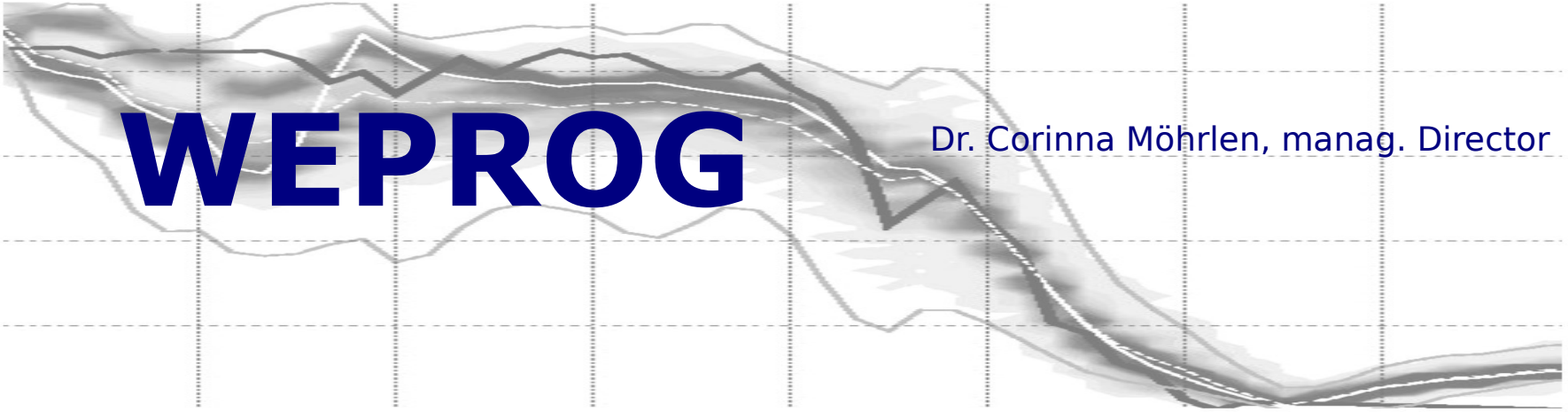
UVIG forecasting workshop
Salt Lake City
February 2013

Trading in Denmark

Neas Energy

Jens Tang, Vice President Renewables Generation



Dr. Corinna Möhrlen, manag. Director

About NEAS Energy

- NEAS Energy operates in trading of electricity, natural gas and carbon emissions
- The company was established in 1998 by four Danish energy supply companies and was purchased by a group of investors April 2011
- Today, NEAS Energy is a market leader in trading of wind power, cogeneration power production and carbon emissions.
- Our customer portfolio includes:
  - **More than 190 combined heat and power (CHP) plants** totaling 2,1 TWh cogeneration power production annually
  - **More than 2,600 MW installed wind power capacity in Denmark, Sweden, Germany and the UK** with a number of new PPA's in pipeline
  - A large portfolio and pipeline of **Clean Development Mechanism (CDM) projects in Africa, Asia and Latin America** and carbon portfolio management contracts with a wide range of ETS compliance companies across Europe
  - **B2C and B2B consumption customers** including a number of the largest companies in Denmark. > 2 TWh.
  - Capital Management for investors with exposure in the European energy markets

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About **WEPROG**

WEPROG stands for **W**eather and **E**nergy **PROG**noses and is providing **real-time ensemble predictions to the energy community** and to companies that can improve their efficiency by knowing the uncertainty in the weather and/or specific weather parameters.

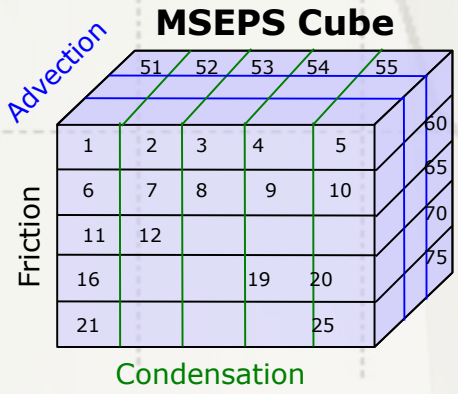
WEPROG operates and maintains several clusters distributed over 3 countries for maximum redundancy and security that are continuously producing forecasts.

Real-time products are available four times per day at 00,06,12,18 UTC and up to 180 hours ahead for all continents.

