The Energy Markets

Use and interpretation of medium to extended range products

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drs. Stefan Meulemans, MSc

Sempra Energy Europe Ltd.

London

smeulemans@sempracommodities.com

- Major global player in metals, polymers, gas, oil and electricity markets
- Offices in New York, London, Houston, San Diego, Singapore, Geneva, Calgary and Toronto

Sempra Energy Europe Ltd.

- Speculative trading on gas, oil and electricity markets
- Using information to anticipate market moves
- Weather major fundamental

Energy markets

- Assessing the supply and demand of the main energy sources
- Determining a price based on all available fundamentals
- Often volatile markets compared with traditional markets

Futures and forwards

- Day ahead (EC)
- Week ahead (EC)
- Month Ahead (EC)
- Cal ahead

Supply and demand

- Supply and demand determine the forward electricity prices
- Traded contracts are day-ahead, week-ahead, month-ahead etc.
- Supply: wind and hydro
- Demand: temperature important

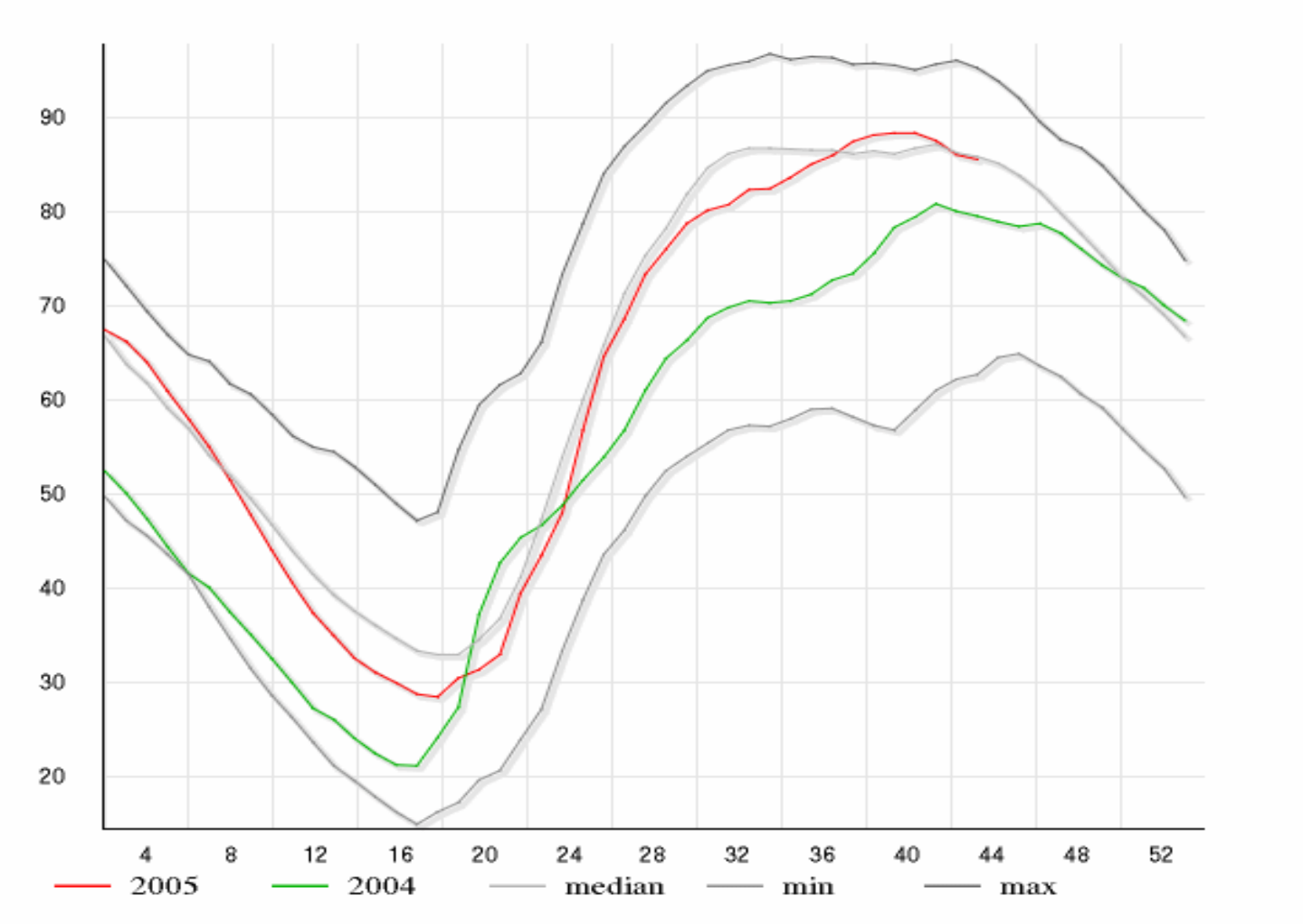
Nordic markets

- Weather crucial due to very high hydro capacity
- Market very dependent on ECMWF model

Hydro

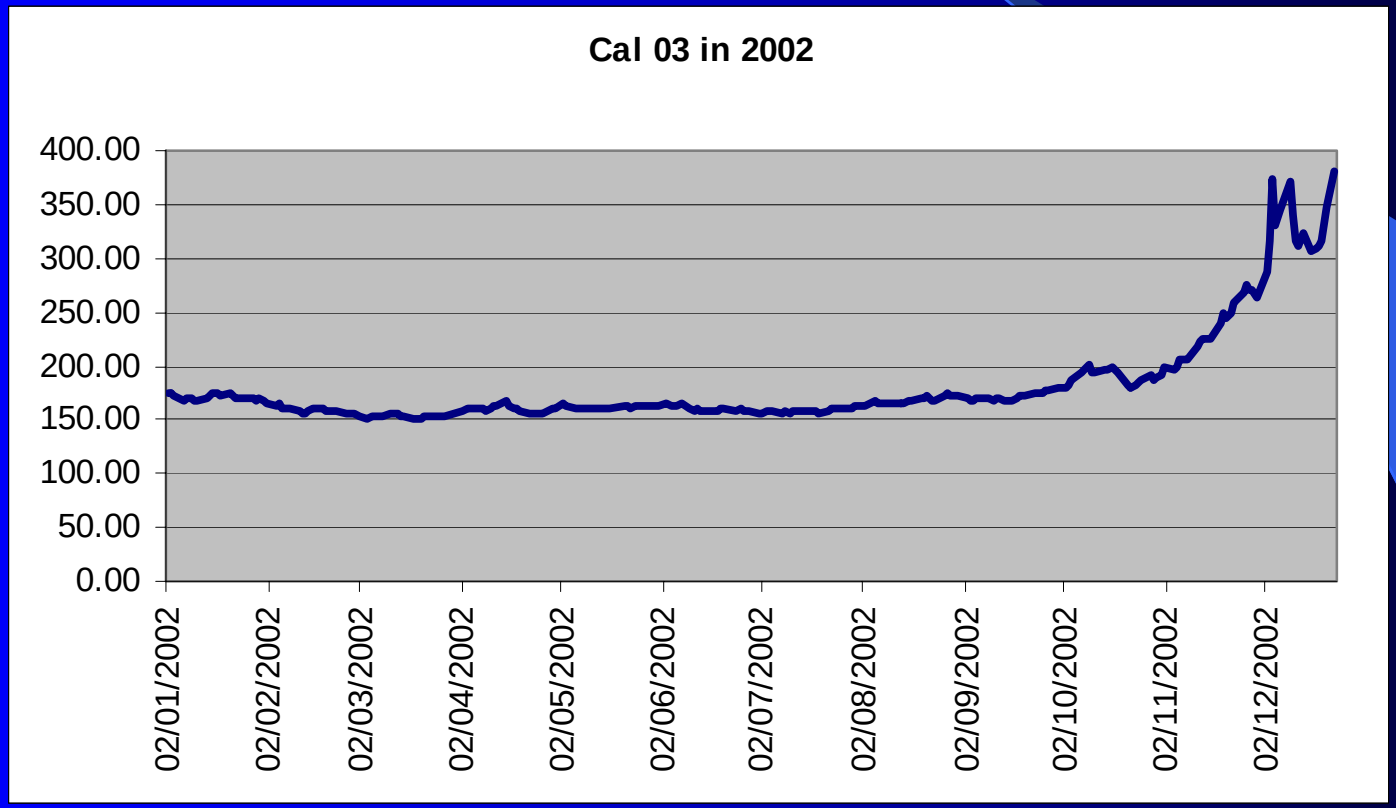
- ECMWF forecasts have to be transposed into a precipitation energy forecast
- We also need an estimate of the snow cover and the expected melt, based on the temperature
- Alps, Pyrenees and Scandinavia

