



SafeWind

Wind Power Forecasting with Focus on Extremes

Final Workshop, 30.08.12, Paris

Detection of extreme events and timely warnings

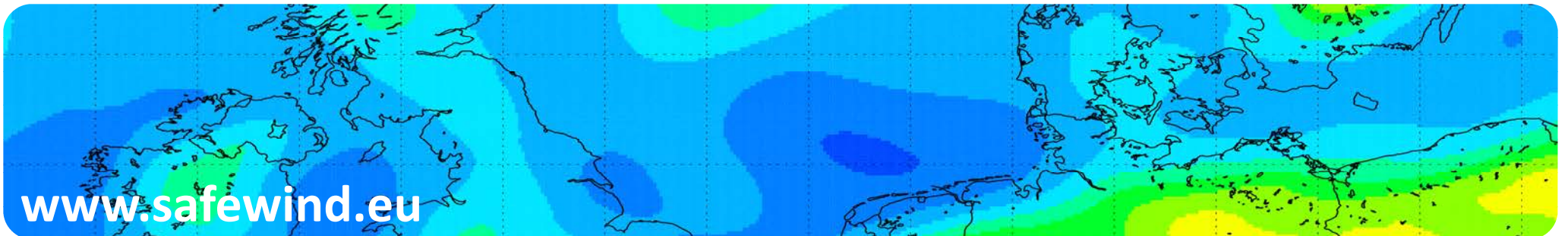
Matthias Lange, Anne Lenz

energy & meteo systems GmbH

matthias.lange@energymeteo.com



www.safewind.eu

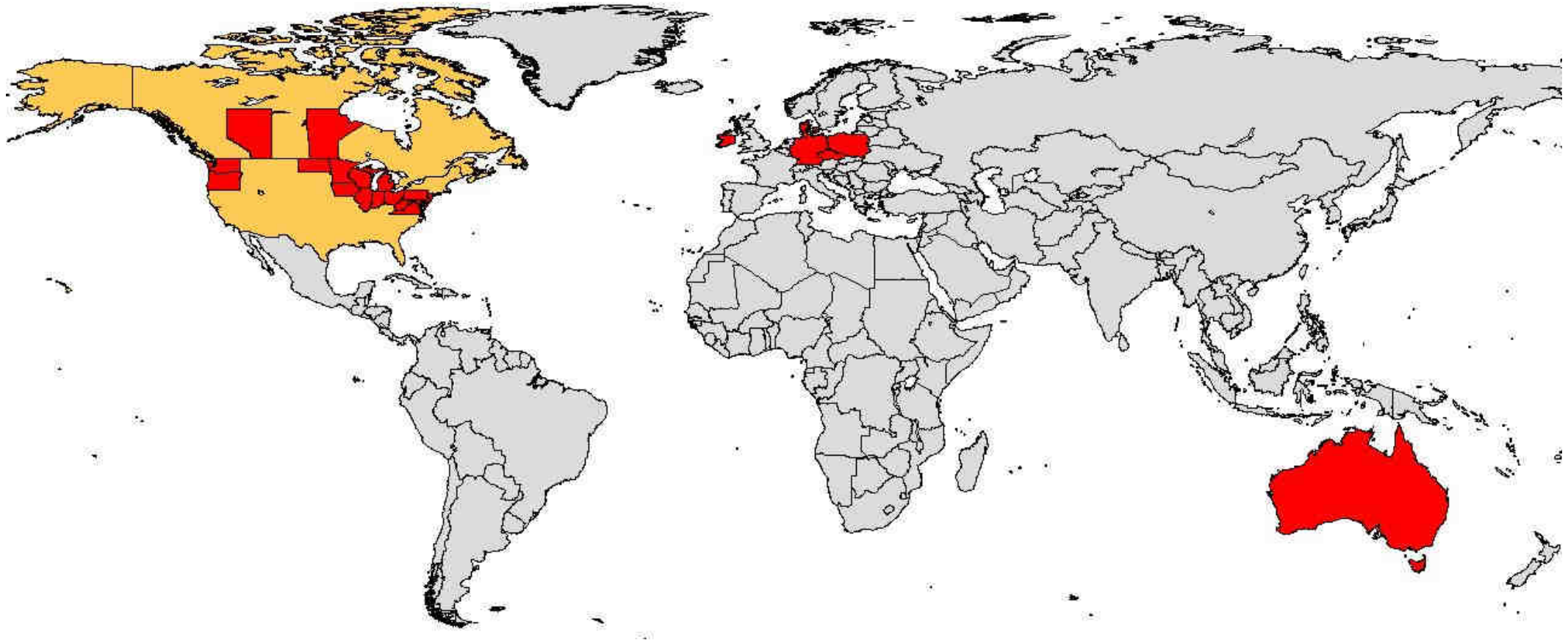


Company profile

- Integration of renewables into grids and markets
- Service provider for energy meteorology since 2004
- Areas of business
 - Wind and solar power predictions worldwide
 - Forecasts for selling wind and solar power directly to energy markets
 - Software for Virtual power plants / demand side management
 - Development
 - Industry projects
 - European research projects

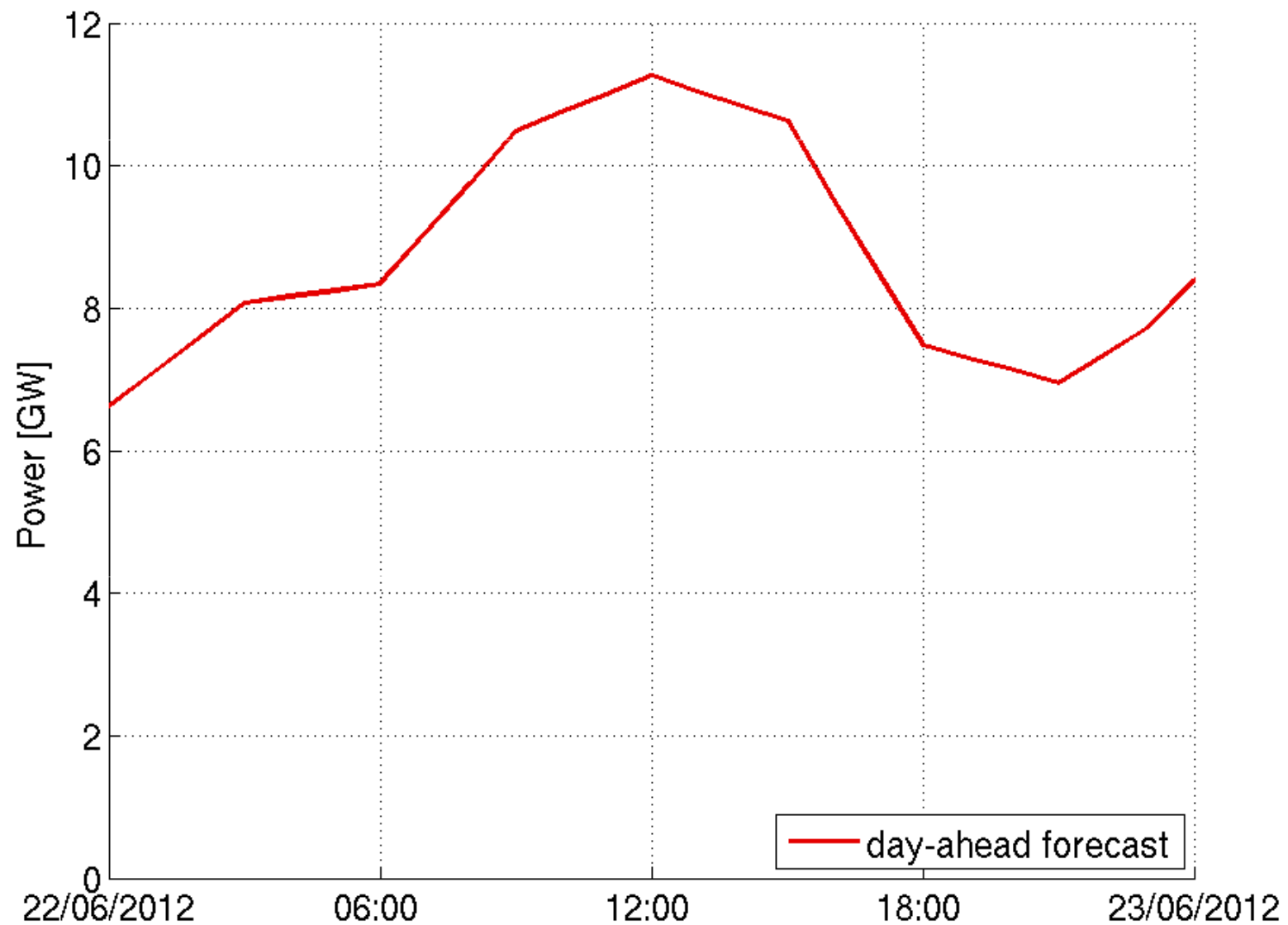
Areas with operational forecasting experience

- 60 GW of installed wind power currently predicted

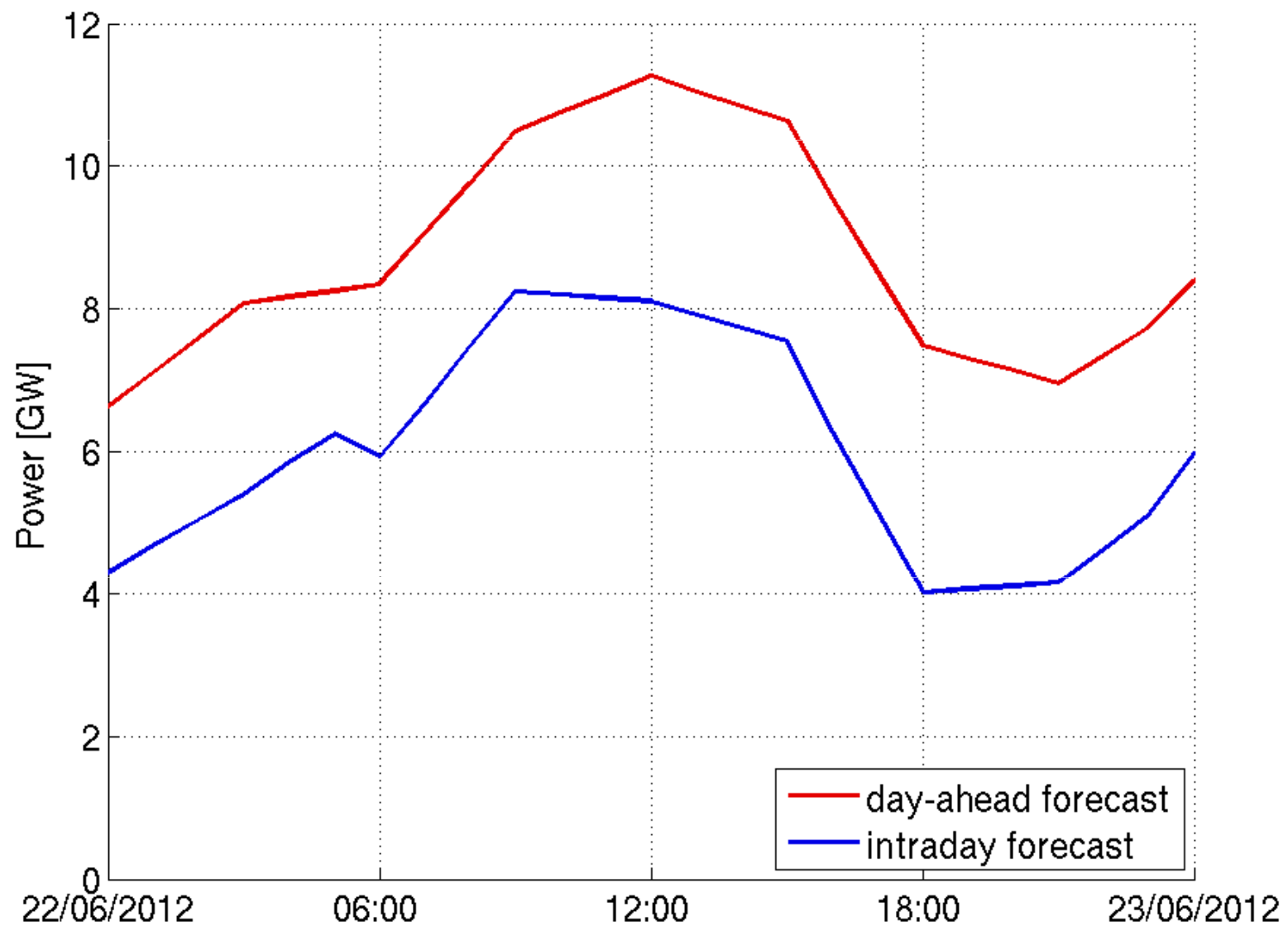


Previento wind power forecasting for grid operators

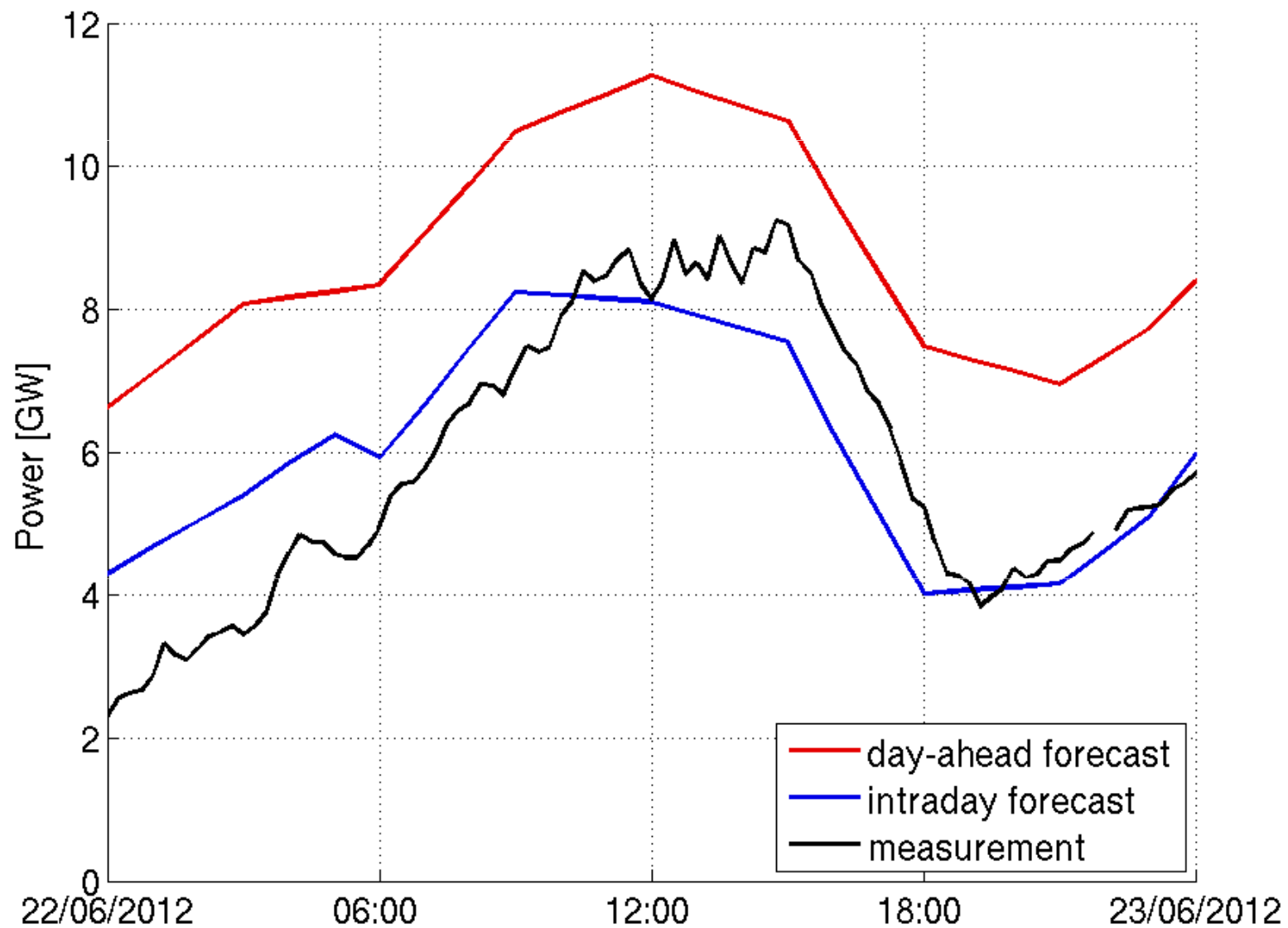
Starting point: day-ahead forecast ...



