



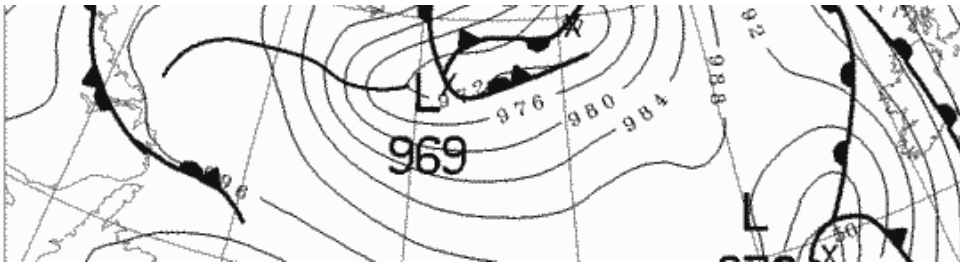
## The pilot phase from the emsys perspective

**Dr. Ulrich Focken**

Wind Power Forecasting Pilot Project Final Workshop

June 11th –12th, 2008

Calgary





## Black line of the presentation

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Feb 



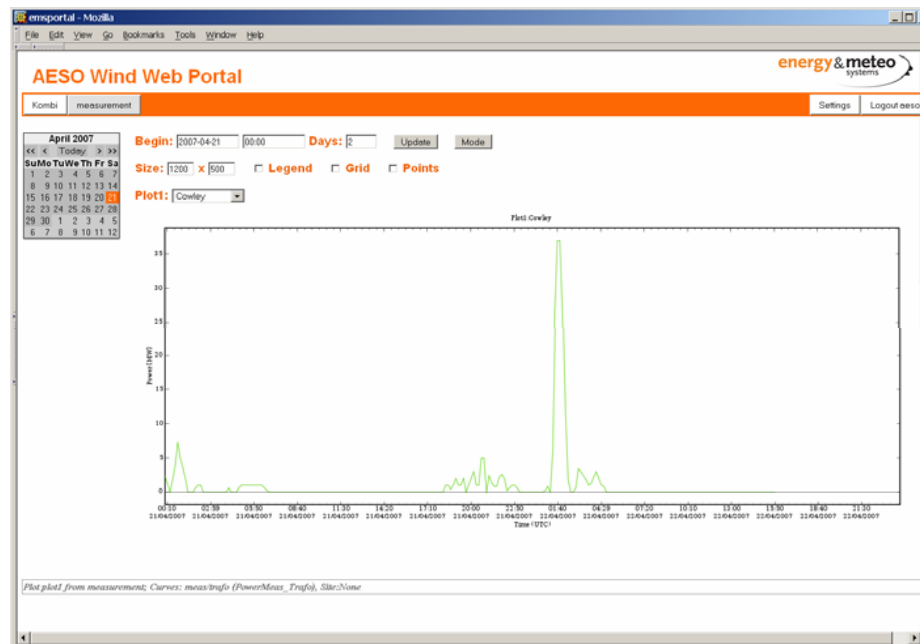
## General comments to the pilot project

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- Very good approach to learn about wind power forecasting
- Advantage of several methods / opinions to how process wind power forecasting
- Many fruitful discussions
- Some struggles with definition what should be the focus of the forecast pilot

# Start

- First view on feed-in behaviour was very impressive



2007



## Initialisation

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- Three month set up of forecast
  - NWP setup
  - Measurements
  - Tuning of models
  - Data flow
  
- 1. Mai start operational delivery



## Reach a stable system

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- First 4 month of operational forecast:  
Several challenges occur
  - New coordinates
  - Changing wind farms to forecast
  - New allocation of wind farms to regions
  - Format changes
  - etc.

Some setup errors occur

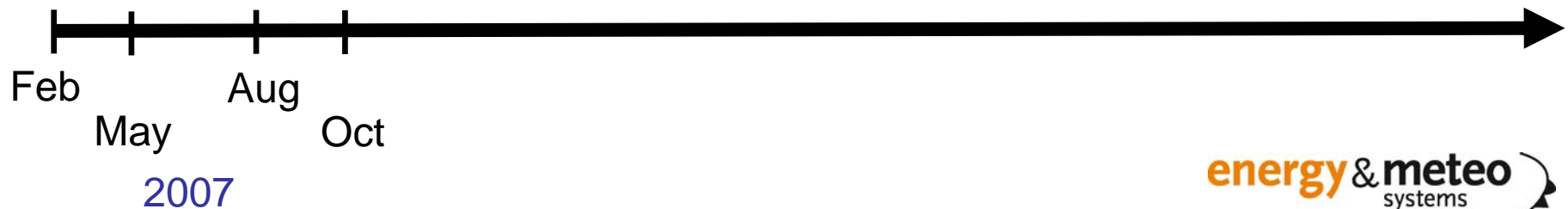
- error in upscaling routine for SW - Region