Hydro Reservoirs Scandinavia

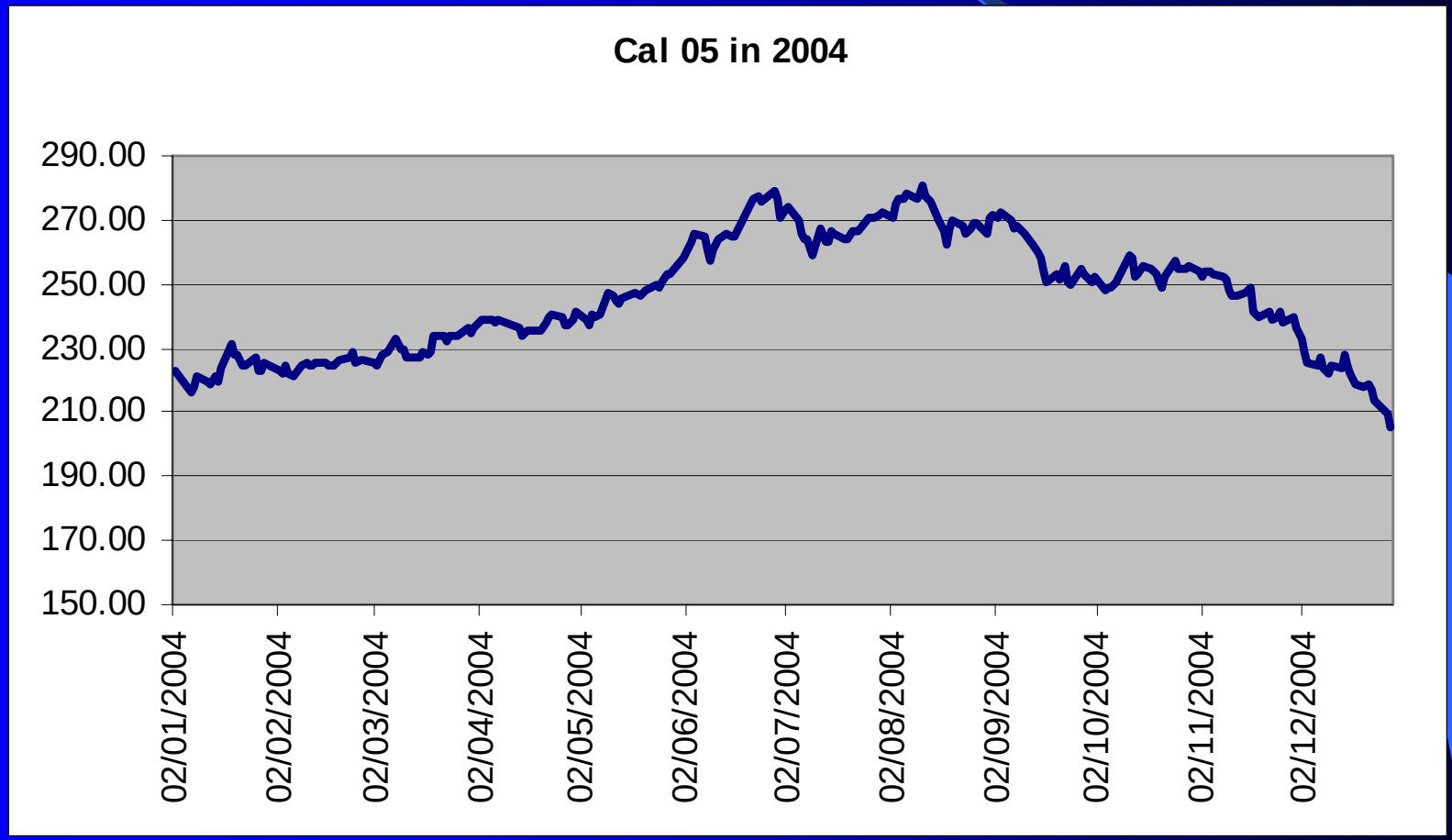


Example Q106 Nord Pool

Dry weather in Nordic…



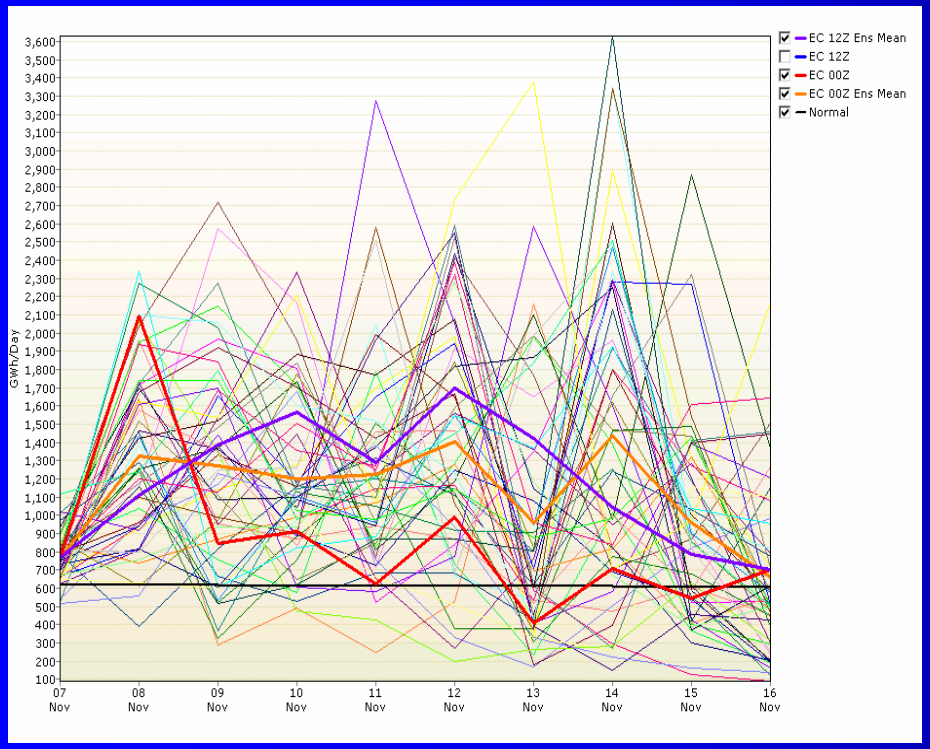
Wet weather in Nordic…

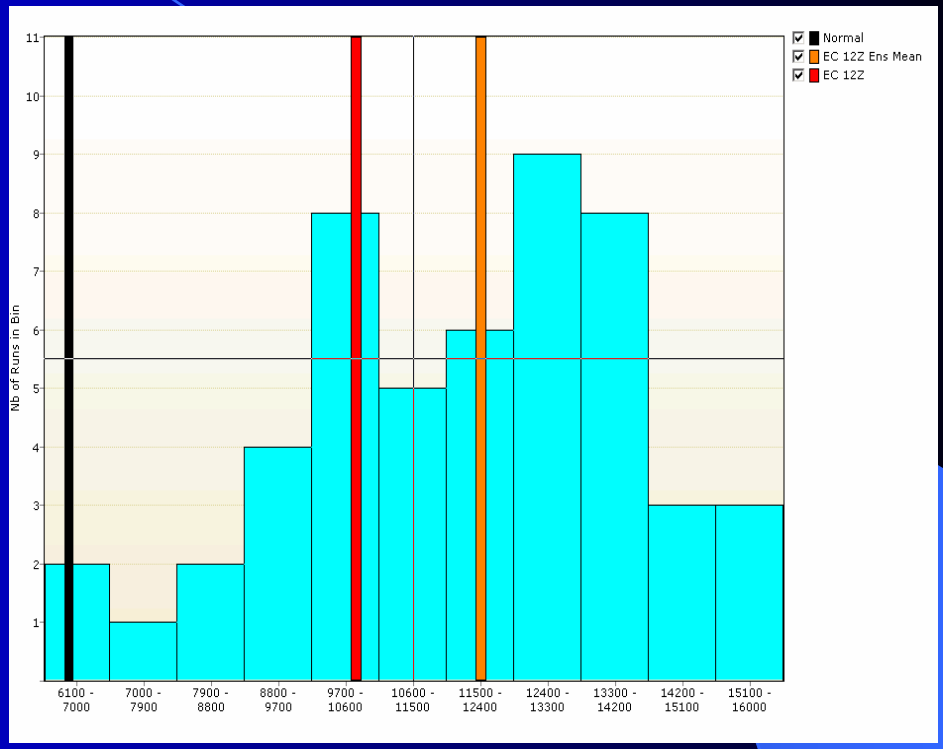


ECMWF Nord Pool

- Data is directly given in GWh. One run moves the market. Ensemble very important.
- Countries around Pyrenees and Alps only influenced by major hydro events, as wind and non-renewable power production is more widely used

