Simultaneous improvement of weather and power forecasts for the grid integration of renewable energies
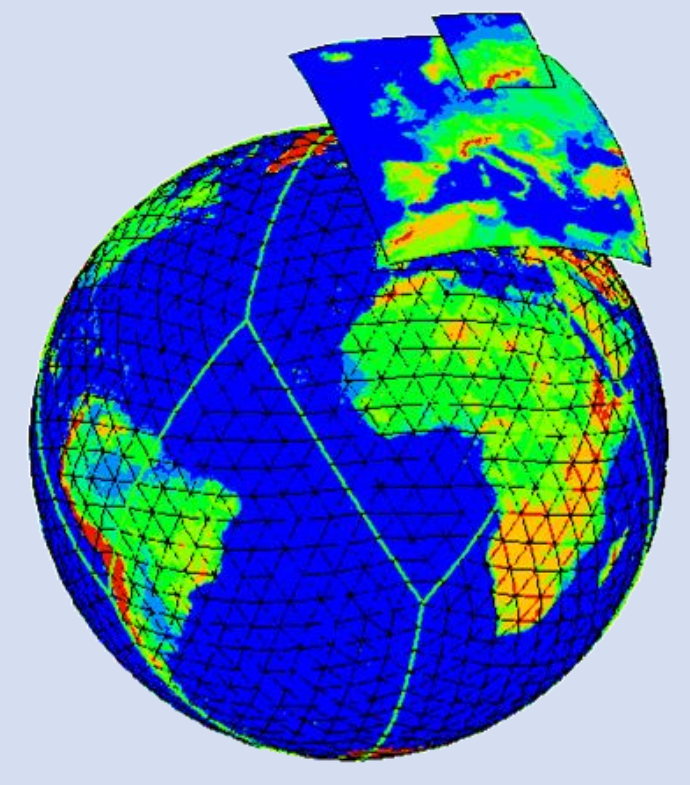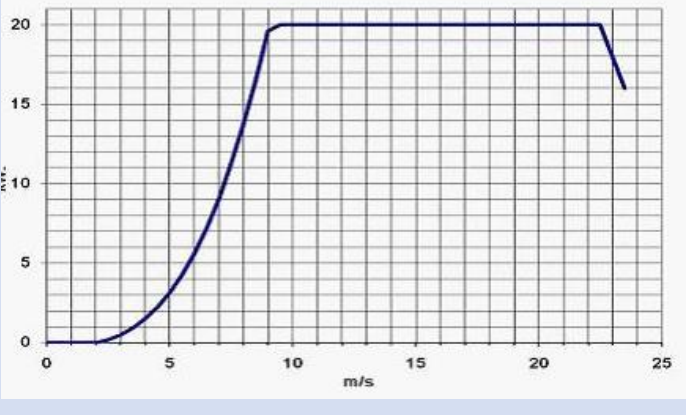
PO.0121

EWeLiNE

The research project EWeLiNE

Weather forecasts
(wind, radiation fluxes,…)

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

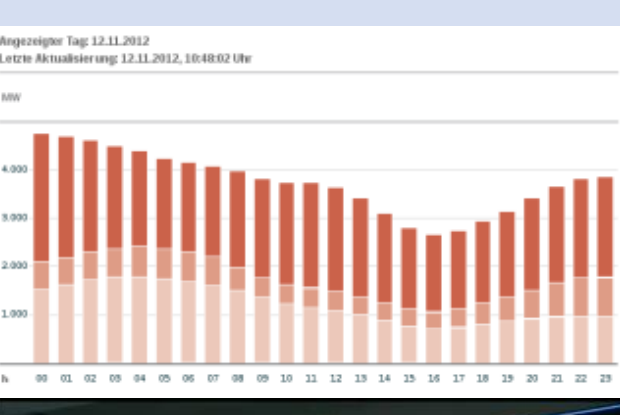**Power forecast**

Transformation in power

Taking into account effects of e.g.:
- atmospheric stability
- orography
- wakes

Fraunhofer
IWES

Power forecasts for decision making processes

50hertz
amprion
TenneT

Project partners are the German Weather Service, the Fraunhofer IWES and three Transmission System Operators.