## Meteorological learning

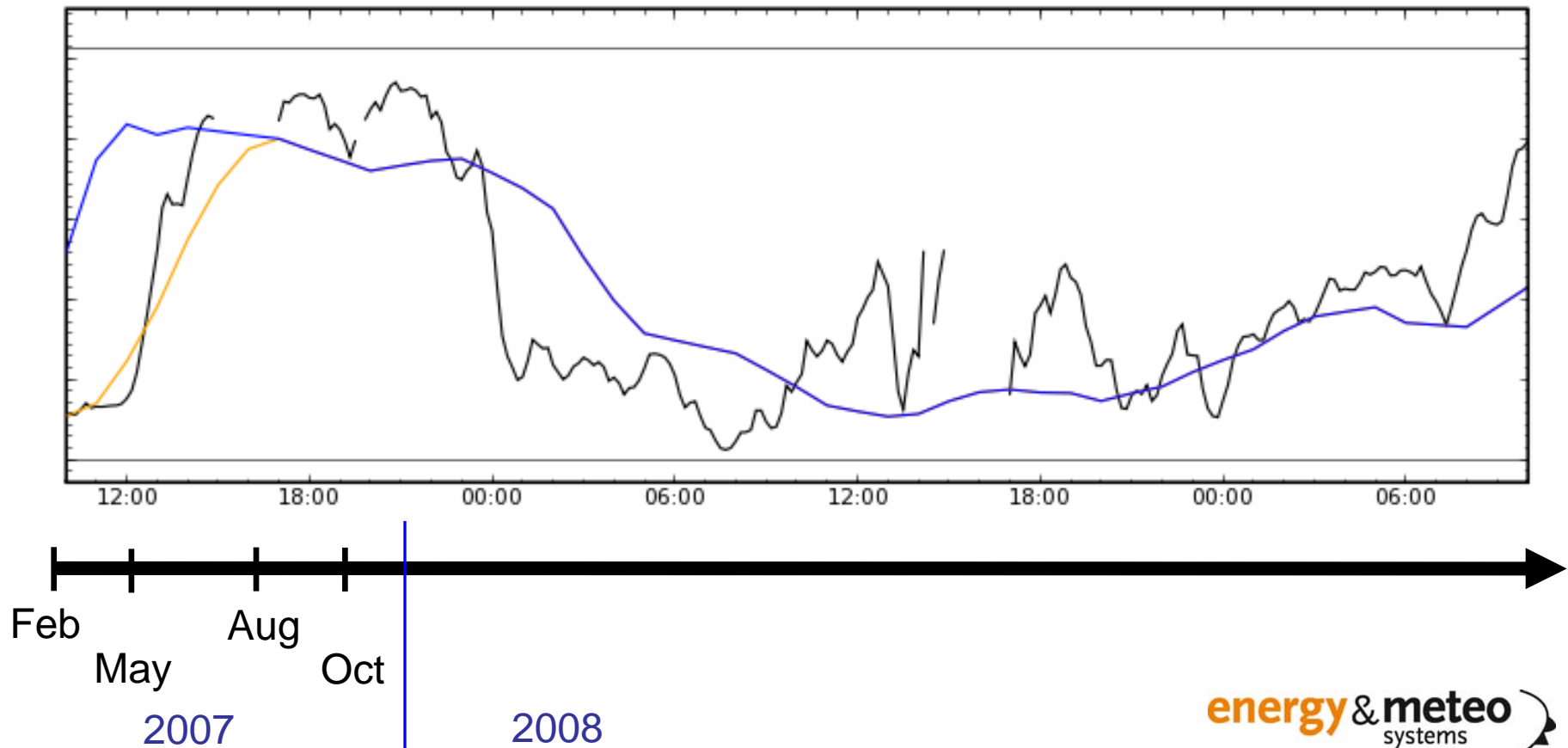
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- First 6 month of operational forecast: focus on understanding of meteorological situation as basis for good forecast for all prediction horizons