Example Point Carbon



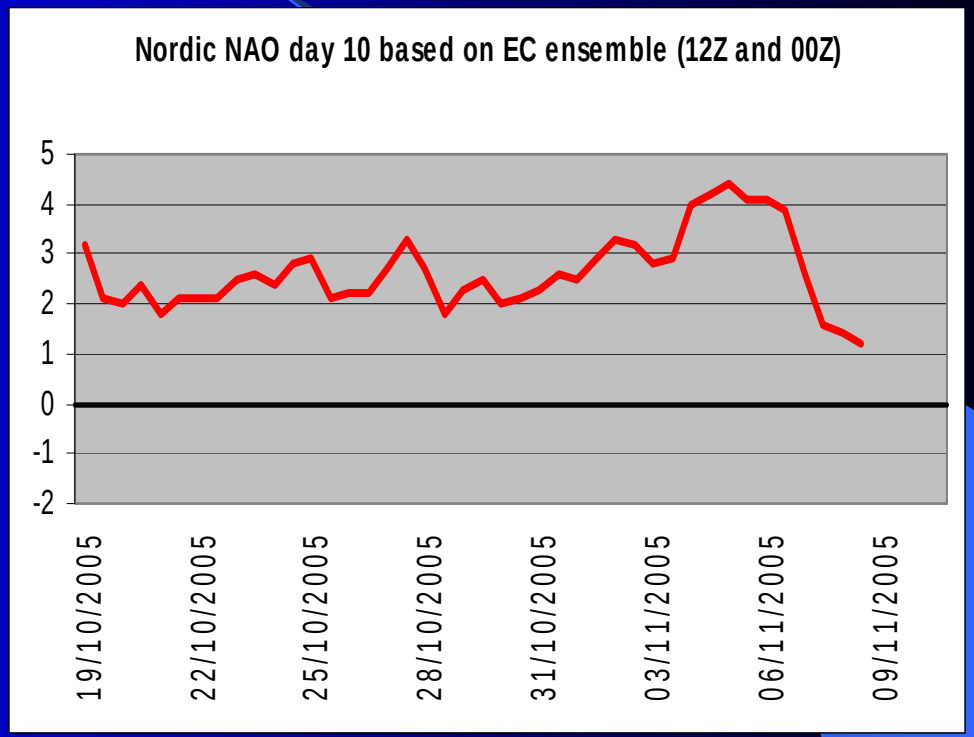


Precipitation energy and date

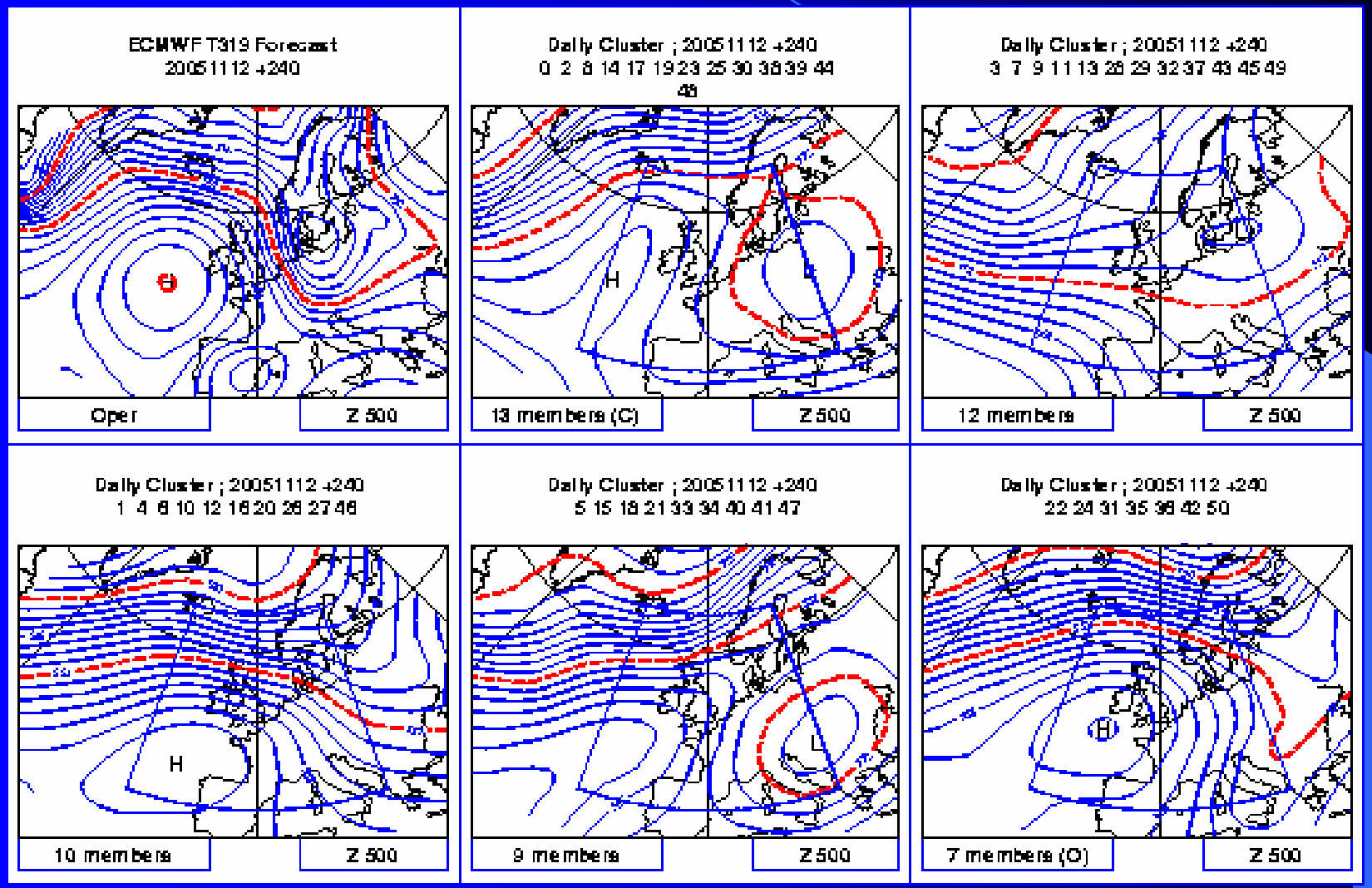
Histogram precipitation energy total

NAO outlook

- Development of Nordic NAO
- ECMWF data day 10 or beyond to calculate the NAO
- Current NAO value known, so not of interest