Key research areas:
- Integration of new types of data (e.g., power production) into the meteorological prediction system
- Optimization of the model system towards energy applications
- Development of forecast products in close collaboration with the users

Feedback from 20 industrial partners and research institutions.

High impact weather for power prediction

The TSO's have identified several critical weather situations, where the day-ahead forecast error approached the operating reserve. An important project goal is the avoidance of these situations.
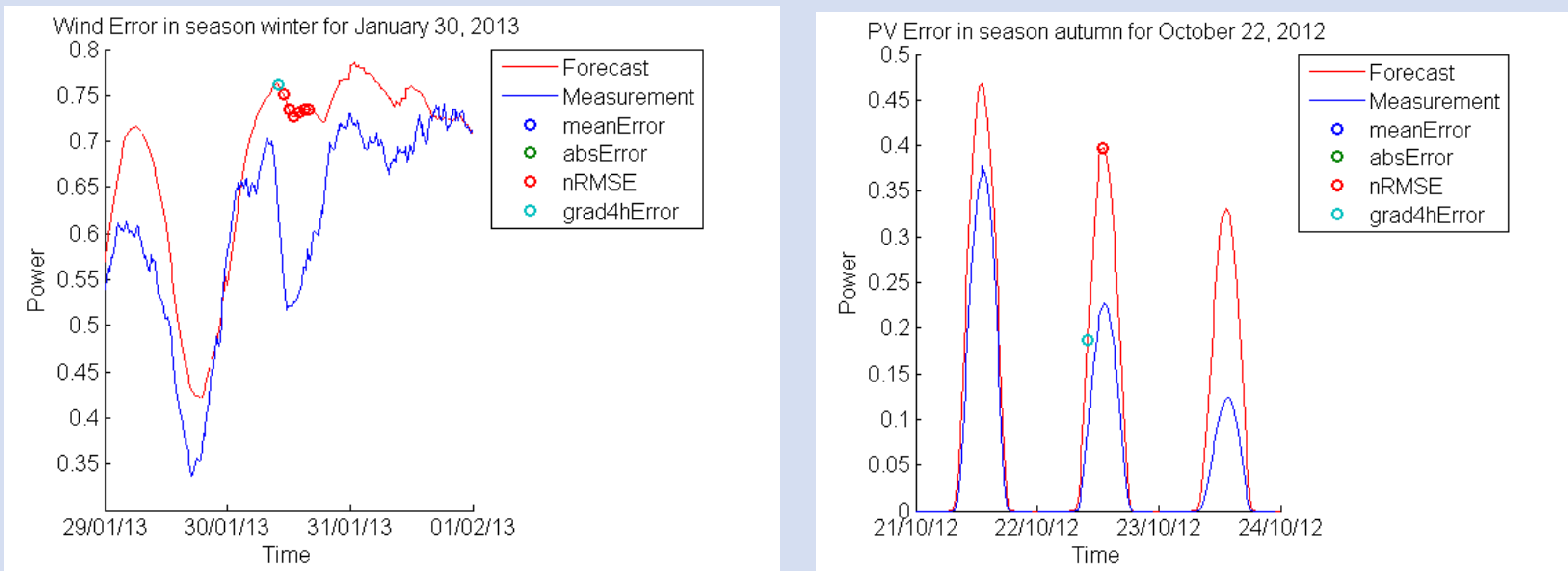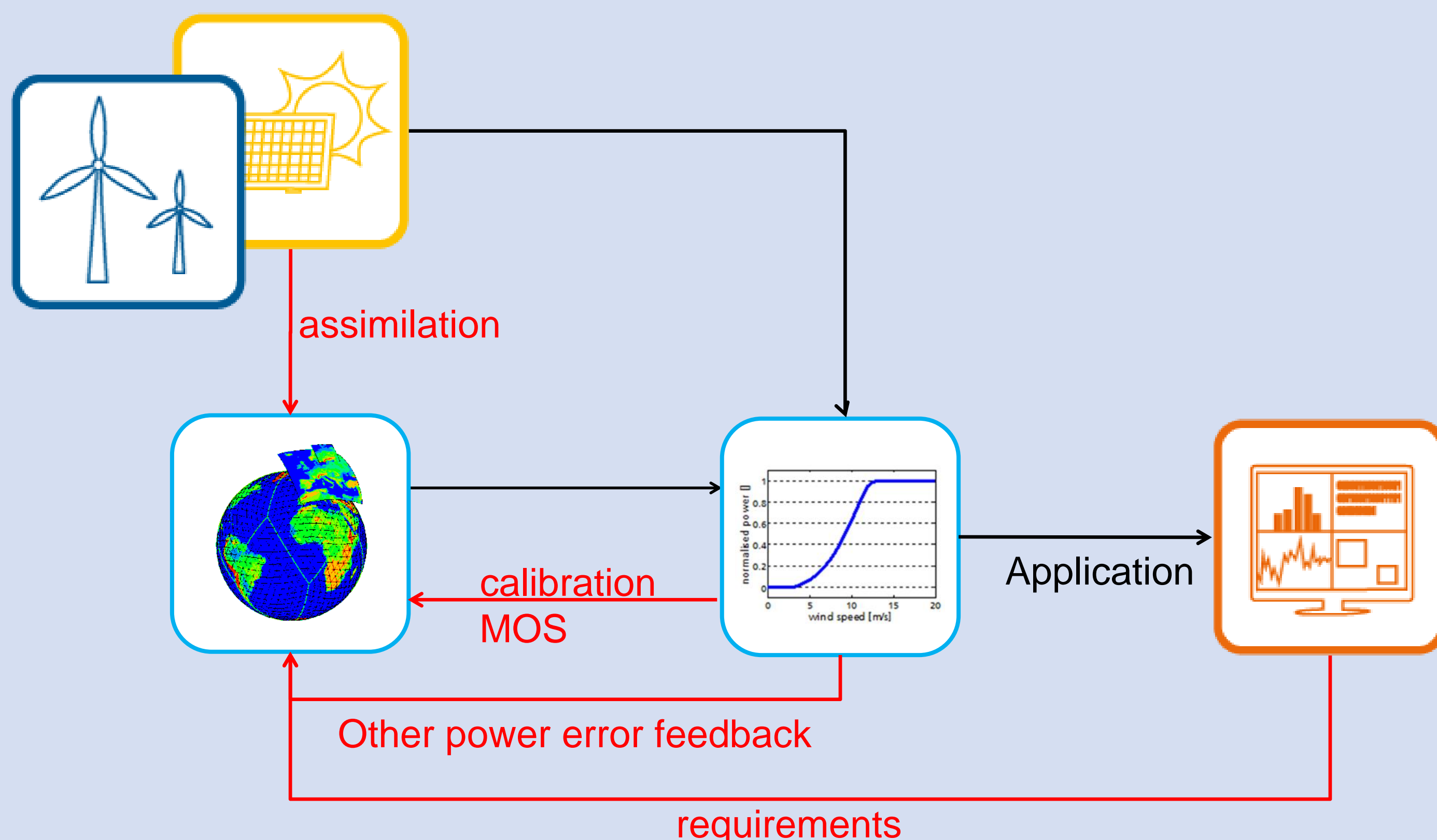