## Very short term forecast

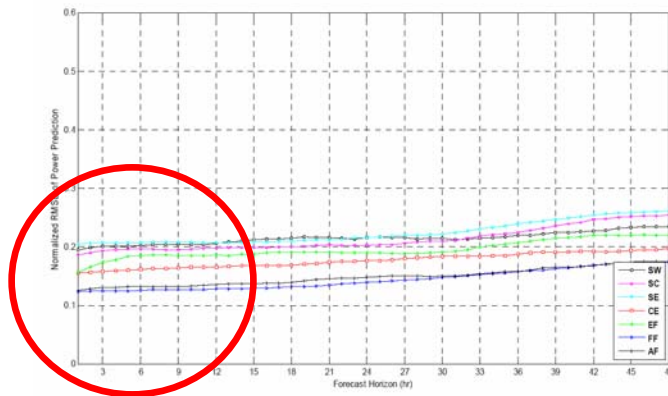
- Start very short term forecast after 6 month based on measurement data



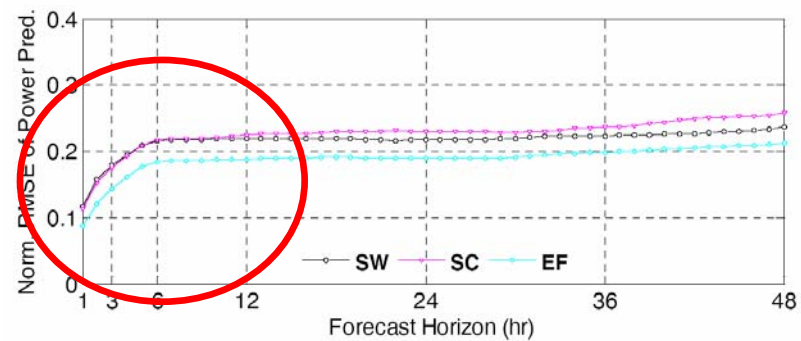
## Very short term forecast

- Start very short term forecast after 6 month based on measurement data

Aug - Oct



Nov - Jan



## Operational system

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- Nov 2007 – Apr 2008: operational forecast delivery without intialisation problems
- Provides reasonable idea about status of forecasting accuracy in Alberta.