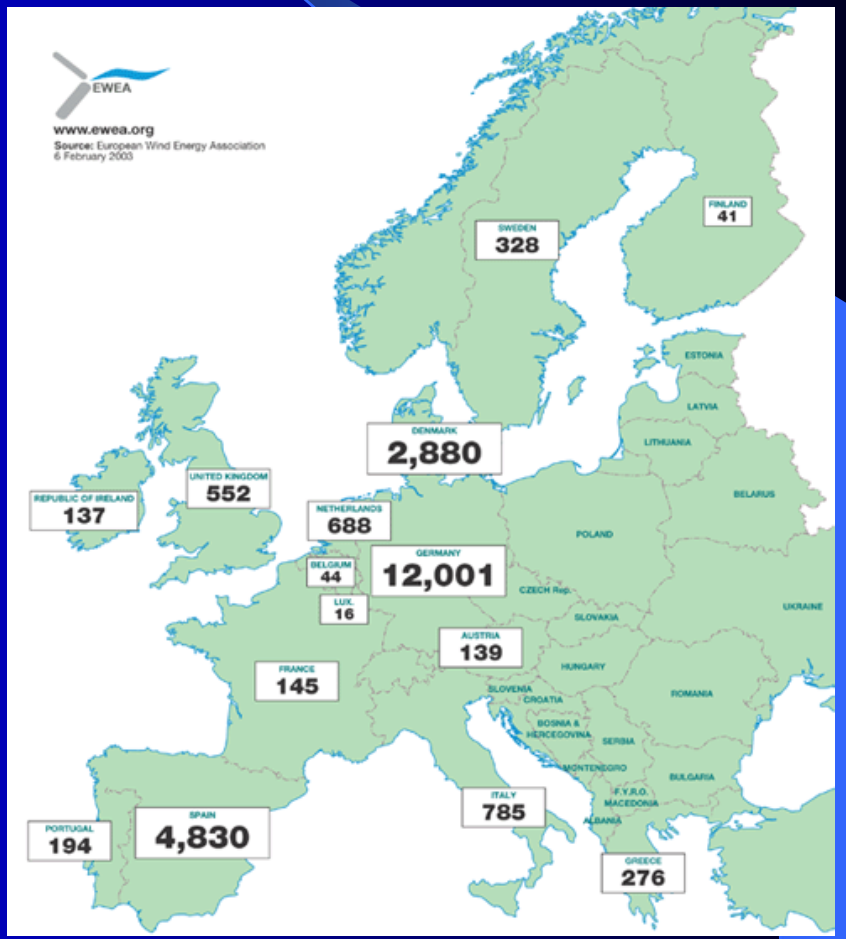
ECMWF cluster outlook



Wind

- Short range deterministic – storms!
- Mid range ensemble ECMWF

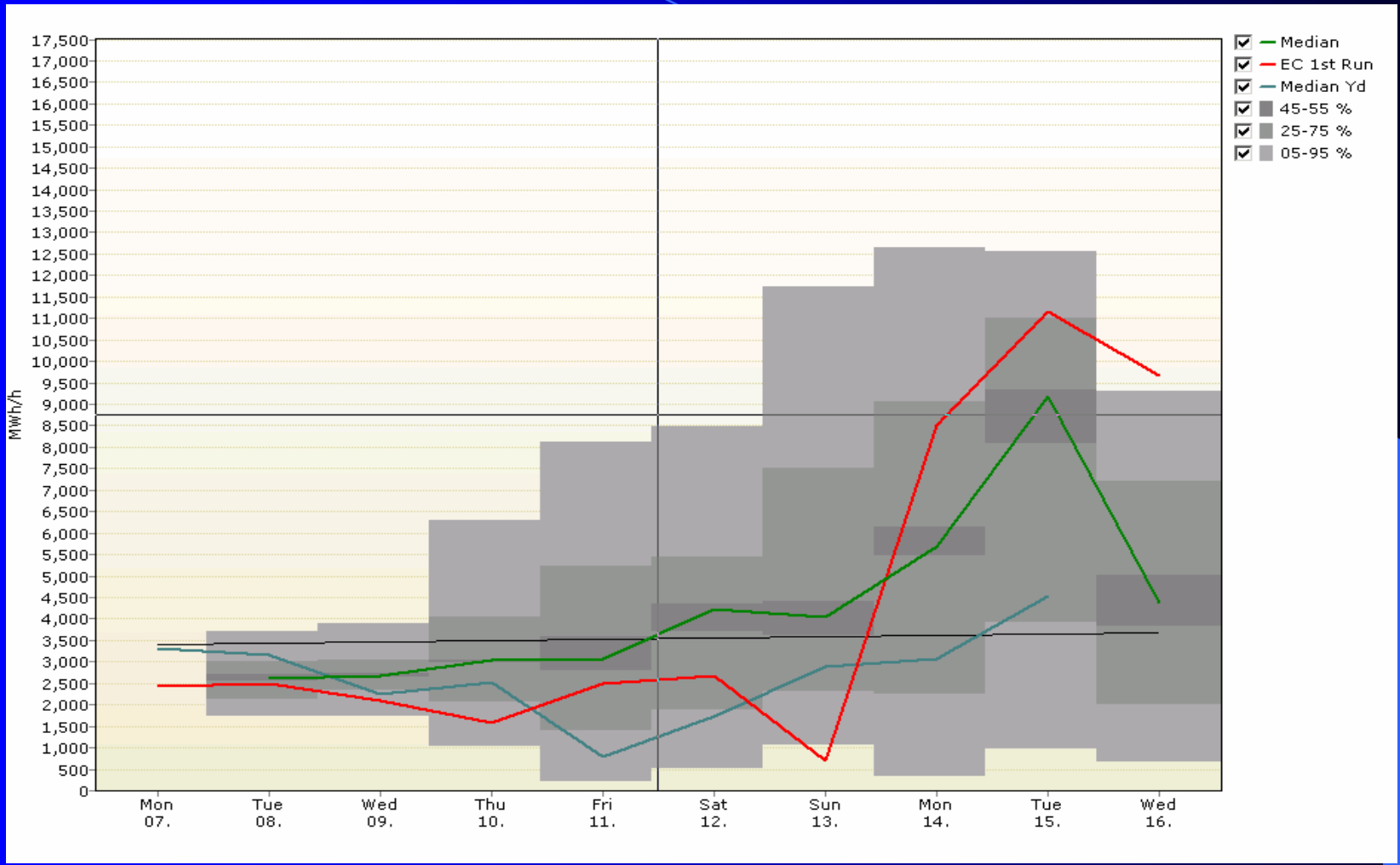
Installed wind capacity



Wind production forecasts

- Short term models for day-ahead wind production. Error should be low.
- First days deterministic ECMWF model
- Further ahead ensemble ECMWF
- Probabilistic wind forecast?
- Germany, Denmark and Spain
- Unit MWh/h