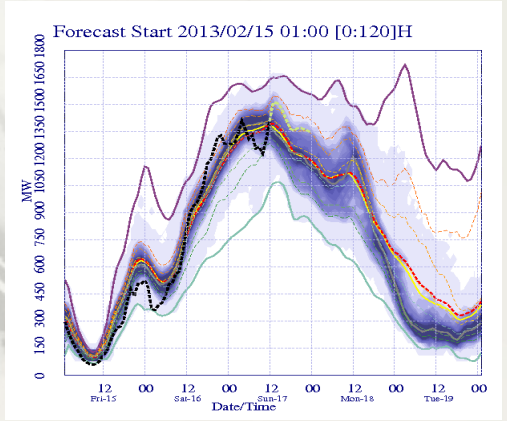
Global Analysis
(State Estimate)

75 independent weather forecasts

MSEPS Cube



Probabilistic weather, wind & solar power forecasts



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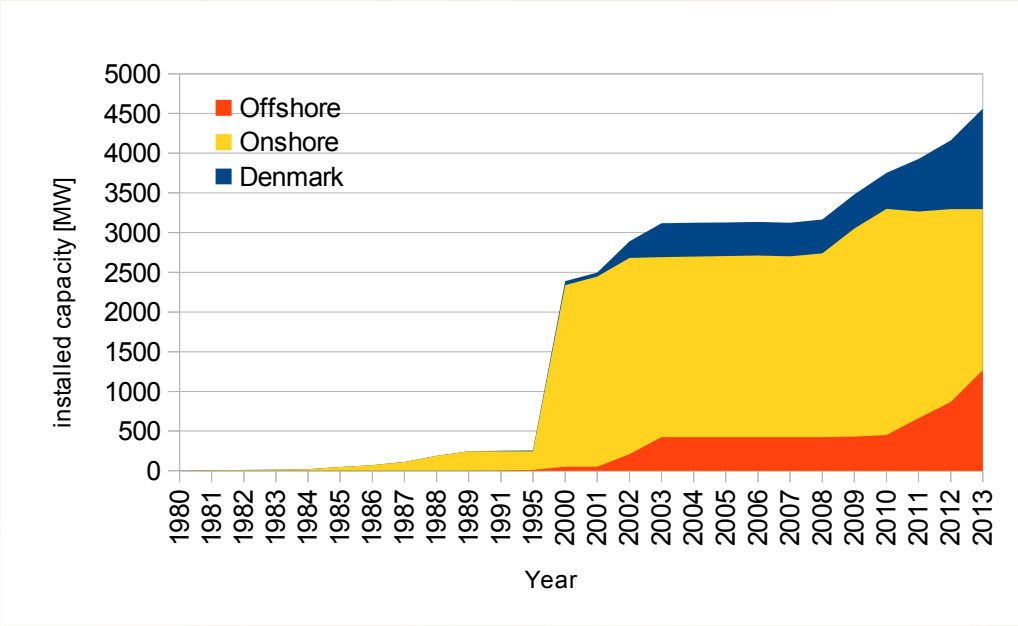
Brief History about Denmarks wind and solar energy development

Wind Power



Onshore: 3300MW Offshore: 1270MW

Onshore: since 2005 wind power on market terms
Offshore: Tender system for Offshore wind parks at specific areas

Solar Power

Plan: 200MW in 2015

In 2011, the Danish government introduced the "6KWp-rule" for households
to be paid for the net production

Installed capacity in 2012:
220MW

2013: 6kWp-rule stopped!

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What characterizes Denmark's renewable energy politics ?