Annual evaluation is very conservative as it includes all starting problems



## General findings

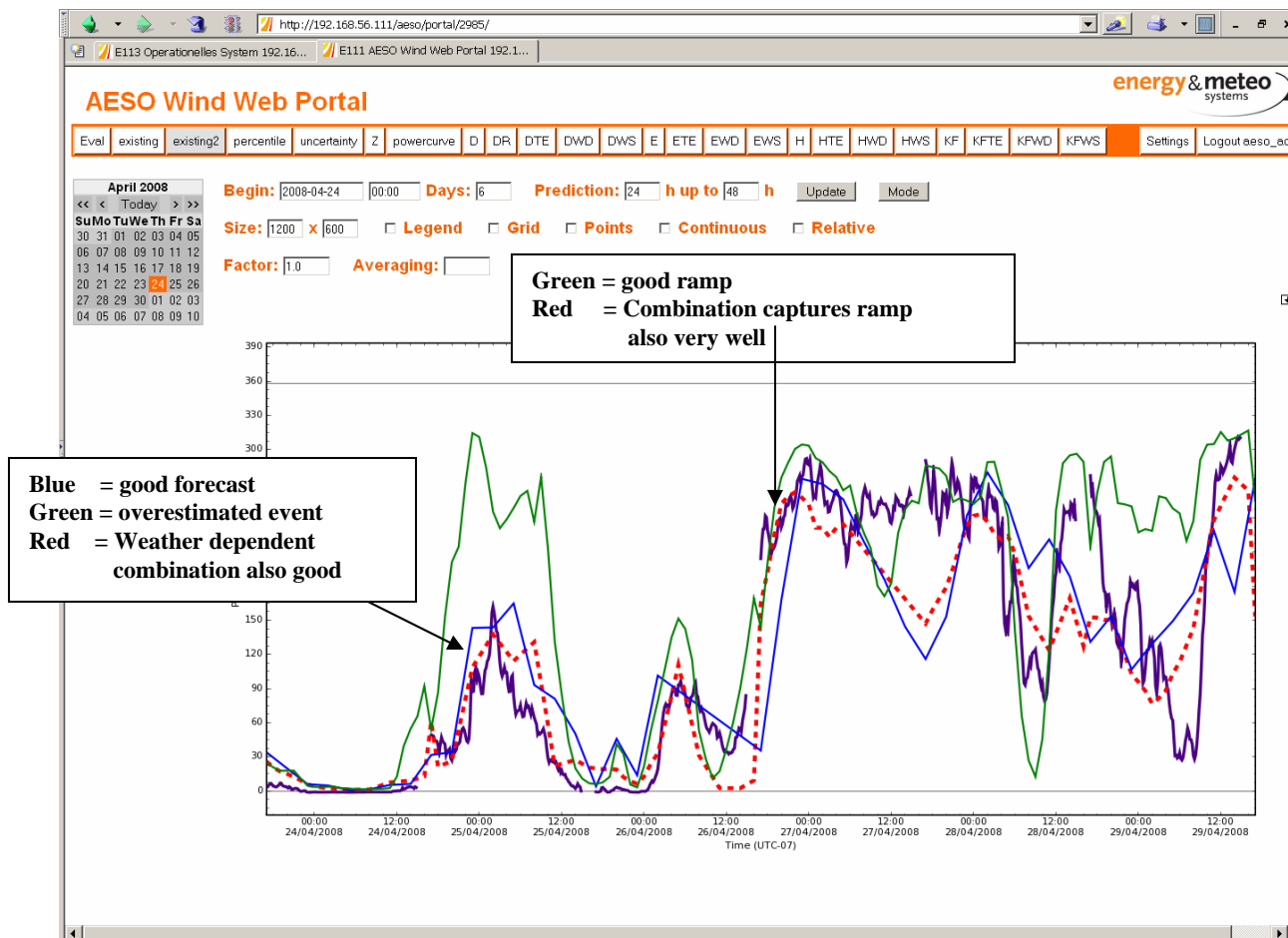
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- Very challenging from a forecaster perspective
- Existing methods are working well
- We did considerable efforts to tune our models