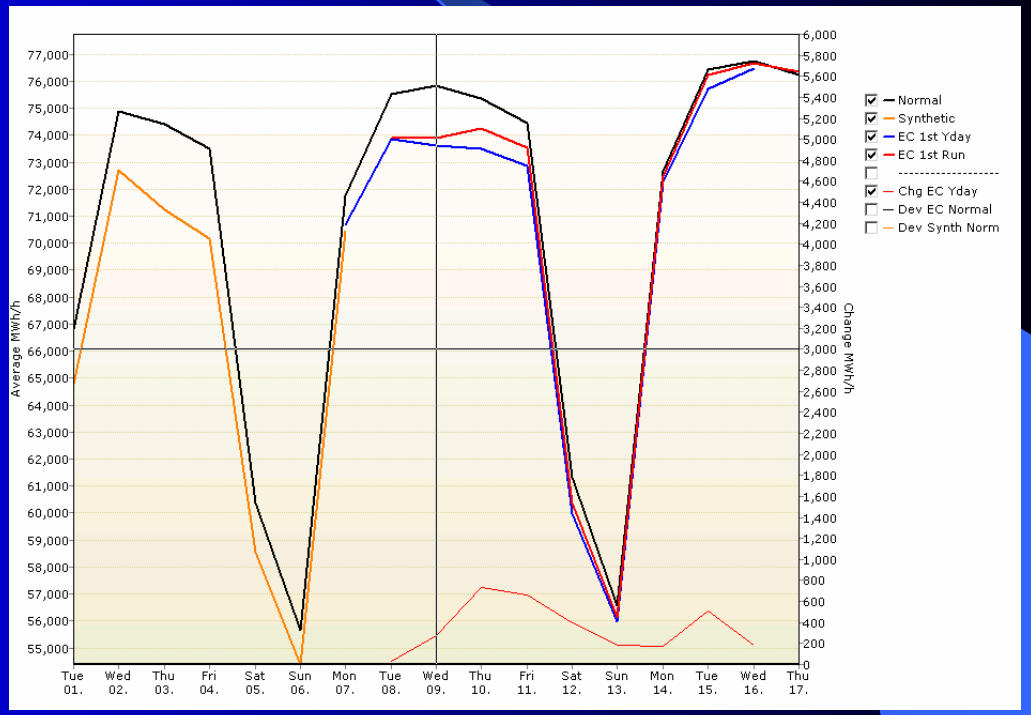
Example Point Carbon



Wind production in MWh and date

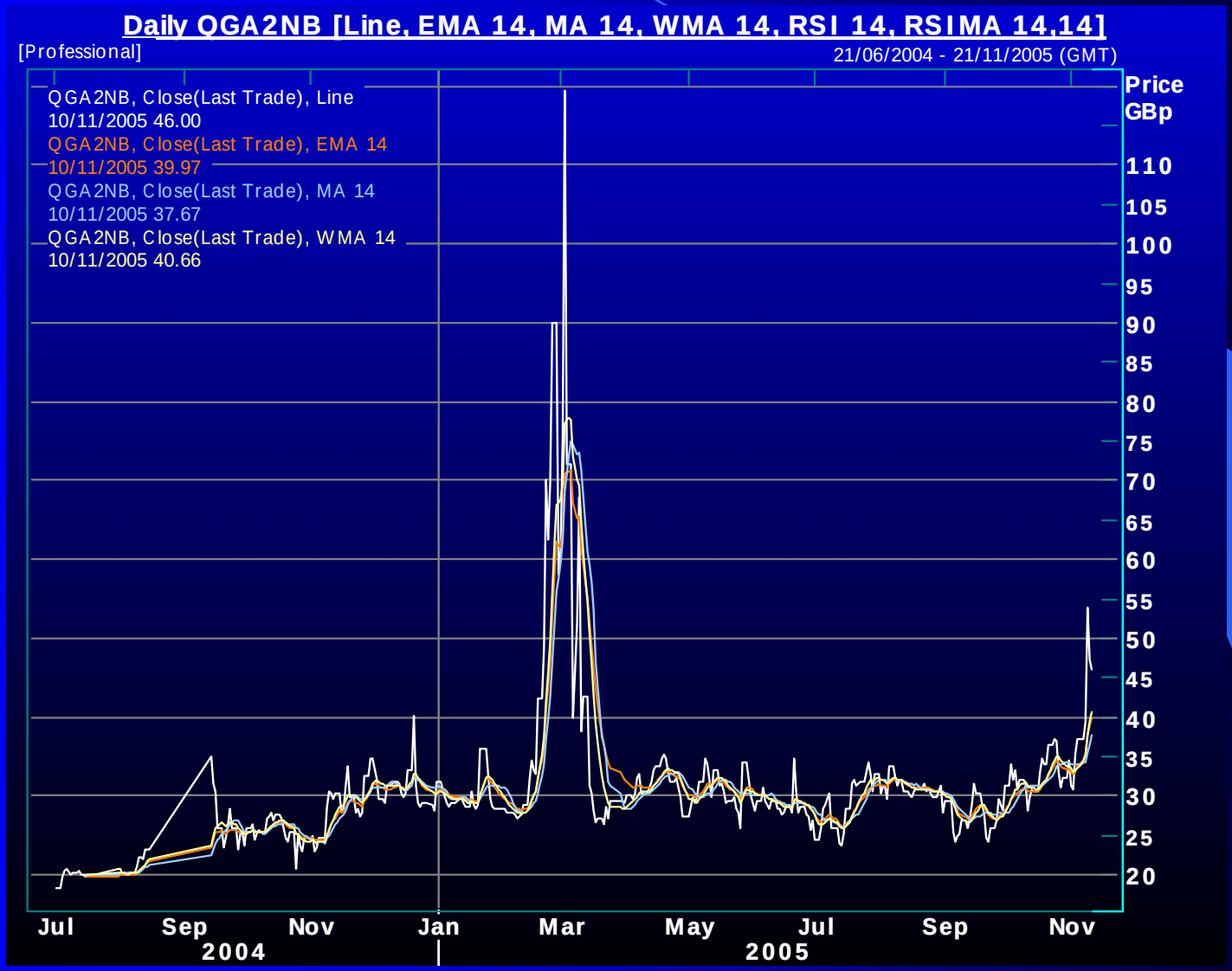
Temperature

- Very well correlated to heating and cooling demand
- Water temperature forecasts with ECMWF data
- Development of demand outlooks