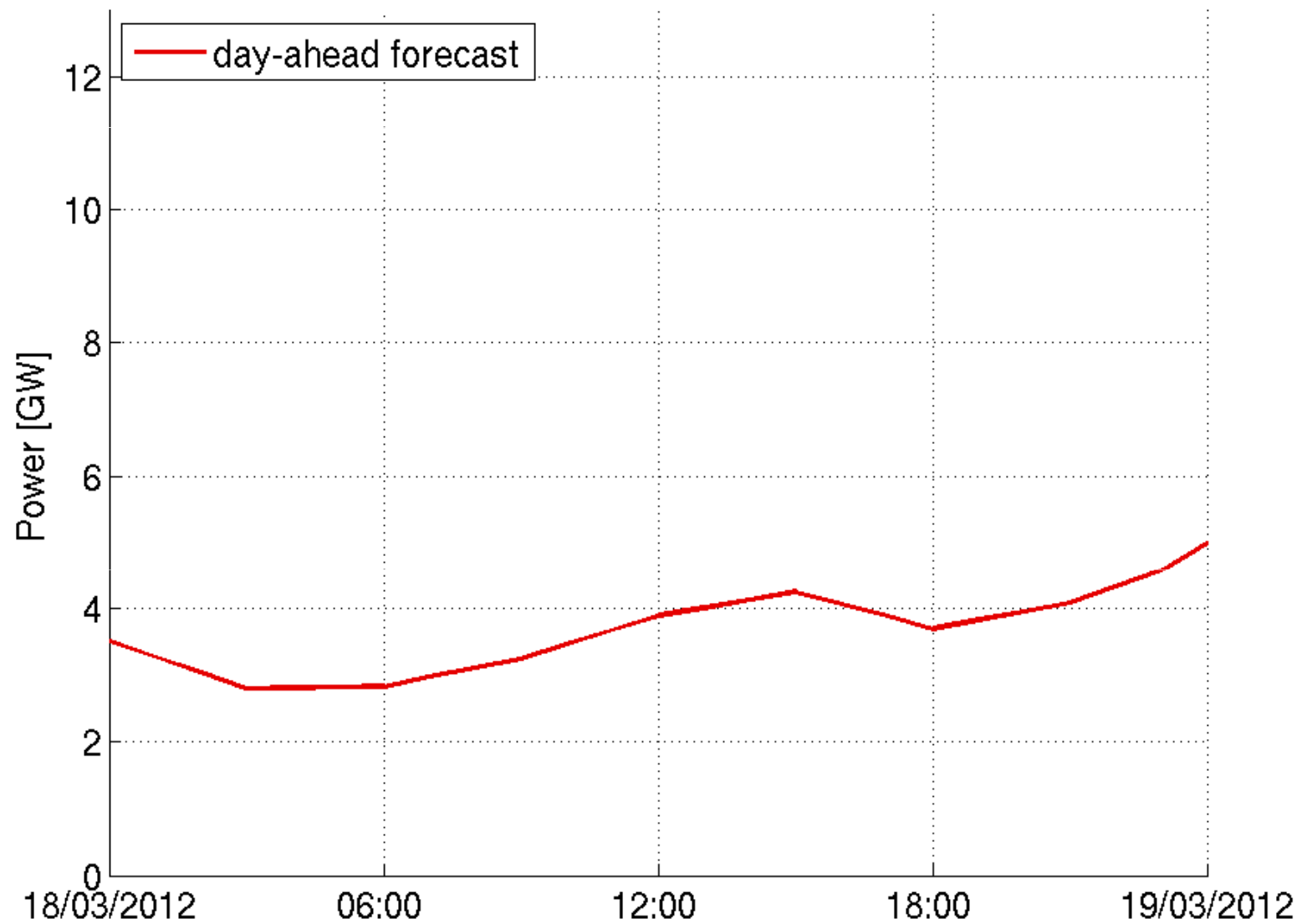
... updated by intraday forecast



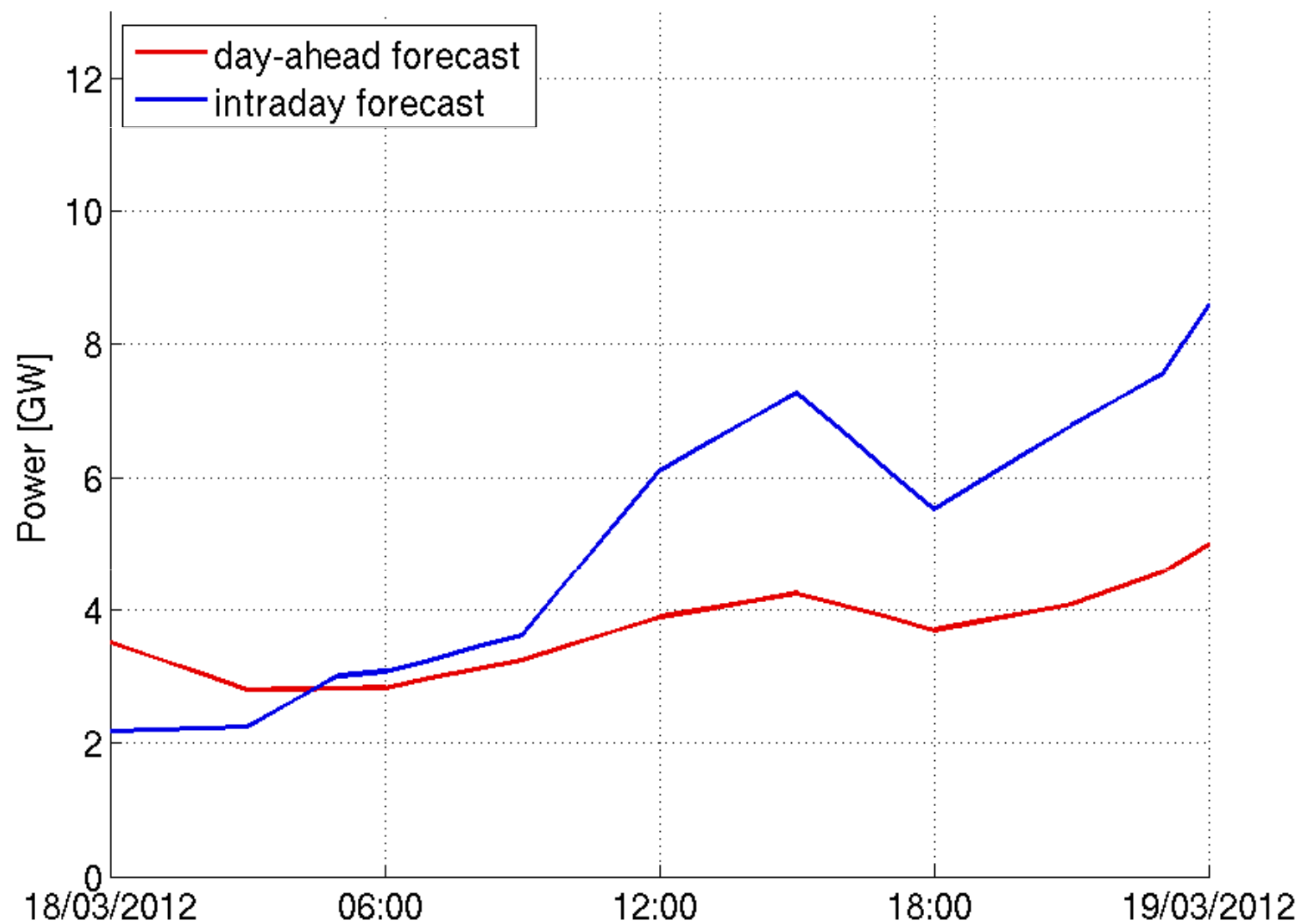
Good intraday update



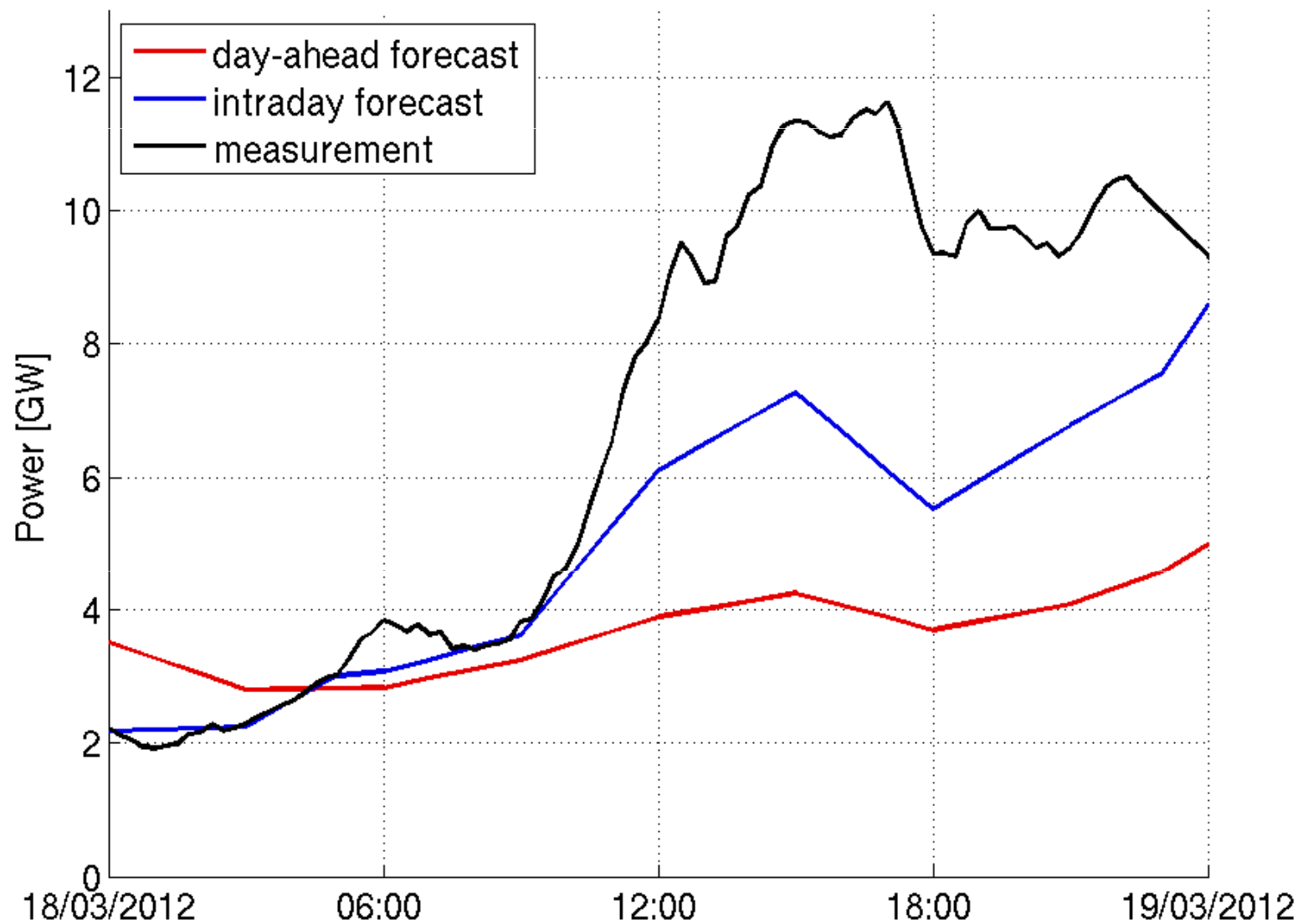
Again: day-ahead prediction ...



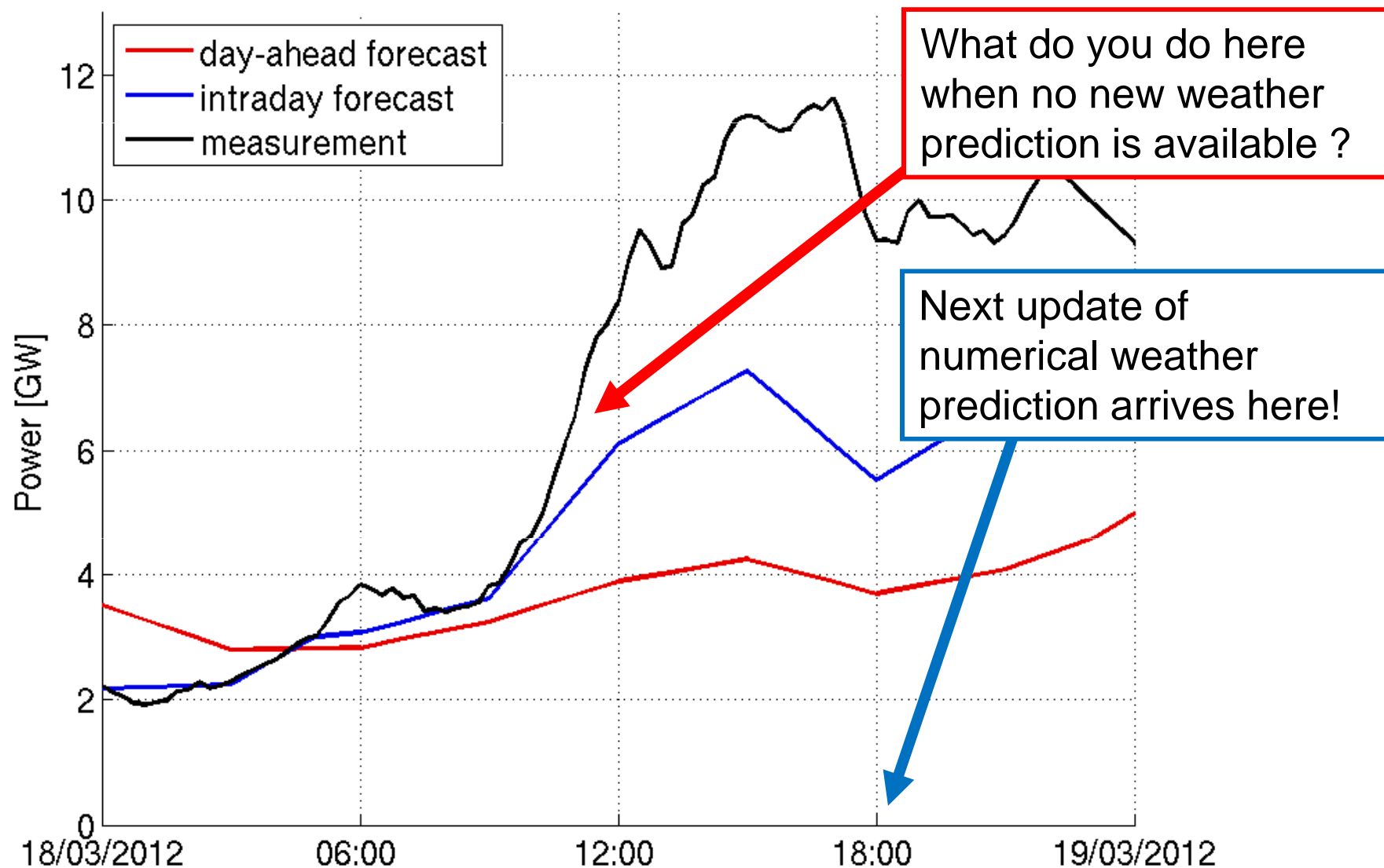
... updated by intraday forecast, but ...



... intraday update still has significant error!



... intraday update still has significant error!