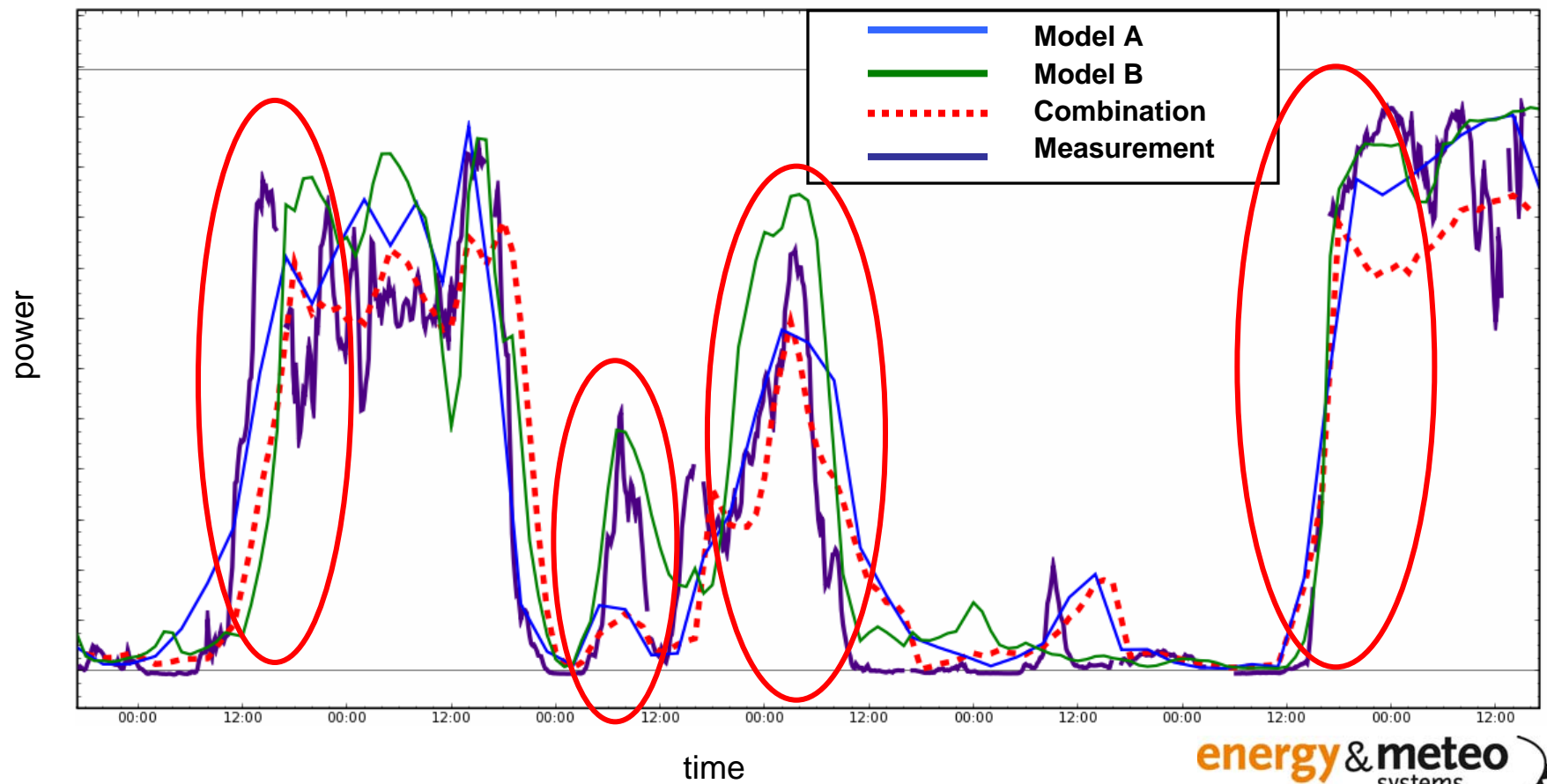
# Major error related to NWP input

- Selection of best NWP input and combination

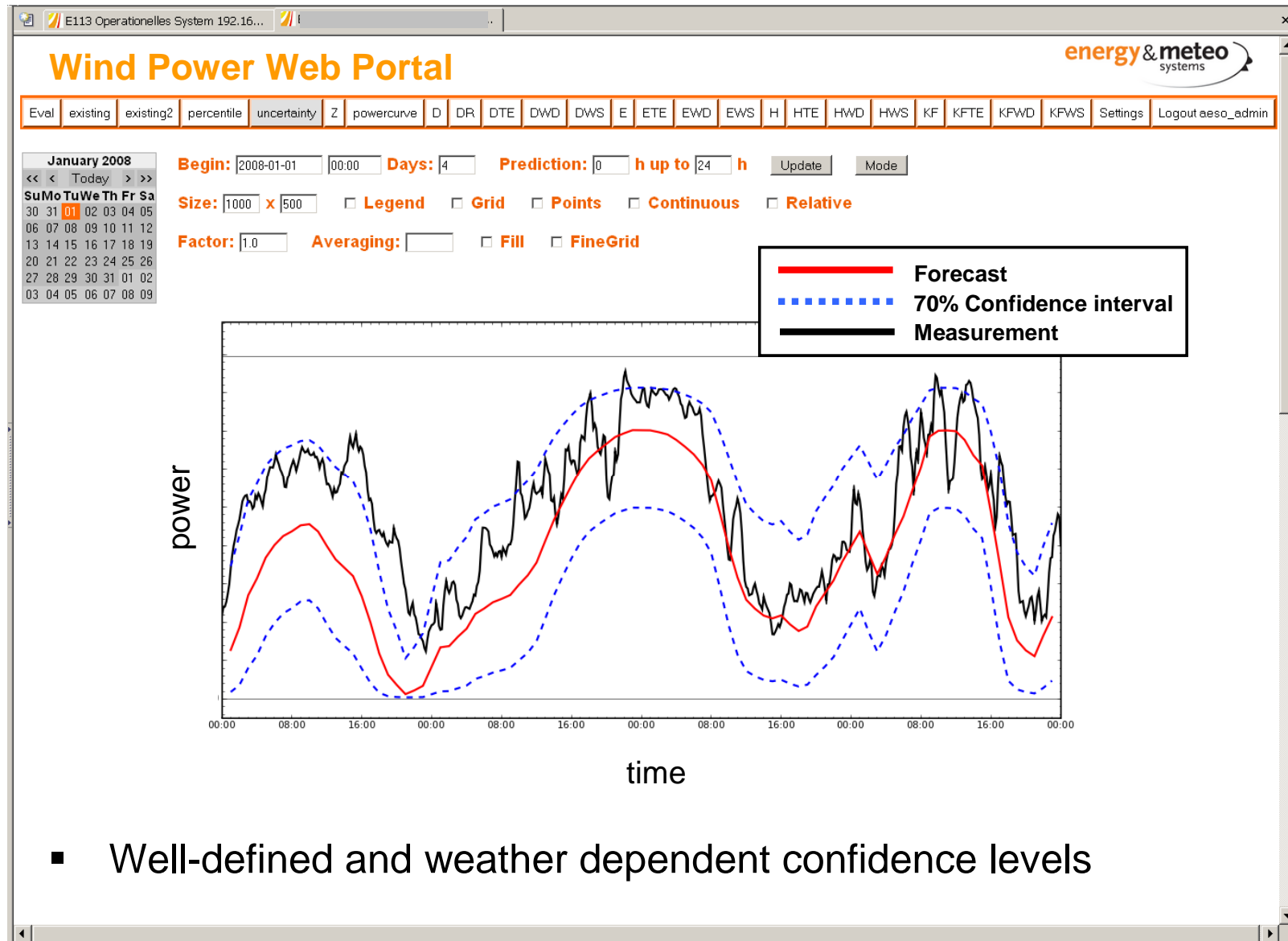


## Meteorological analysis of extreme events

- Tuning of combination model to capture ramps