Point Carbon example

Cold spell and NBP gas

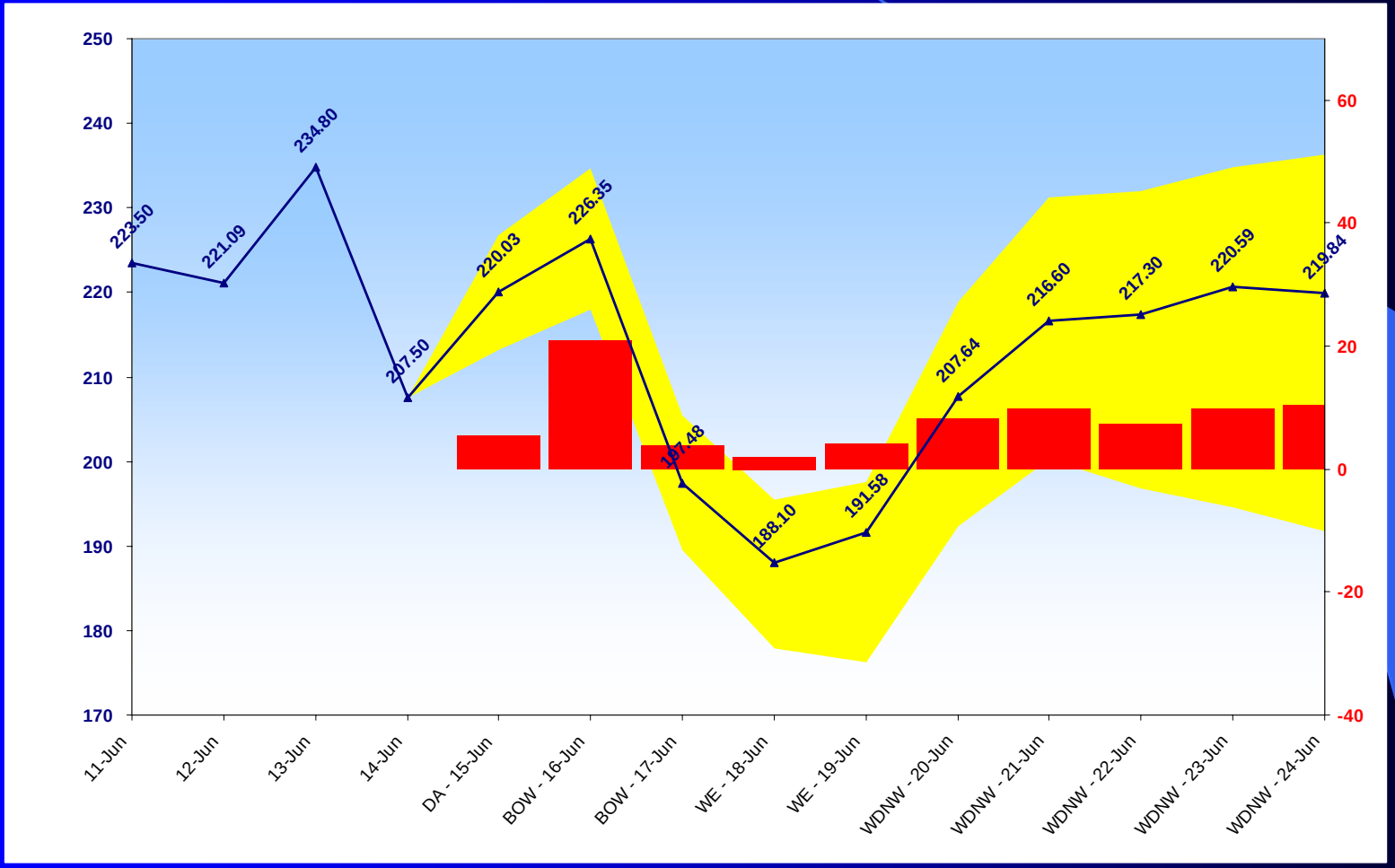


Day ahead German electricity

Demand models

- Main variable temperature
- Demand industry and basic load
- Day of the week and holidays
- In case of electricity hourly load calculation

