

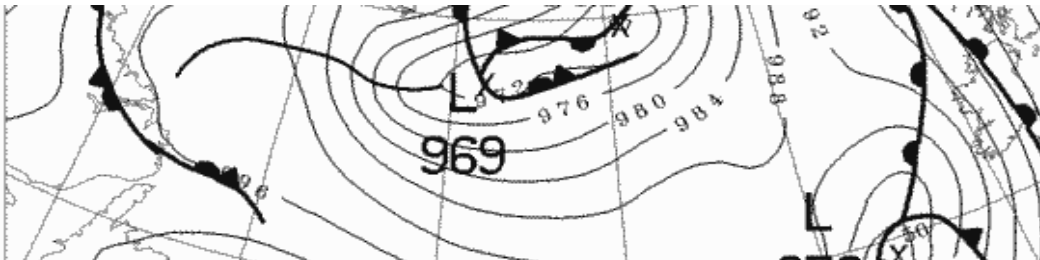


Wind Power Forecast for Alberta

Dr. Ulrich Focken

Calgary

24. April 2007



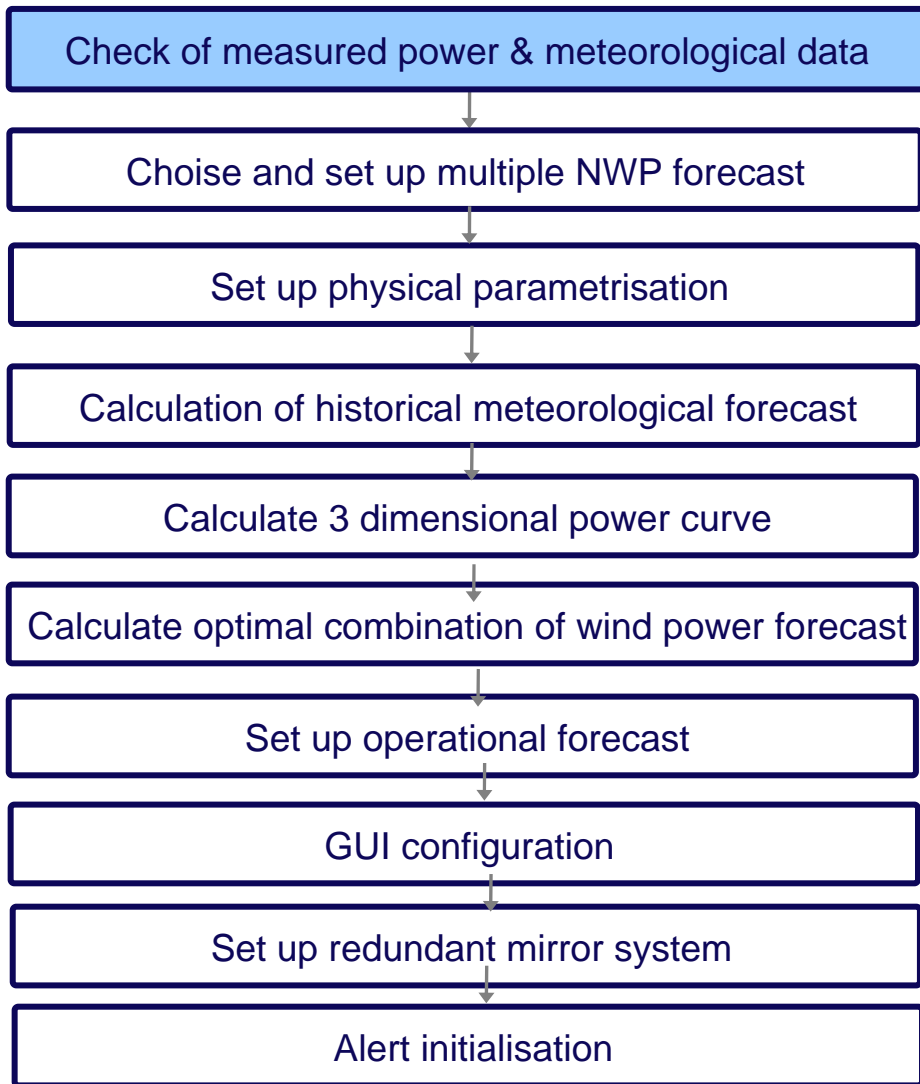
Overview

- Short Company description
- Previento – our way to predict wind power
- What else are we doing – some examples

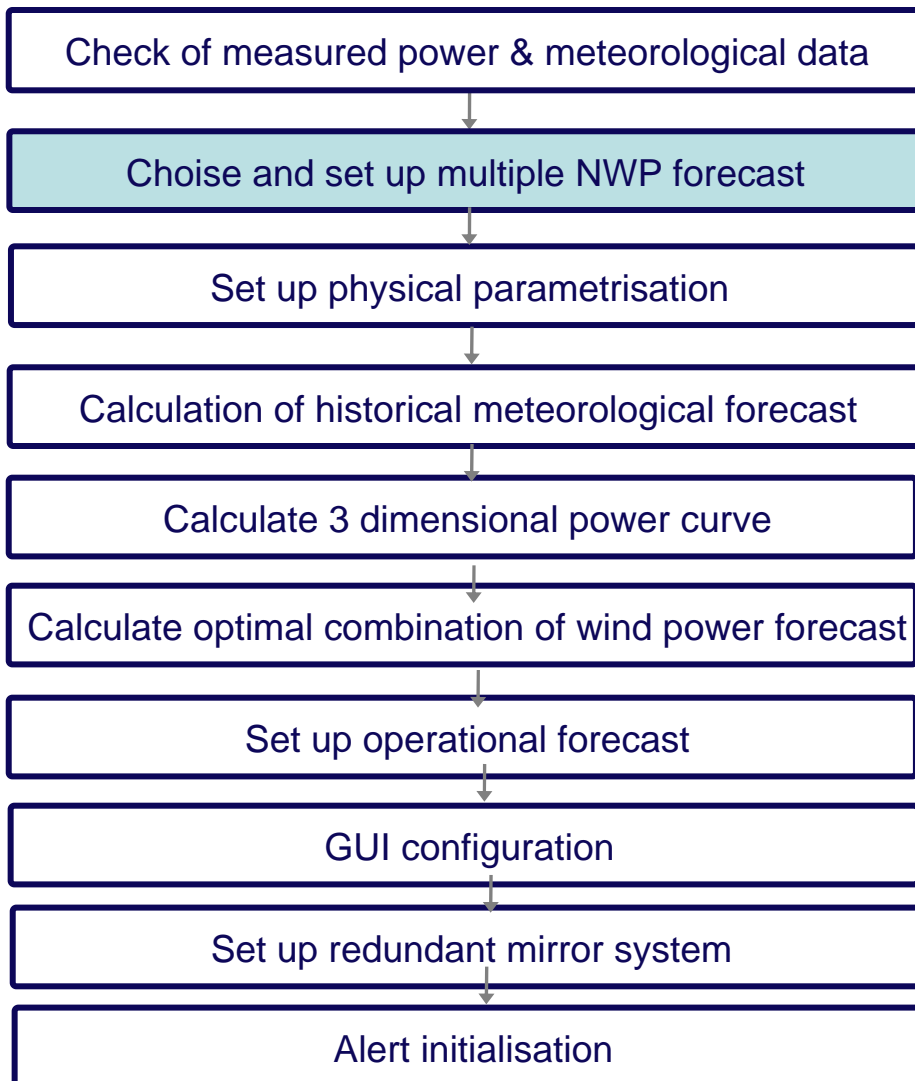
energy & meteo systems

- Services for effective integration of renewable energy sources into the power systems
- Services in energy meteorology:
 - upgrading of weather information for the power industrie
- Core business wind power prediction *Previento*
- Support: e.g. training workshops for dispatcher
- Development of distributed energy management system
- Guidance for politics (studies etc.)
- Applied R&D