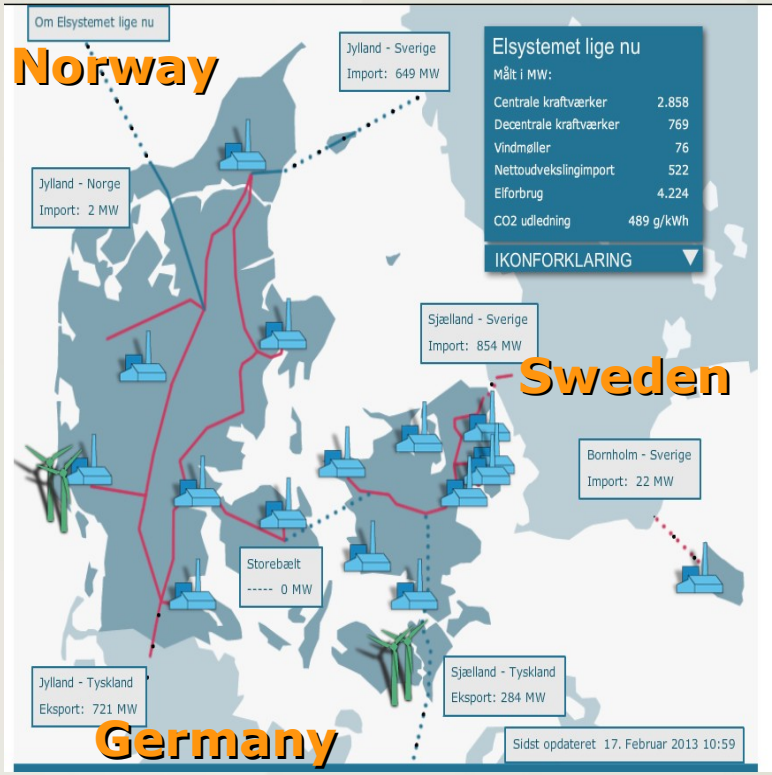
Denmark is extremely well interconnected between much larger countries (DE,SE,NO), but there is more to it....

Denmark **built a decentralized power system** already after the **70'ies oil crisis with** many combined heat and power plantss (CHP)
-> marks also beginning of their "wind power story"!

Wind energy was started as many small "community" projects (*"everybody was on bord"*)

<u>New policy (2005)</u>: all new wind power on market terms
<u>Consequence (2013):</u> 90% of wind power is traded by private BRP today

Efficient tendering process introduced for offshore projects:
environmental impact studies are done once (in tender) and material is provided to wind project bidders to
- reduce risk and costs of participating in tender
- ensure competition



source:
Energinet.dk

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What characterises the Scandinavian market ?

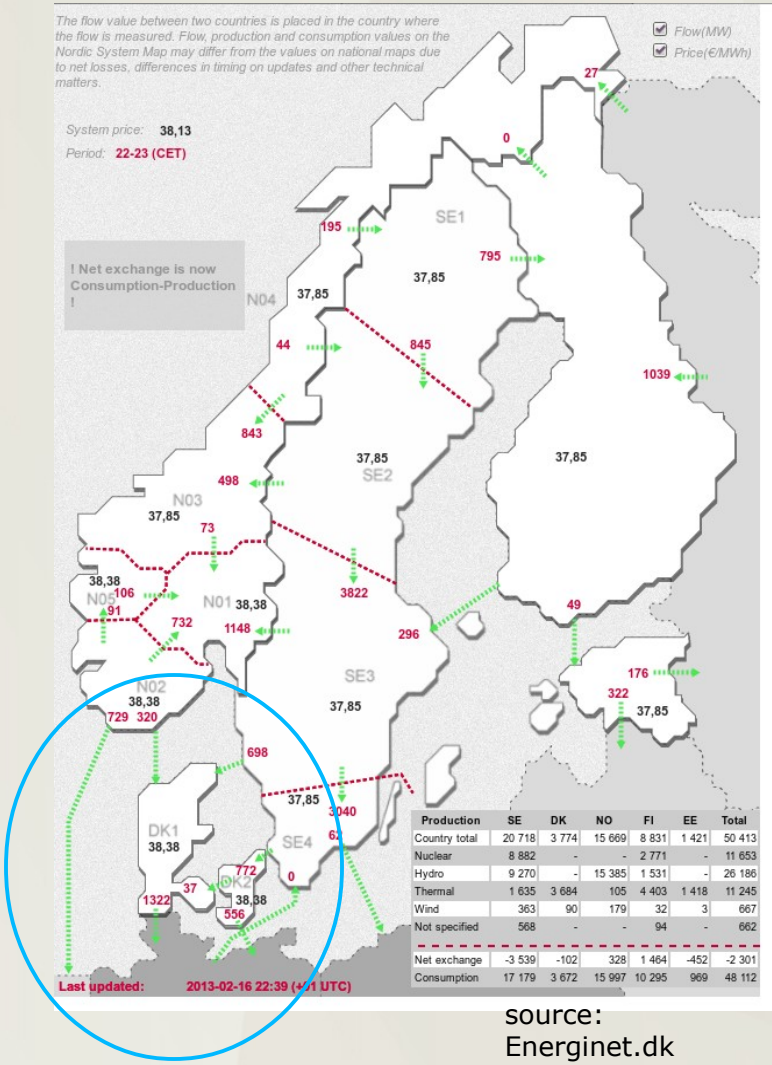
Scandinavian countries have a long cultural history