- Ramps occur in different weather conditions



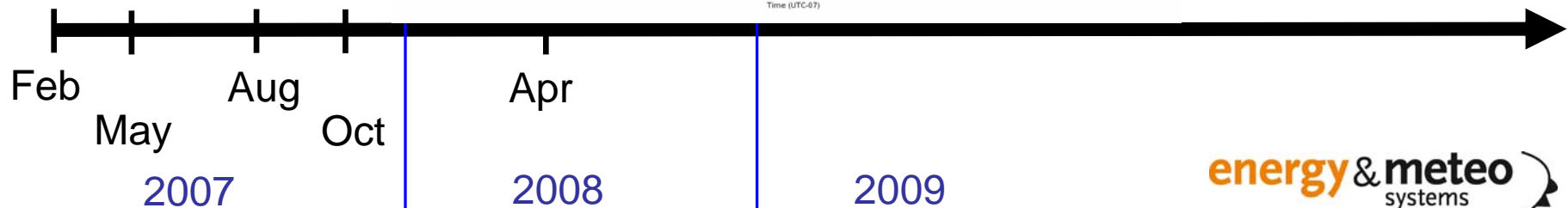
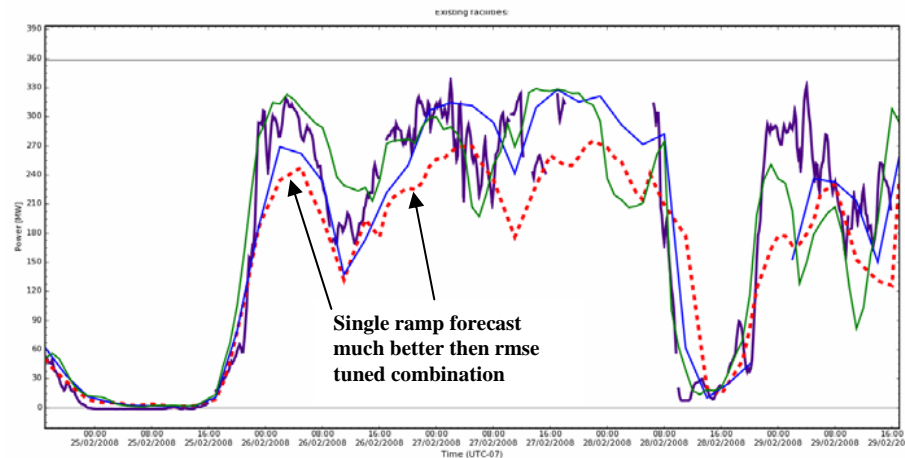
# Uncertainty of forecasts



## Areas for improvement – next steps

Short term forecast (10 to 72 h)