Sempra's gas model



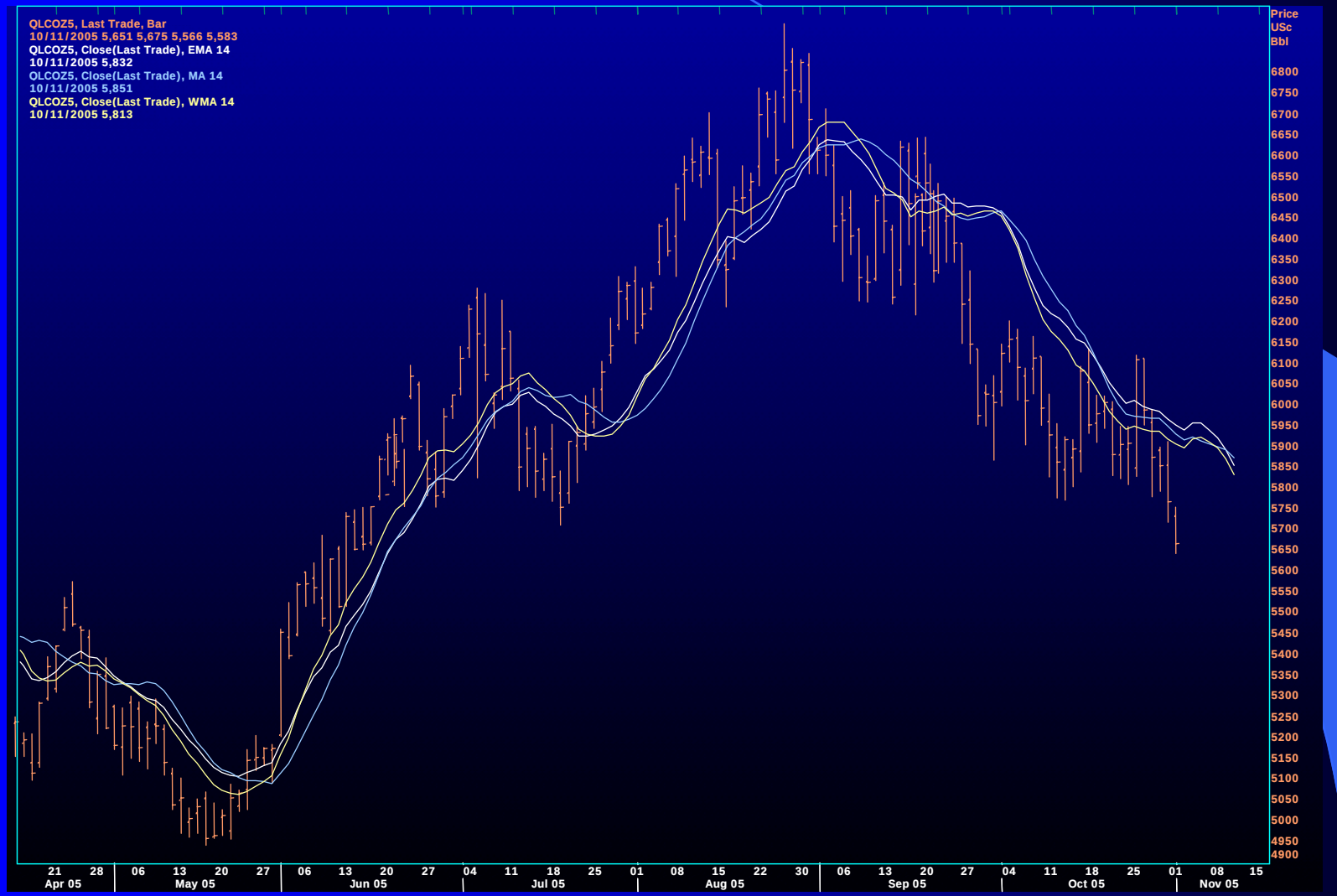
Oil markets

- ECMWF tropical model. New hurricane track forecast immediately moves the market.
- Weekly inventories oil and natural gas make the market move. Weather data important.

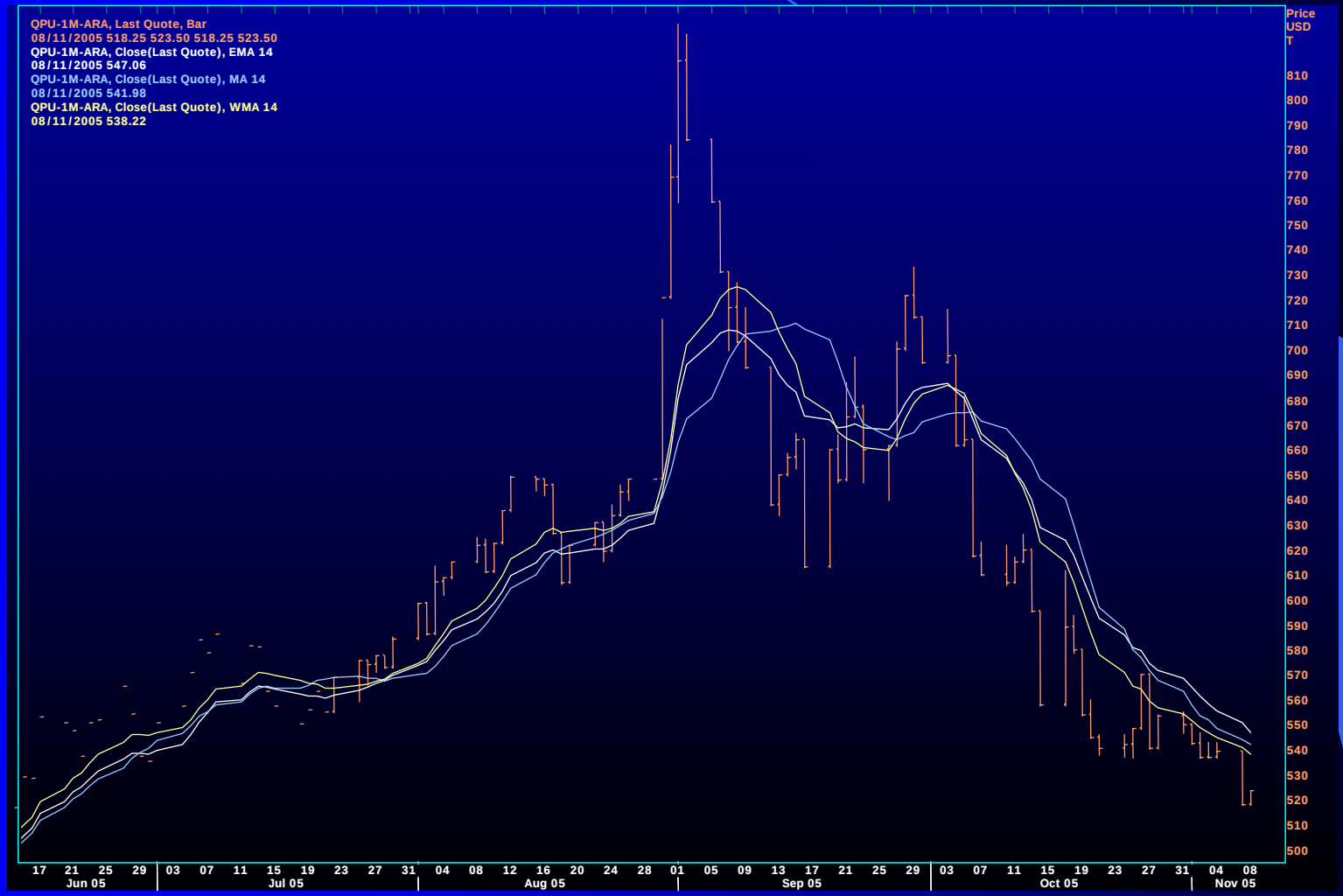
Katrina and the Gulf

- Depending on track, certain oil product are influenced
- Probability outlook very important