Previesto

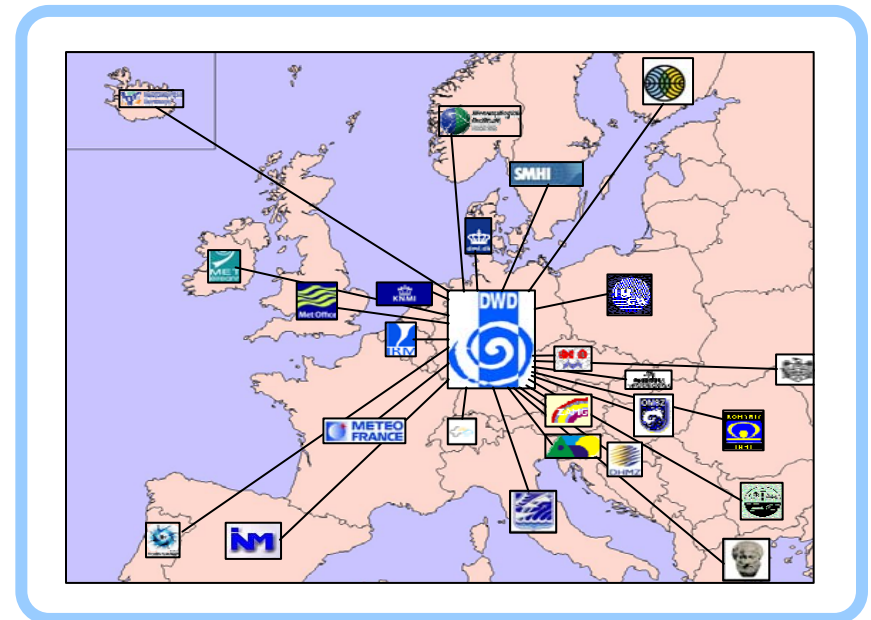


Previesto



We use more than one NWP

- Increase accuracy (especially for extreme events)
- Increase availability

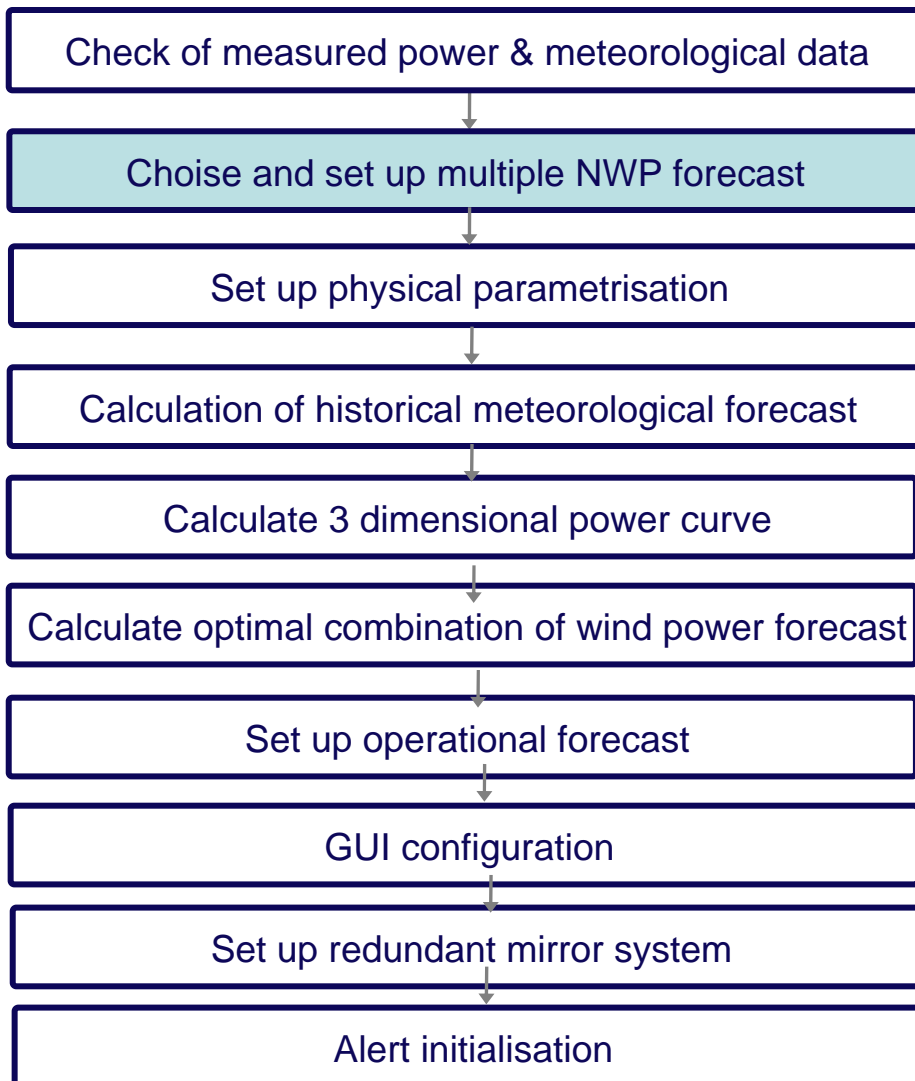


For Alberta

Choose and set up multiple NWP forecast

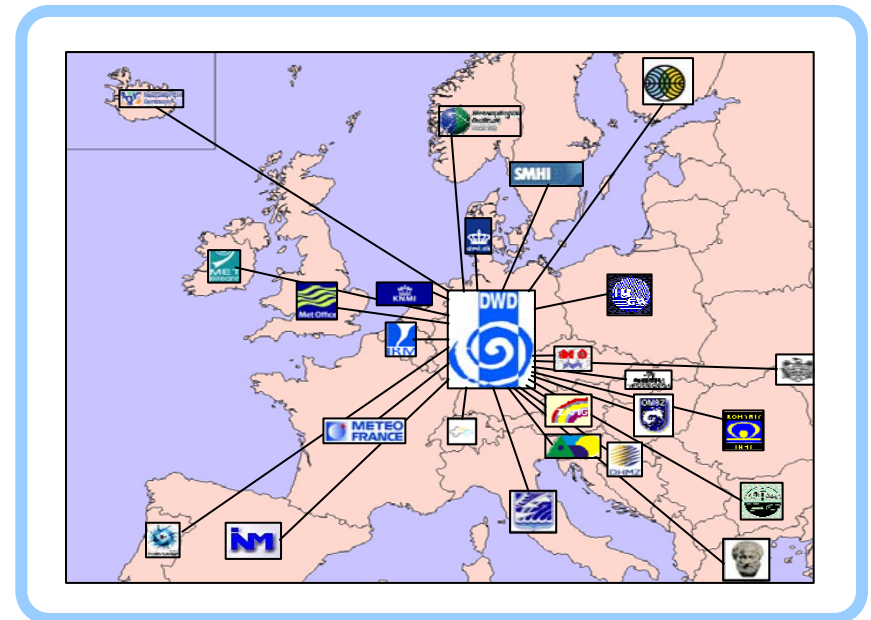
- European Center of Medium Range Forecast
 - 0.25 Degree ~ 25 km resolution
 - High vertical resolution
 - Very good data assimilation
 - 00 and 12 h run
 - Historical forecast available: 1 year
- NOAA: North American Mesoscale (NAM)
 - 12 km resolution
 - 00, 06, 12 and 18 h run
 - Historical forecast available: 6 month
- Environment Canada
 - 15 km resolution
 - High vertical resolution
 - 00 and 12 run
 - Historical forecast available: 1 year

Previesto

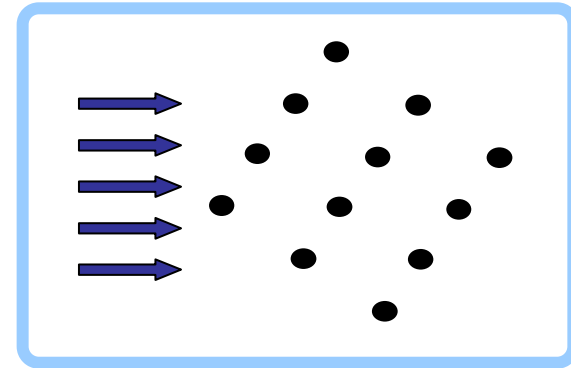
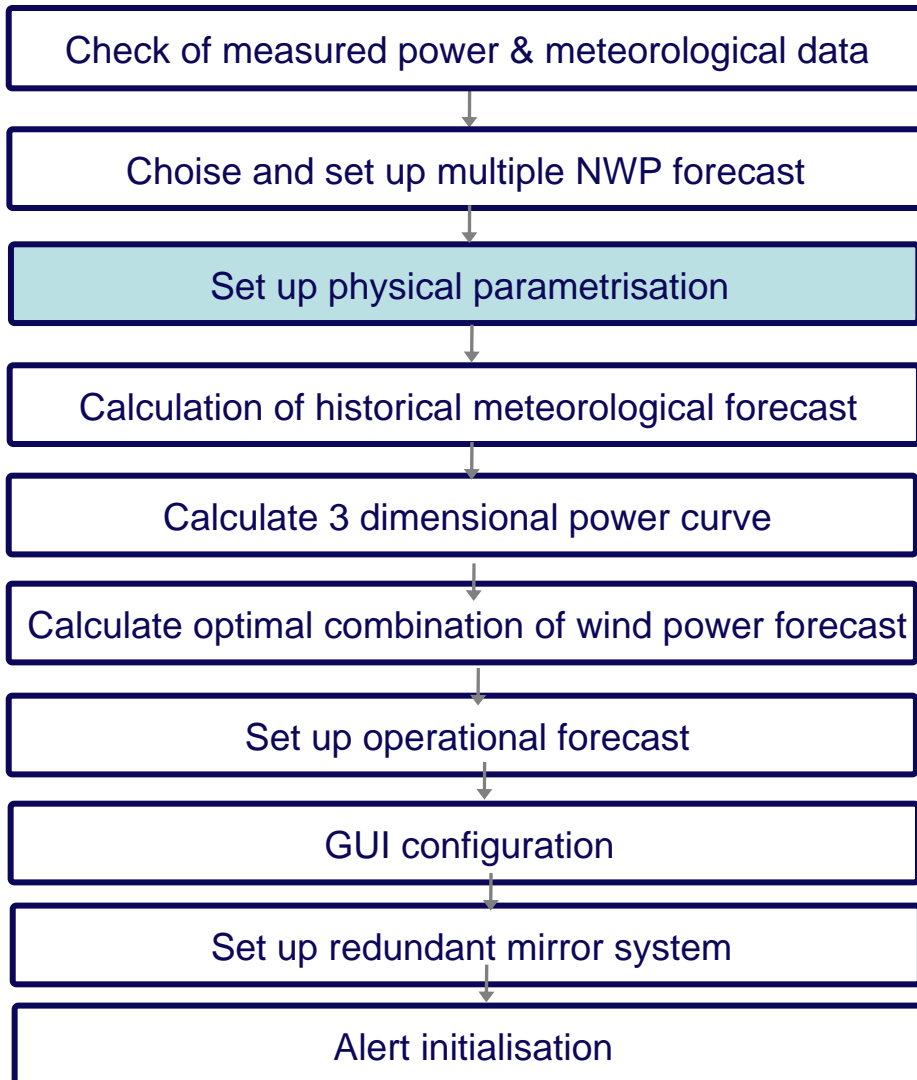


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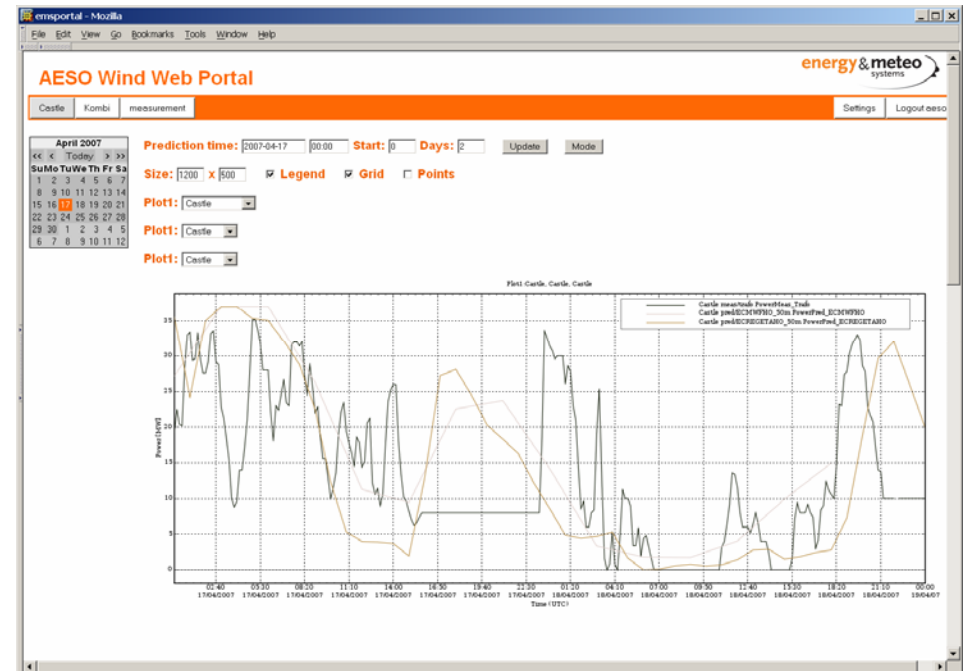
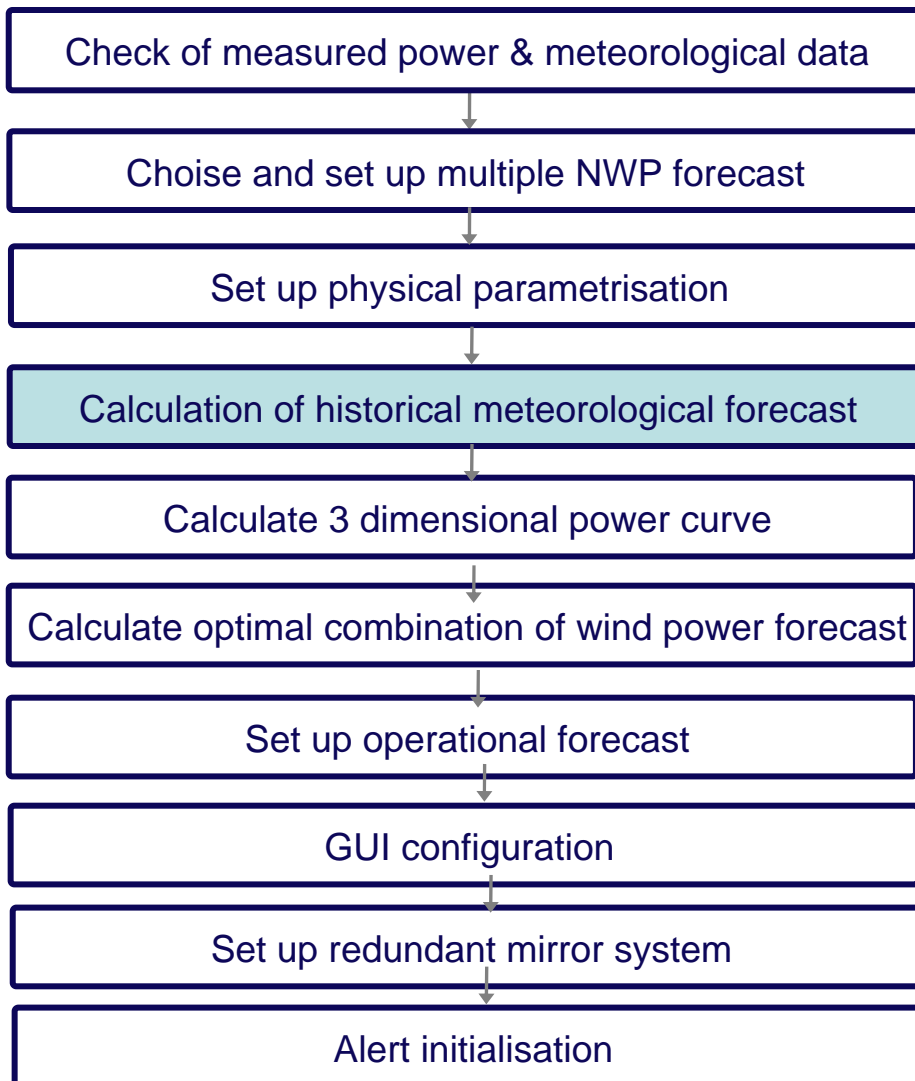


