon of “very short-term” (0...60min?)
- A list of needs of very short term forecasting (time horizon, wind speed/direction/shear, etc)
- An overview of the gap to NWP and lower limits of models in terms of forecasting horizon and what the important parameters are
- An answer to what the target forecasting horizon should be and which forecasting horizon is of interest now and in the future
- A list of barriers and solutions to close the gap of numerical weather prediction models (NWP) to forecast the power output of wind turbines and wind farms in very short-term period using:
    - Statistical analysis of past data
    - Measurements of long-range lidar
    - Measurements of radar
    - Assimilation of SCADA data into NWP

Concept

The workshop will be a combination of

1. Presentations from scientists and service providers of different forecasting techniques and approaches, presentations from end users: what do they need
2. Group works for the different forecasting techniques (e.g. lidar, radar, SCADA):
    a. What are the barriers that stop the technique from being adopted?
    b. What are the solutions to overcome these barriers?

Expected Outcome

The outcome of the workshop will be

1. An exchange of experience in very short-term forecasting techniques
2. Creating links between the potential users and the researchers
3. A list of barriers and possible solutions to the adoption of very short term forecasting
4. Initiation of a working group to write a common paper of the results of the workshop
5. Proceedings of the workshop

Expected Participants

This workshop is oriented towards scientists that work on new NWP approaches or forecasting techniques using measurements; service providers that develop their own forecasting code and also end users of forecasts such as wind farm operators or grid operators.

Practical Arrangements

Registration

For participation in the workshop, please register via the online registration form.
Please register before **May 27 2018**. Prior to the workshop, registered participants will receive additional workshop details and materials. Registration for the workshop is free of charge.

Venue Information

The workshop will be held at the DTU Risø Campus, Niels Bohr Auditorium, Bldg 112, Roskilde, Denmark
Public transportation time schedules: www.rejseplanen.dk

Contact Information

Please contact Elliot Simon (ellsim@dtu.dk, +45.935.11593) in case you have any questions.

Program Draft

Start	Day 1
09:00	Arrival and registration
09:30	**Introduction** • Workshop goals • Introductions
10:00	**Where are we with very short-term forecasting?** • David Schlipf, Uni Stuttgart: Introduction to Task 32; Presentation of State of the art lidar applications • Gregor Giebel, DTU: Introduction to Task 36; Presentation of state of the art forecasting techniques and overview of different forecasting horizons. What are the gaps that need to be filled in the short/very-short term region?
11:00	**Break**
11:15	**What is the target forecasting time and parameter?** Plenum discussion and viewpoints from different stakeholders; definition of short-term forecasting horizon, on which factors does it depend?
12:00	**Experiences with very short-term forecasting Part 1 SCADA Data** Presentation of different stakeholders • Alexandre Costa, Gabriel Dantas and Valentin Perruci, UFPE Brazil: An operational forecasting tool using different approaches - results from the HPC4E EU project and the EOLIPREV Brazilian project • Christopher Bay, NREL: Wind direction consensus and forecasting for improved wind farm operation
12:30	**Lunch**
13:15	**Experiences with very short-term forecasting Part 1 SCADA Data** Presentation of different stakeholders: • Harley Mackenzie, HARD Software Australia: Short term forecasting of wind power plant generation for system stability and provision of ancillary services • Ciaran Gilbert, Uni Strathclyde, Pierre Pinson, Jakob Messner, DTU Elektro: Very high resolution forecasts using a nested LES system • Bahri Uzunoğlu, Uppsala University: Maximum likelihood ensemble filter SCADA data assimilation for wind farms for very short-term forecasting

14:15	**Experiences with very short-term forecasting Part 2 Lidar & Radar** ● Anamaria Sirghie, Jesper Thiesen and Mikkel Hansen, ConWX: Lidar based short term forecast for offshore wind ● John Zack, AWS Truepower: Intra-hour wind ramp forecasting in Hawaii using scanning lidar
15:00	**Break**
15:30	**Experiences with very short-term forecasting Part 2 Lidar & Radar** ● Corinna Möhrlen, WEPROG, Can Lidars replace met masts in real-time system operation: results from a study for the Irish TSOs ● Laura Valldecabres, Uni Oldenburg: Very short-term probabilistic forecast of offshore wind power using dual-Doppler radar ● Elliot Simon, DTU Wind Energy: A machine learning approach for intra-hour wind speed forecasting using scanning lidar inflow measurements
16:30	**Conclusions of the day**
17:00	**End of Day 1**
19:00	**Dinner at Bryggergården (Algade 15, Roskilde city center)**

Start	**Day 2**
09:00	**Welcome and recap of Day 1**
09:15	**Looking over the horizon: Experiences with remote sensing devices** ● Thomas Schmidt, DLR, Short term solar forecasting from sky imaging, up to 30 min ● Ines Würth, Uni Stuttgart, How far can we see? Analysis of the measurement range of long-range lidar data for short-term forecasting
10:00	**World Cafe: What are the barriers and what are possible solutions** Splitting into different working groups decided during the plenum discussion, e.g. ● … SCADA data ● … Lidar ● … Radar Discussions taking into account different forecasting horizons
10:30	**Break**
10:45	**World Cafe: What are the barriers and what are possible solutions**
11:15	**Presentation of the results from each group and discussion**
12:00	**Summary of the workshop and formulation of next steps**
12:30	**End of workshop**

Participant List

	First Name	Last Name	Company
1	Markus	Abel	4cast
2	John	Zack	AWS Truepower
3	Shane	Holden	Bord na Móna
4	Gabriel	Dantas	CER-UFPE
5	Valentin	Perruci	CER-UFPE
6	Anamaria	Sirghie	ConWX
7	Mikkel	Hansen	ConWX
8	Thomas	Schmidt	DLR
9	Charlotte	Bay Hasager	DTU Wind Energy
10	Henrik	Stang	DTU
11	Pedro	Santos	DTU Wind Energy
12	Elliot	Simon	DTU Wind Energy
13	Gregor	Giebel	DTU Wind Energy
14	Ignacio	Marti	DTU Wind Energy
15	Mike	Courtney	DTU Wind Energy
16	Torben	Mikkelsen	DTU Wind Energy
17	Tobias	Ahsbahs	DTU Wind Energy
18	Marie-Sophie	Briem	Enercon
19	Anders	Lindfors	FMI
20	Laura	Sanmartin	ForWind – Oldenburg
21	Frauke	Theuer	ForWind - Oldenburg
22	Shigang	Yao	Goldwind
23	Xuefu	Jin	Goldwind
24	Harley	Mackenzie	Hardsoftware
25	Sebastian	Gaidi	KTH
26	John	Bremnes	met.no
27	Christopher	Bay	NREL
28	David	Schlipf	Stuttgart Wind Energy (SWE), University of Stuttgart
29	Ines	Würth	Stuttgart Wind Energy (SWE), University of Stuttgart
30	Ciaran	Gilbert	University of Strathclyde
31	Benjamin	Baier	Vattenfall
32	Corinna	Möhrlen	WEPROG
33	Antoine	Larvol	Windar Photonics A/S
34	Guillermo	Rilova	Windar Photonics A/S
35	Nikolaos	Kouris	Windar Photonics A/S
36	Scott	Wylie	ZephIR Lidar
37	Tingting	Jiang	Zhejiang Windey Co., Ltd.
38	Nicolai	Nygaard	Ørsted
39	Bahri	Uzunoğlu	Uppsala University
40	Anton	Kaifel	Center for Solar Energy and Hydrogen Research (ZSW)