Learn from past time series = looking back

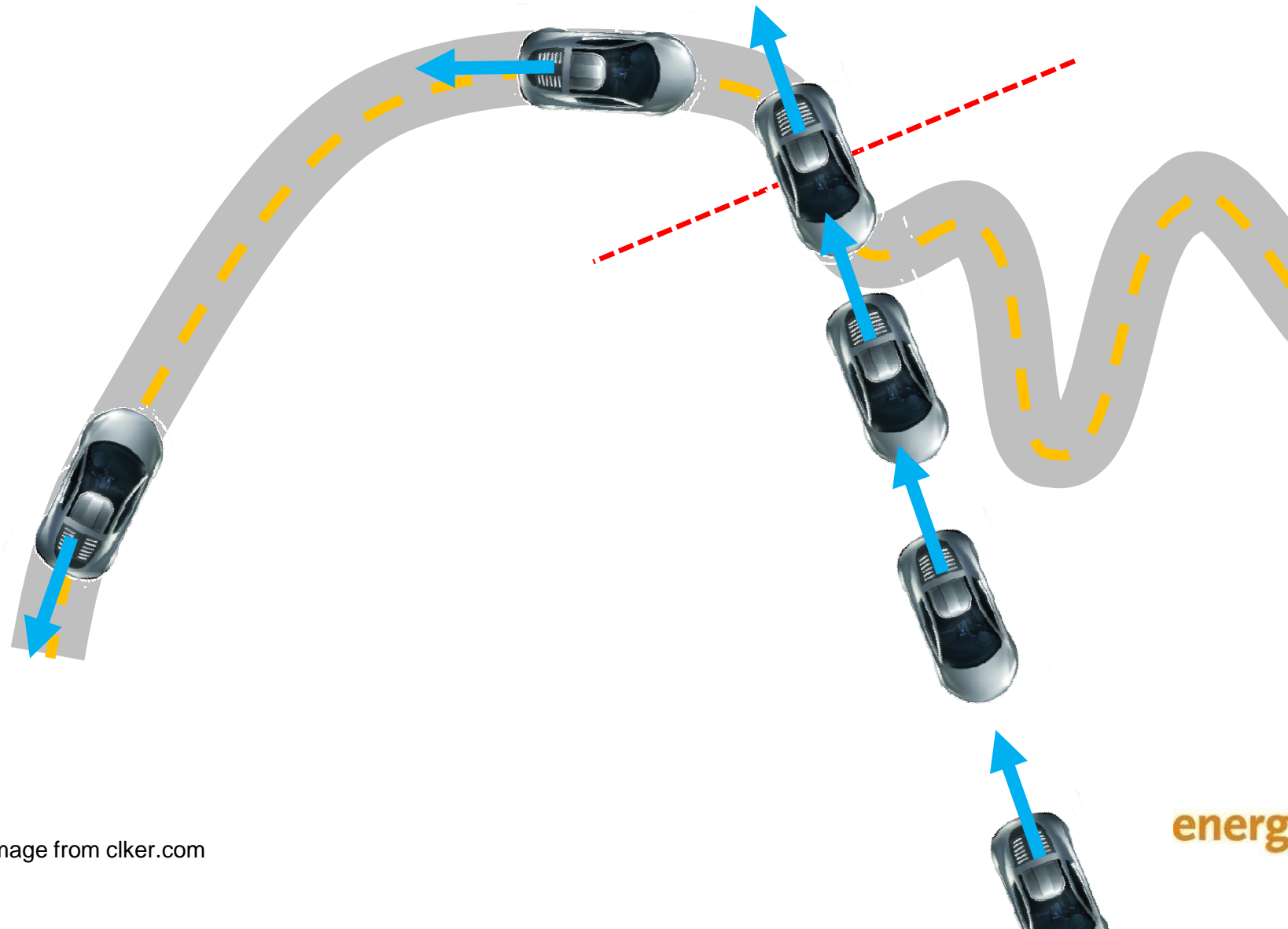
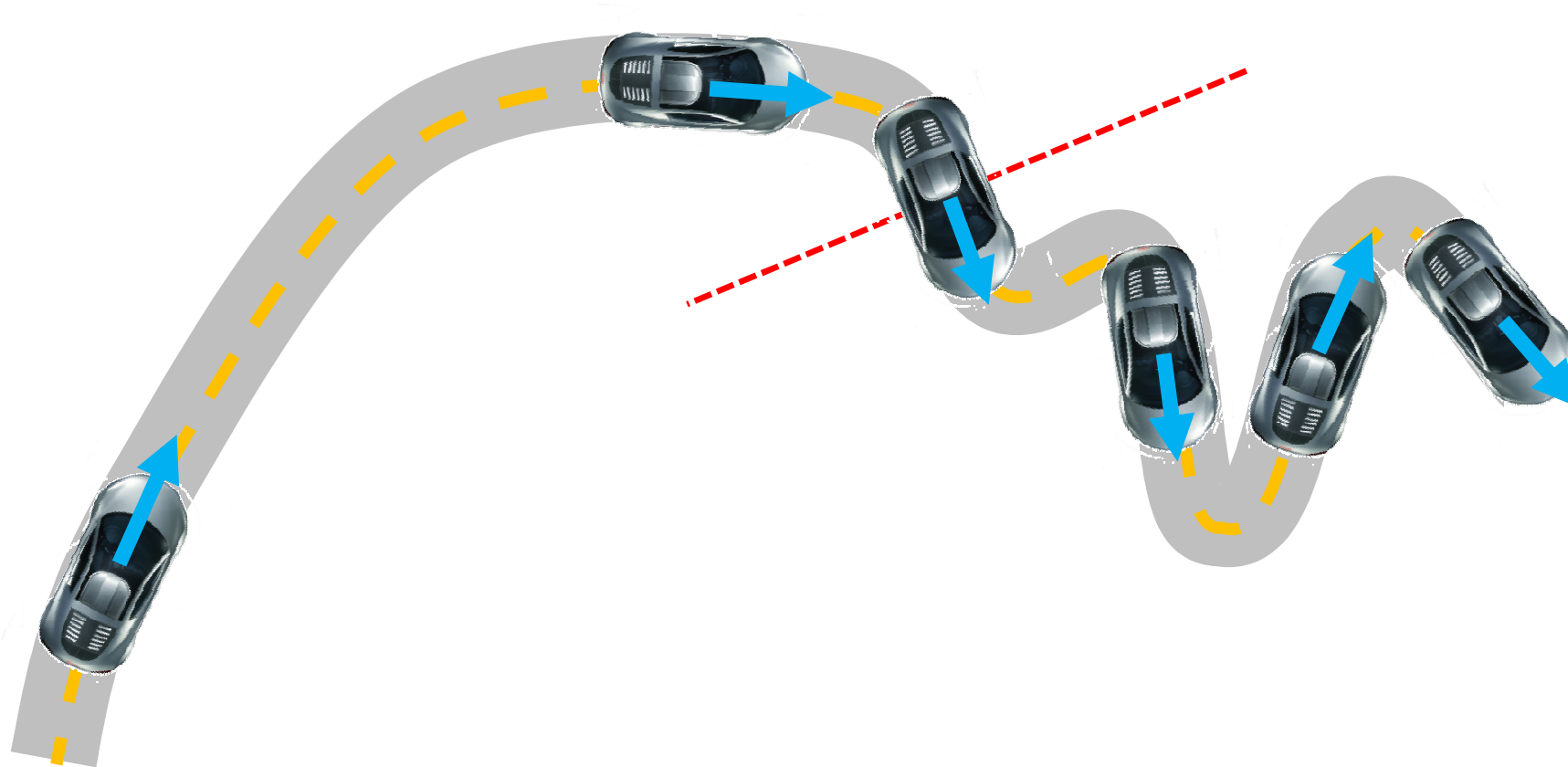
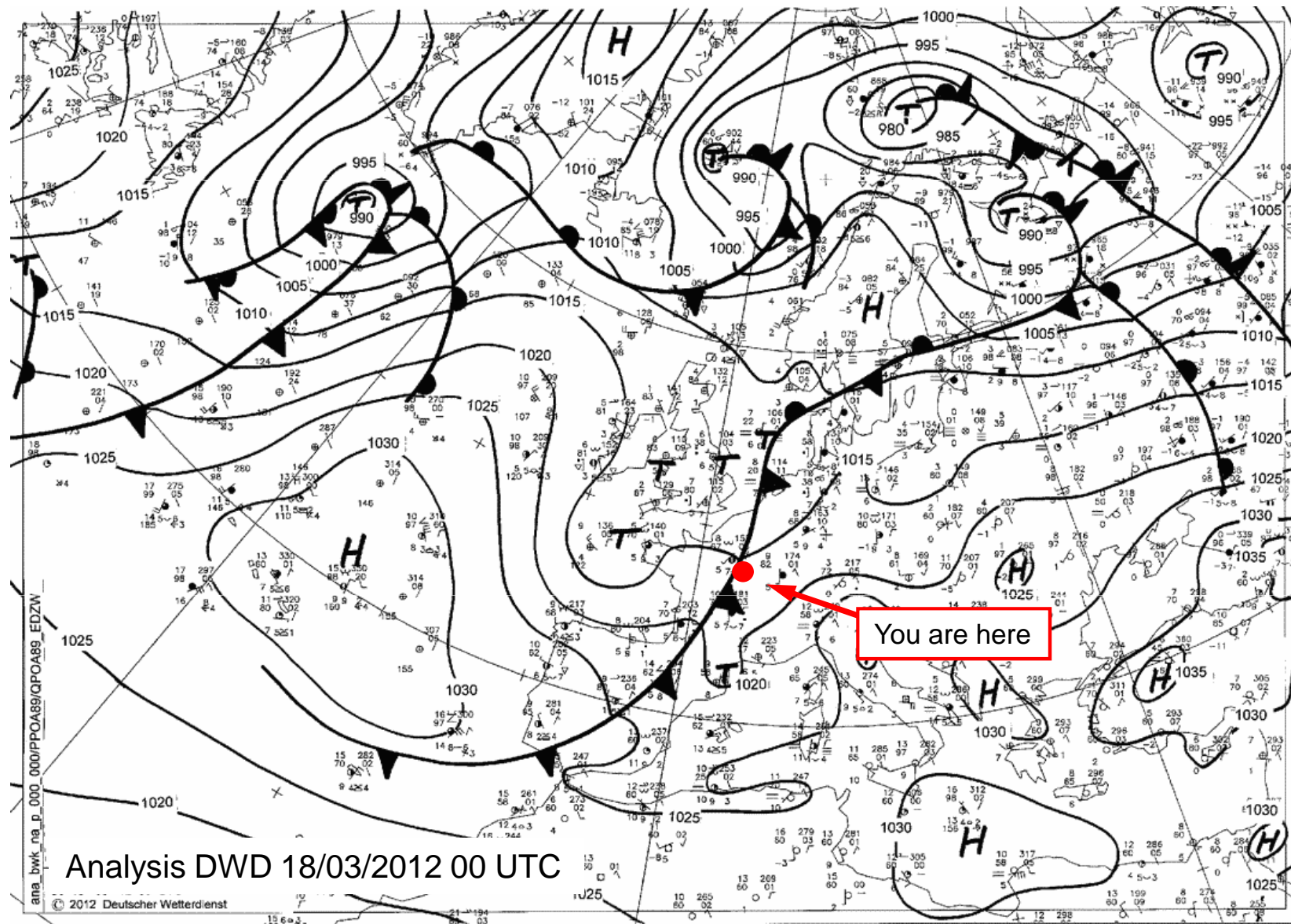


image from clker.com

.....



Looking into future = looking at large-scale weather



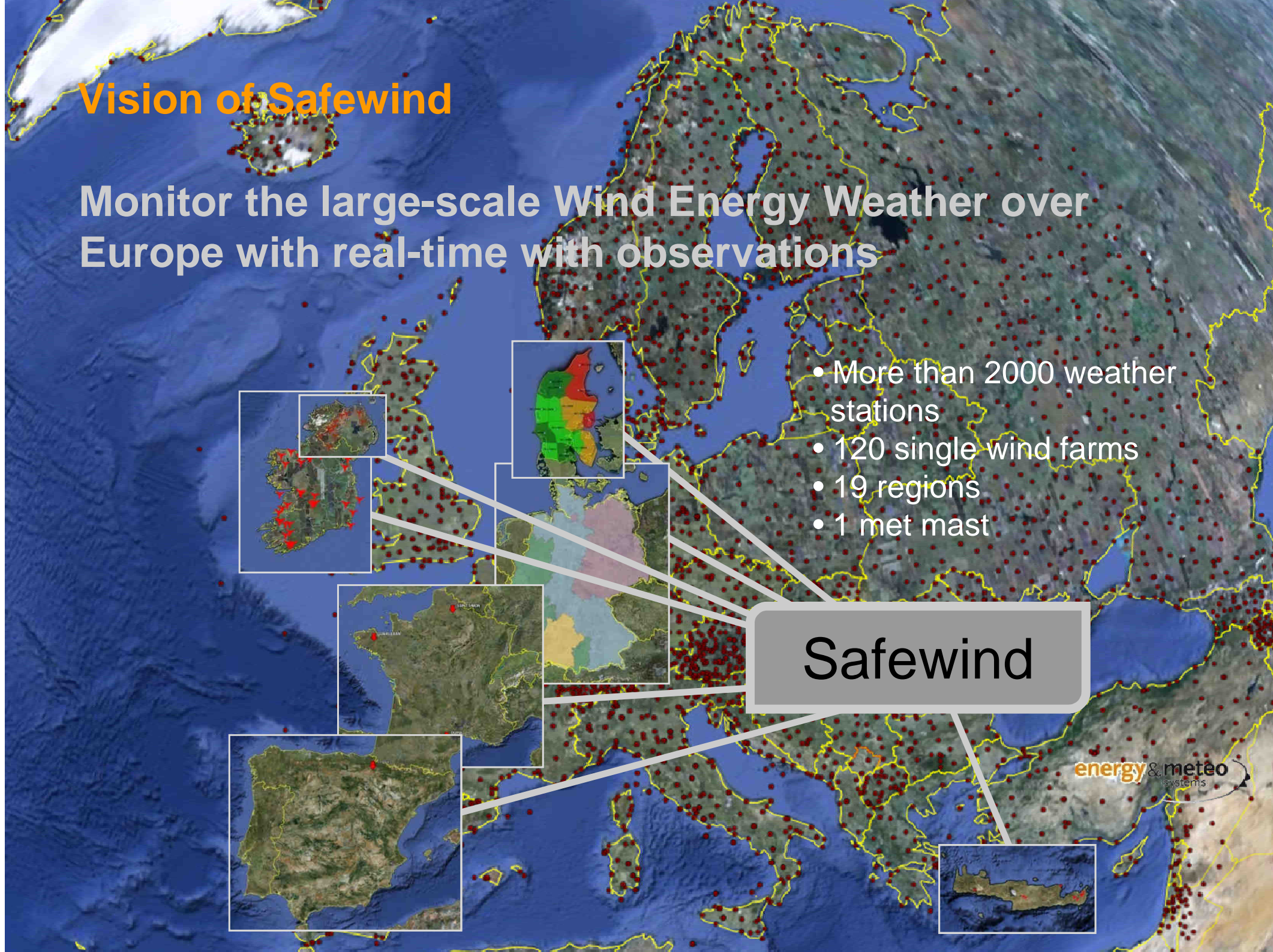
Vision of Safewind

Monitor the large-scale Wind Energy Weather over Europe with real-time with observations

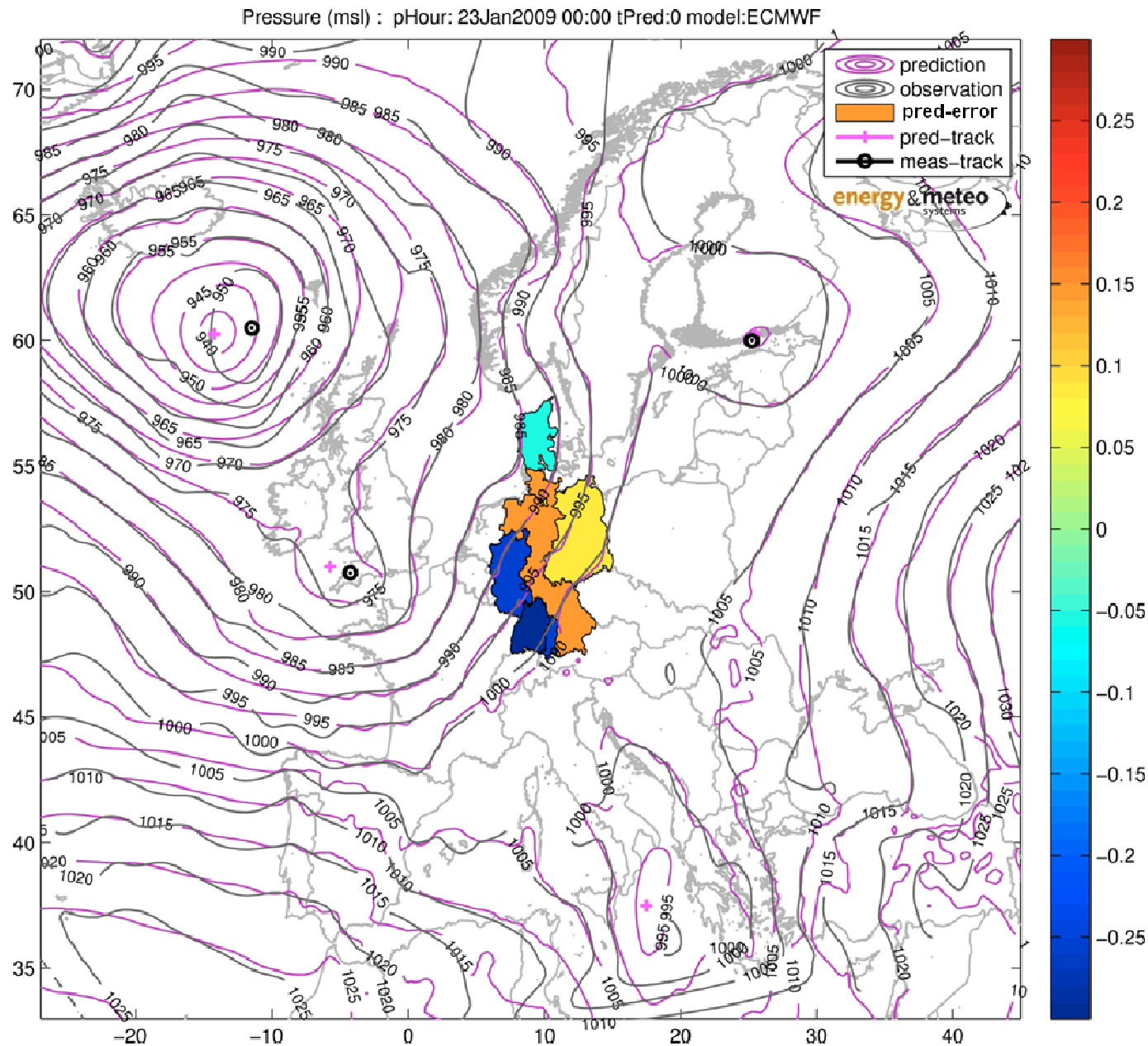
- More than 2000 weather stations
- 120 single wind farms
- 19 regions
- 1 met mast