Previesto

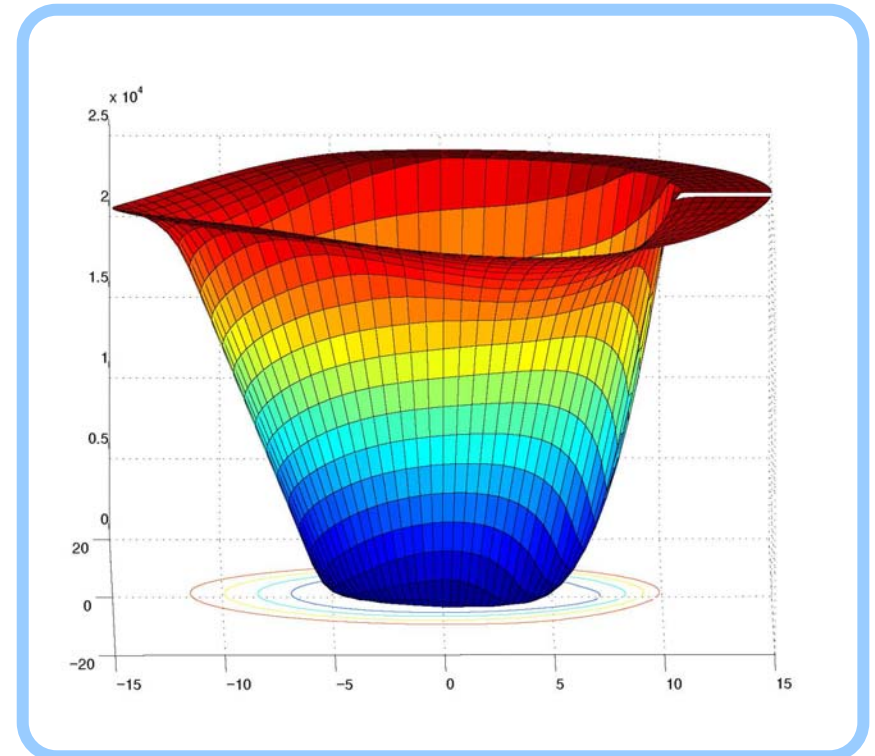
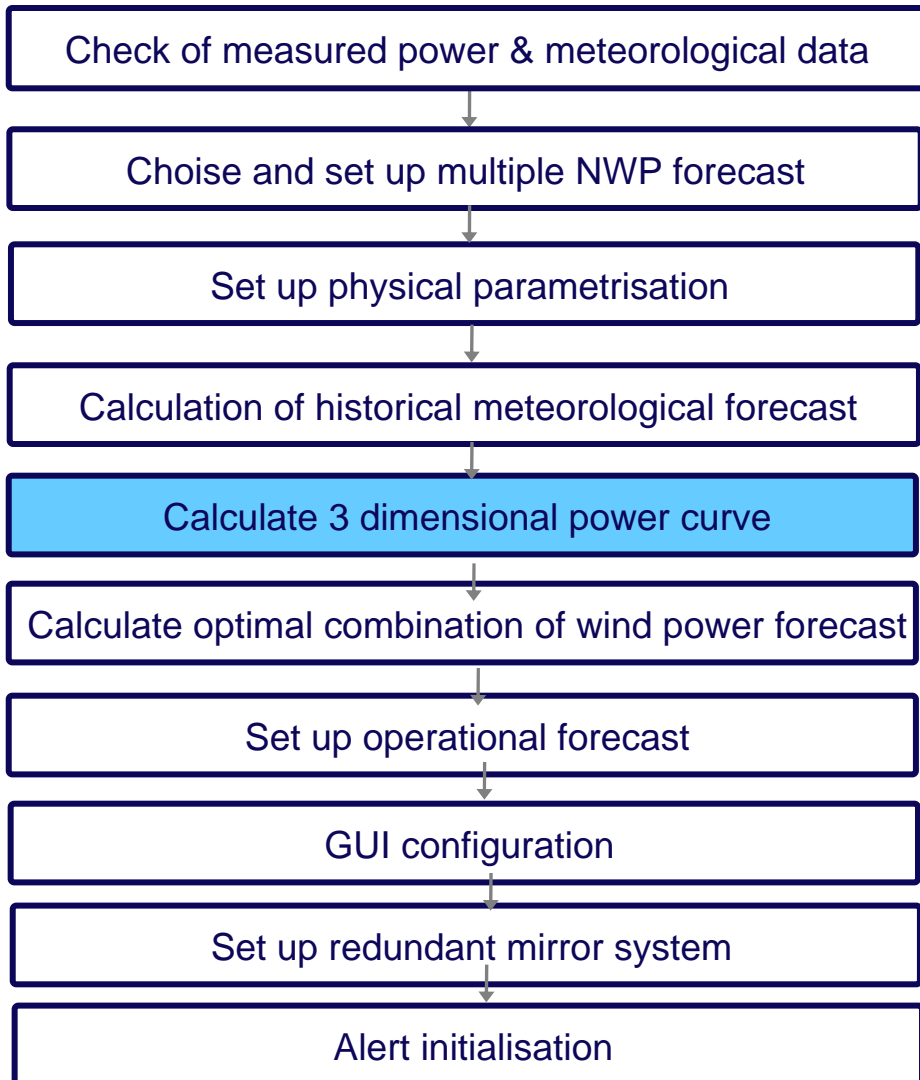


- ▶ farm effects
- ▶ orography
- ▶ roughness
- ▶ thermal stratification

Previesto



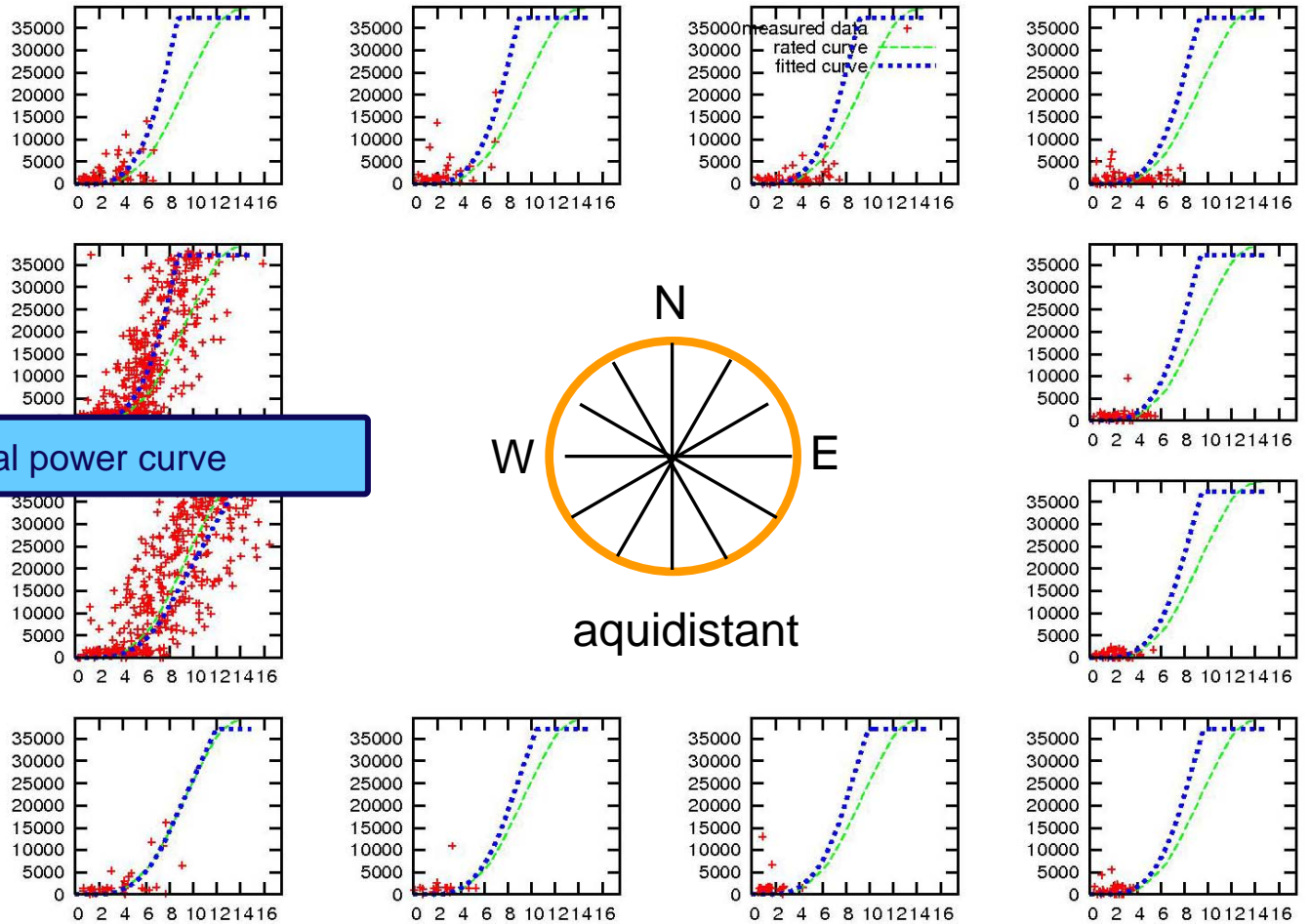
Previesto



For Alberta

Extreme
direction distribution
with maximum
between 220 – 250 °

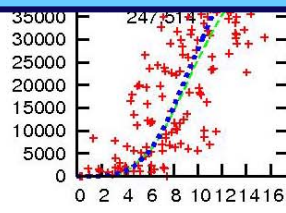
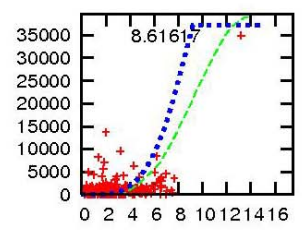
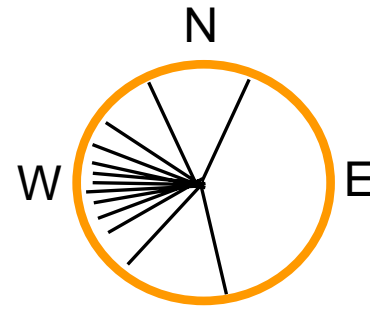
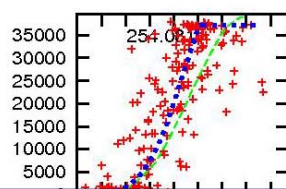
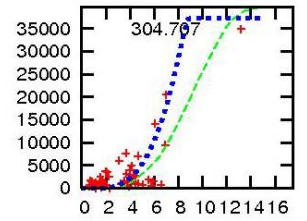
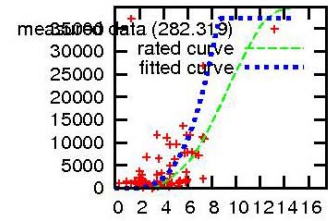
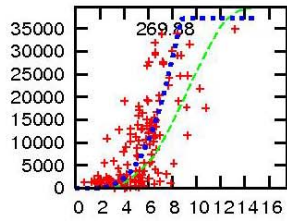
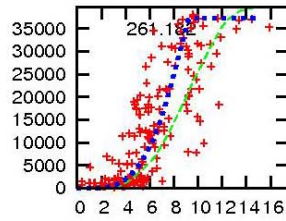
Calculate 3 dimensional power curve