"Scandinavian Model" is characterized by a strong state: in energy politics, this meant that:

- Scandinavian countries were the **first to introduce a common multi-country market operator** (NordPool)

- NordPool spotmarket is **owned by the state owned transmission system operators**

- **Market coupling shows transmission limits** in large markets:
  Sweden had to introduce price zones to insure that the energy does not flow the wrong way in the "cold months"



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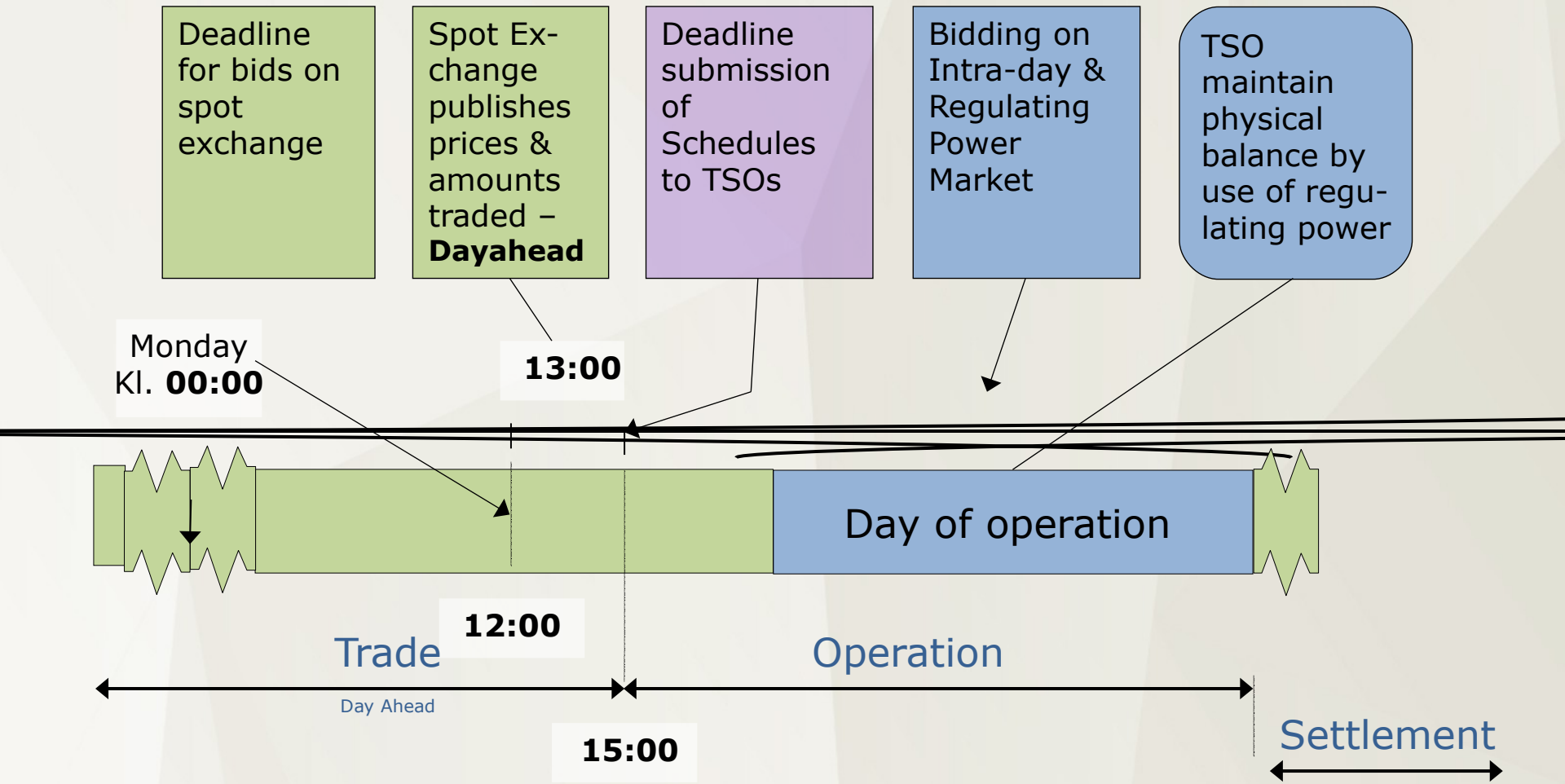
Time-line in the central and northern European electricity markets