Safewind

energy & meteo
systems

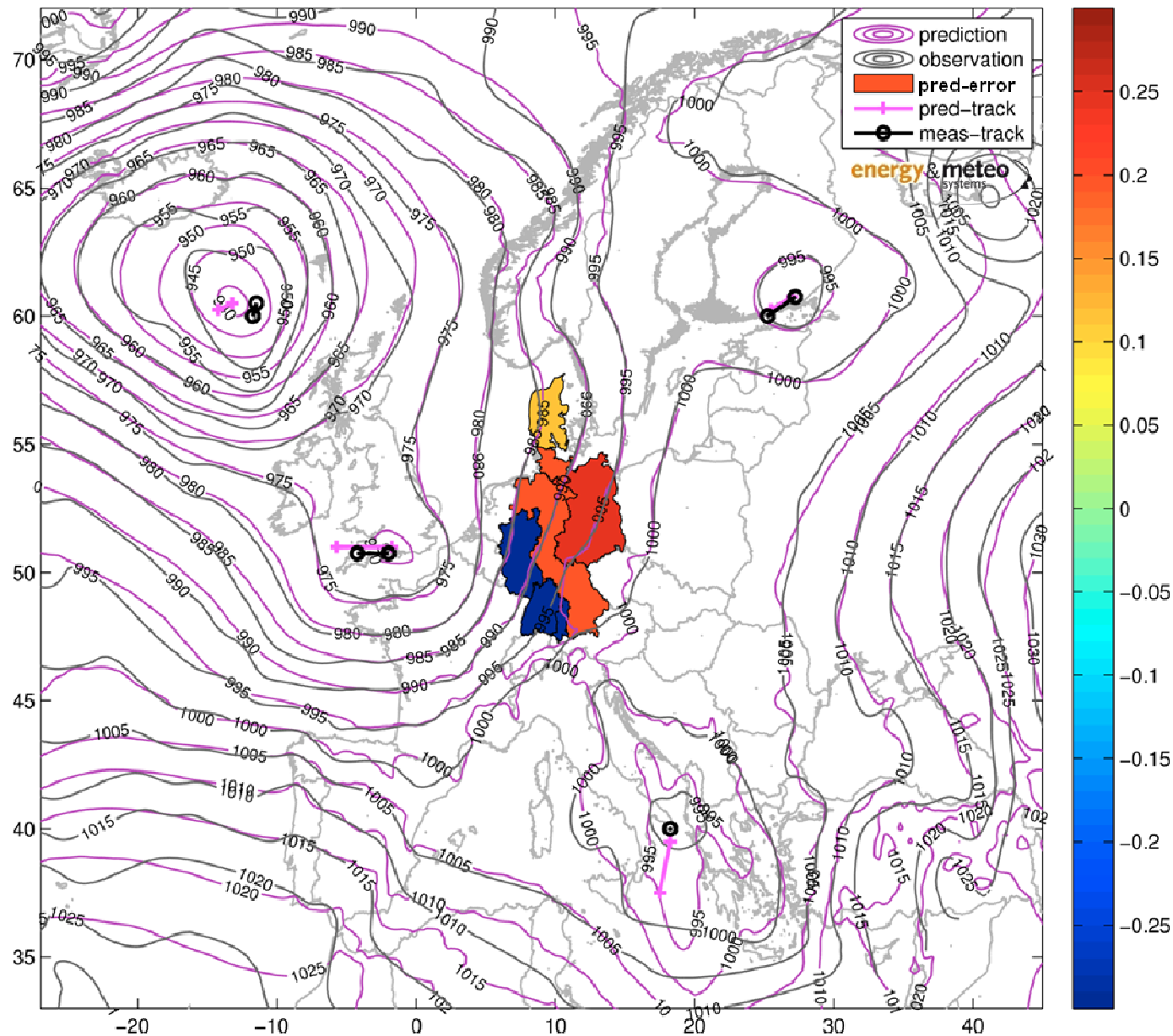


Monitoring the Weather Situation



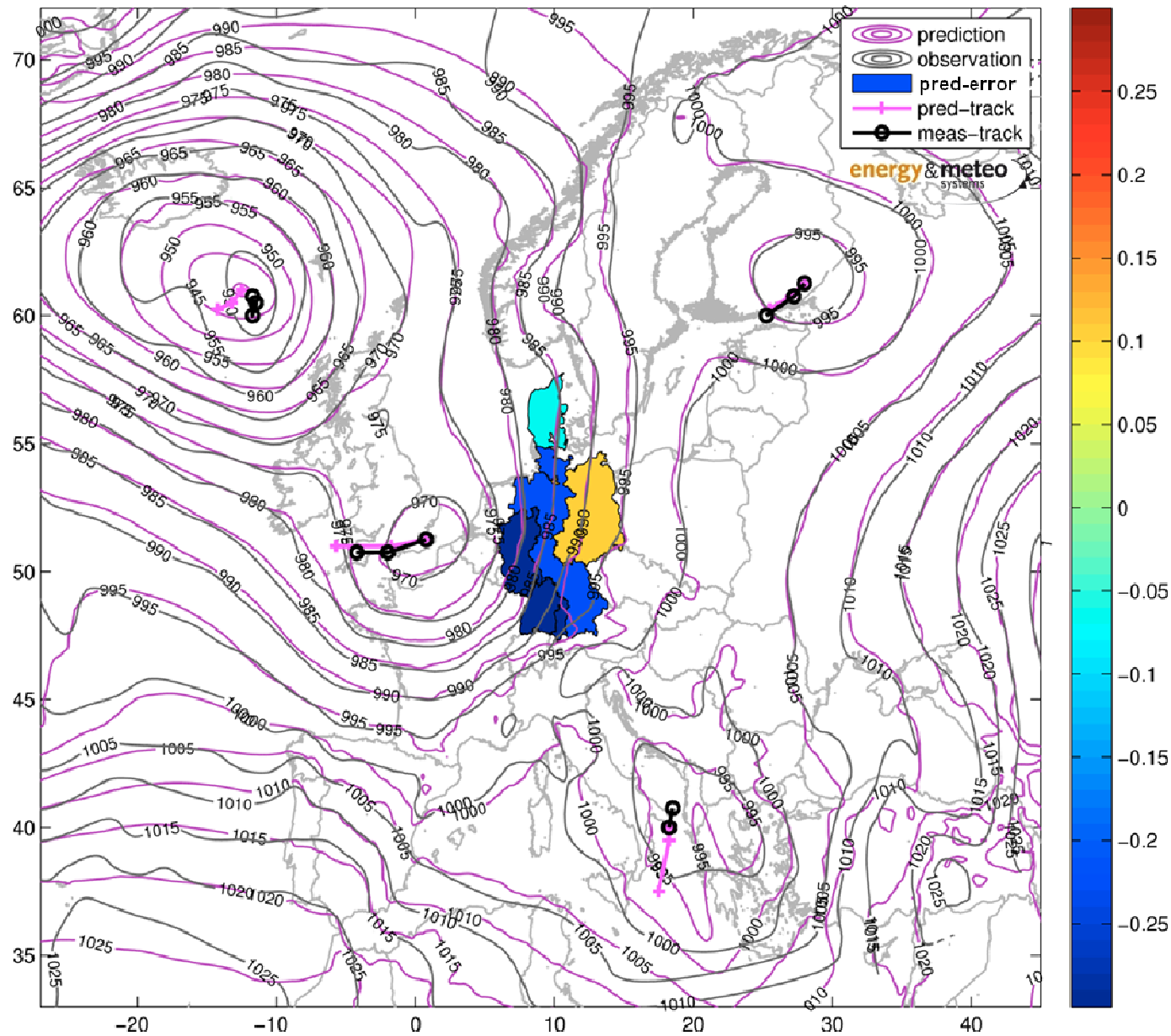
Monitoring the Weather Situation

Pressure (msl) : pHour: 23Jan2009 00:00 tPred:3 model:ECMWF

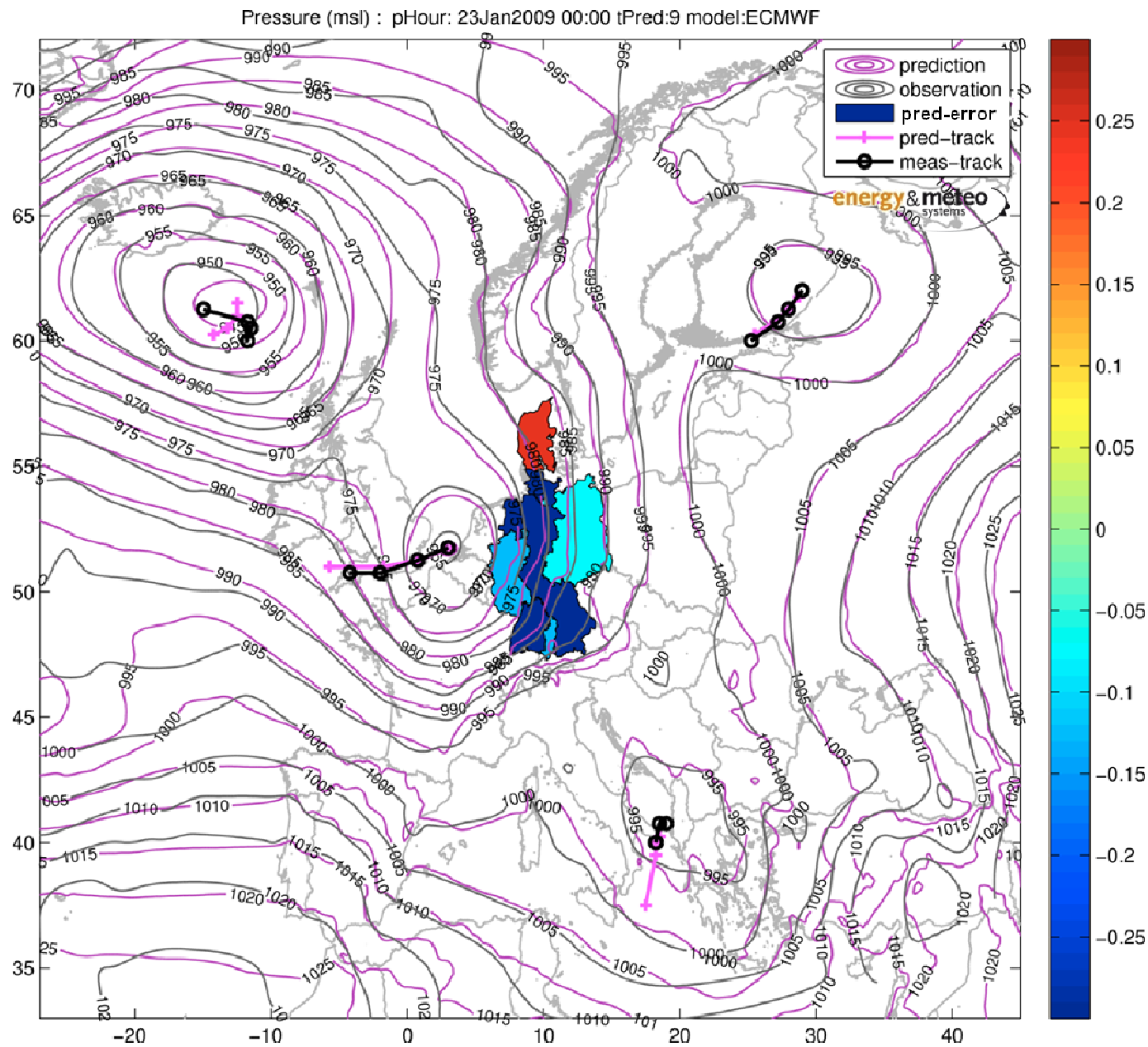


Monitoring the Weather Situation

Pressure (msl) : pHour: 23Jan2009 00:00 tPred:6 model:ECMWF

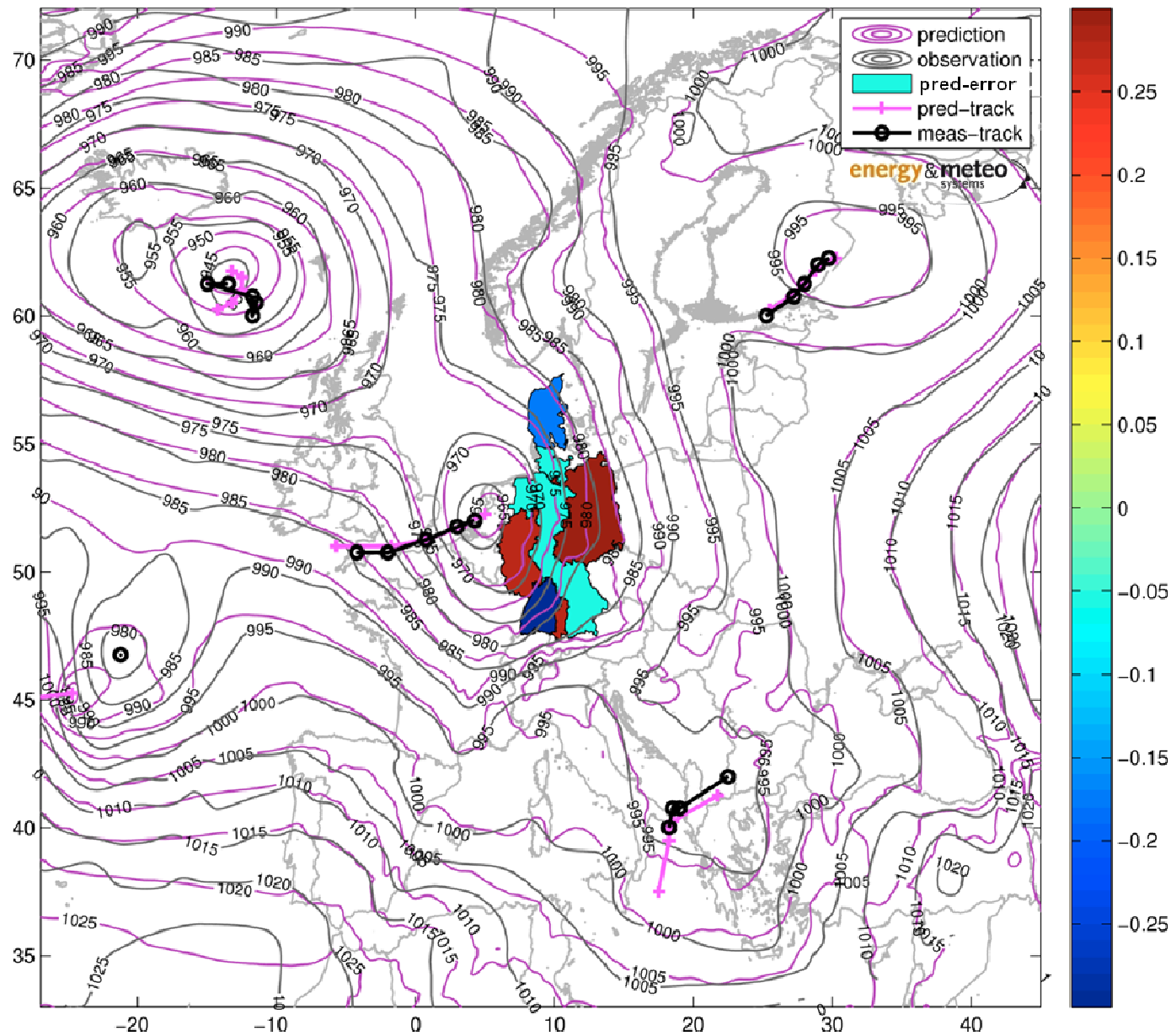


Monitoring the Weather Situation

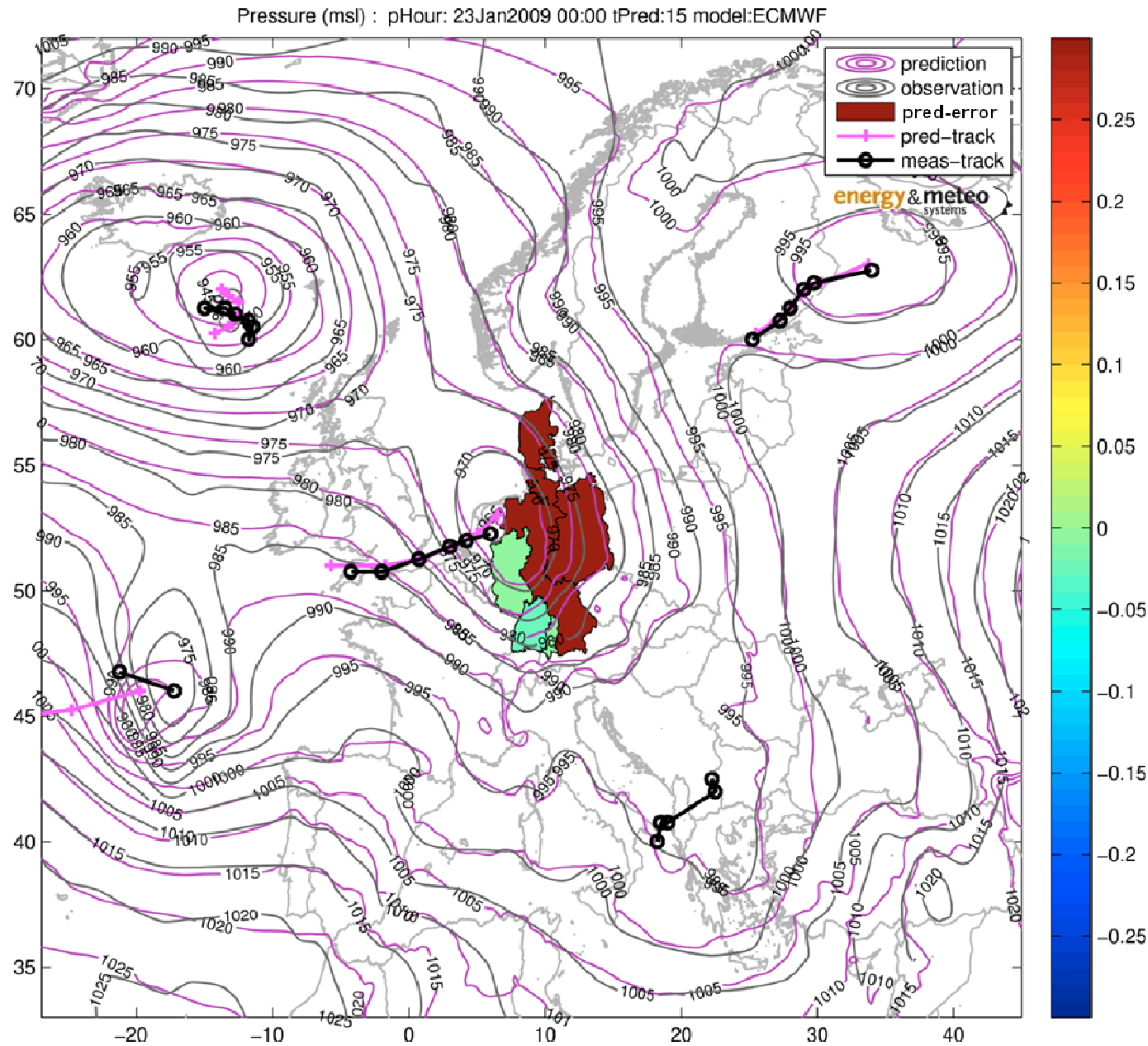