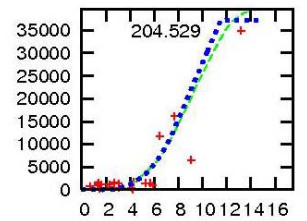
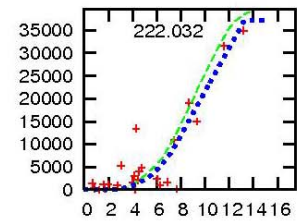
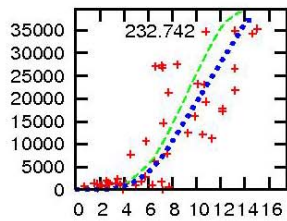
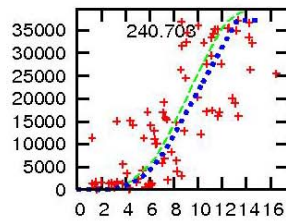
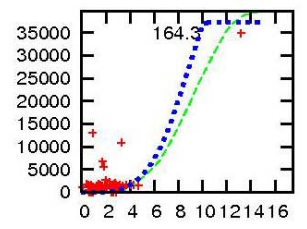
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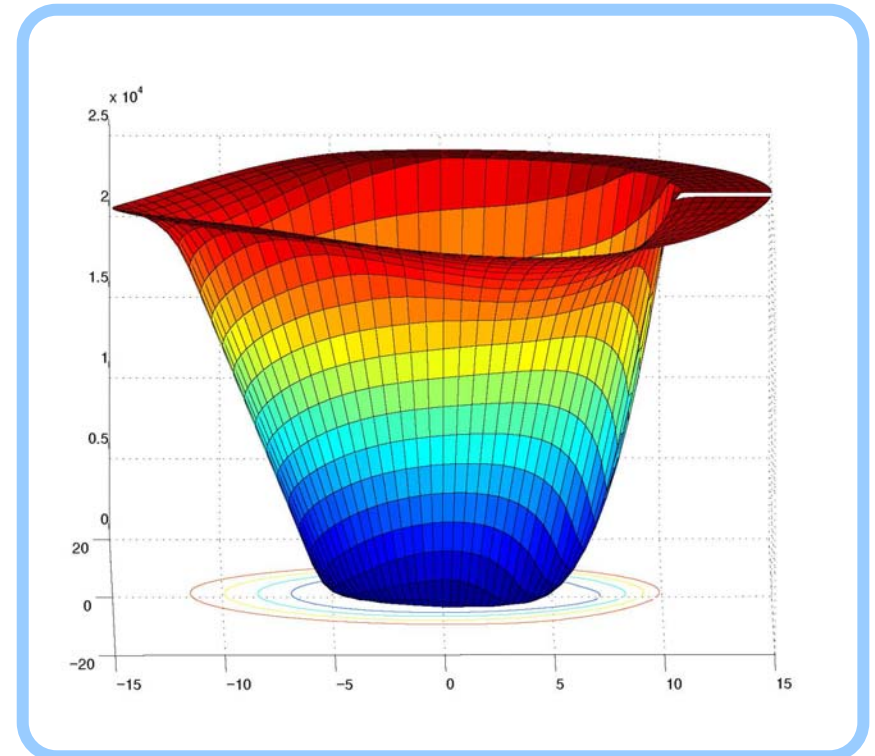
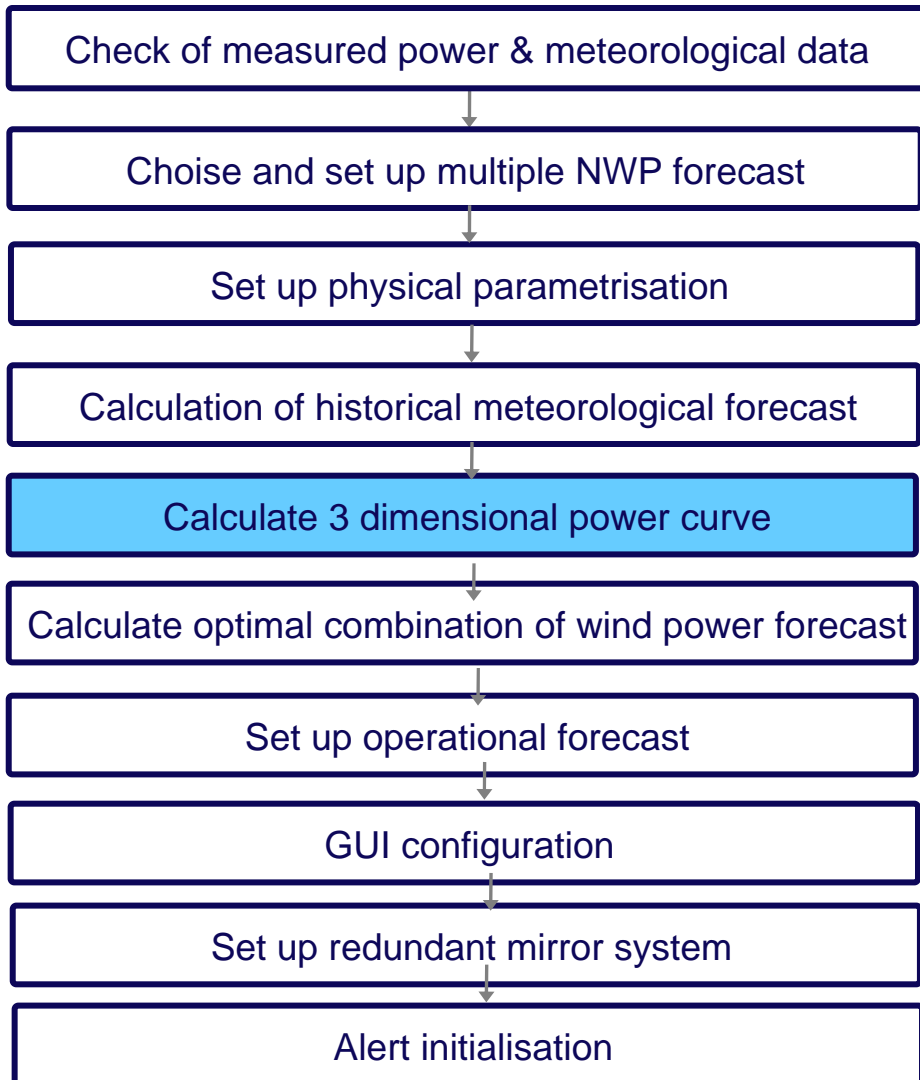
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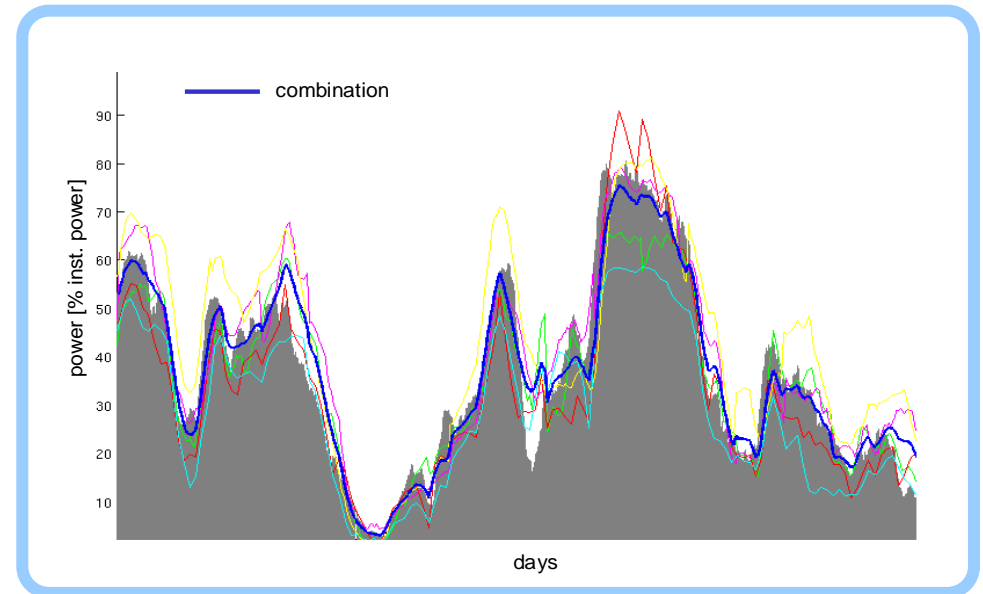
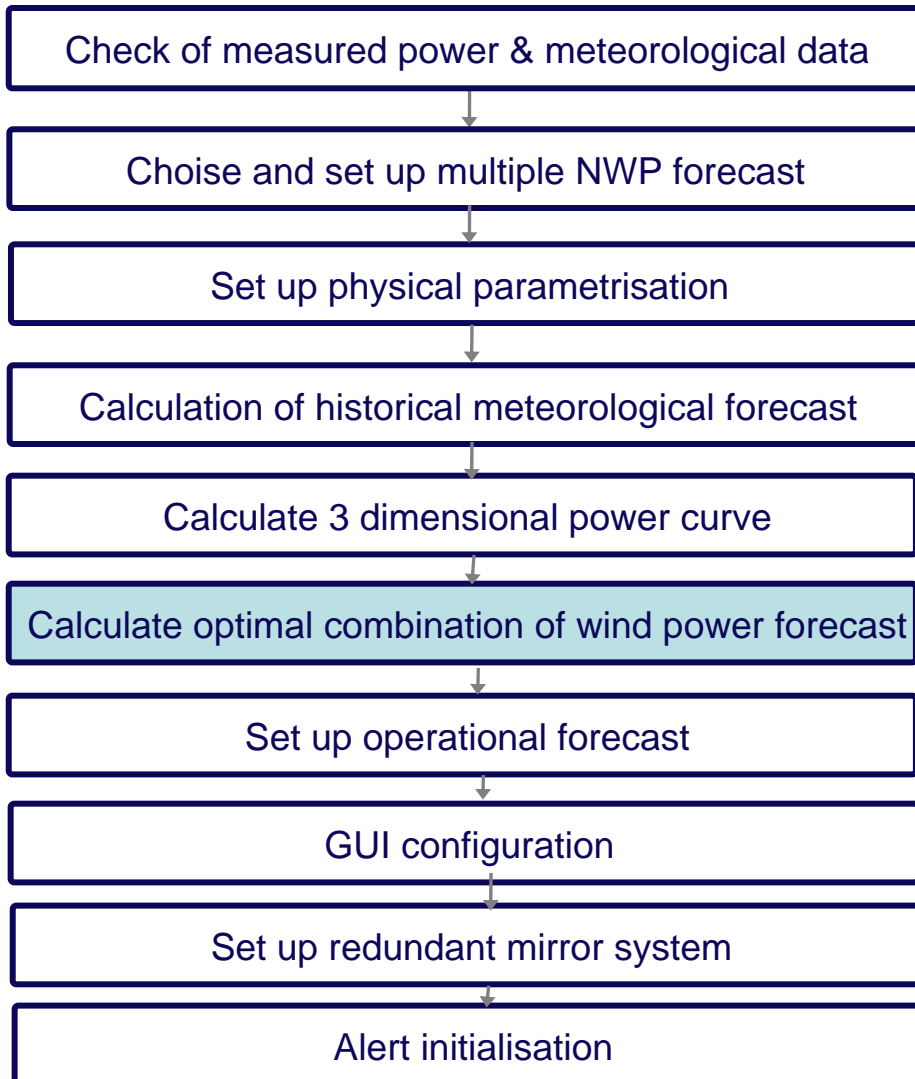
adjusted