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Power Trading seen from a private BRP's view: *NEAS Energy*

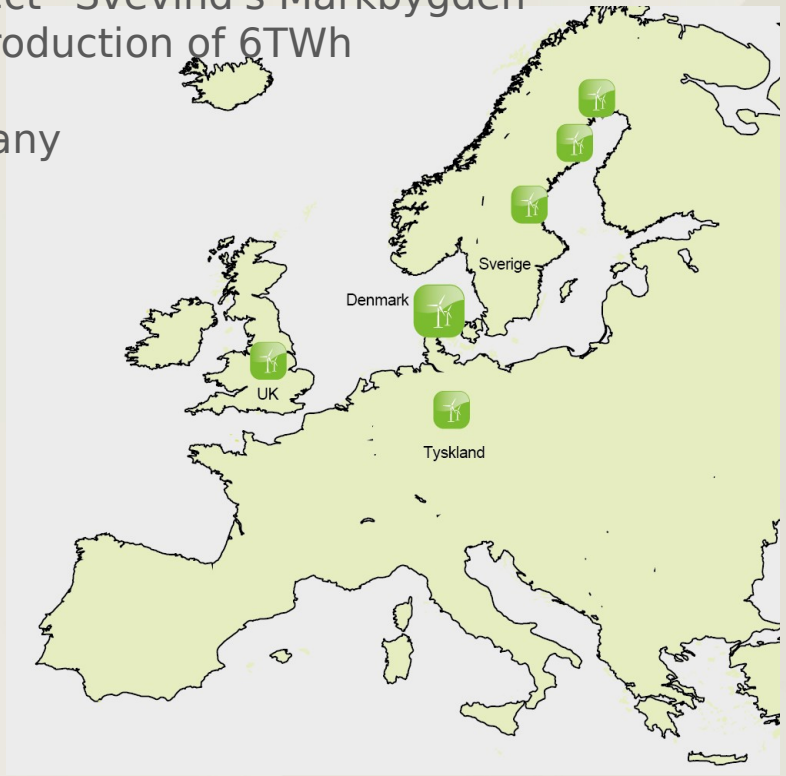
- NEAS Energy is a Scandinavian market leader in trading and balancing of wind- and PV power production

- NEAS Energy is **trading and balance responsible party (BRP)** for:

  - **2600MW wind power in Denmark, Sweden, Germany and UK** incl. Europe's largest onshore wind power project "Svevind's Markbygden" with 1100 wind turbines equalling an annual production of 6TWh

  - **PV generated power** in Denmark and Germany

  - **hydro power** in Scandinavia



- NEAS **services in VG trading** include:
  - Structured trading & production management
  - BRP (weather desk, forecasting, scheduling)
  - reporting and 24/7 remote control
  - Financial trading & hedging strategies
  - Optimization of governmental subsidies

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Handling Renewables in the Nordic Market
Why forecasting is so important

- **Wind and PV handling** in Neas Energy is a **core capability** and a focal area
- Wind Power and PV power **forecasting is "mission critical"** for the business area:
  - Key information and **decision base for acting as BRP** and trading in the various power markets
  - **VG Forecasts** in combination with other key functions at Neas Energy **determines how Neas Energy acts in the different power markets**

- Neas Energy's own **"Weather Desk"** ensures the best possible power forecasting quality and in combination with other functions **determines how Neas Energy trades at the different markets**

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How NEAS Energy manages trading of VG: meteorology and balancing

- Own Weather Desk – **3 meteorologists** – manned every day
- **3 Providers - 2 deterministic + 1 Ensemble**
- Subscribe to weather info on energy trader sites
- Data is received automatically via **web services or FTP**
- Meteorologists **analyze weather data** and perform **quality check on** statistical models.
- Meteorologists **improve forecast right up to trading deadline** + adds the human touch!
- Meteorologists use in house developed software (Big M) to handle all sources of weather input – Forecast data, online data and market data – to optimize use of data and time to market reaction!