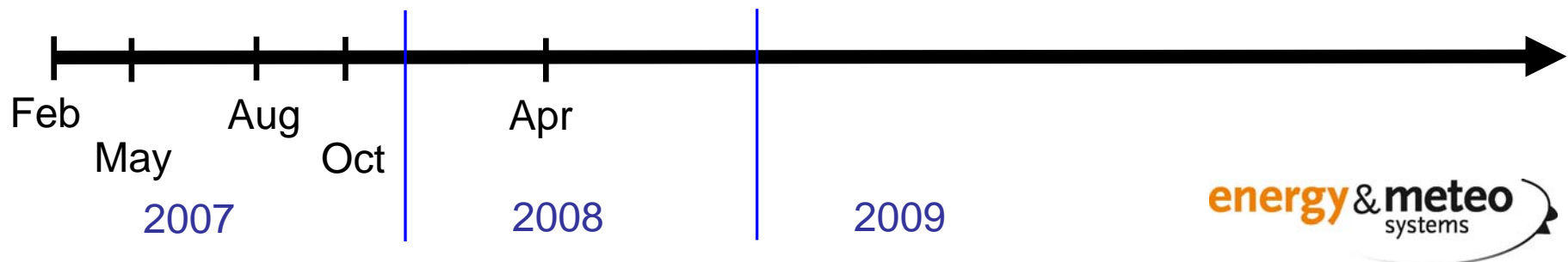
- Involvement of two or three extra NWP
- Advanced methods for high pressure situations
- Tuning to ramps /extreme events



## Areas for improvement – next steps

### Short term forecast (10 to 72 h)

- Involvement of two or three extra NWP
- Advanced methods for high pressure situations
- Tuning to ramps /extreme events
- More detailed training of methods (available data is more than enough for that)
  - Seasonal dependence of weather pattern
  - Extreme events that causes ramps
  - Enhancement of automatic weather classification



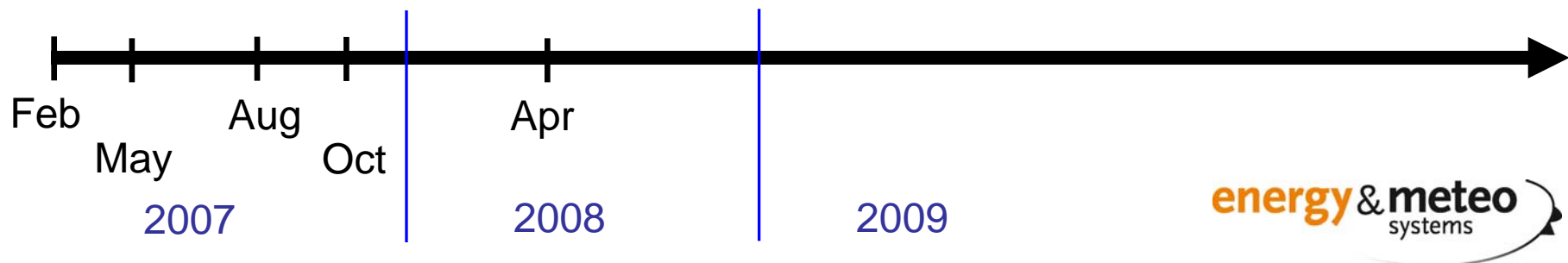


## Areas for improvement – next steps

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Very short term forecast (0 – 10 h)

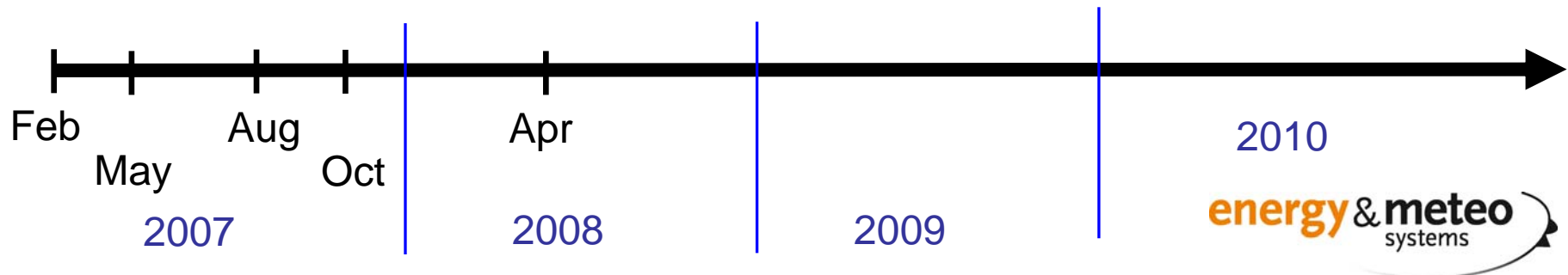
- Improved online information on wind farm availability
- Improved online availability of power measurement
- Enhancement of shortest term module