Previesto

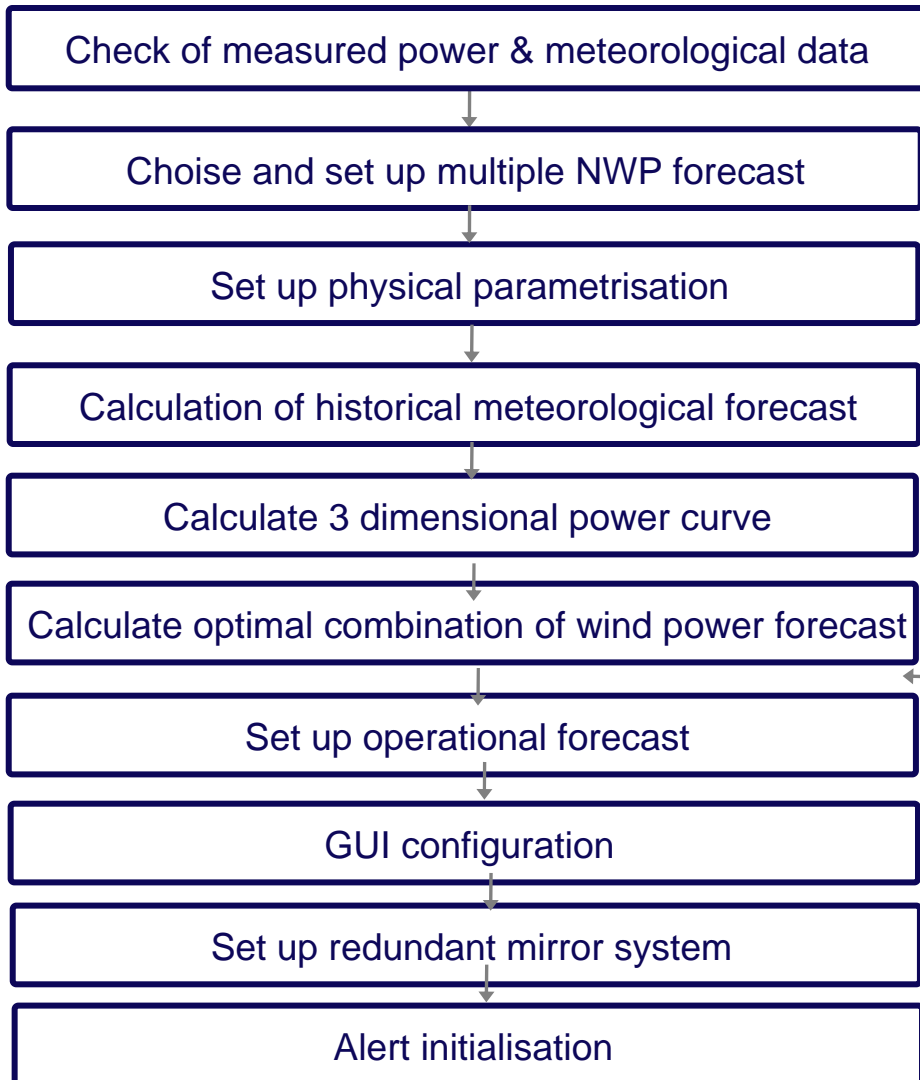


Previesto



Weather dependend
combination of wind
power predictions which
are calculated on basis of
different NWP

Previesto

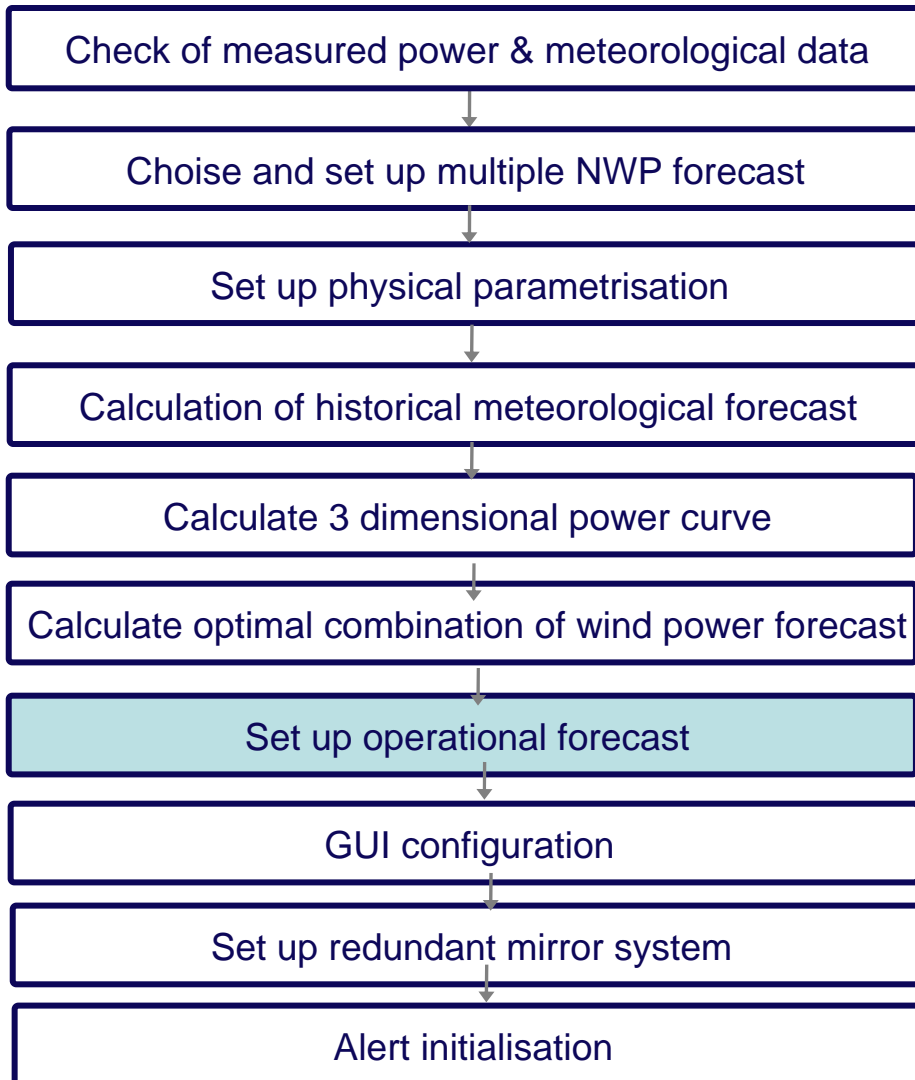


3 Methods developed

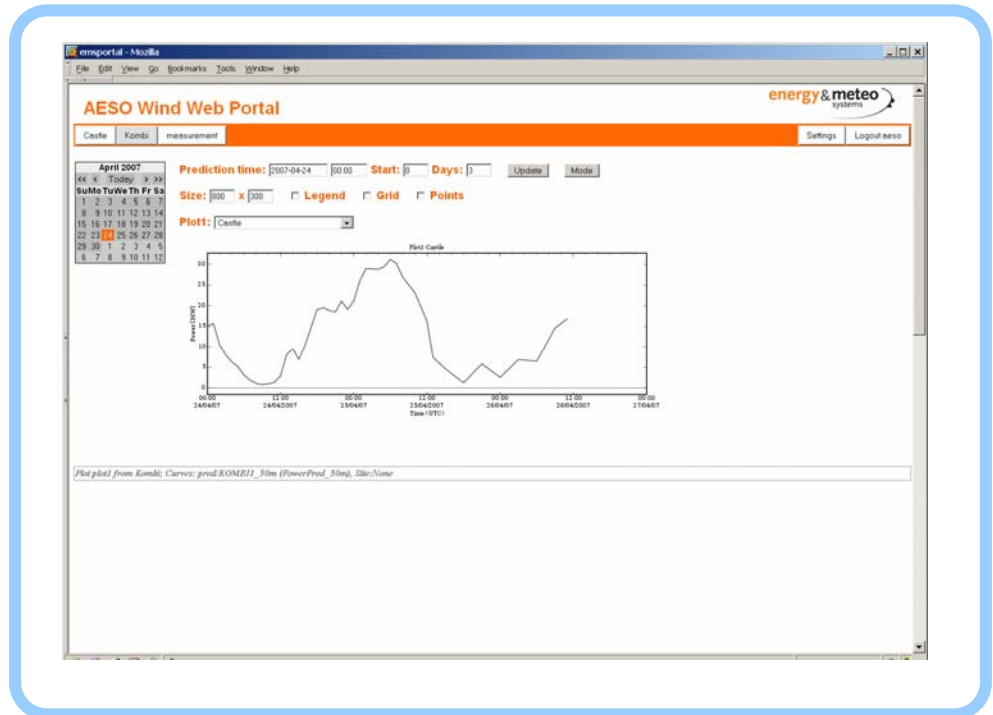
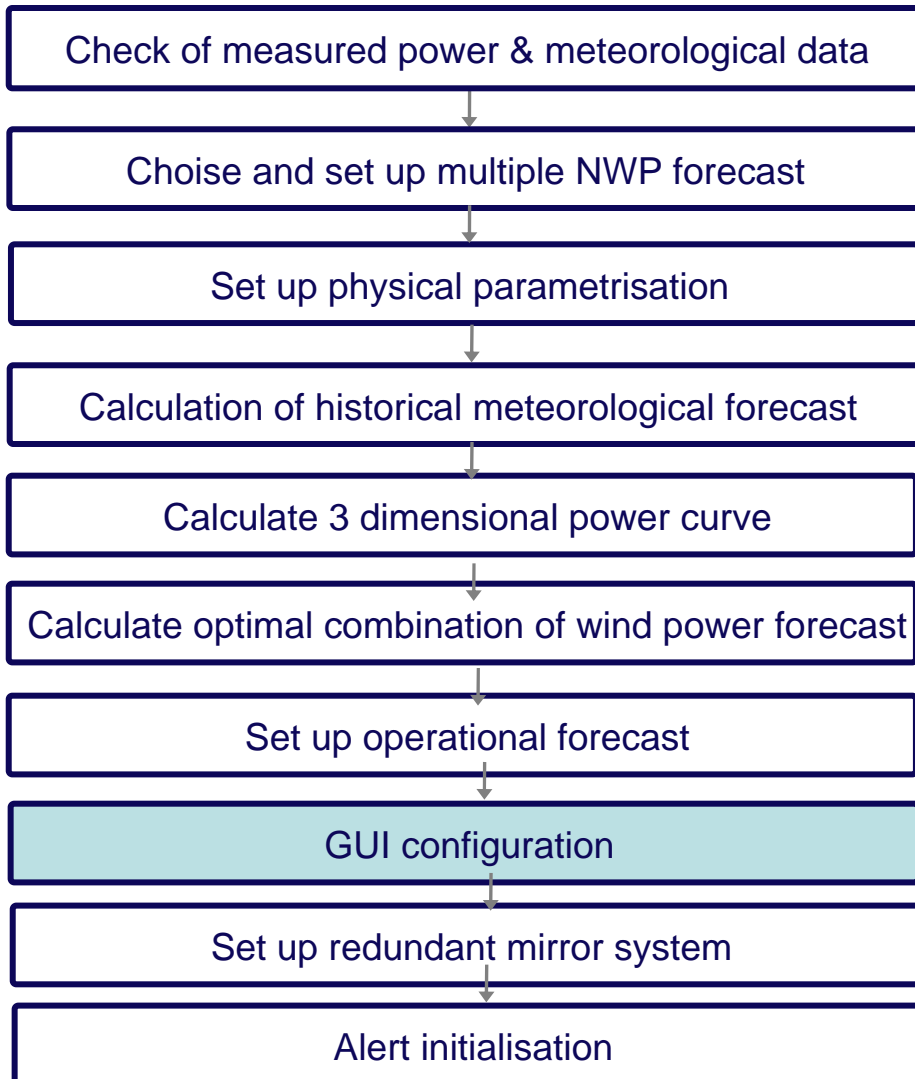
- ▶ Heuristic
- ▶ ANN
- ▶ Arima Model