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Communication in the Electricity market

Power Exchanges

Change of BRP
EDI data – metered data

ElSpot Trading
Intra-Day Trading
Day-After

Balance Responsible Party

Portfolio-Management
Forecasts
Trading
Communication
Monitoring

Online-Data
Regulating services

Schedules exchange
SystemBalancing
Regulating services

Generator - Consumer

TSO – system responsible

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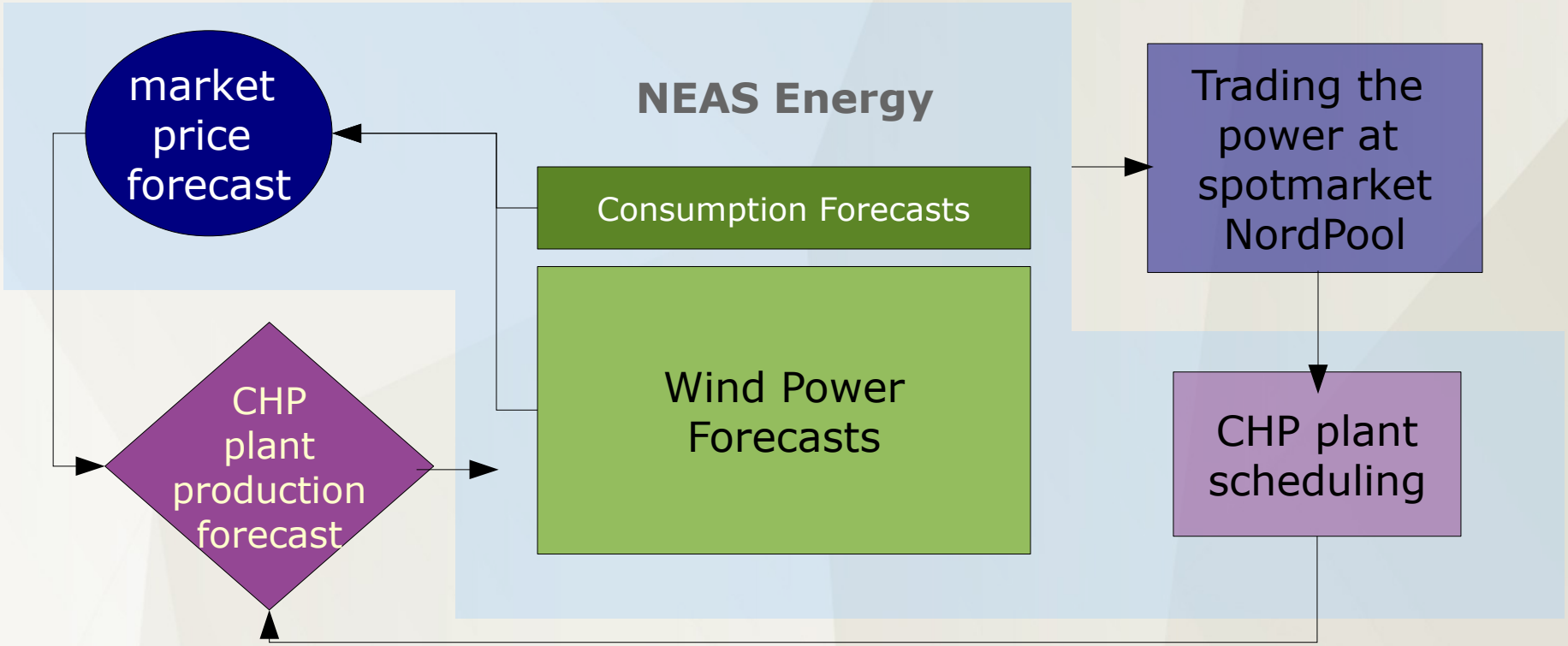
Why Wind Power Forecasting has such a central role in Denmark

Wind Power in Denmark has such a high market share that it influences:
=> the market price
=> production units schedule (remember: many CHP plants**)**



Trading and scheduling of Combined Heat and Power (CHP) plants with **PBAS** - In house developed web based system for power integration.

The Plants deliver expected production data to Neas Energy based on
- Forward spot prices
- Reserve prices

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Thank you for your attantion!

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