Monitoring the Weather Situation

Pressure (msl) : pHour: 23Jan2009 00:00 tPred:12 model:ECMWF

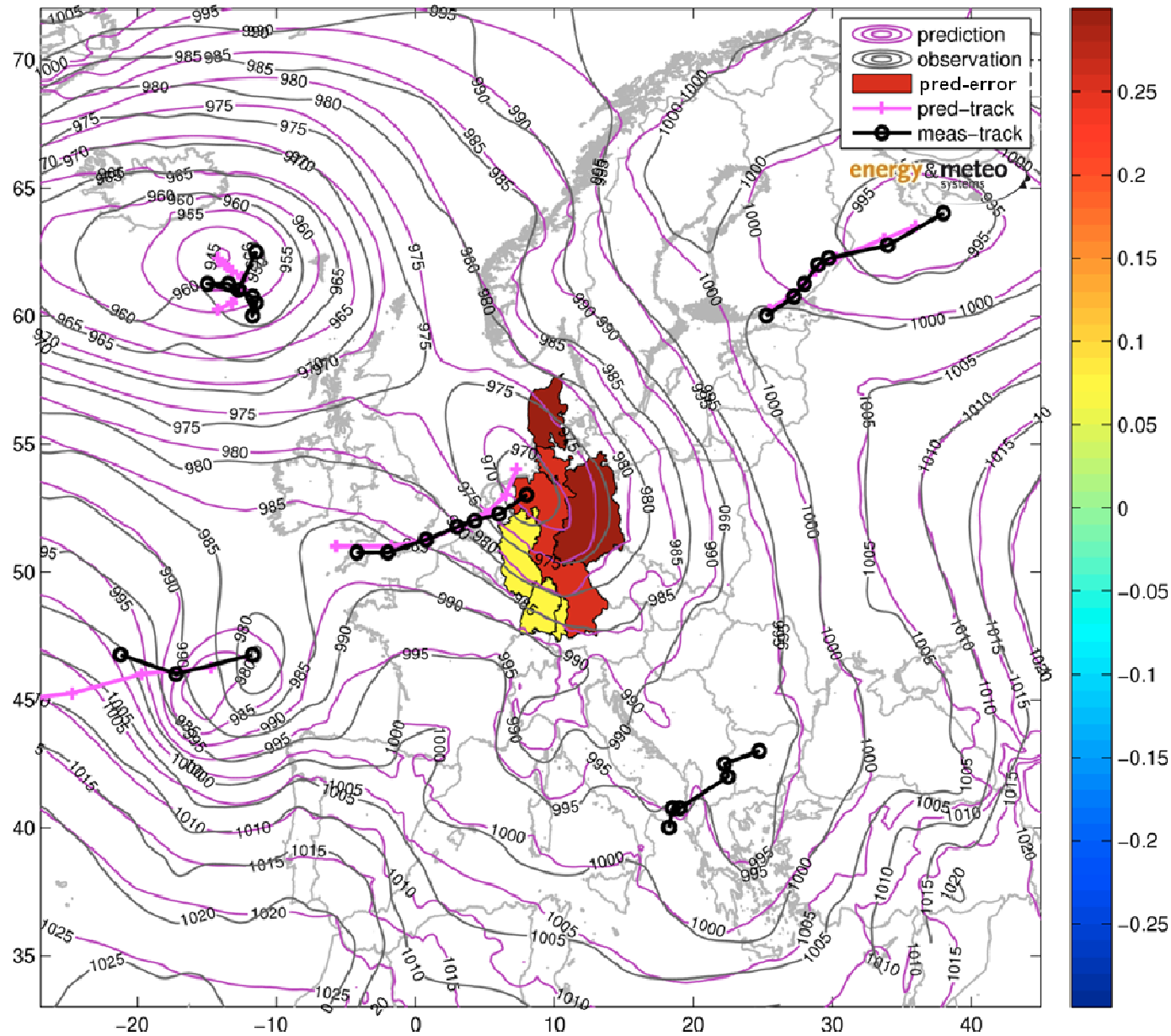


Monitoring the Weather Situation



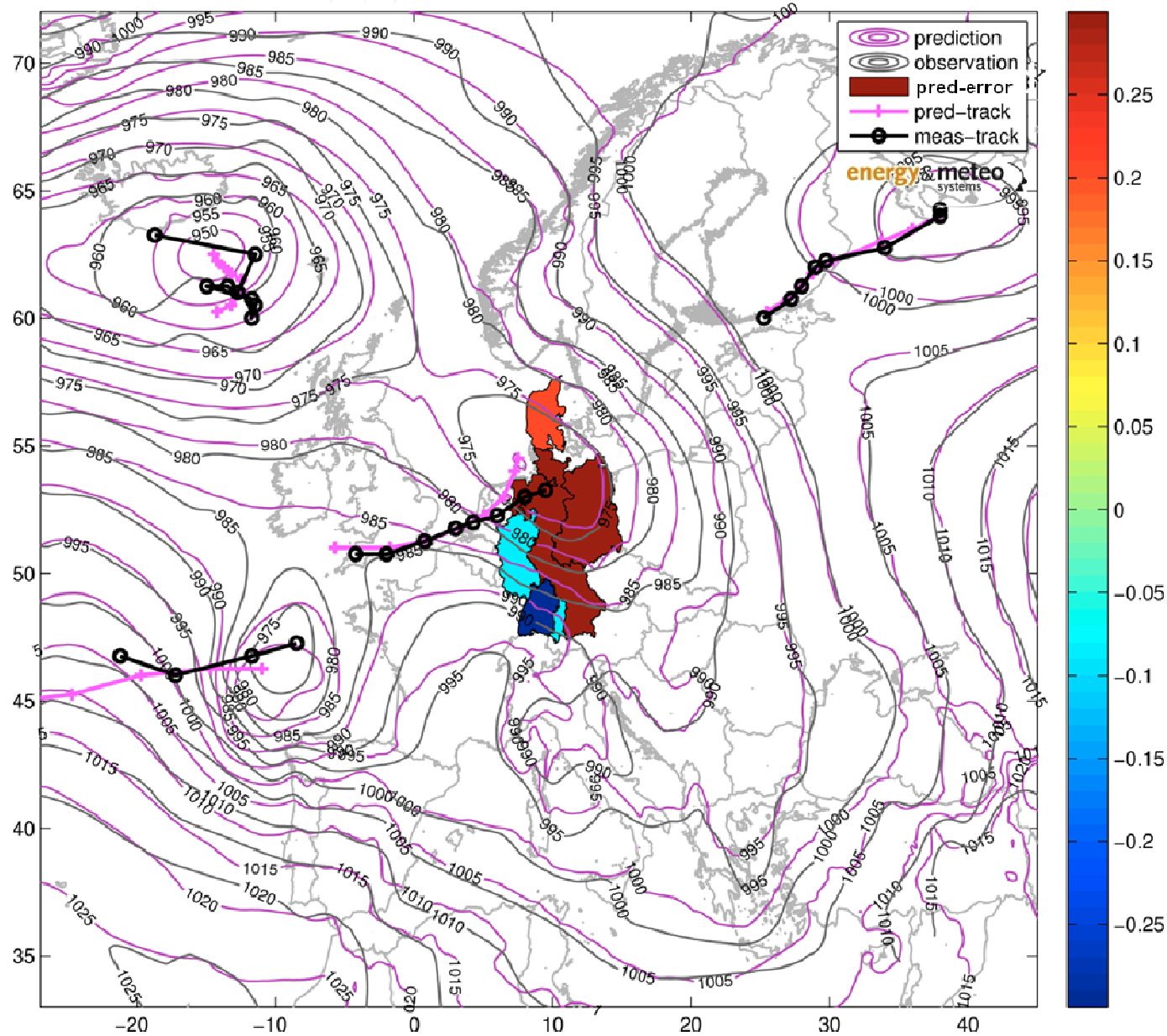
Monitoring the Weather Situation

Pressure (msl) : pHour: 23Jan2009 00:00 tPred:18 model:ECMWF

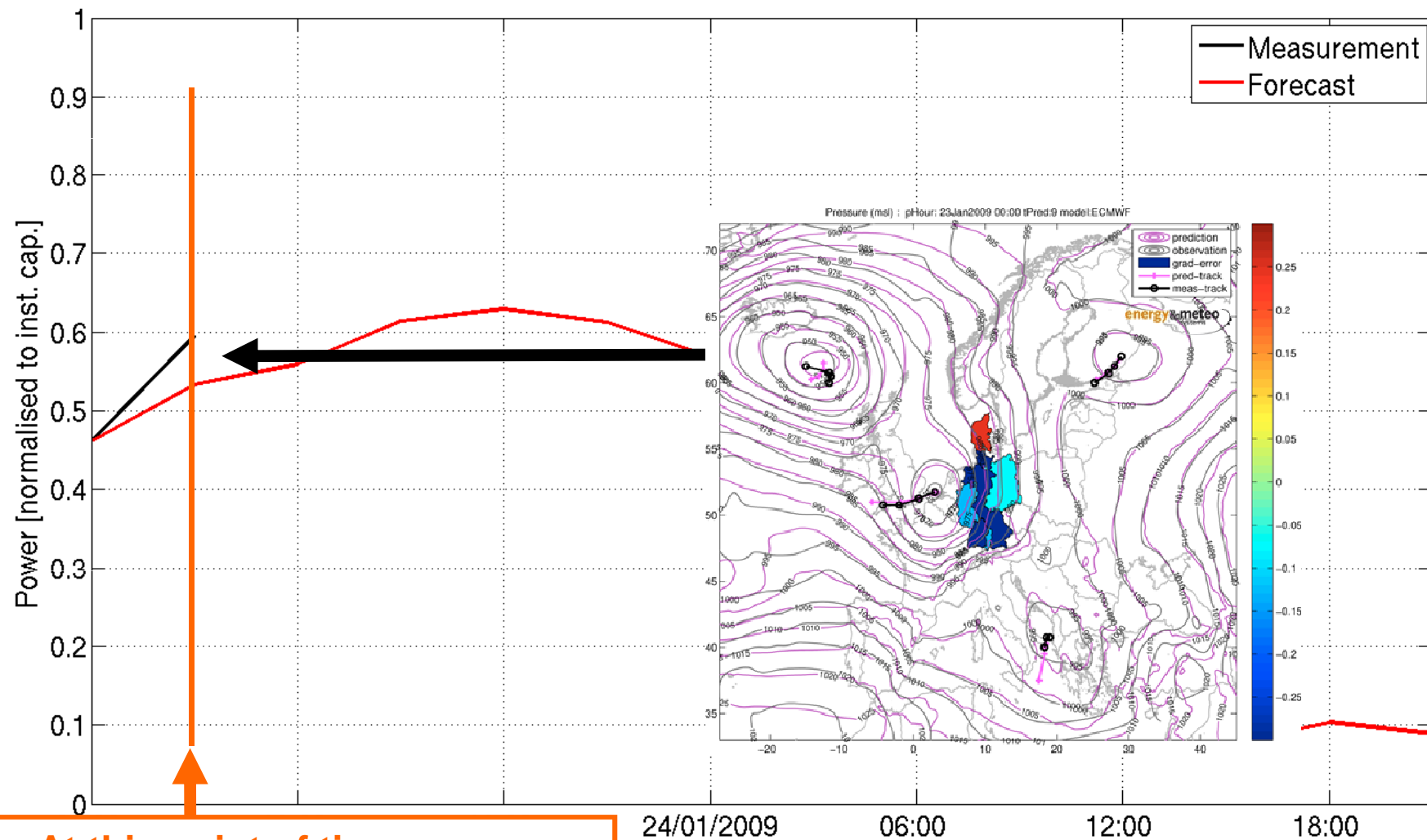


Monitoring the Weather Situation

Pressure (msl) : pHour: 23Jan2009 00:00 tPred:21 model:ECMWF

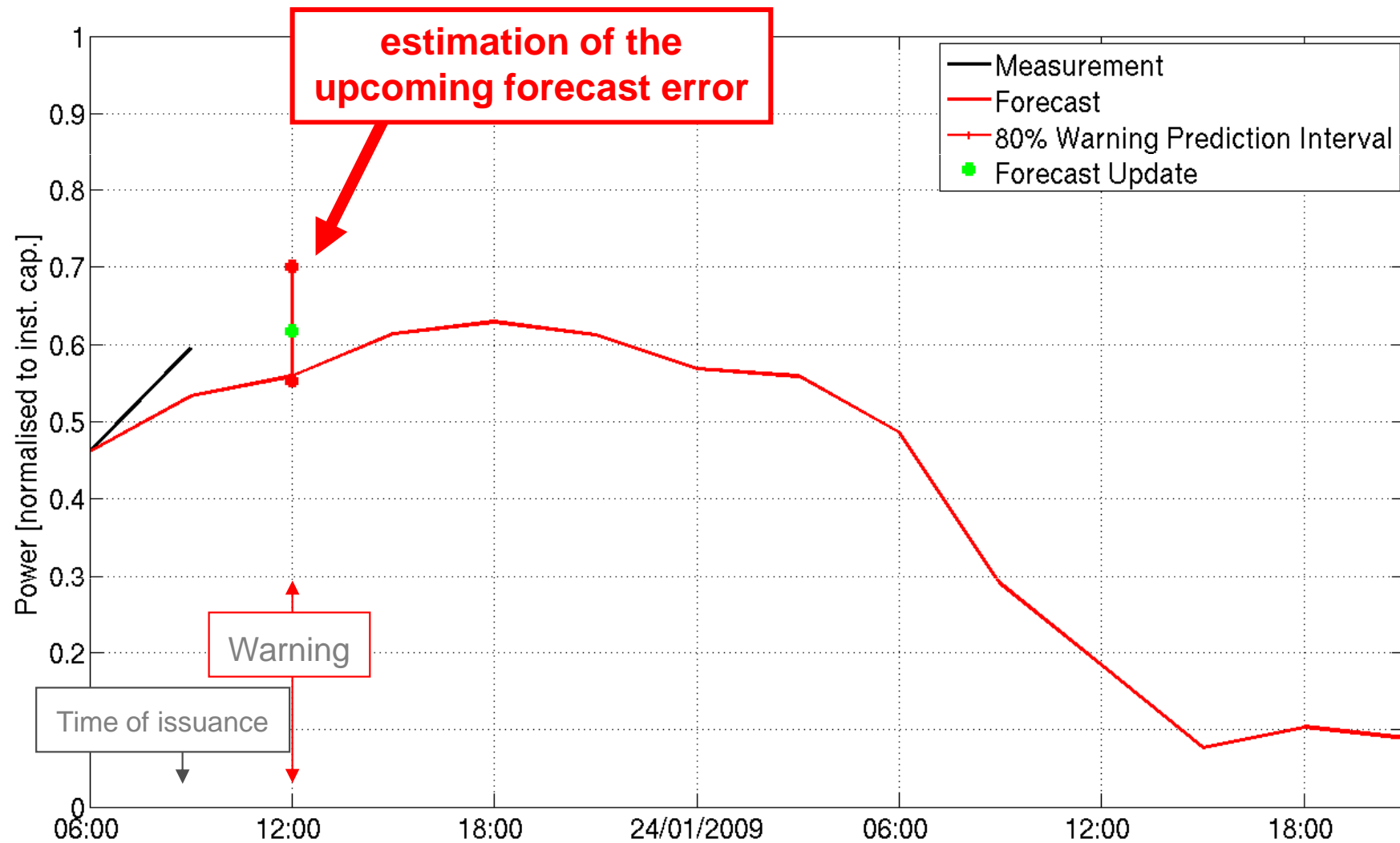