Very short term forecast (0 to 6 hours)

Previesto



Previesto

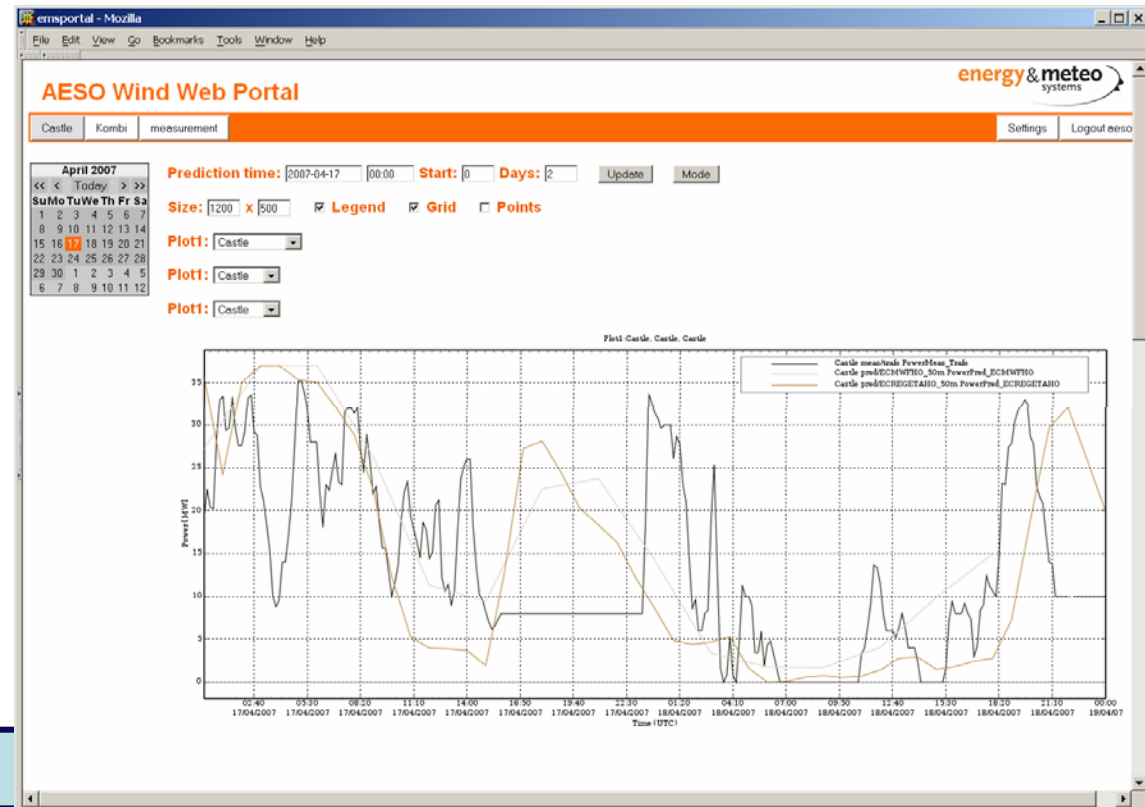


For Alberta

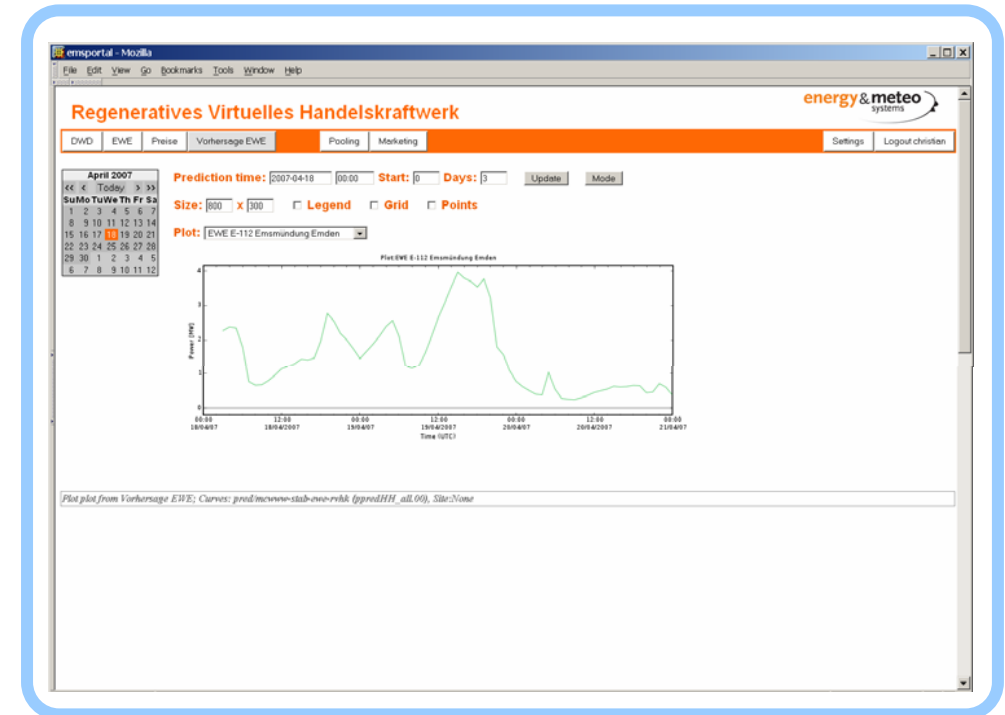
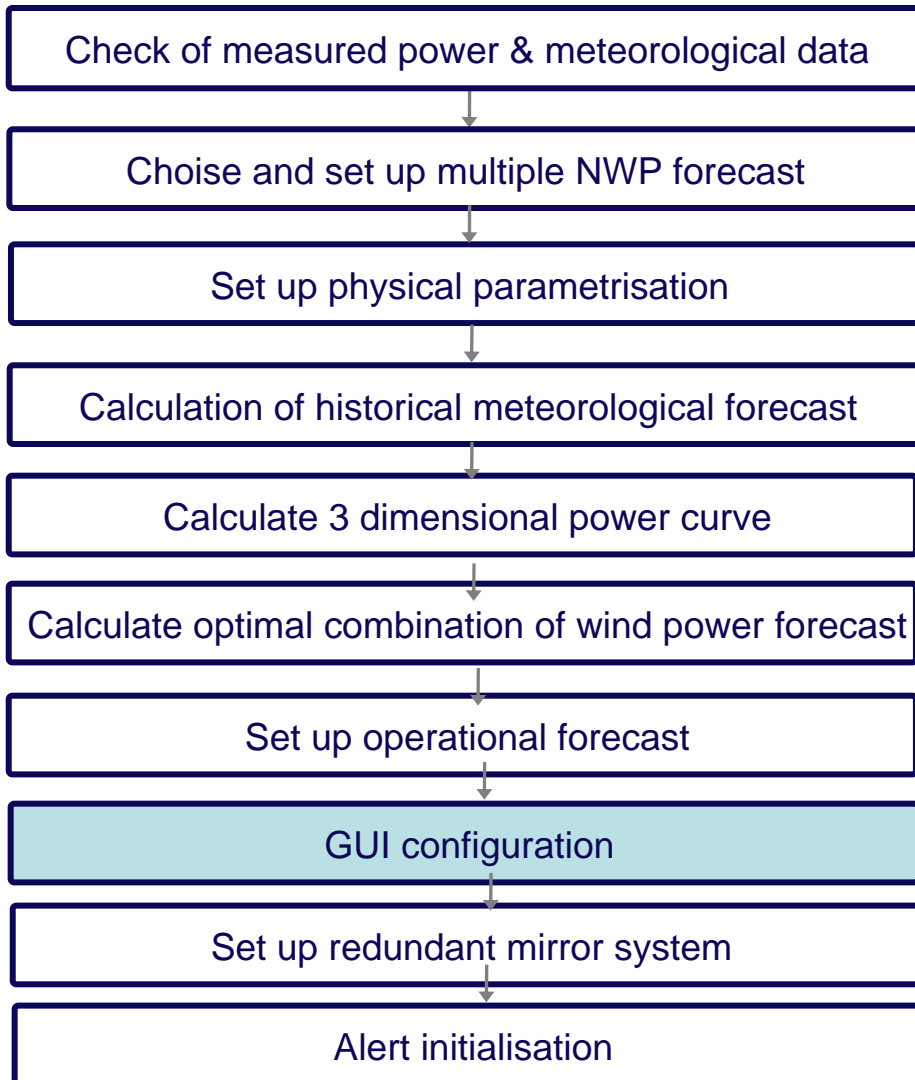
looking every day in operation helps a lot in evaluation of the forecast

- GUI can be assessed easy via standard web browser
- Individual user settings (e.g. for each dispatcher, wind farm operator)
- Historic data available