Brent oil price since April



European gasoline contract



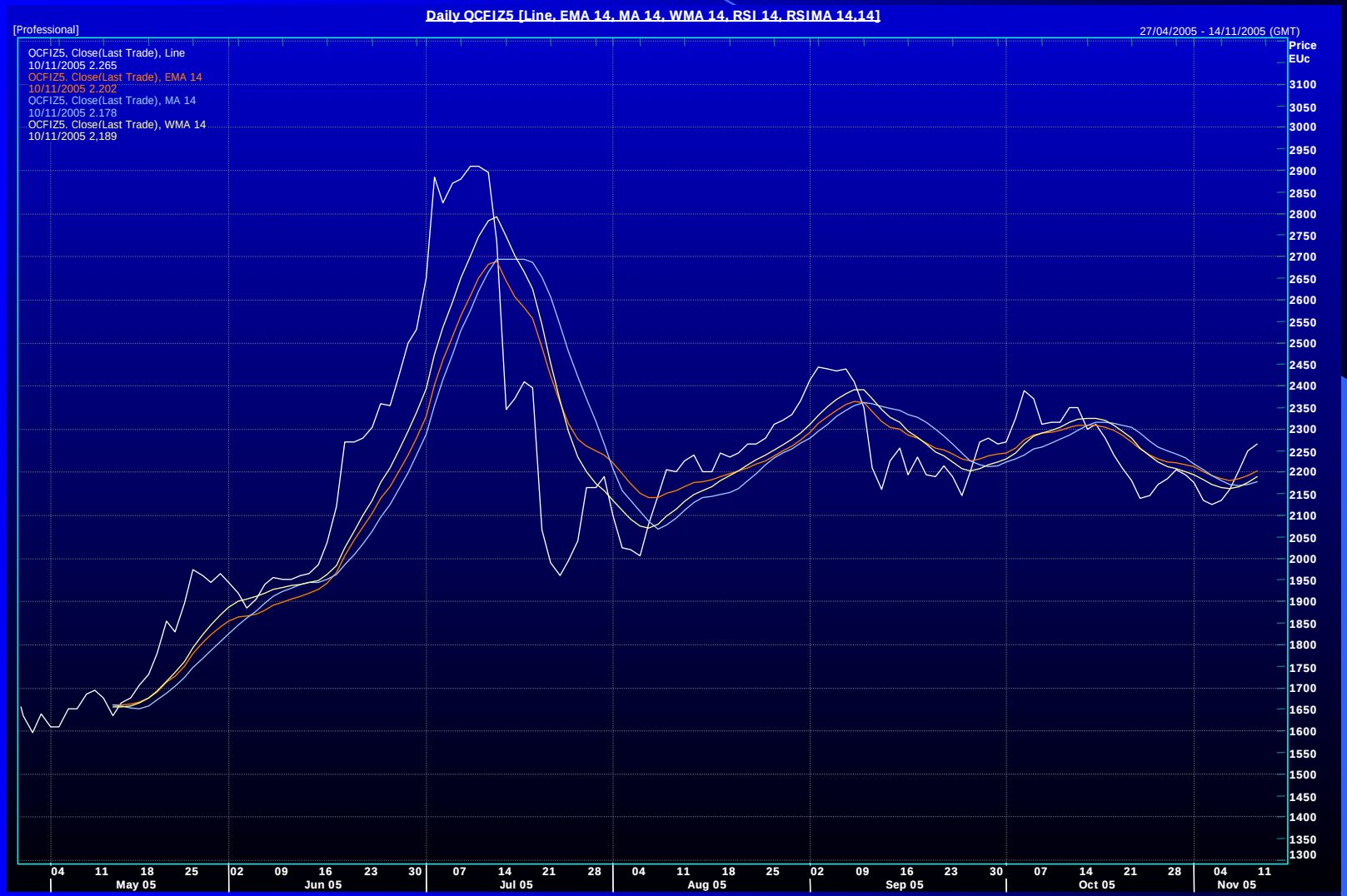
Emissions market

- Emission markets originated from Kyoto agreement
- Each country has a maximum allowance to emit CO_2
- If country emits more than allowed, it has to buy allowances, and vice versa

Emissions market

- Weather also important to anticipate emissions output
- ECMWF data can be translated in expected $C0_2$ output from power stations

Emissions market



Weather derivatives

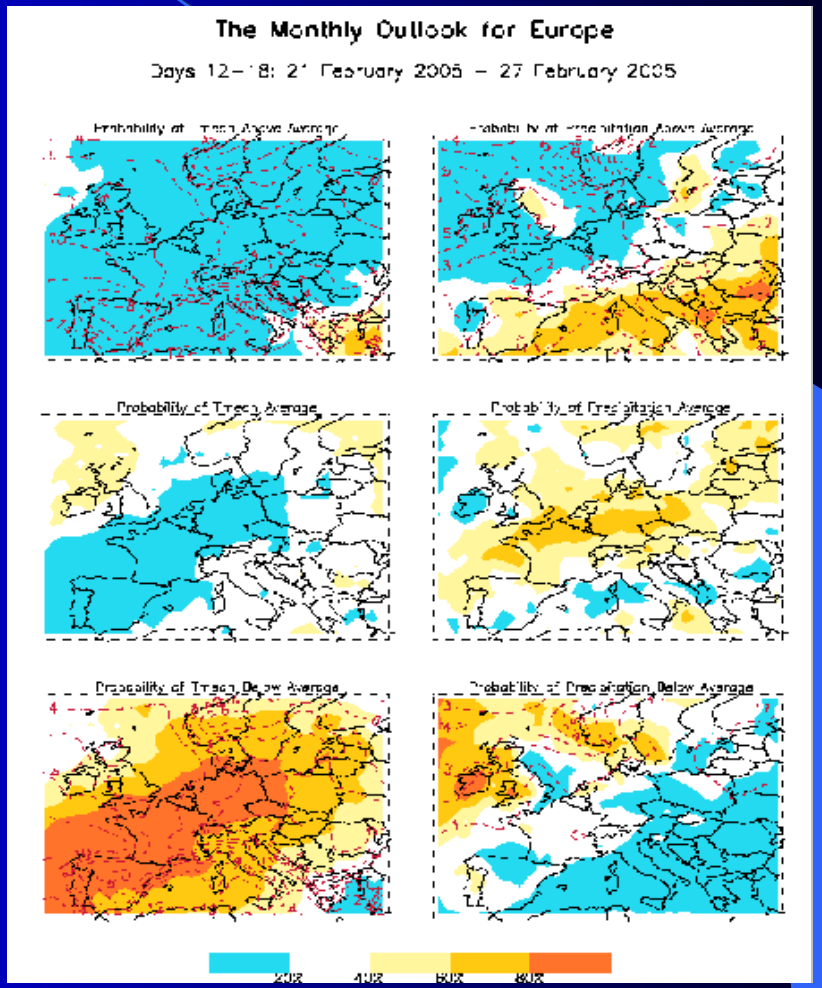
- Directly linked to weather outlook. Trading HDD, CAT and precipitation indices.
- Weather markets about to develop significantly
- Weather derivatives also important to hedge other energy contracts

Converting data in HDD

- Sempra directly converts the model data in different possible scenario's for HDD and CAT.
- Mid- and long-range forecasts all needed

Risk management

- Use of long-term probabilistic outlooks
- Assess risk of certain energy scenario's
- Try to have view on weeks- and months-ahead



Probabilistic long-range outlook

- Reduced risk on mid-range positions
- Now particularly for temperature and precipitation, but wind would be interesting too
- When signal is strong, it makes sense to take significant long or short positions

Summary

- Mid- to long-range model data very relevant to different energy commodities
- Importance of also considering the energy industry when models would be enhanced. E.g. probabilistic data
- Development of 30-days ensembles would interesting