Time Series Example: 50Hertz TSO 23/1/2009 00UTC

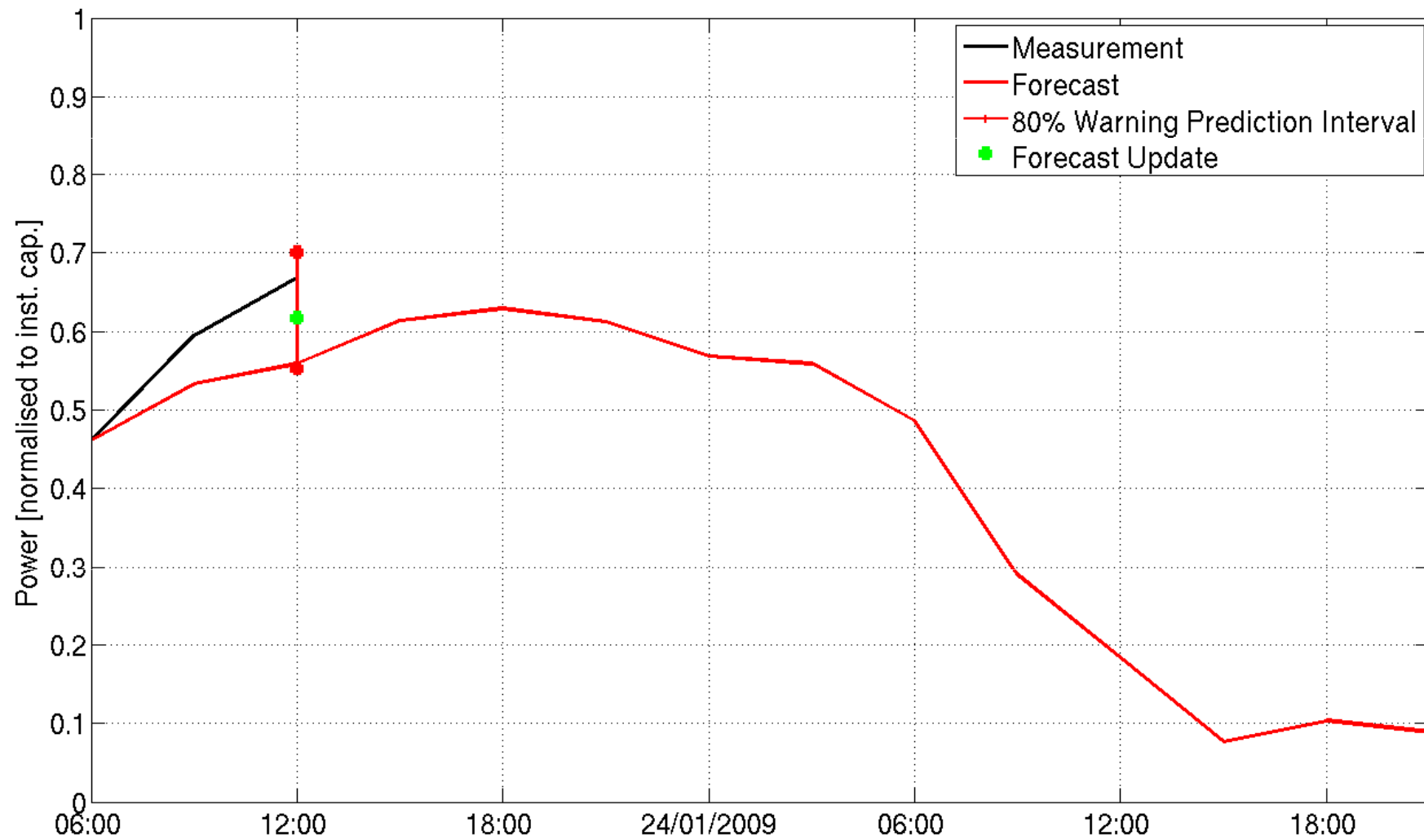


At this point of time: use
information on weather situation
and current forecasting

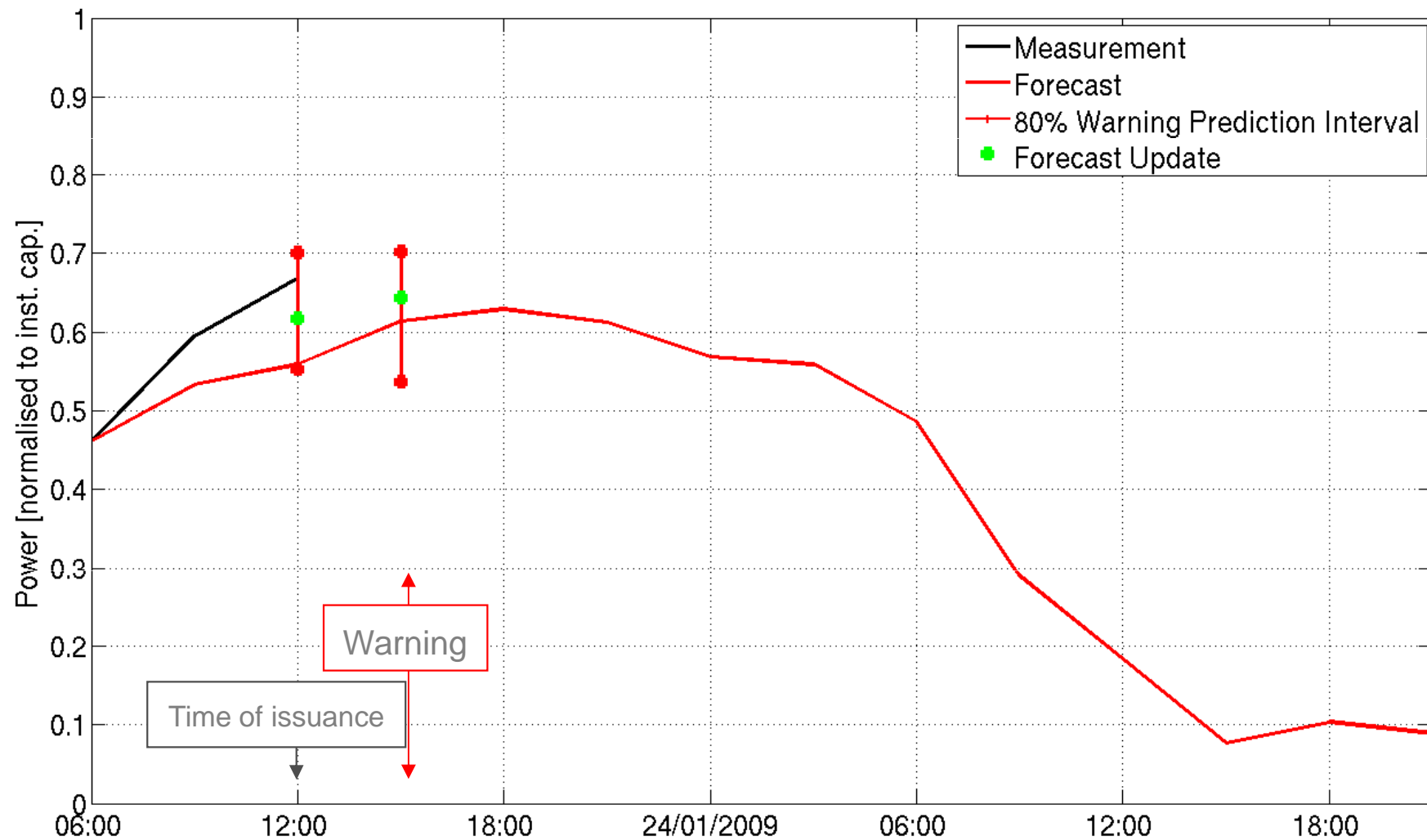
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



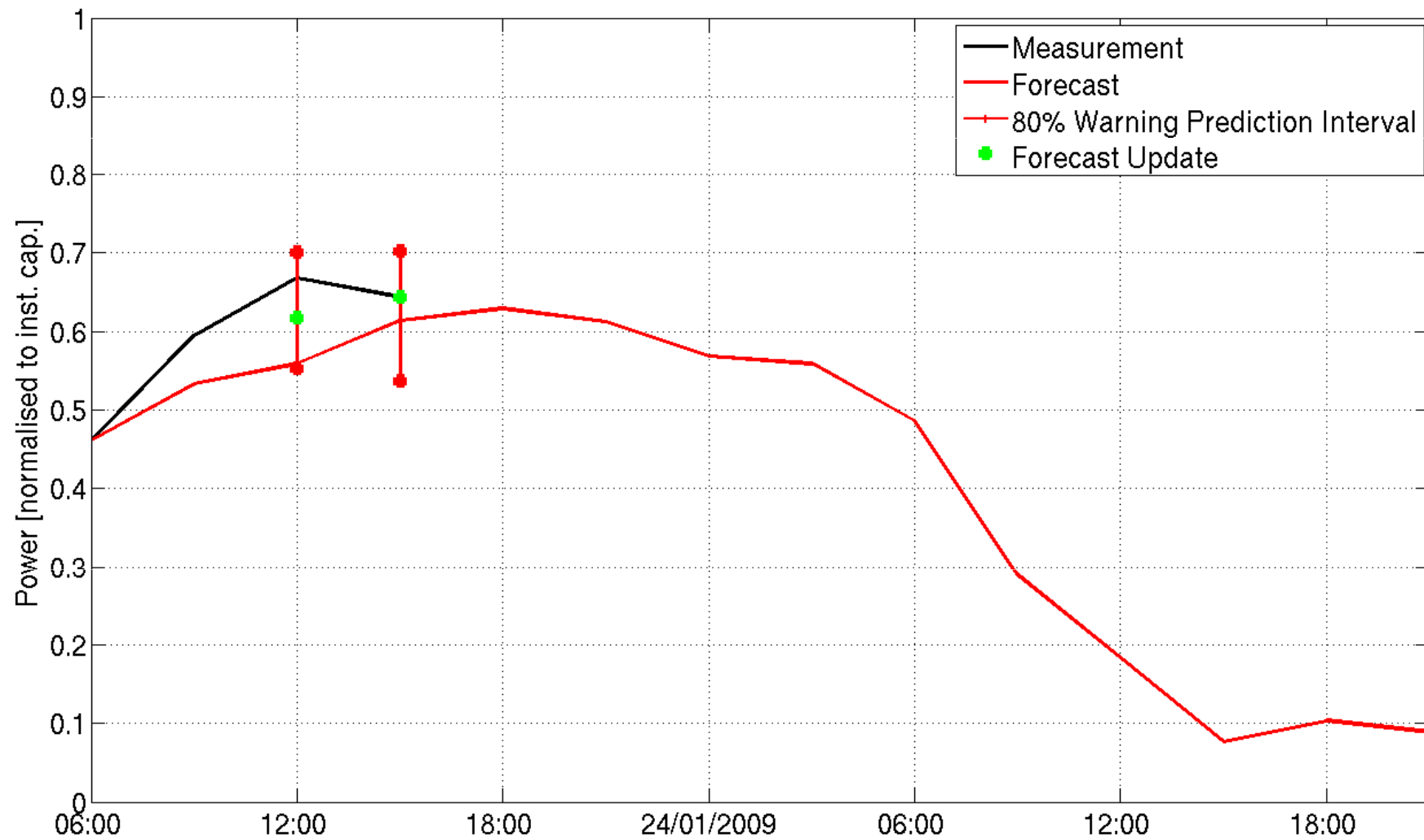
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



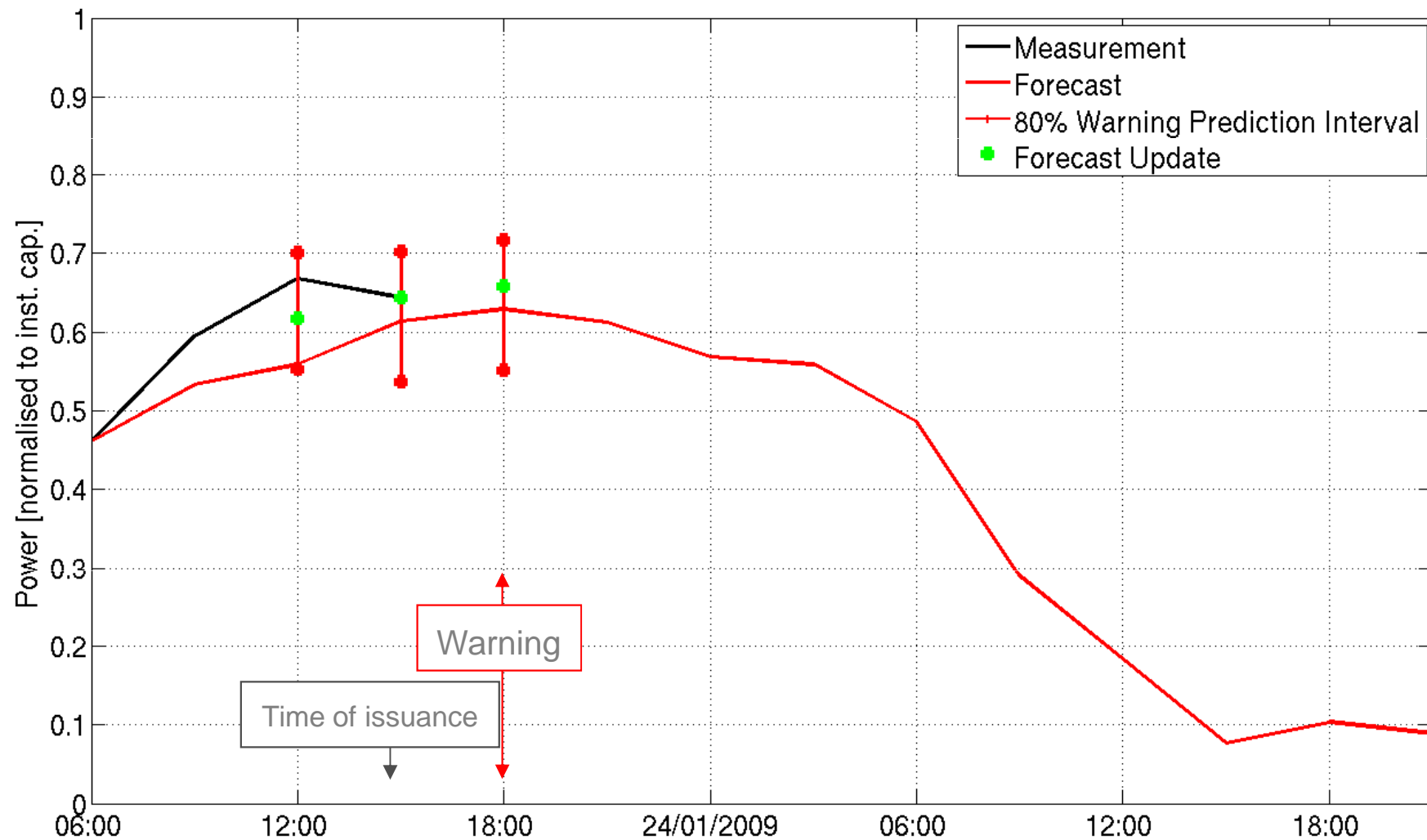
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