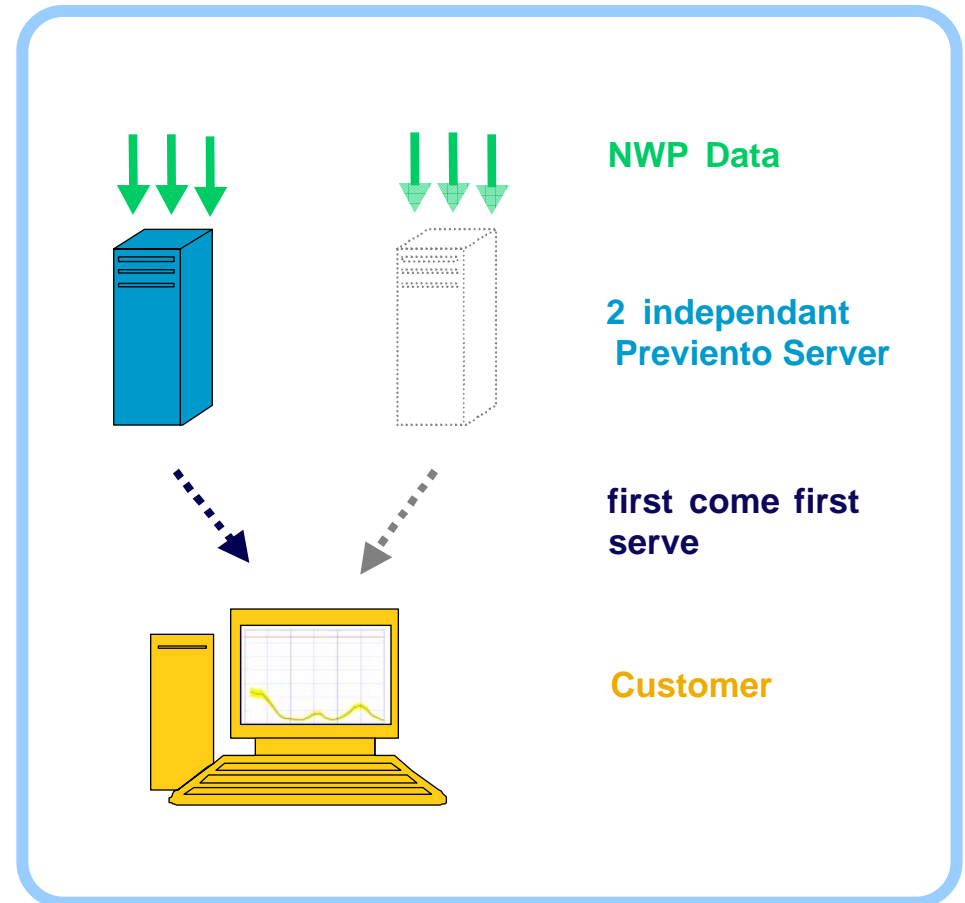
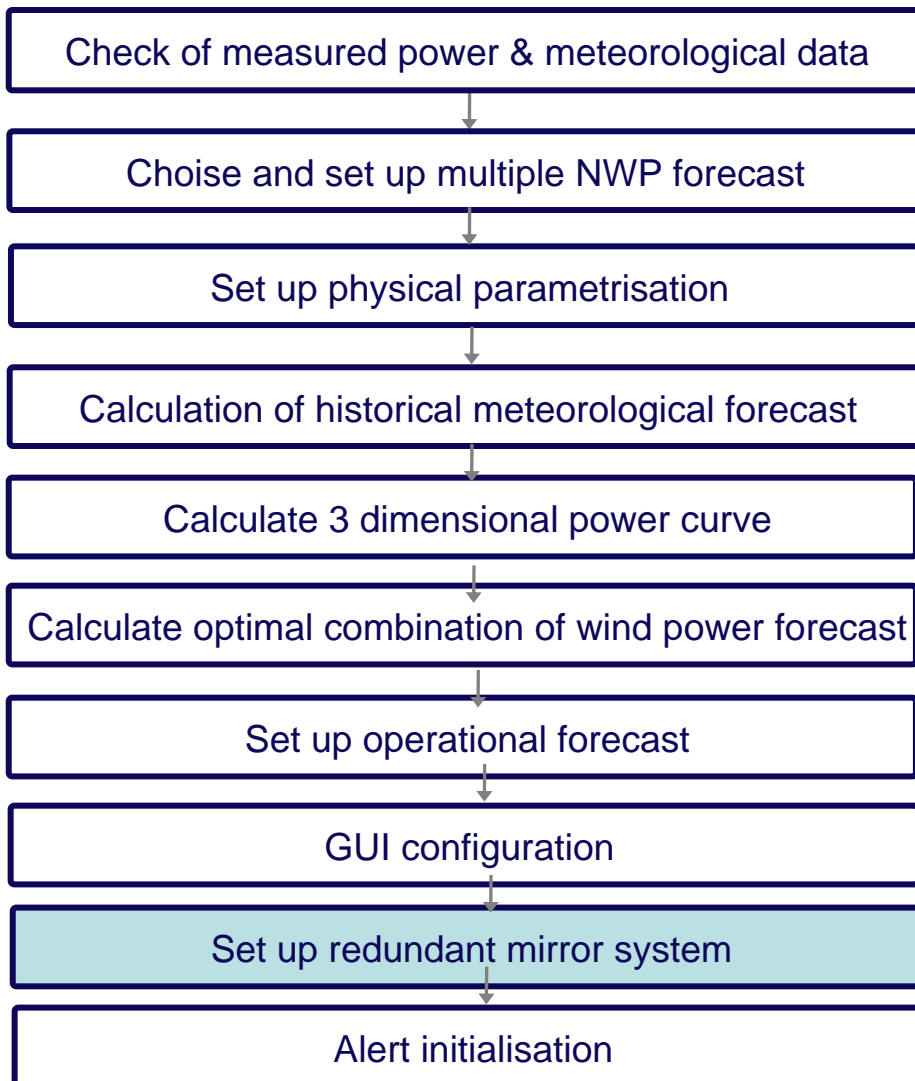
GUI configuration



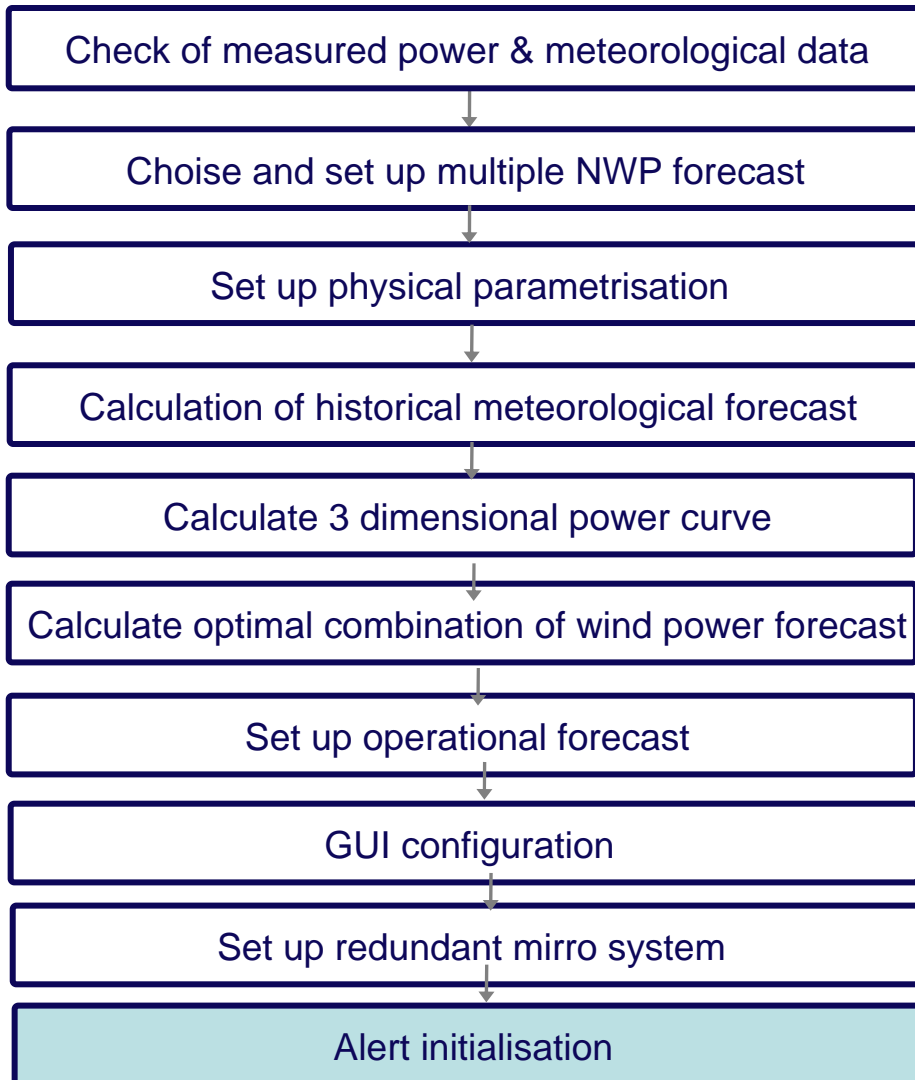
Previesto



Previento



Previesto



AESO Wind Web Portal

Kombi measurement

Settings Logout aes0

November 2006

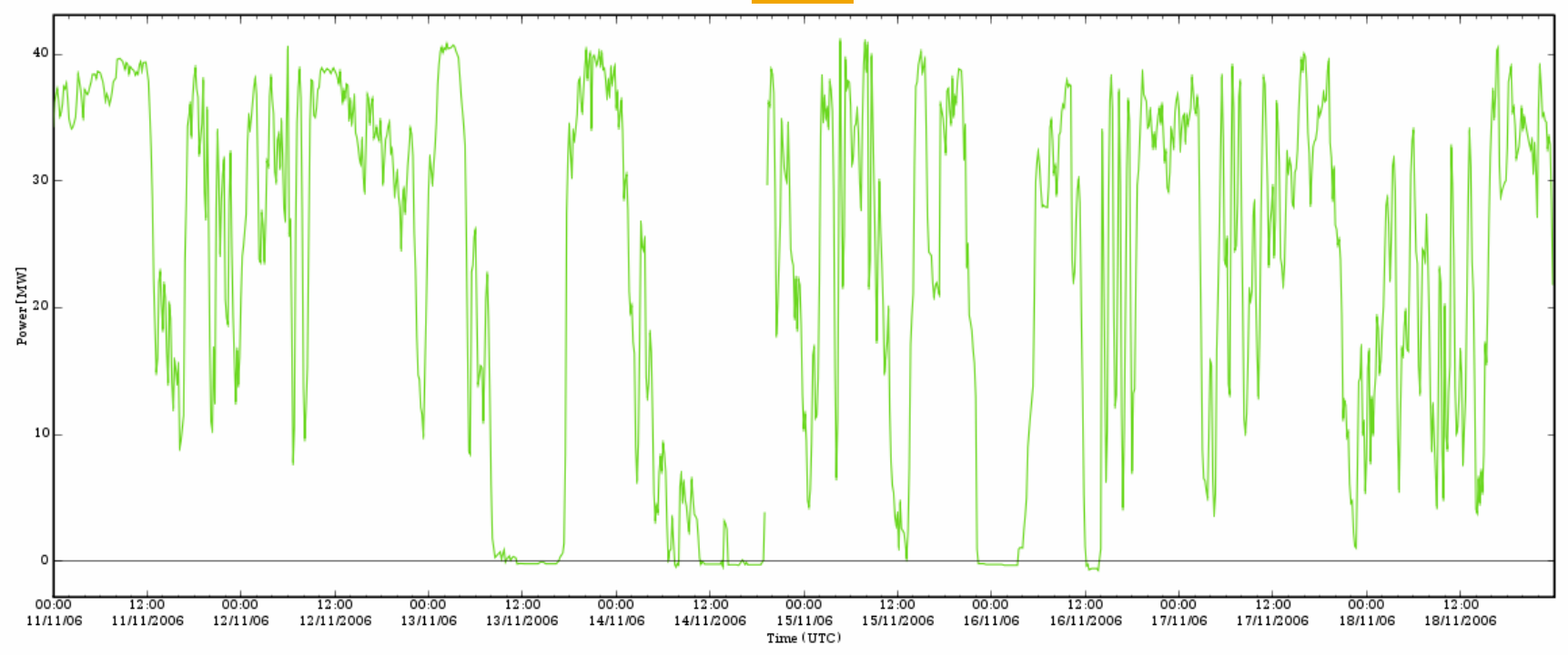
<< < Today > >>

Su	Mo	Tu	We	Th	Fr	Sa
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9

Begin: 2006-11-11 00:00 Days: 8 Update Mode

Size: 1200 x 500 Legend Grid Points

Plot1:



Plot plot1 from measurement; Curves: meas/trafo (PowerMeas_Trafo), Site:None

What input we need from the wind farm ?