Decrease of wind power not predicted


Fog not predicted

Holistic Forecast Improvement

The forecast is improved on as many as possible steps in the forecast process chain. In particular, feedback to the weather prediction model is included in many steps.

assimilation

calibration
MOS

Other power error feedback

Application

requirements

Assimilation of power data for improved weather forecasts

Online measurements of PV and wind power data are used to improve weather model initialization.

NWP model

radiation, wind speed

Forward-operator

measured power

Δ
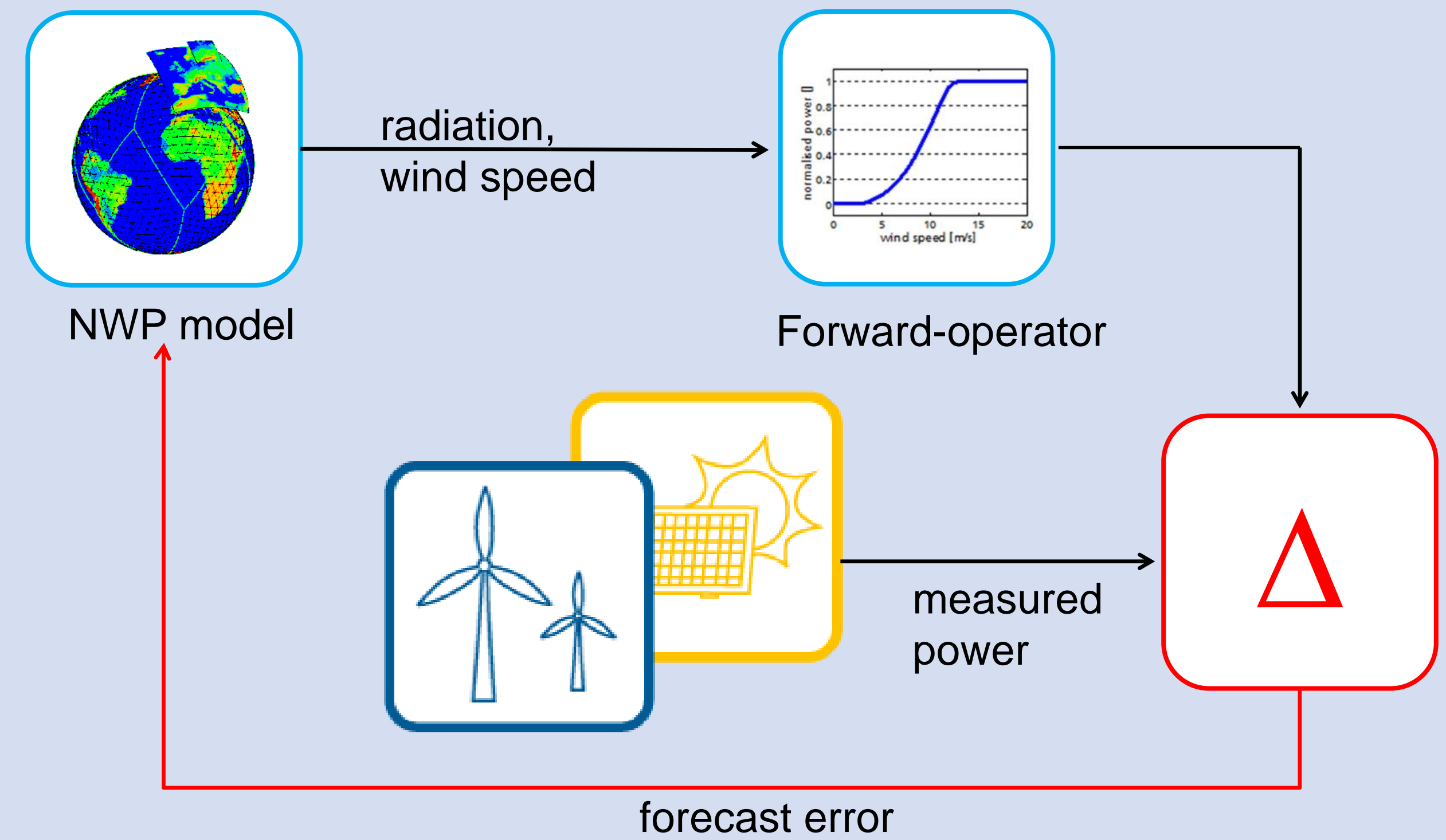
forecast error

Improvement of the model physics

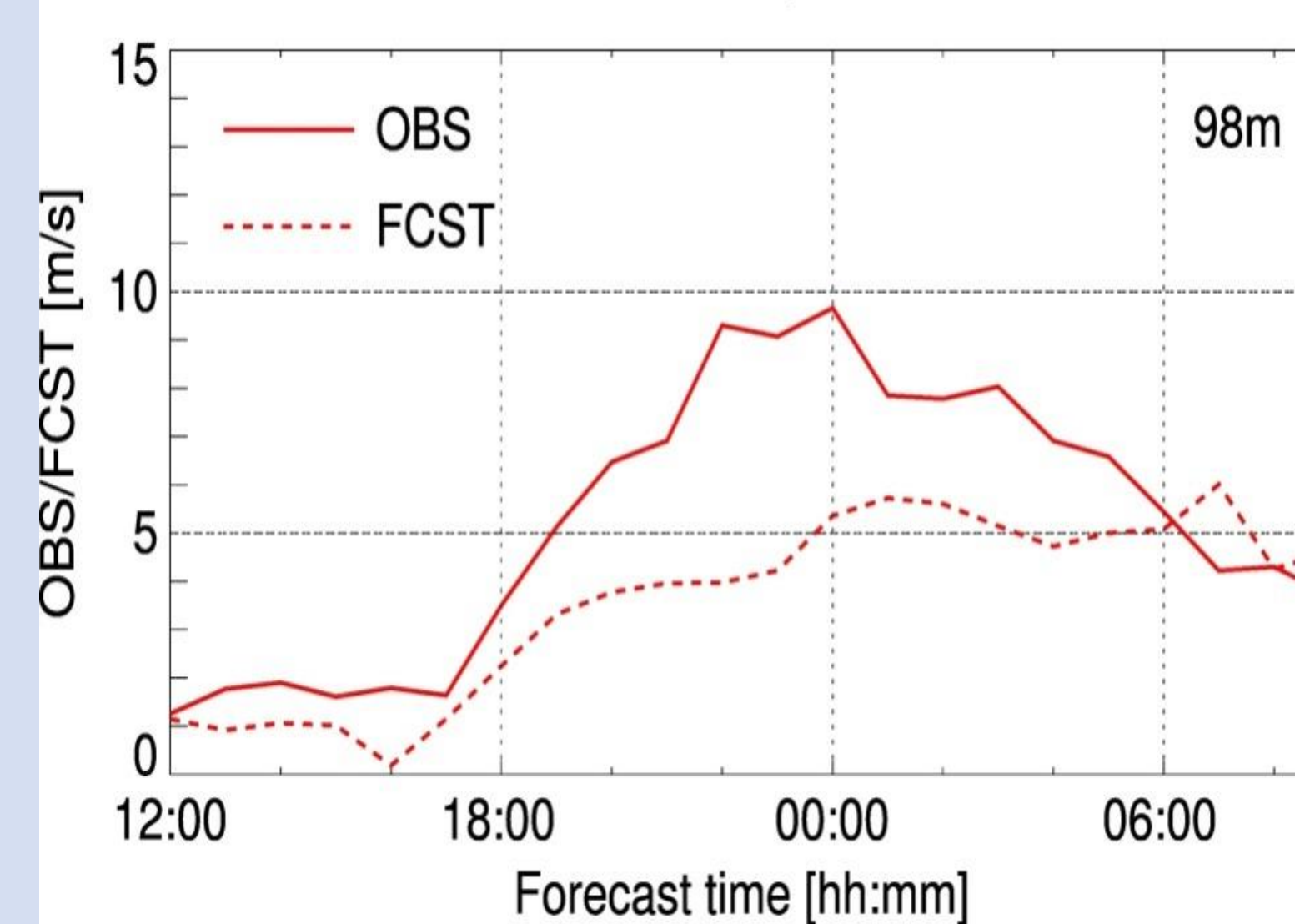Model physics are improved to reduce power forecast errors.