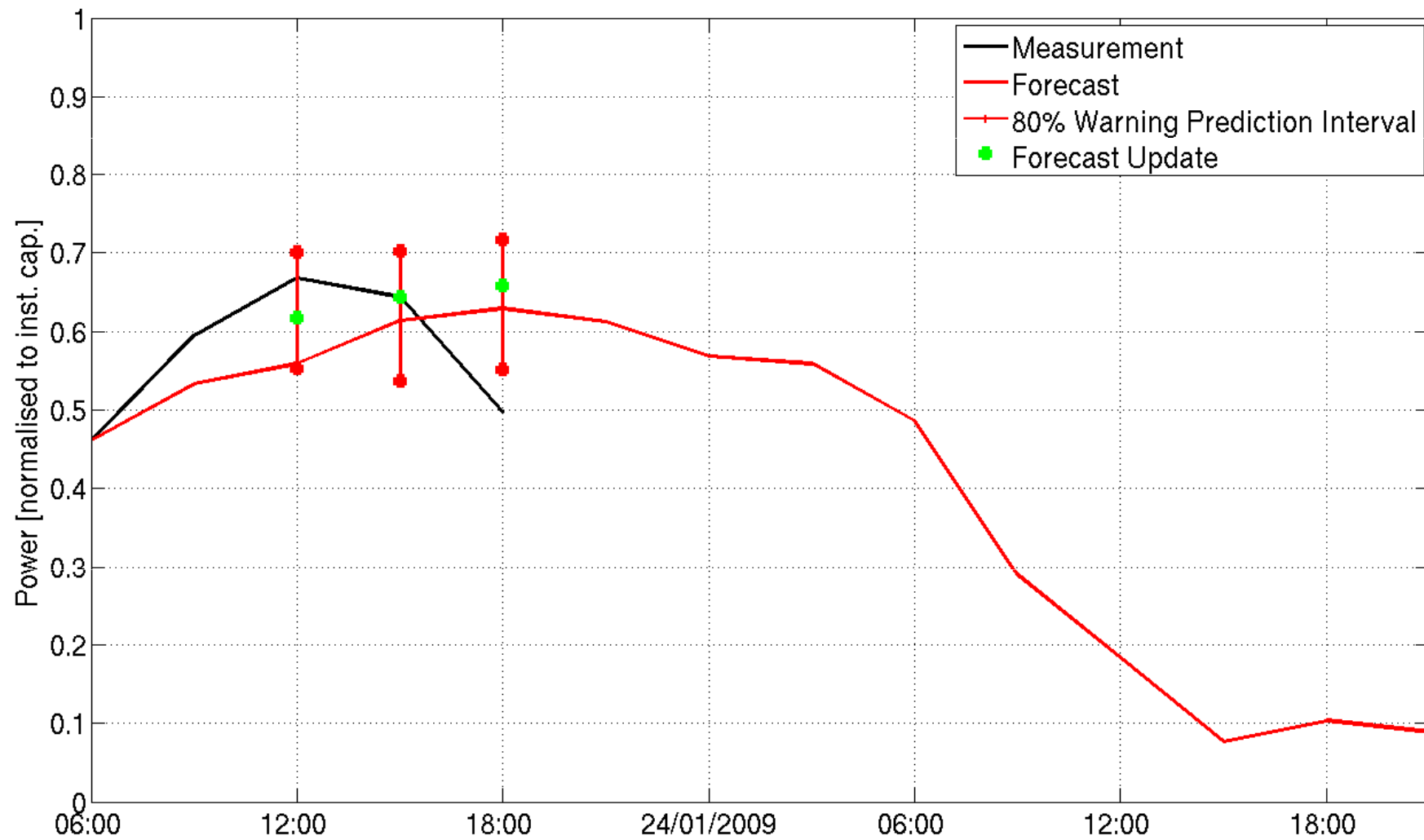
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



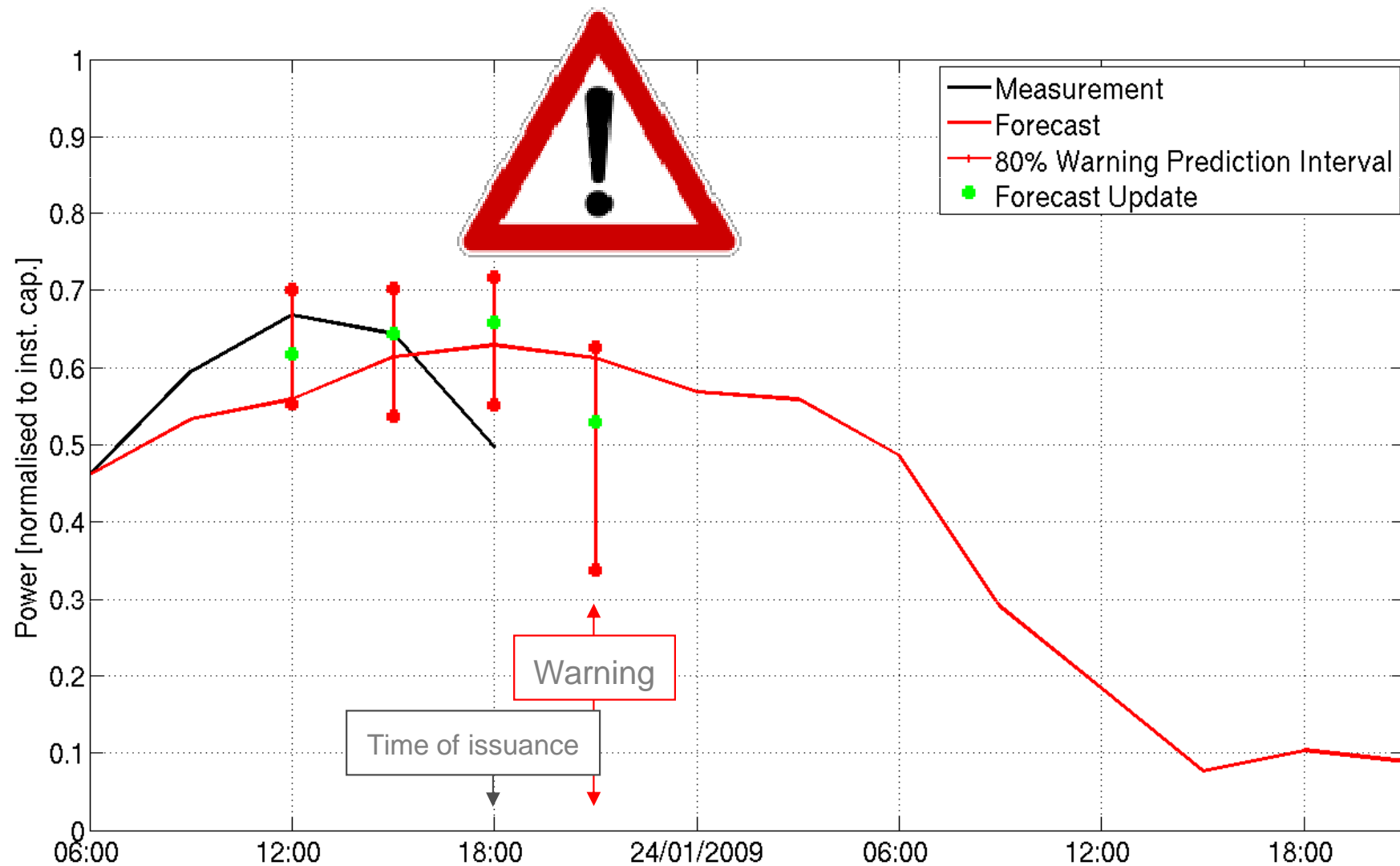
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



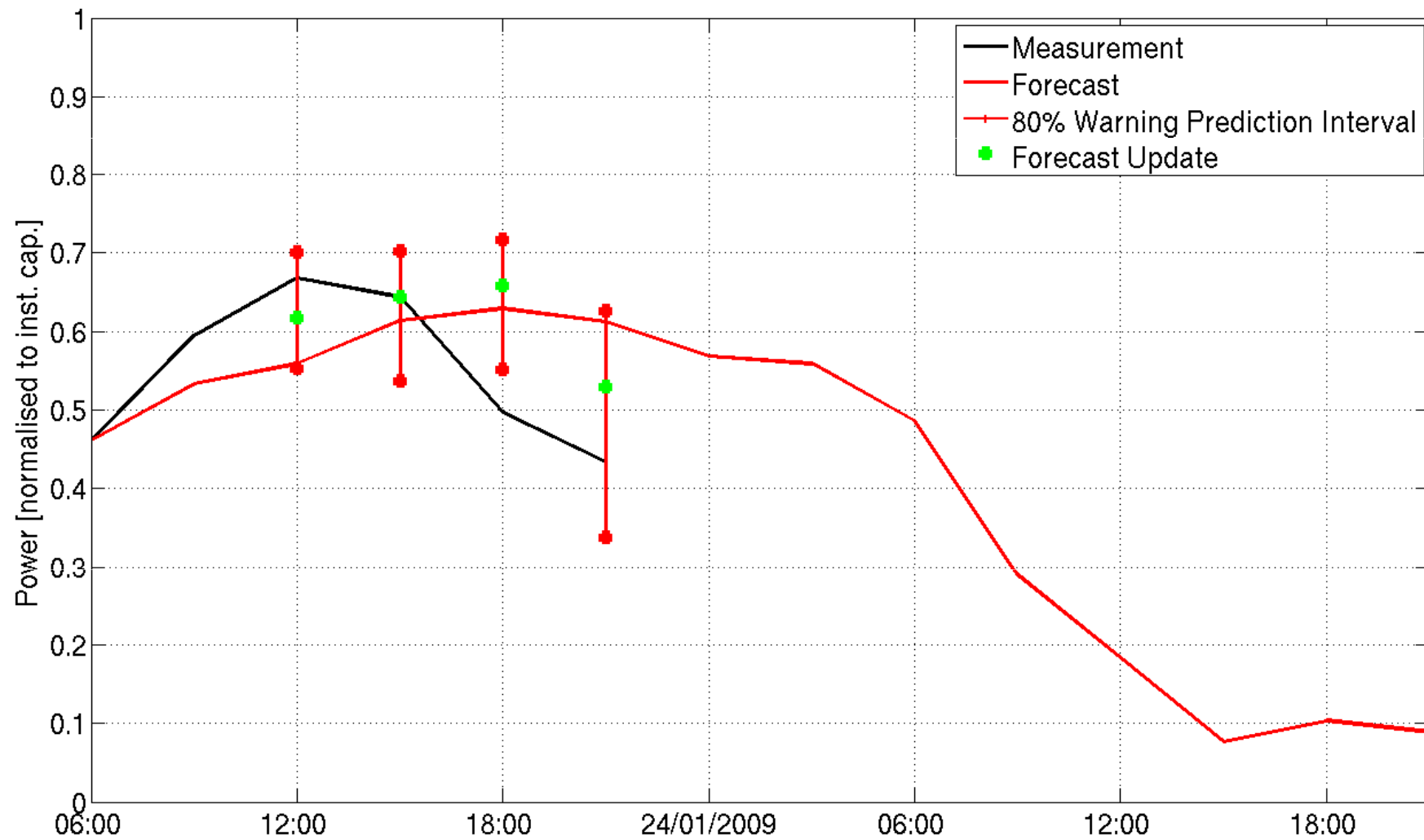
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



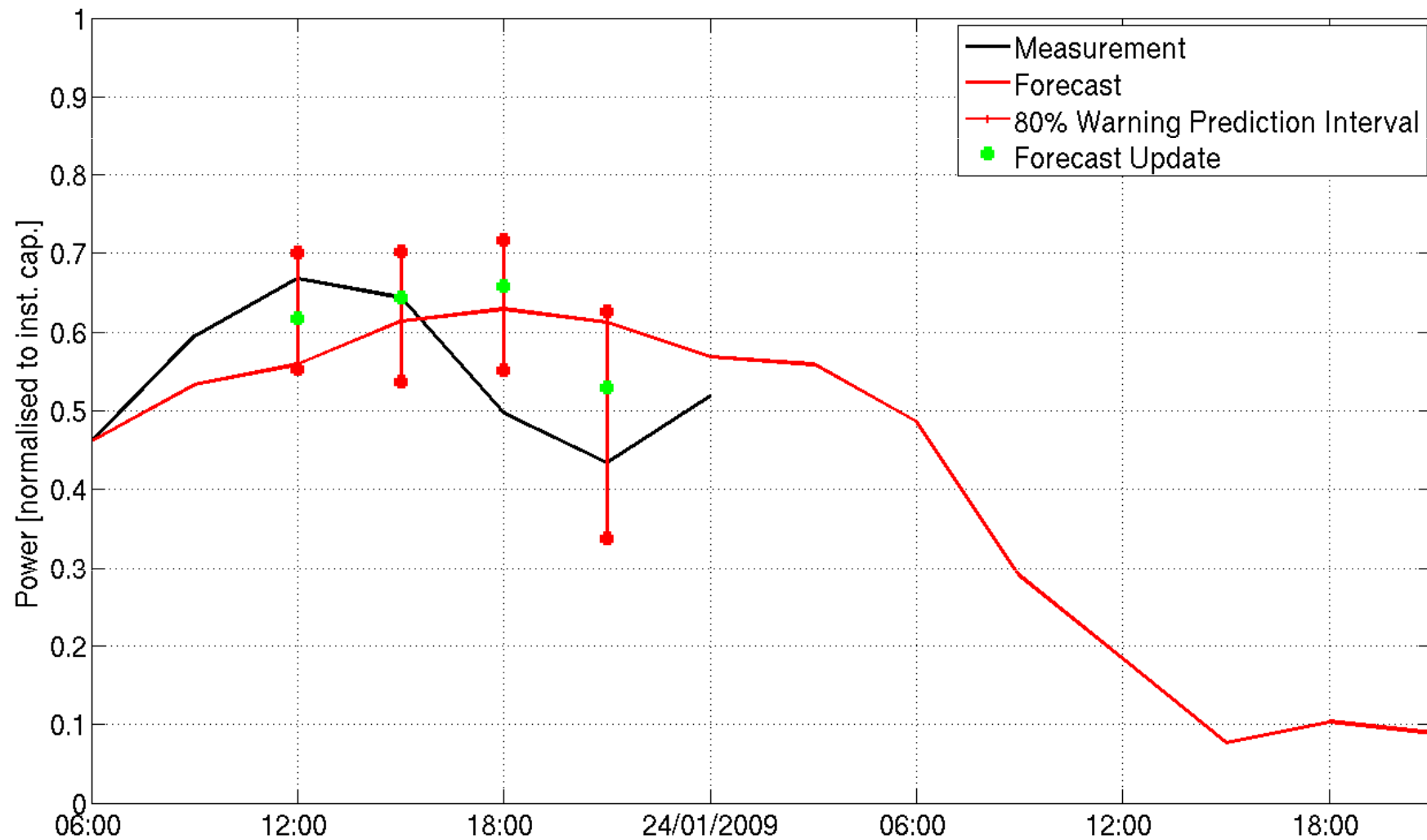
Time Series Example: 50Hertz TSO 23/1/20 00UTC