Needed:

- Historical Measured power
- Online Measured power
- Turbine data: Coordinates, Hubheight, Type,

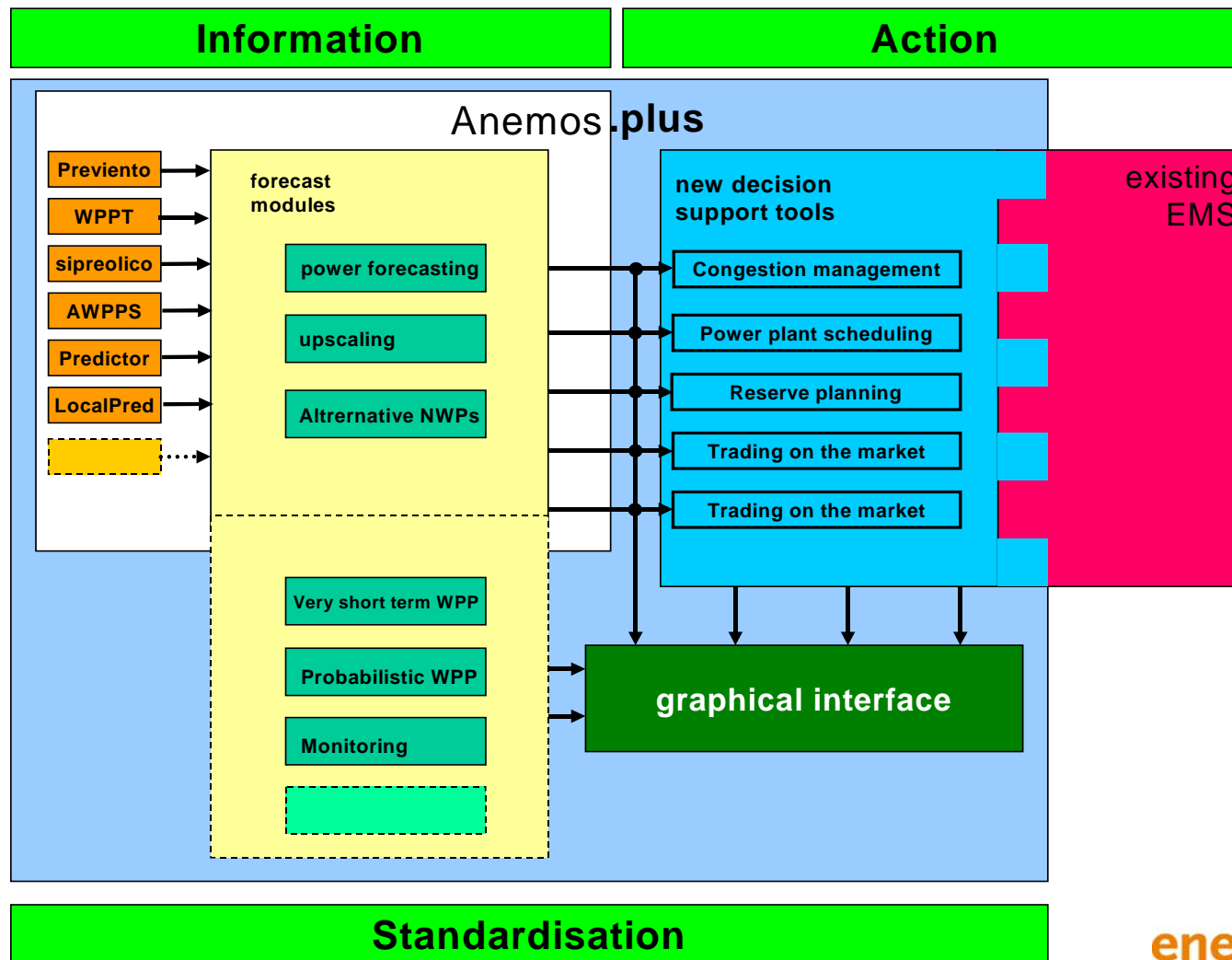
Nice to have:

- Measured wind speed, direction, temperature
- Availability of wind turbines

What else we are doing ? - some examples

- Decision support tools: ANEMOS.plus
- Renewable virtual trading platform
- HyWindBalance
(storage of wind power in hydrogen to provide balancing power)

ANEMOS.plus - Overall implementation scheme



ANEMOS.plus – Konsortium

Energy companies

ACCIONA (E)
EDF (F)
EIRGRID (IRL)
ELSAM (DK)
ENERGIE E2 (DK)
EWE (D)
PPC (GR)
REE (E)
REN (P)
SONI (GB)
VATTENFALL (S)

Wind forecast companies

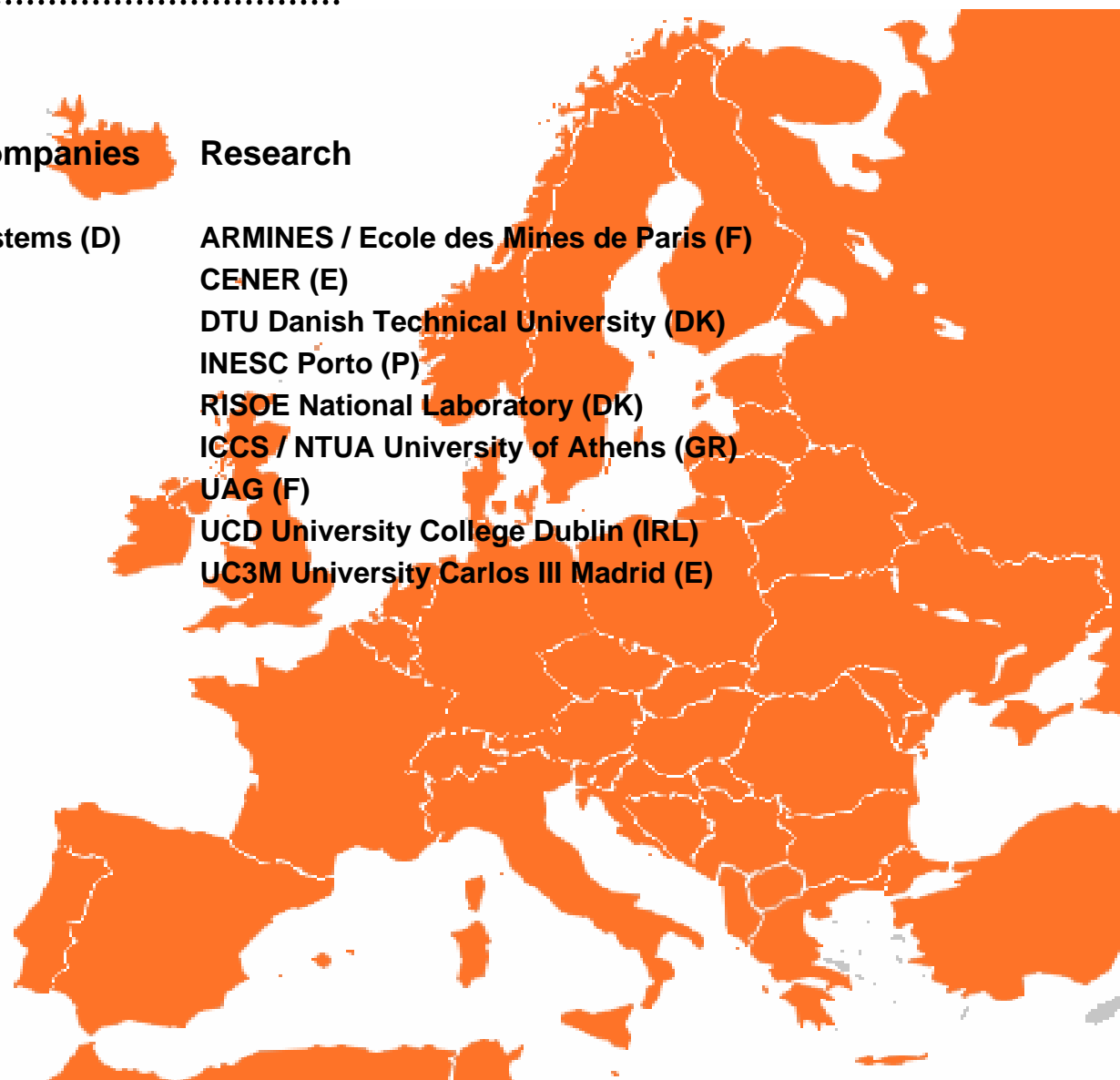
energy & meteo systems (D)
ENFOR (DK)
MeteoFrance (F)
Overspeed (D)

Research

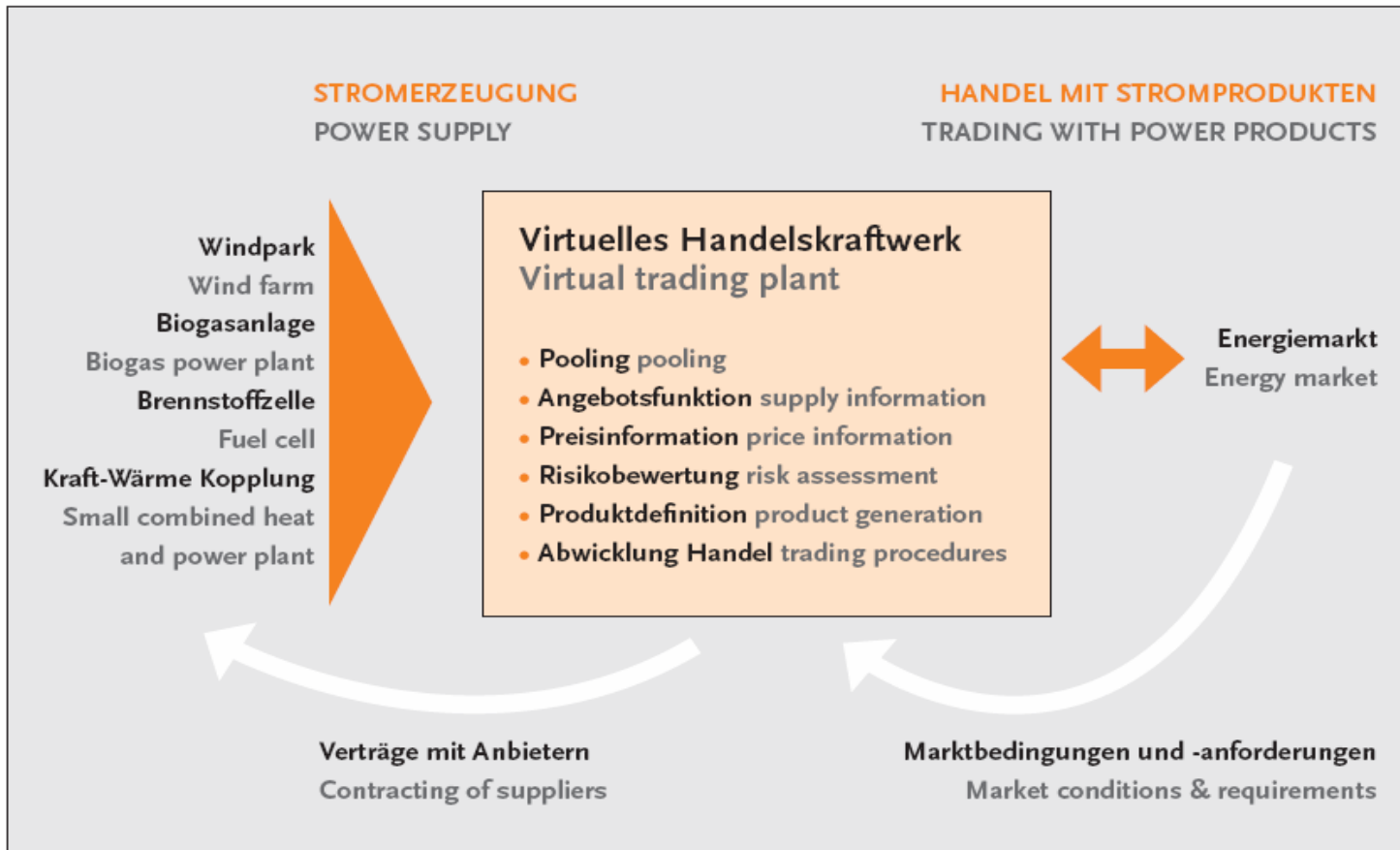
ARMINES / Ecole des Mines de Paris (F)
CENER (E)
DTU Danish Technical University (DK)
INESC Porto (P)
RISOE National Laboratory (DK)
ICCS / NTUA University of Athens (GR)
UAG (F)
UCD University College Dublin (IRL)
UC3M University Carlos III Madrid (E)



www.anemos-plus.eu



Renewable virtuell trading platform



Thanks for your attention !



Contact

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