## Areas for improvement – long term perspective

Short term forecast (10 to 72 h)

- Cooperation with weather service to improve tuning of the NWP models to wind speed

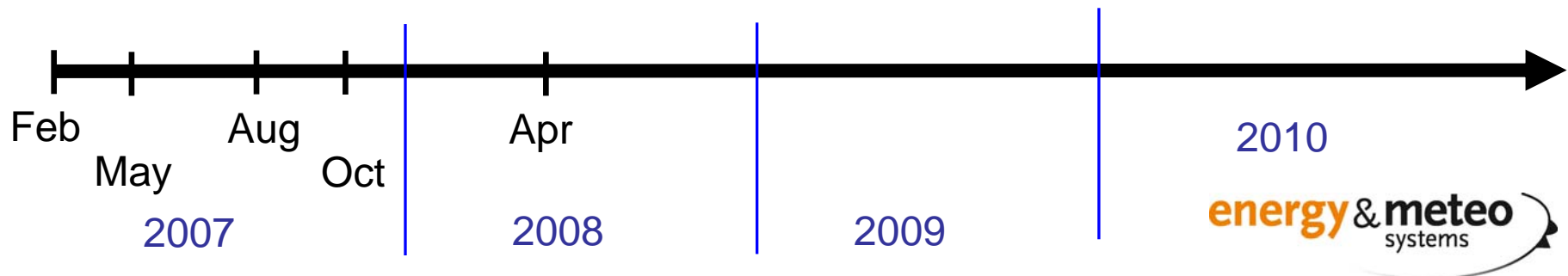


## Areas for improvement – long term perspective

Very short term forecast (0 – 10 h)

- Online assessment of the prevailing weather situation and correction of weather forecast
  - Other wind farm data
  - Data from synoptic weather stations
  - Wind measurement towers

See also „SafeWind“ project





## Technical requirements – general comment

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### Resource assessment versus forecasting

- The error of assessment is mainly caused by the error of the meteorological measurement
- The error of wind power forecasting is mainly caused by the error of the NWP forecast

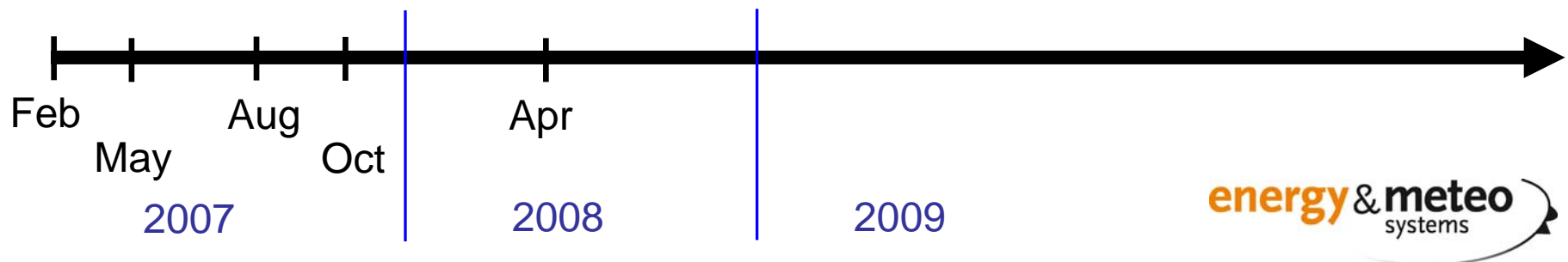
### Avoid data overkill

- Energy & meteo systems did not use any provided extra meteorological data so far for operational purpose
- The discussion and collection of meteorological data should not be the major focus.

## Data requirements for the next steps

Ranking of influence on accuracy:

- Very high availability of online power measurement
- Very high availability of turbine availability
- Online measurements of nacelle wind speed and direction
- Online maintenance schedule
- Existing meteorological measurements e.g. from the weather service
- Extra meteorological measurements from wind towers in main wind direction





**Alberta is standing for a market ...**  
.....

... also for wind power forecasting !

**The best stimulation for improvement is the  
competition of several forecaster !**

**Thanks for your attention !**

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