PO.0113

Probabilistic forecast information for the renewable energy sector: Can we bridge the gap between theory and praxis?

Isabel Alberts, Vanessa Stauch, Renate Hagedorn
www.dwd.de, Email: isabel.alberts@dwd.de

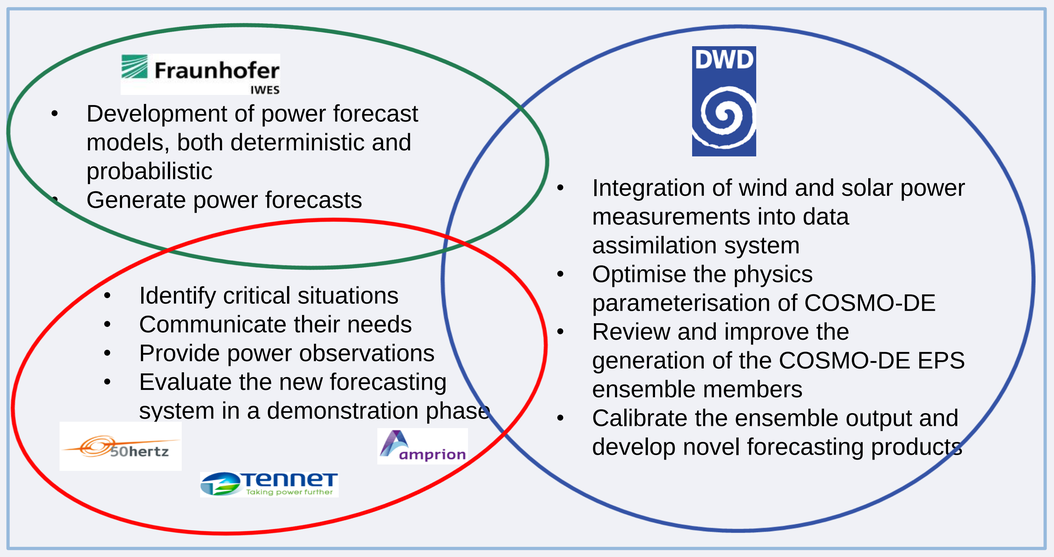
EWeLiNE

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

The research project EWeLiNE

The project is a cooperation between the Fraunhofer IWES, DWD and three of the German TSOs as associated project partners. With the increasing share of renewabes in the energy portfolio, the TSOs are facing new challenges caused by the variability of the produced energy and the limited predictability of atmospheric processes. Therefore, new strategies are required using probabilistic products.
As the quality of power predictions depends crucially on the quality of weather predictions the main tasks for DWD within the project are:

- Improve initial conditions: assimilation of new data, e.g. data from power plants (see talk by Declair et al.)
- Optimize the deterministic NWP model physics parameterizations concerning the relevant processes (e.g., fog, cloud cover, low level jet)
- Improve probabilistic weather forecasts based on COSMO-DE-EPS using stochastic physics and calibration
- Optimize post-processing (MOS) methods (see poster Vogt et al.)
- Development of user specified products



Ensemble system COSMO-DE EPS

- Based on convection permitting NWP model COSMO-DE (DWD)
- Initial and boundary conditions are provided by four different global models
- Five non-stochastic perturbations of model physics parameters

- 20 members
- Grid size 2.8 km
- 8 runs per day
- Lead time 0-27 hours
- For this project, it is planned to extend one run to 45 hours lead time

Example: Radiation forecast

- In Fig. 1, the radiation forecast from the COSMO-DE EPS is compared to pyranometer measurements at one station
- Small-scale clouds lead to a drop in radiation and in photovoltaic power output as a result
- Other typical situations connected with a high error of wind and solar forecasts include frontal passages, low stratus and stable high pressure conditions

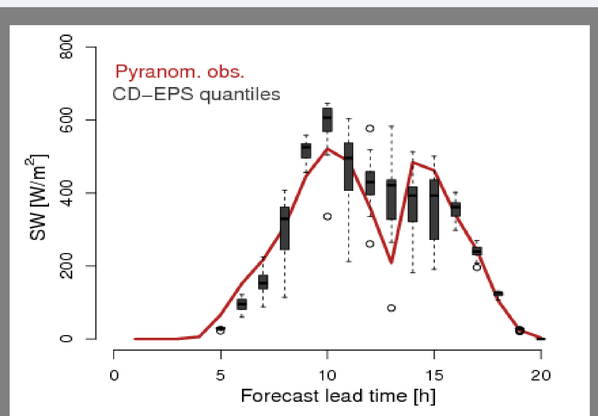
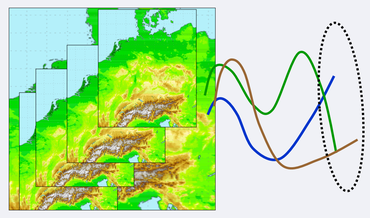


Fig. 1: COSMO-DE EPS forecast and pyranometer observations for Lindenberg on 08 August 2012

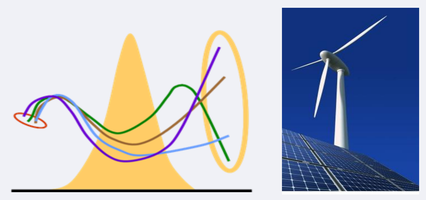
Concept

1) COSMO-DE-EPS 2.8 km



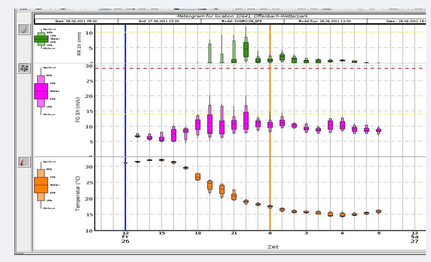
Ensemble Prediction System of DWD

2) Product generation



customized probabilistic weather and power forecasting products

3) Visualization



4) Decision making with probabilistic forecast

chance for power > v_{crit} → categorical decision

what is the critical probability for decision making?

How to integrate probabilistic forecast information into the decision making process?

What is needed?

Role of the end users (TSO)

- definition of needs and requirements
- integration of new forecast products in the decision making process
- adaptions of operational processes
- provision of PV and wind data

COMMUNICATION

workshops / meetings

What is possible?

Role of the developers (DWD / IWES)

- model improvement according to user needs
- COSMO-DE-EPS optimization and calibration
- integration of uncertainty information into decision making tools
- Development of new weather and power forecast products

Requirements

- overall improvement of weather and power forecasts
- reduce large forecast errors especially in short range
- information about the probability distribution (e.g., of timing of frontal passages)
- development of new strategies in the planning of the network management

Potential applications for probabilistic forecasts:

- forecast for day-ahead and intra-day trading
- short term congestions forecast
- forecasts for network stability
- forecasts for grid nodes
- scenarios
- risk management

Sources of errors depending on weather situations:

Photovoltaic	*Wind*
• snow and icing on panels	• frontal passages
• fog and stratus clouds	• turbulence
• convection and subgrid clouds	• wake effects
	• icing

Strategy

- development of new products with focus on wind and PV relevant variables (e.g., 100 m wind, radiation)
- probabilistic forecast products tailored to the users` needs
- decision support tools based on probabilistic forecasts andtaking into account the costs
- development of statistical forecast models for expected large errors
- visualization tailored to the users` needs

using / understanding

generation / verification