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IEA Wind Task 36 Forecasting

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Summary

This poster gives an overview of the IEA Wind Task for Wind Power Forecasting. The Operating Agent is Gregor Giebel of DTU, Co-Operating Agent is Joel Cline of the US Department of Energy. Collaboration in the task is solicited from everyone interested in the forecasting business. We collaborate with IEA Task 31 Wakebench, which developed the Windbench benchmarking platform, which this task will use for forecasting benchmarks. The task runs for three years, 2016-2018.

The main deliverables are an up-to-date list of current projects and main project results, including datasets which can be used by researchers around the world to improve their own models, an IEA Recommended Practice on performance evaluation of probabilistic forecasts, a position paper regarding the use of probabilistic forecasts, and one or more benchmark studies both for purely meteorological test cases as well as for power. Additionally, spreading of relevant information in both the forecasters and the users community is paramount.

Participation is open for all institutions in member states of the IEA Annex on Wind Power, see ieawind.org for the up-to-date list.

Activities

NWP Improvements

This WP brings together global leaders in NWP models as applied to the wind industry to exchange information about future research areas. The emphasis is on improvements of the wind-related forecast performance of these models especially in typical rotor heights.

Two lists of up-to-date data are mentioned below (tall met masts and experiments). Additionally, this WP verifies and validates the improvements through a common data set to test model results upon and discuss at IEA Task meetings.

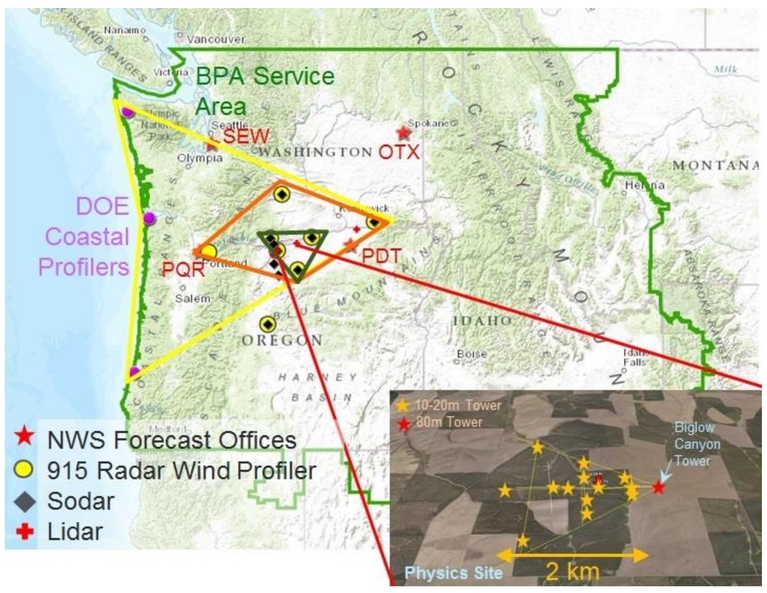

Figure 1: The instrumentation of WFIP2, in the Northwest of the USA. Source: Joel Cline.

Benchmarks

This second WP reviews the state-of-the-art for error and uncertainty quantification for wind and wind power forecasting models, with a special emphasis on the underlying NWP forecasts. This activity will further develop guidelines, best practices, and perhaps standards, for forecasting trials and benchmarks.

Typical pitfalls encountered by the forecast providers lead to invalid trial results, which are a waste of time for all involved parties (typically the client and 3-8 forecasters). Those pitfalls include too short trials, not concurrent timing, different wind farms for different forecasters to work on, insufficient communication and available data, and other issues. The Task will prepare an IEA Best Practice Recommendation and decision support.

Additionally, we will collect and distribute public benchmarks, e.g. Kaggle or the IEA WindBench platform.

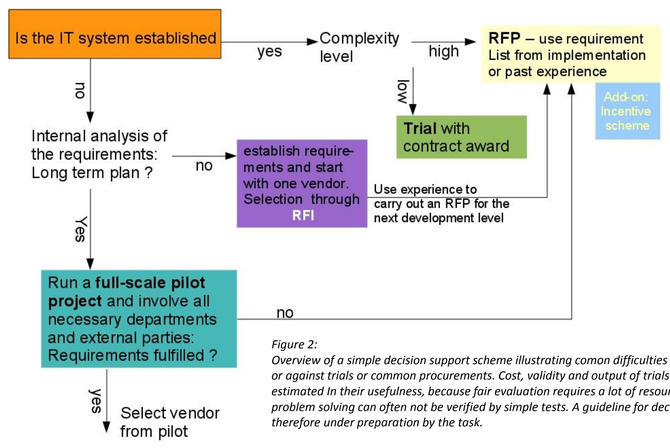

Figure 2: Overview of a simple decision support scheme illustrating comon difficulties when deciding for or against trials or common procurements. Cost, validity and output of trials are often over estimated In their usefulness, because fair evaluation requires a lot of resources, and complex problem solving can often not be verified by simple tests. A guideline for decision making is therefore under preparation by the task.

Advanced Usage

The third WP surveys the current state of use of forecast uncertainties by the power systems sector and documents and publishes results in a report and publications. It engages both actors of the wind industry and the research communities to identify how current and emerging capabilities to determine uncertainties can be used to address the variety of decision-support needs of the industry. Indicators of which forecast approach serves which requirements are being developed. This WP also provides outreach to users of forecasts via webinars or other means to enhance their knowledge and ability to use all available information for operations.

Results: Use of Forecasting...

Trading type	day-ahead market	intra-day market	ancillary services	reserve market
percent [%]	92	63	25	29

Business hours:	24/7	7-- 22	9—5
percent [%]	60 (64)	5	35

Trading Model:	price taker	price maker
percent [%]	78 (80)	22 (20)

Type of forecast	single forecast	multiple forecasts
percent [%]	36 (37)	68

Knowledge of Ensemble Forecasting	Knowledge	Use EPS Forecasts	work after OPR rules
percent [%]	71	21	38

Figure 3: Preliminary results of the questionnaire. Source: C. Möhrlen, R.J. Bessa, M. Barthod, G. Goretti and M. Siefert: Use of Forecast Uncertainties in the Power Sector: State-of-the-Art of Business Practices. 15th Int. Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Farms, Vienna, 15 - 17 November, 2016.

Results

Public Lists

A list with masts useful for validation of the forecasts is underway, measuring at least 100m. The list currently contains more than a dozen masts on- and offshore.

A list of meteorological experiments going on currently or recently, either to participate or to verify a flow model against.

A list of current or finished research projects in the field of wind power forecasting.

See

IEAwindforecasting.dk.

Workshop Future Issues

In July 2016, the group held a public workshop in Barcelona on Experiences with Forecasts and Gaps in Research. The slides are available from the website.

The **most important gaps** were identified as:

- More frequent, and higher time and spatial resolution data. Short-term ensembles.
- Data assimilation of wind power data, and improved NWP model physics, including icing.
- Interaction between wind farms.
- Ramps, and seasonal forecasting.
- Optimal use of probabilistics, and reliable quantiles.

Advanced Usage Questionnaire

We currently conduct a mapping of the use of probabilistic forecasts in the industry. Please help us filling it in (scan the QR code):

Preliminary results (see also Figure 2):

- Knowledge about how to make use of uncertainty forecasts is lacking:
- 98% use multiple forecasts
- 60% know provider and products of uncertainty forecasts
- < 10% make use of uncertainty forecasts
- < 10% of all organisations employ meteorologists or engineers with an atmospheric science education