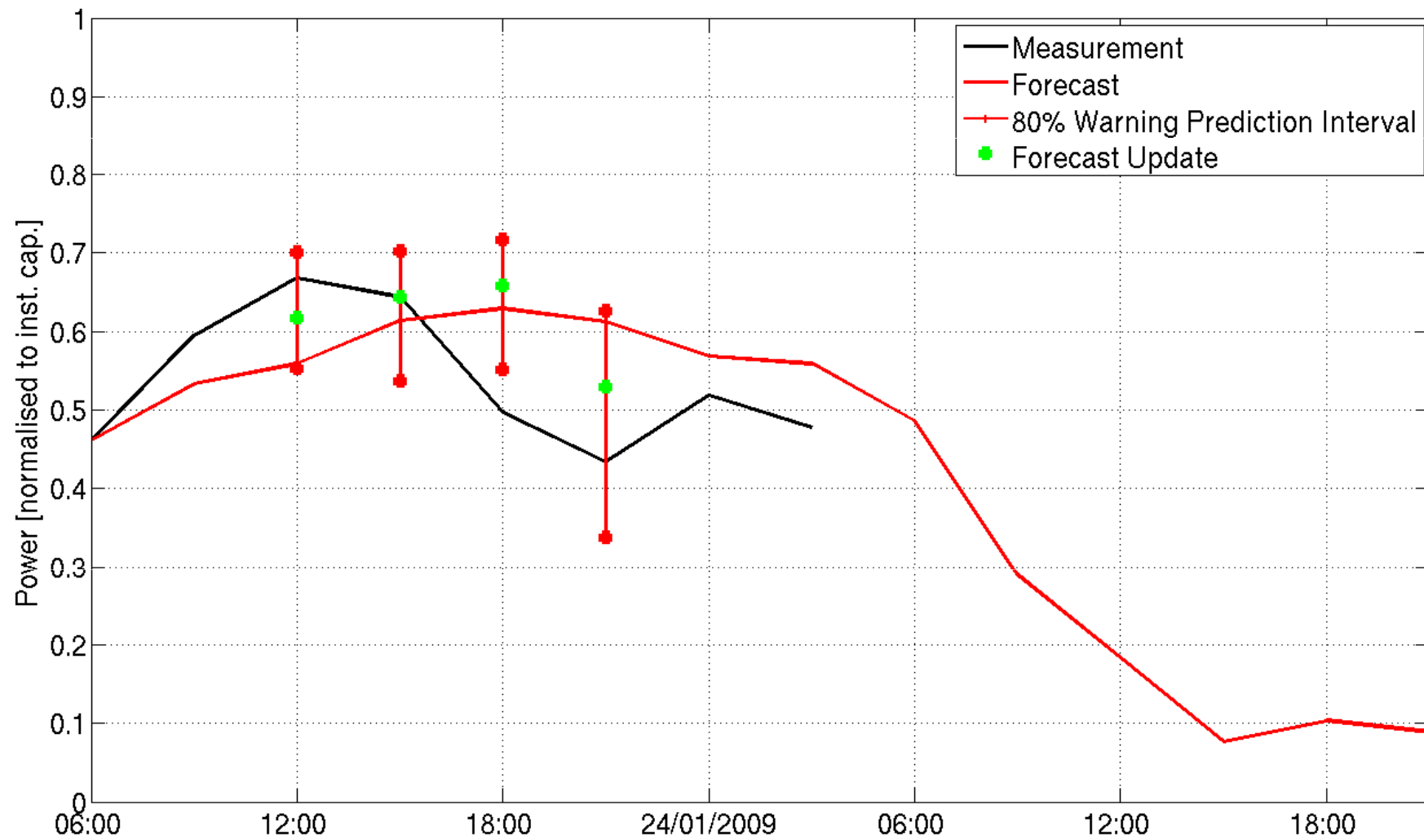
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



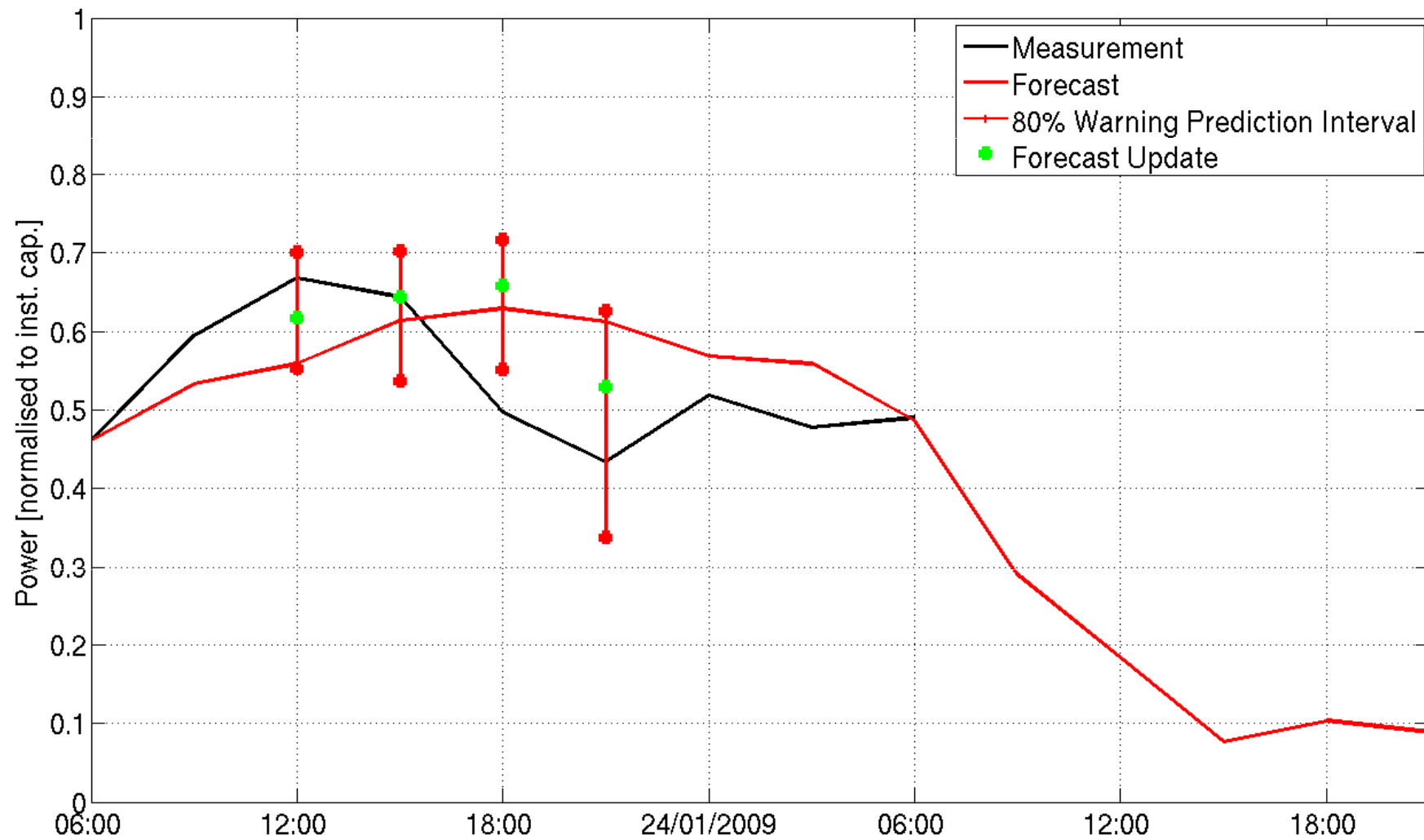
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



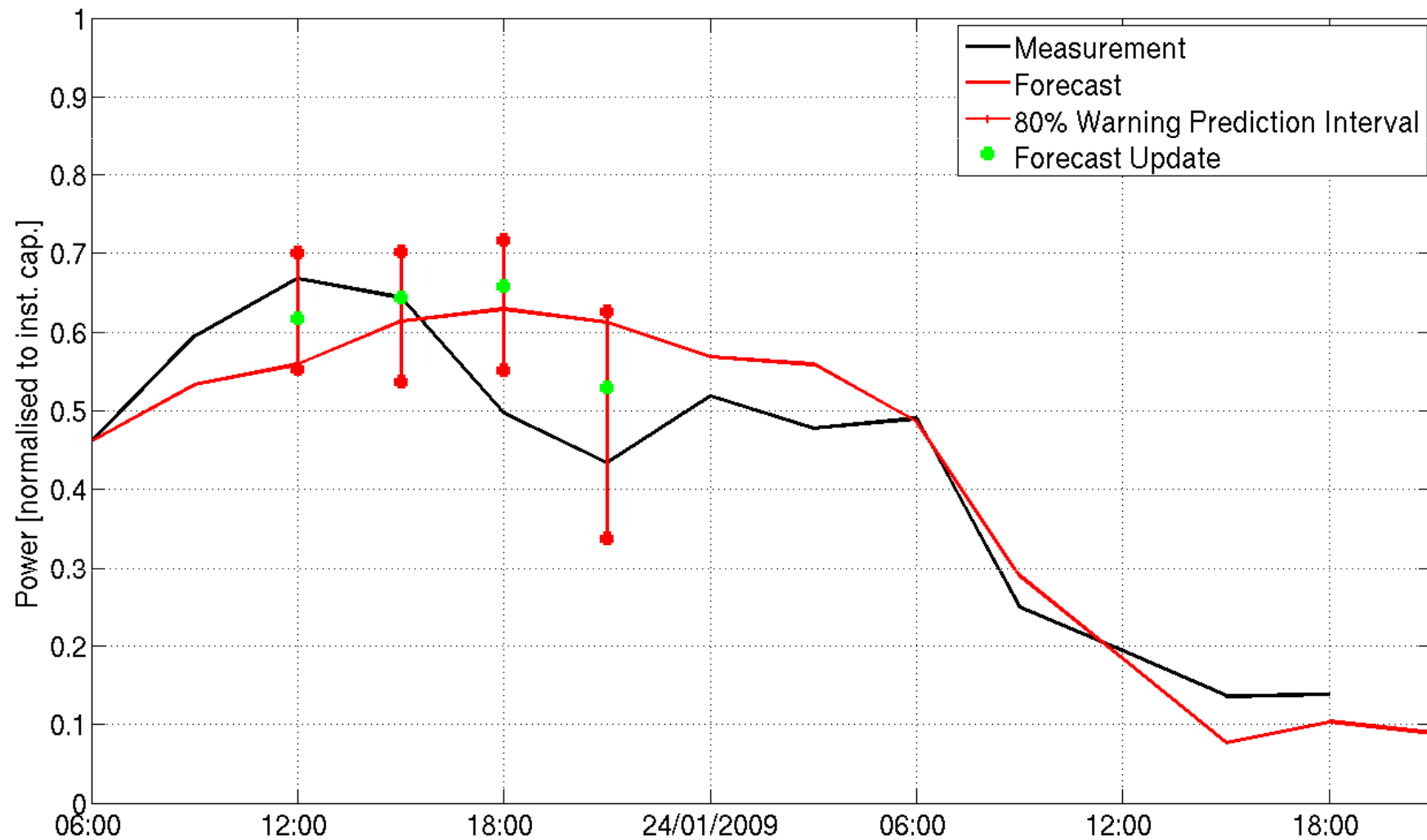
Time Series Example: 50Hertz TSO 23/1/2009 00UTC



Time Series Example: 50Hertz TSO 23/1/2009 00UTC

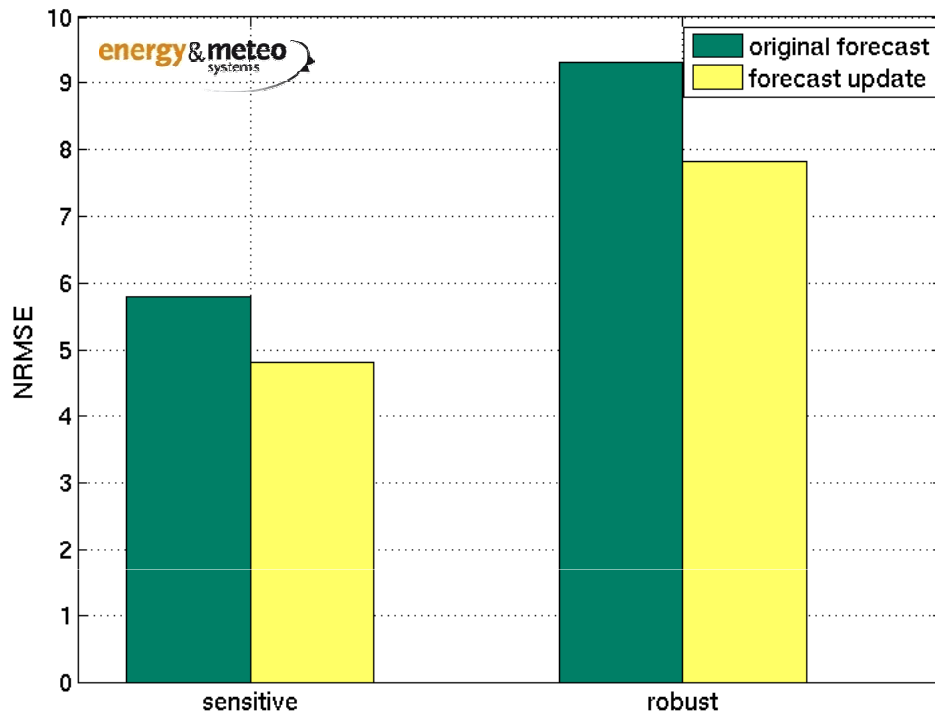


Time Series Example: 50Hertz TSO 23/1/2009 00UTC



Improvement by forecasting updates

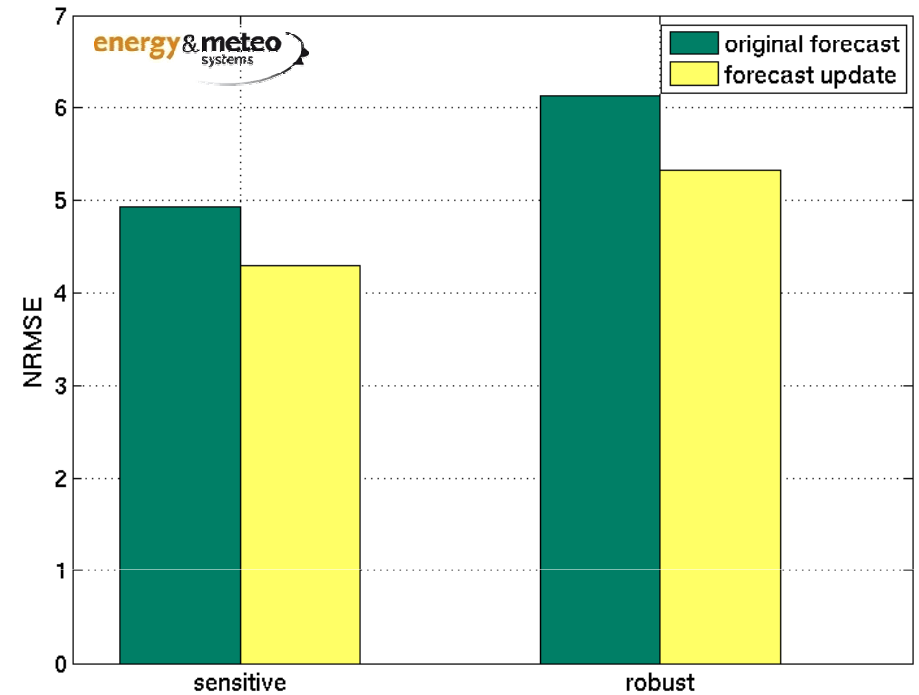
50Hertz TSO Germany



6% of situations

1% of situations

DK1 energinet.dk Denmark



6.5% of situations

1.3% of situations

„robust“ and „sensitive“ are different thresholds of warning level

Messages

- Basic idea: monitor large scale weather situation
- Detection of forecasting errors by comparing predicted and real weather situation at any time
- Warnings can be sent out to inform end-users at least 3 hours in advance
- 3h-updates of power predictions lead to significant improvements
- System works best in low pressure situations, fronts still challenging
- Data requirements are very high in terms of online-availability and quality

A photograph of a wind farm at sunset. The sky is a gradient of blue and orange. Several wind turbines are visible, with the one in the foreground being the largest and most prominent. The turbines are silhouetted against the bright sky.

Thanks for your attention !

www.energymeteo.com

Contact:

Dr. Matthias Lange

matthias.lange@energymeteo.com

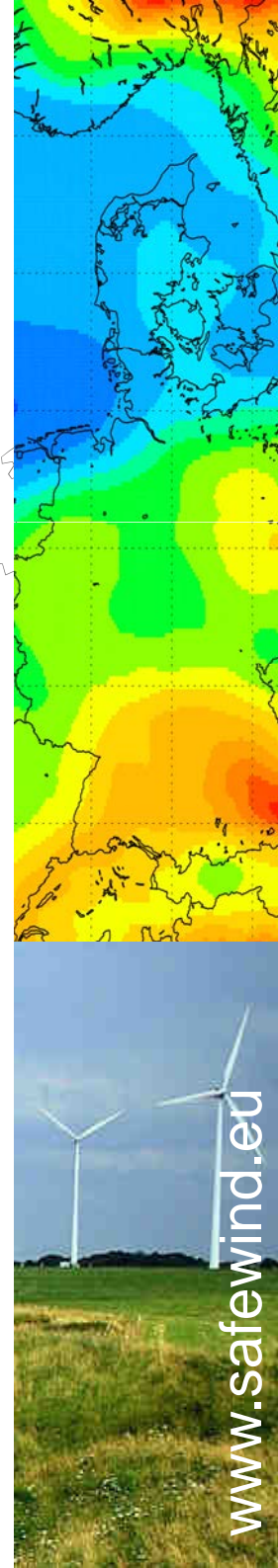


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Community research

Wind Power Forecasting with Focus on Extremes

SafeWind Project Final Workshop Paris, 31 August 2012



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