Wind
- Winter: stable conditions (pos. bias)
- Summer: low level jet not reproduced
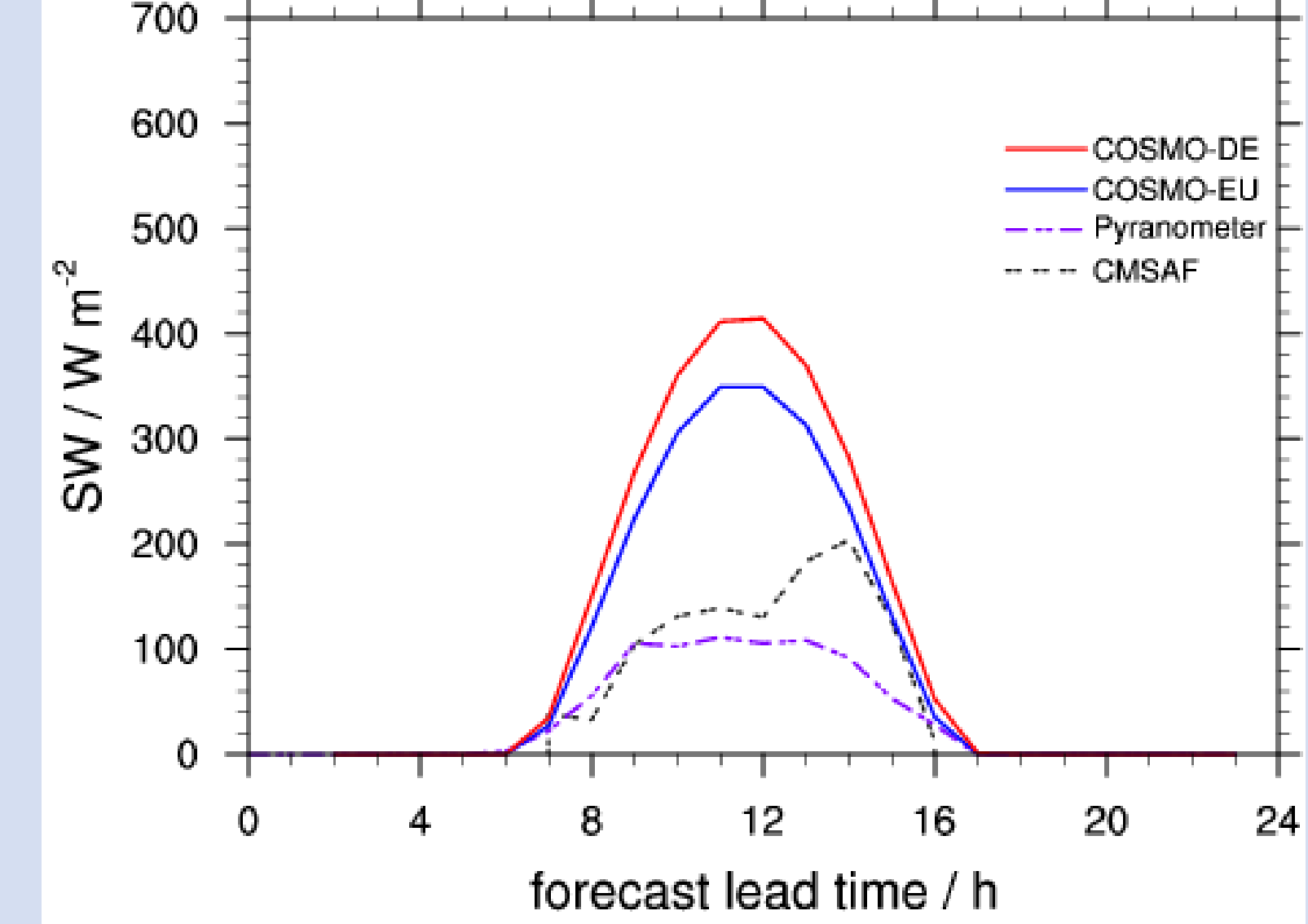- (fronts are improved via better initialization)

Photovoltaic
- convective weather situations
- snow cover on PV-panels
- fog, low level clouds

Cosmo-DE and LIND, fcr: 2012081812

date= 20121021

Numerical Weather Prediction Ensemble

The COSMO-DE is extended to produce ensembles.

COSMO-DE-EPS
Δx = 2.8 km
20 ensemble members
Forecast 27 hours

1 2 3 4 5

IFS
GME
GFS
GSM

BC-EPS

Probabilistic weather forecasts for energy applications

Why?
Important for risk management

Research topics
➔ Improved ensemble generation

➔ Adapt post-processing methods to user requirements

First step
Verify forecasts for critical periods

60 MW   0 MW

MEAN   MEDIAN

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

DWD

50hertz

amprion

TenneT
Taking power further

Fraunhofer
IWES

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit