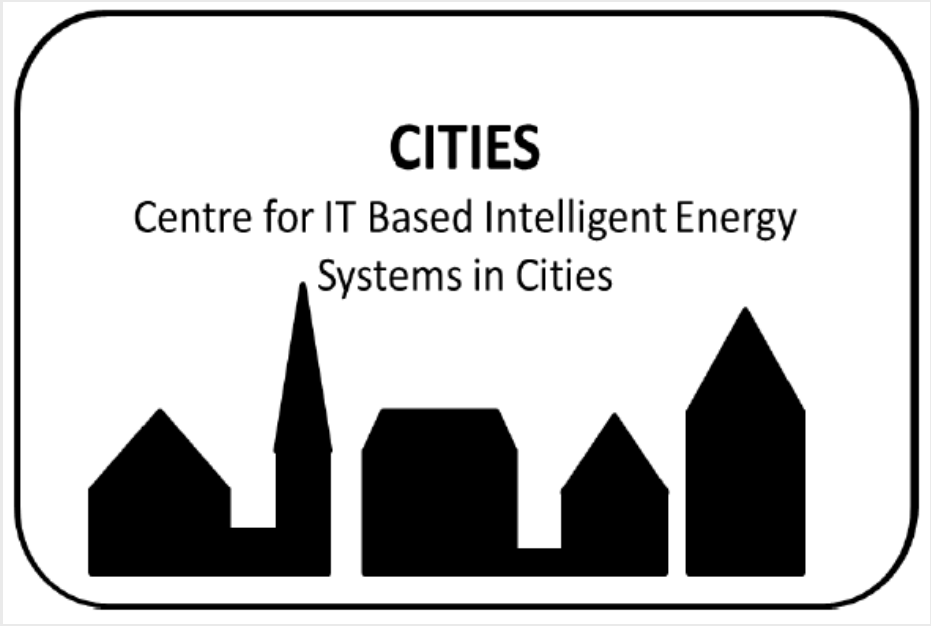

KICKOFF-meeting in CITIES, 29-1-2014

Market based adaption of flexible energy plants for the energy supply of CITIES

Anders N. Andersen, EMD International A/S
ana@emd.dk

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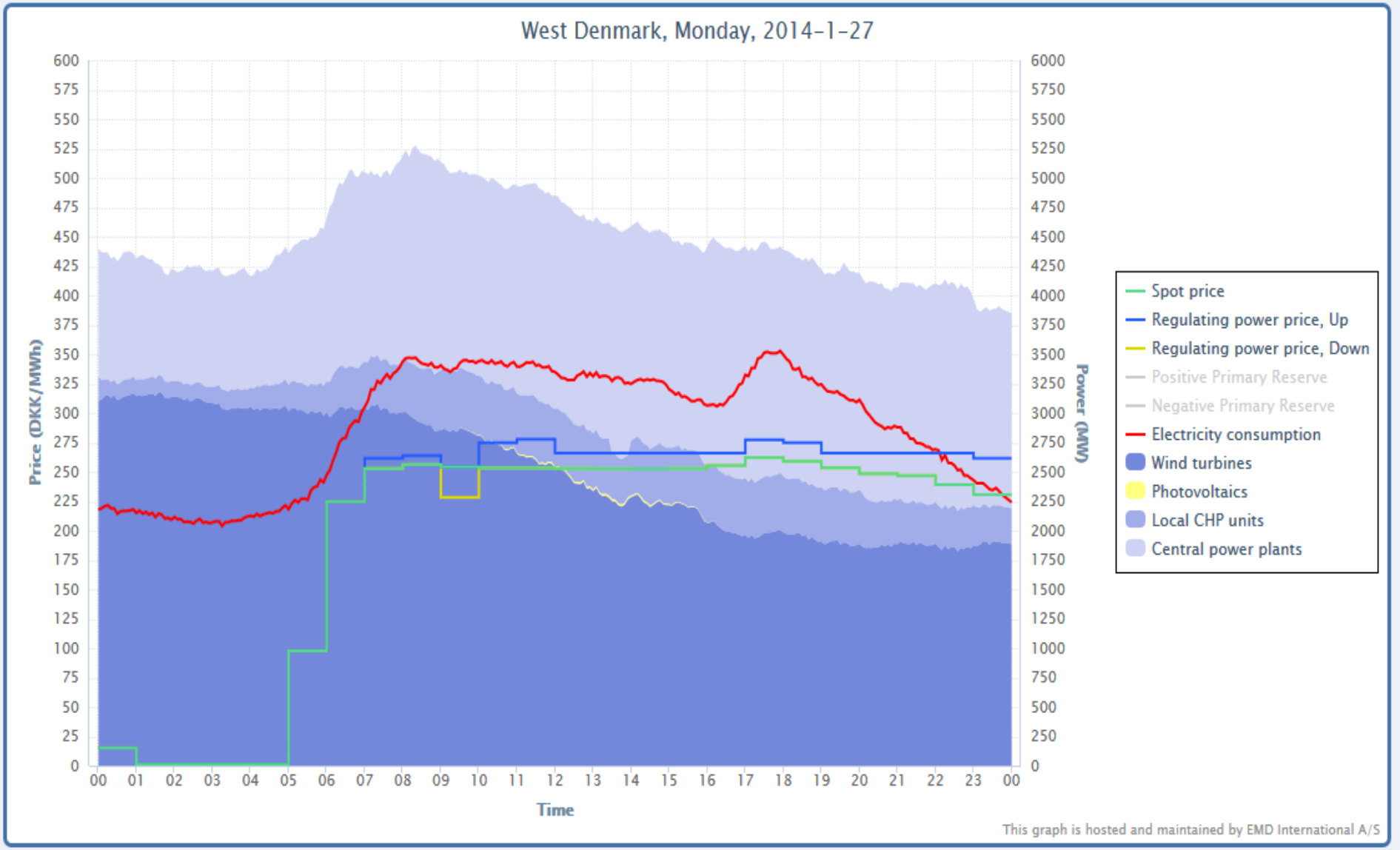
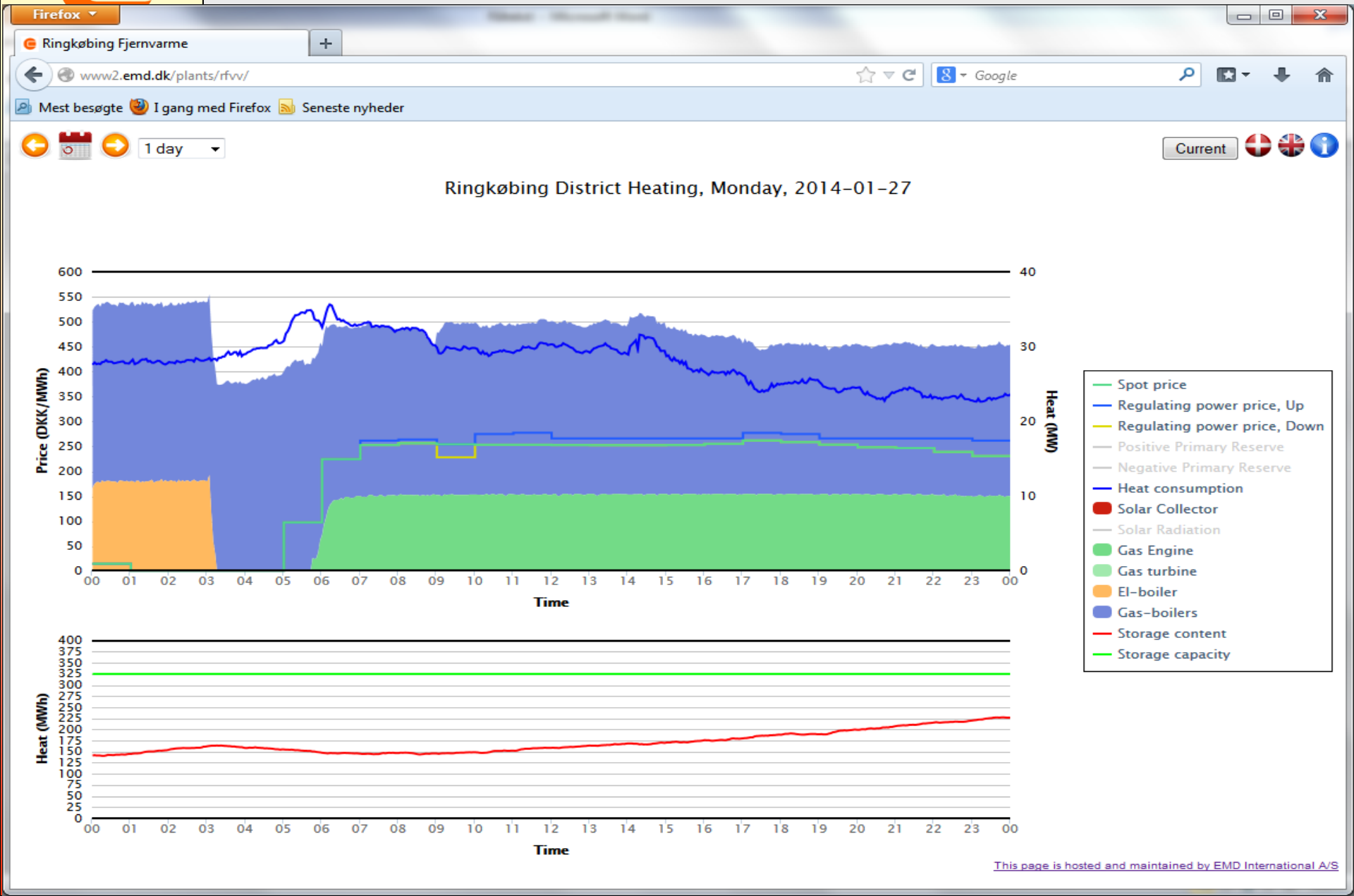
In 5 hours 27-1-2014 the spotprice was next to 0.



Question 1: Why did the electrical boiler in Ringkøbing only operate in 3 hours that day and not in 5 hours ?



I will in my presentation address a few of the focus areas in CITIES

- Current operational, control and market frameworks are poorly suited for renewable integration.
- Increased flexibility within the system through storage, substitution of energy carriers and flexibility of consumption.
- Develop methodologies and IT solutions for the analysis, operation and development of fully integrated urban energy systems.
- Identify commercial opportunities within the smart cities.

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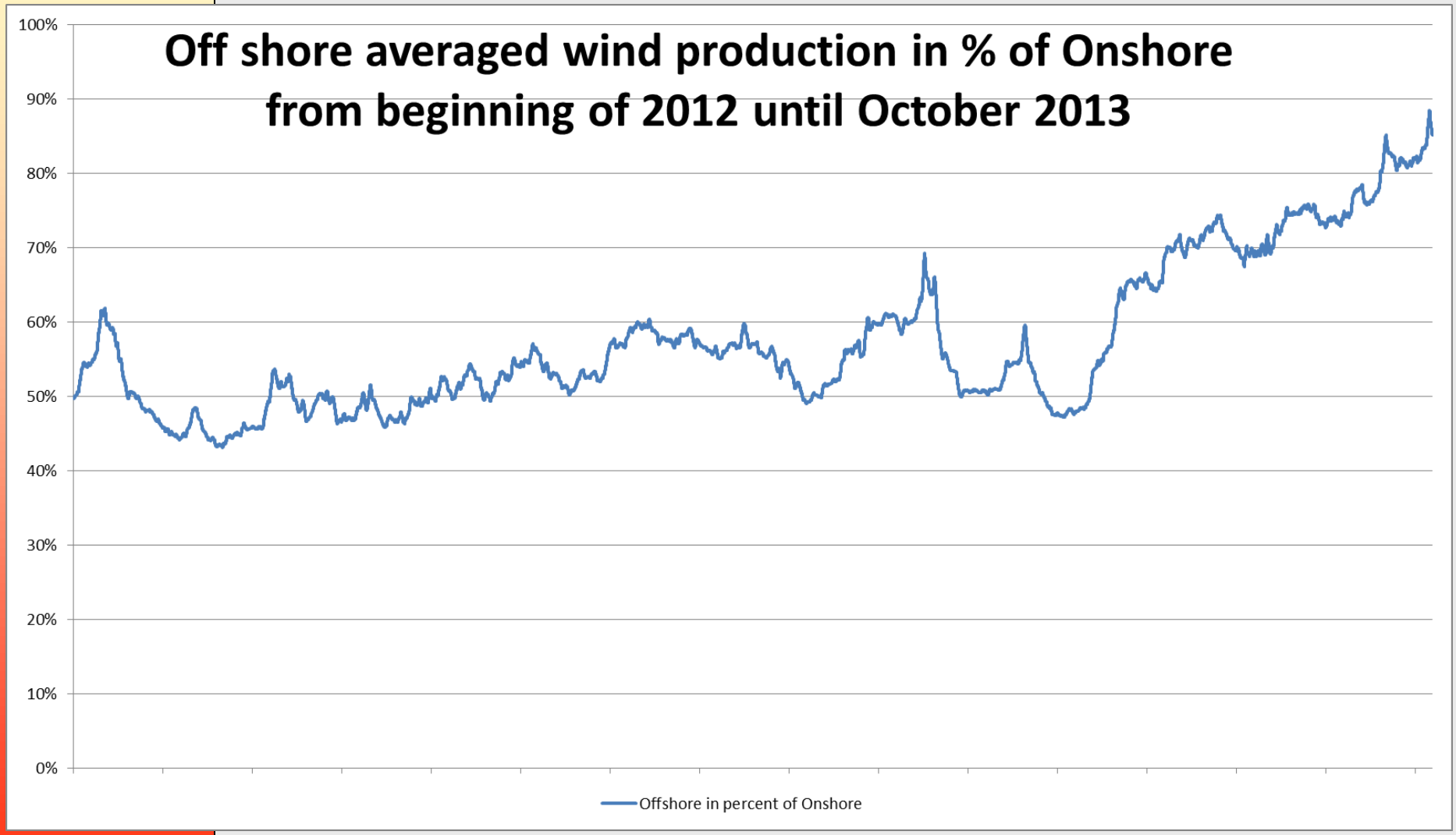
An important starting point is that CITIES have in Denmark to absorp Off shore wind.



The TSO electricity markets for balancing the electricity system and wind productions

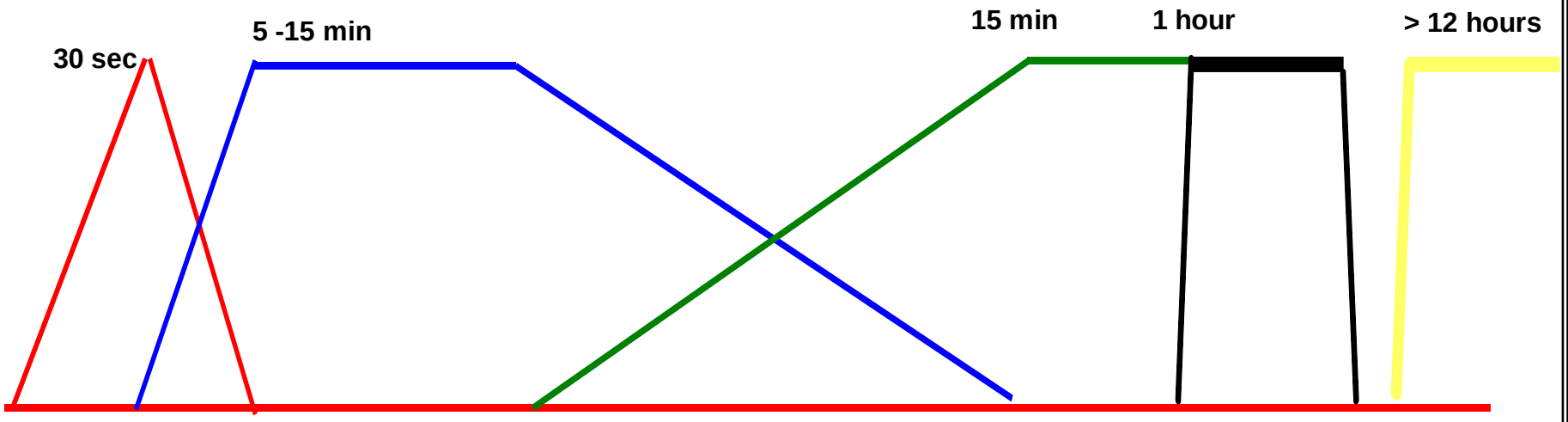
Frequency containment reserves, Primary reserve

Frequency restoration reserves, Secondary reserve

Replacement Reserves,Tertiary reserve

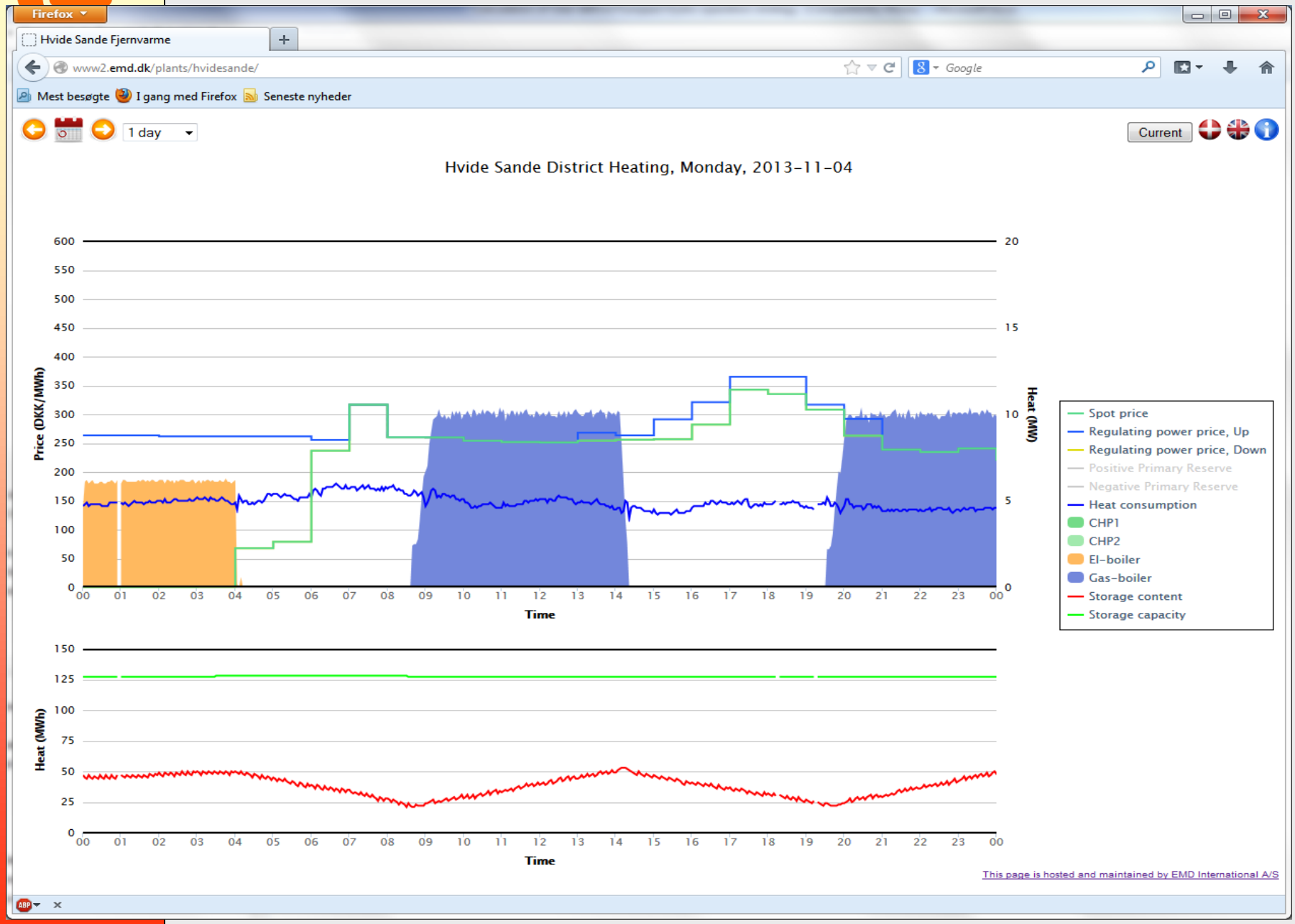
Intra day wholesale market

Day ahead wholesale market



Hvide Sande won trade in Primary reserve market, Regulating power market and spot market that day.

Question 2: Hvide Sande bought electricity in spot for the electrical boiler. Why did it not in these 4 hours then win upward regulation in Reg.m.



We have in a research project made live test of the economic benefit for a 21 MW wind farm of offering themselves downward regulation to the TSO

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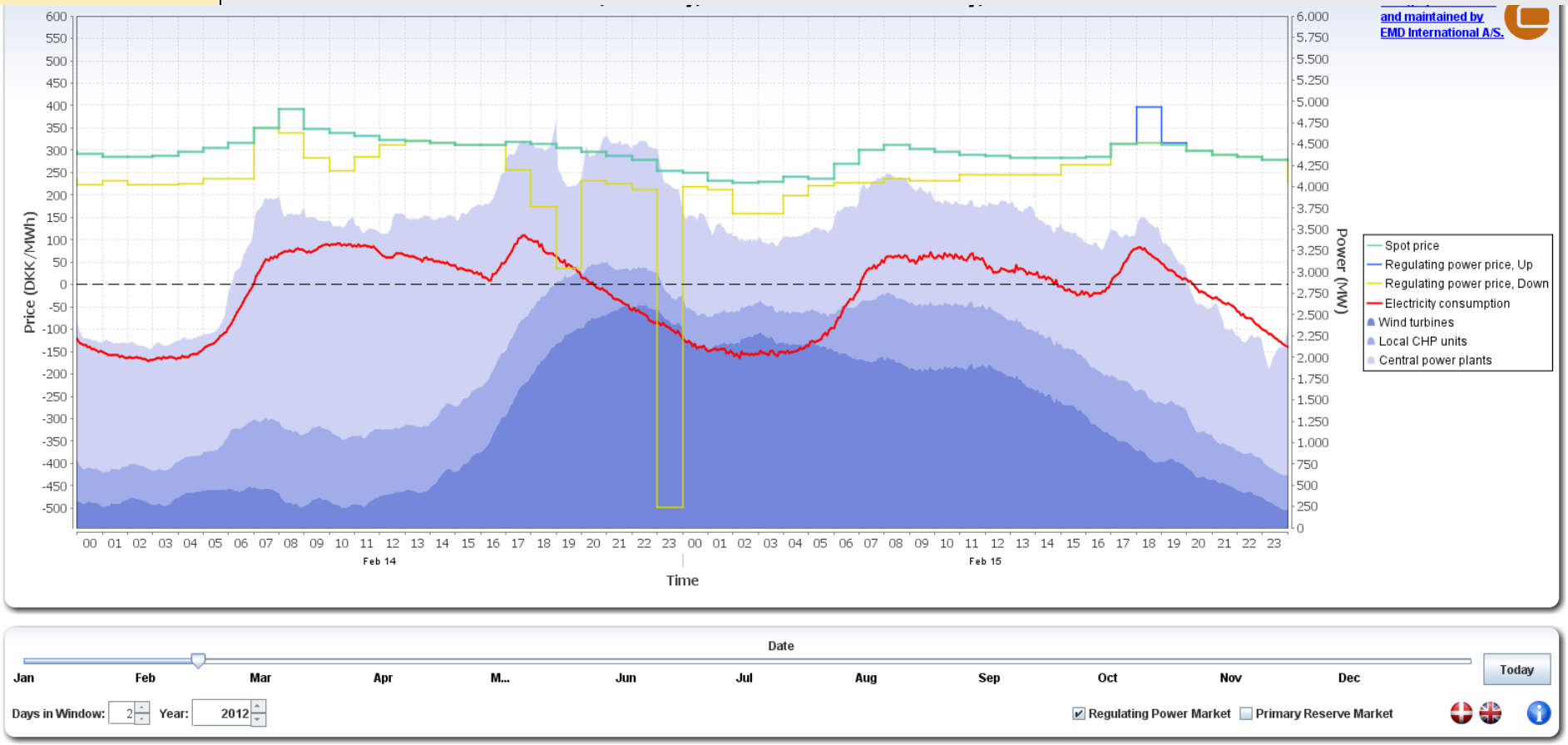
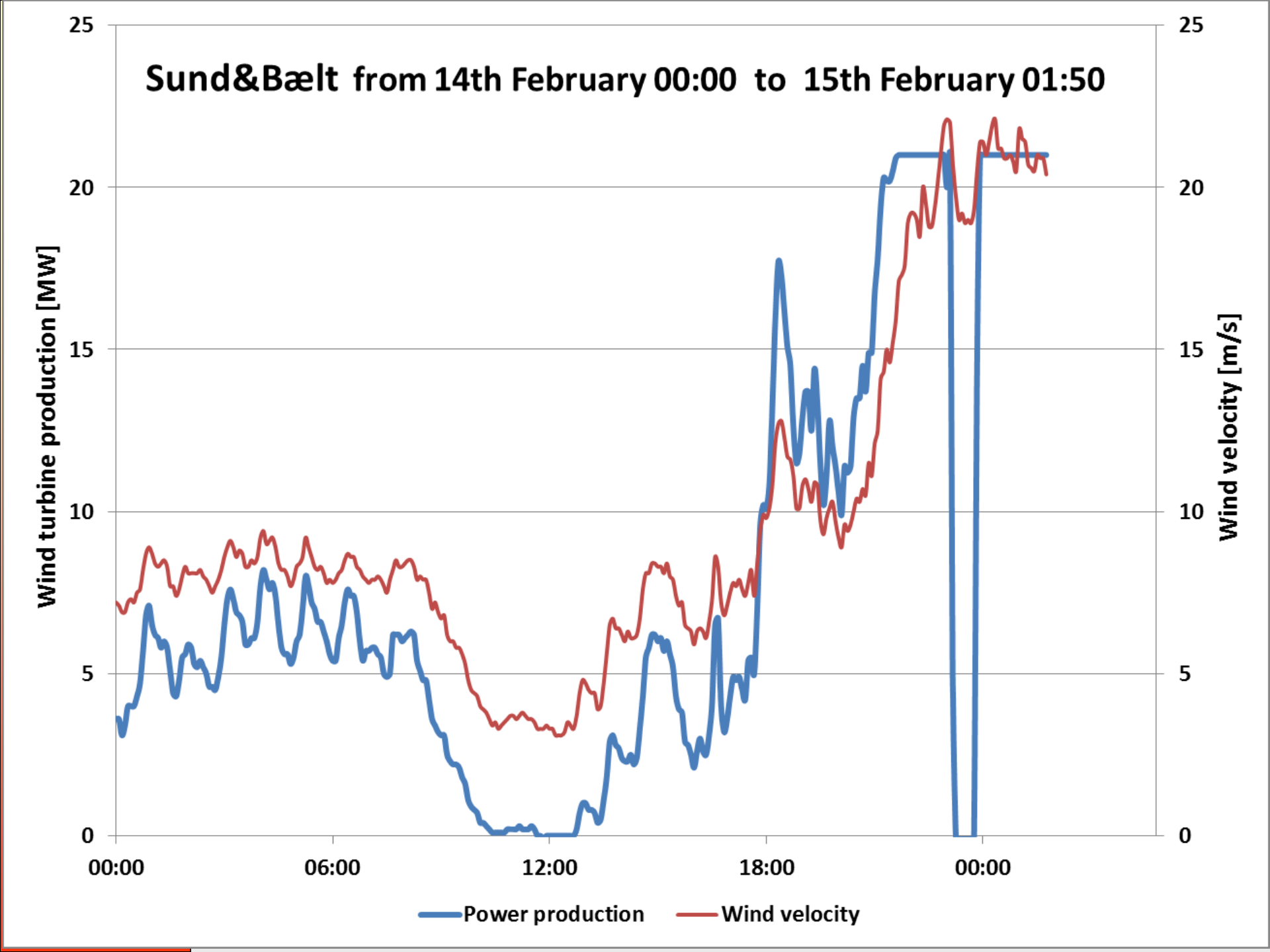
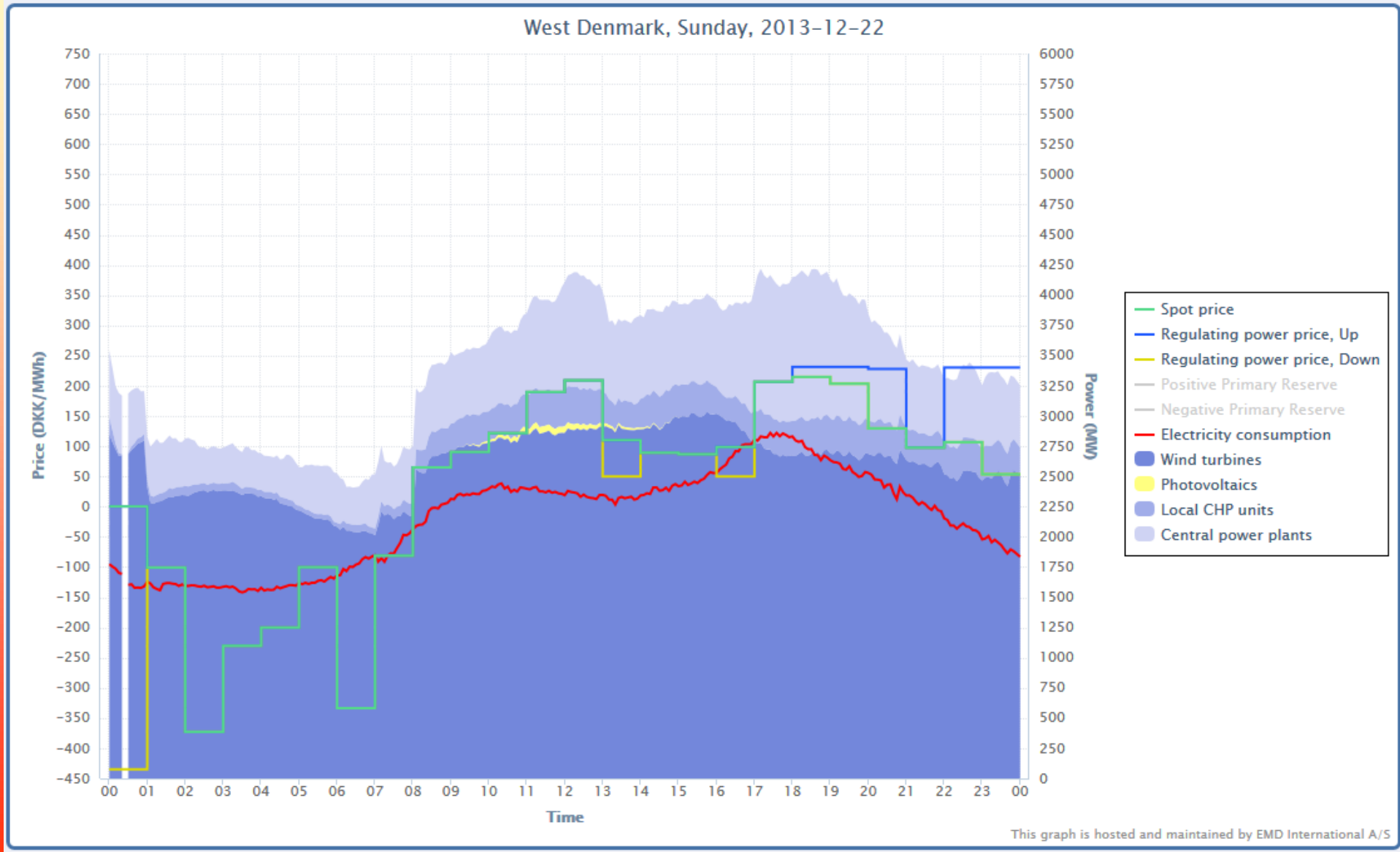
http://emd.dk/el/



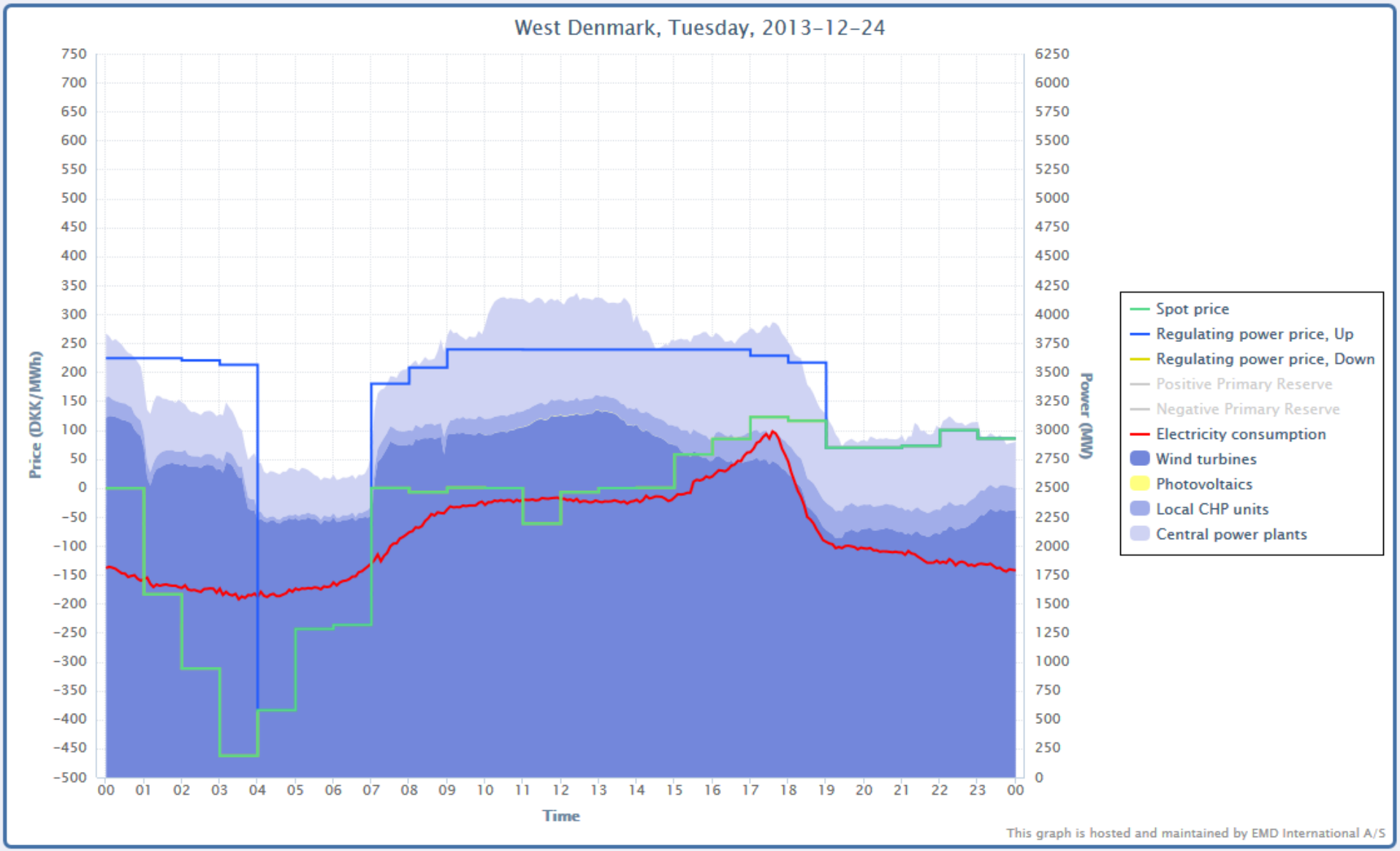
EMD

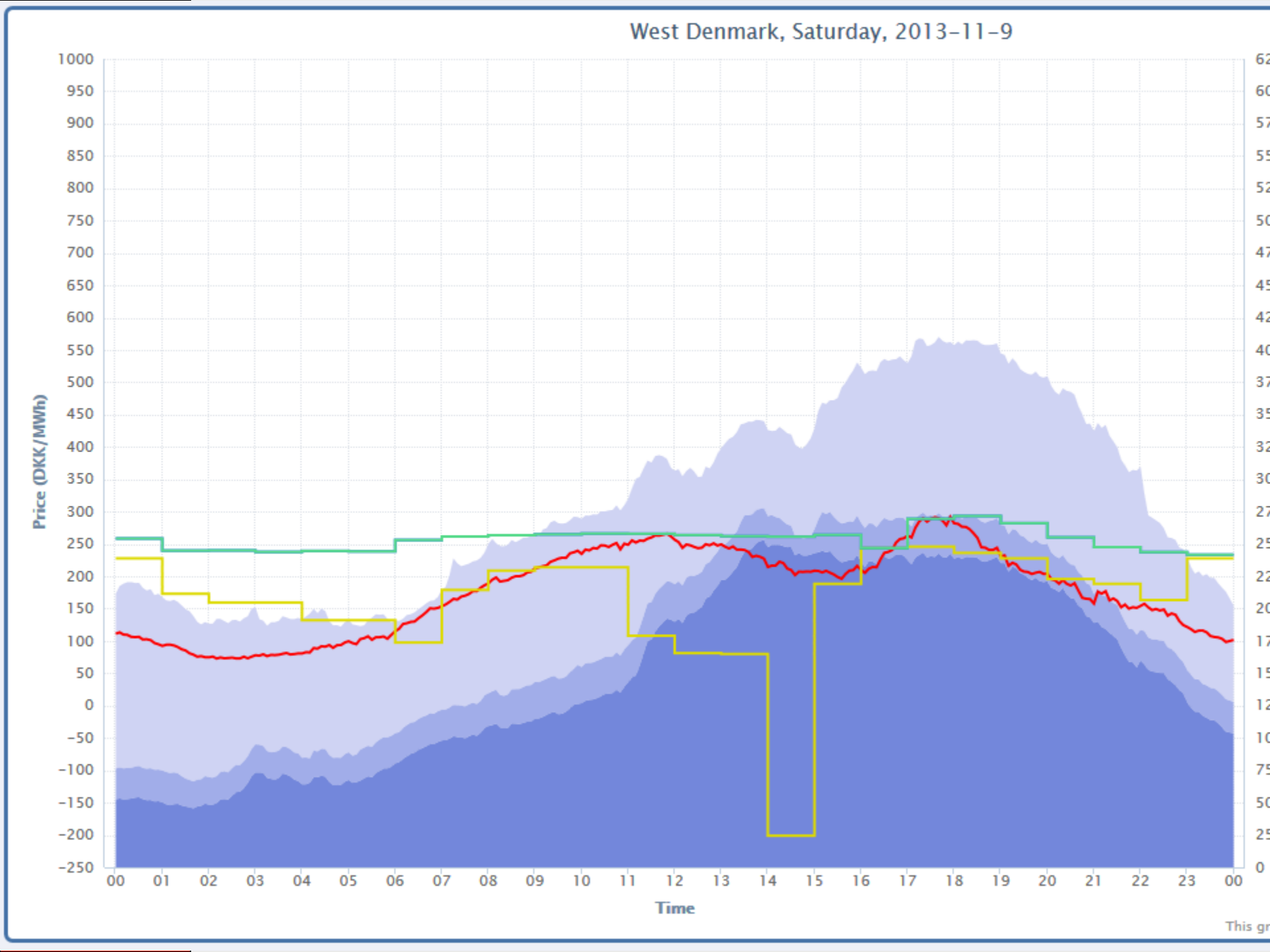

Sund&Bælt from 14th February 00:00 to 15th February 01:50
Wind turbine production [MW]
Wind velocity [m/s]
25
20
15
10
5
0
00:00
06:00
12:00
18:00
00:00
Power production
Wind velocity

Wind turbines lost trade in spot 22-12-2013 and had to stop for some hours, see www.emd.dk/el

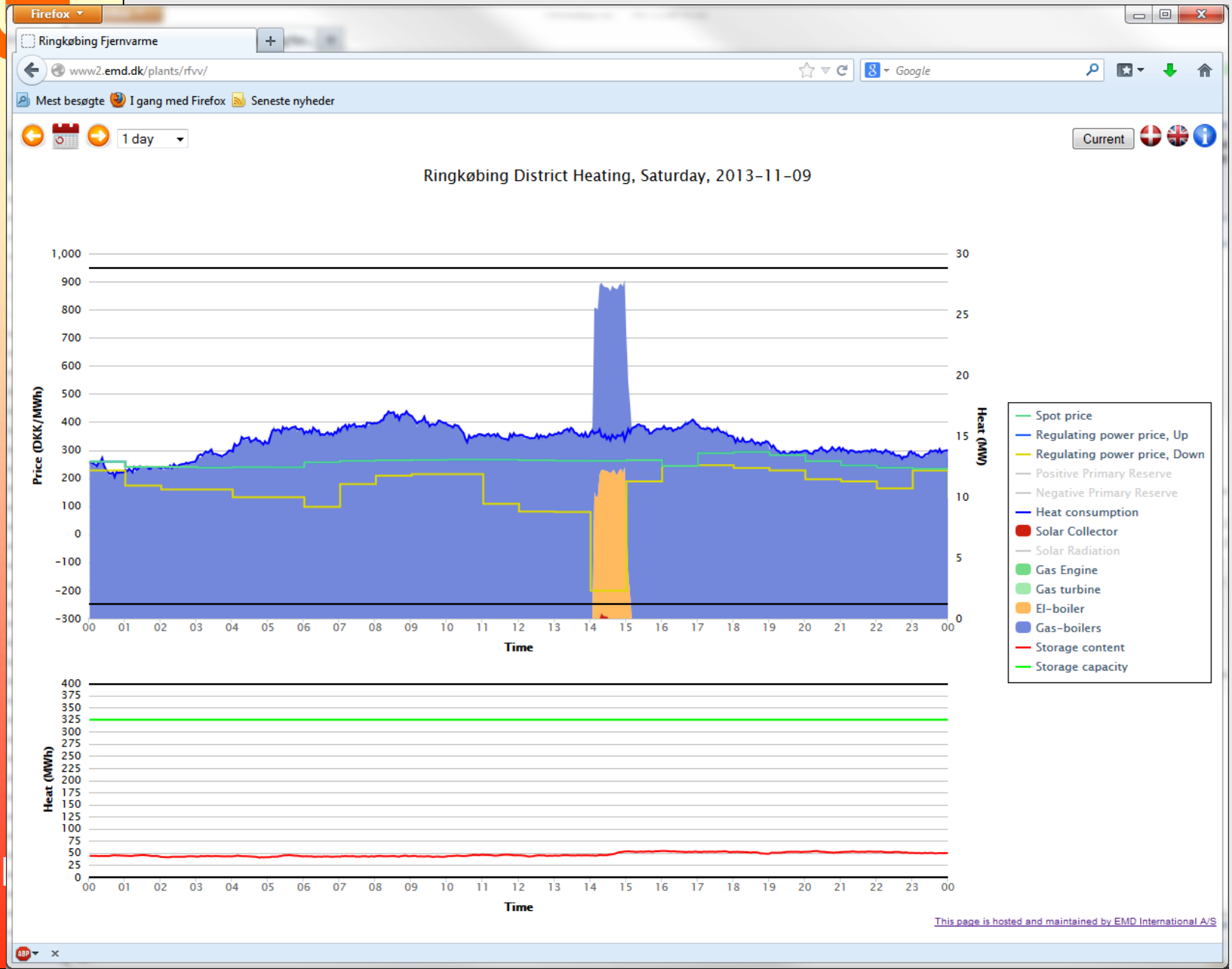


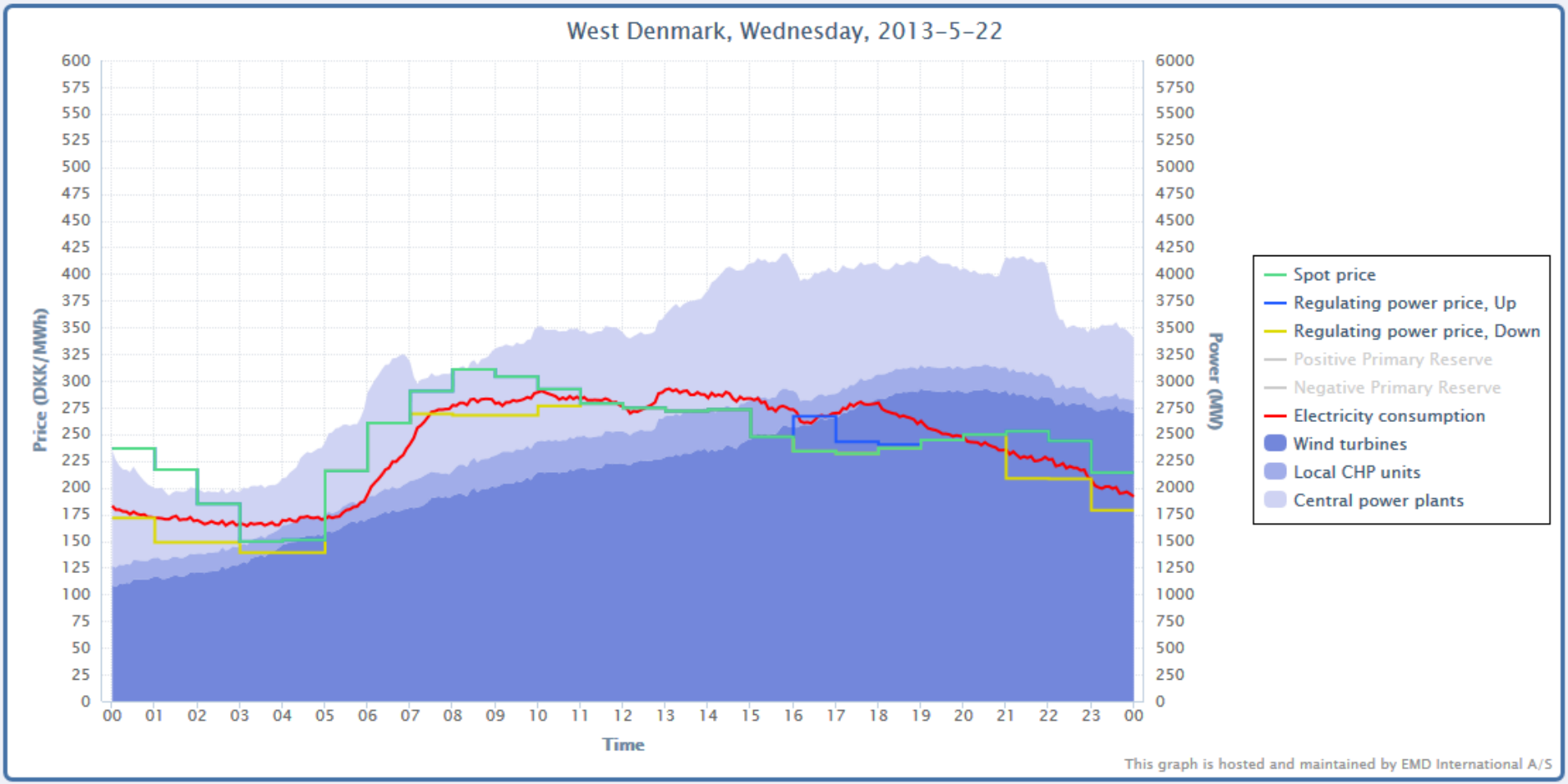
Wind turbines won 24-12-2013 upward regulation in the Regulating power market at 01:00, see www.emd.dk/el.




West Denmark, Saturday, 2013-11-9
Price (DKK/MWh)
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
00
Time

http://www.emd.dk/plants/rfv/




West Denmark, Wednesday, 2013-5-22
Price (DKK/MWh)
Power (MW)
Time
Spot price
Regulating power price, Up
Regulating power price, Down
Positive Primary Reserve
Negative Primary Reserve
Electricity consumption
Wind turbines
Local CHP units
Central power plants
This graph is hosted and maintained by EMD International A/S

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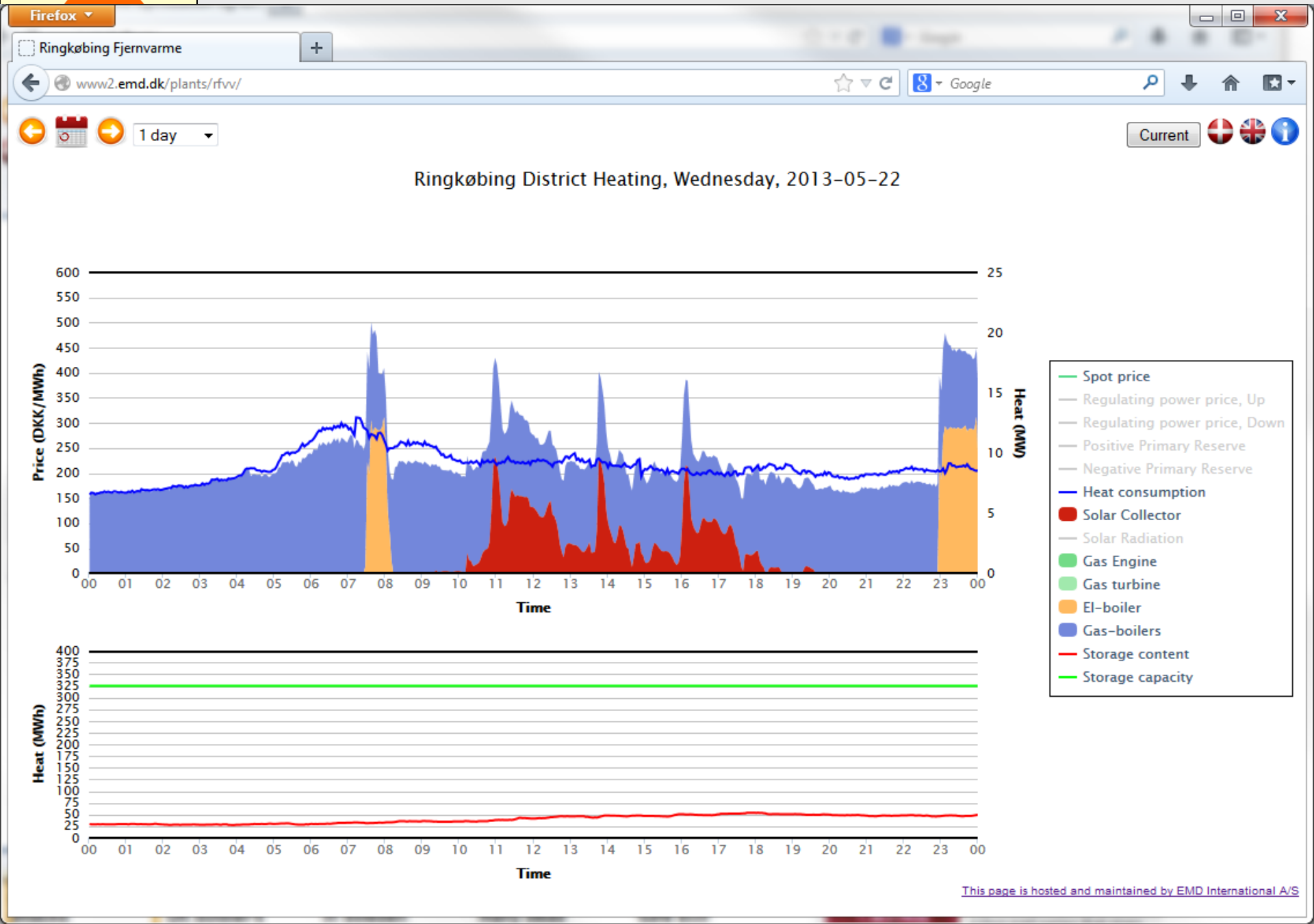
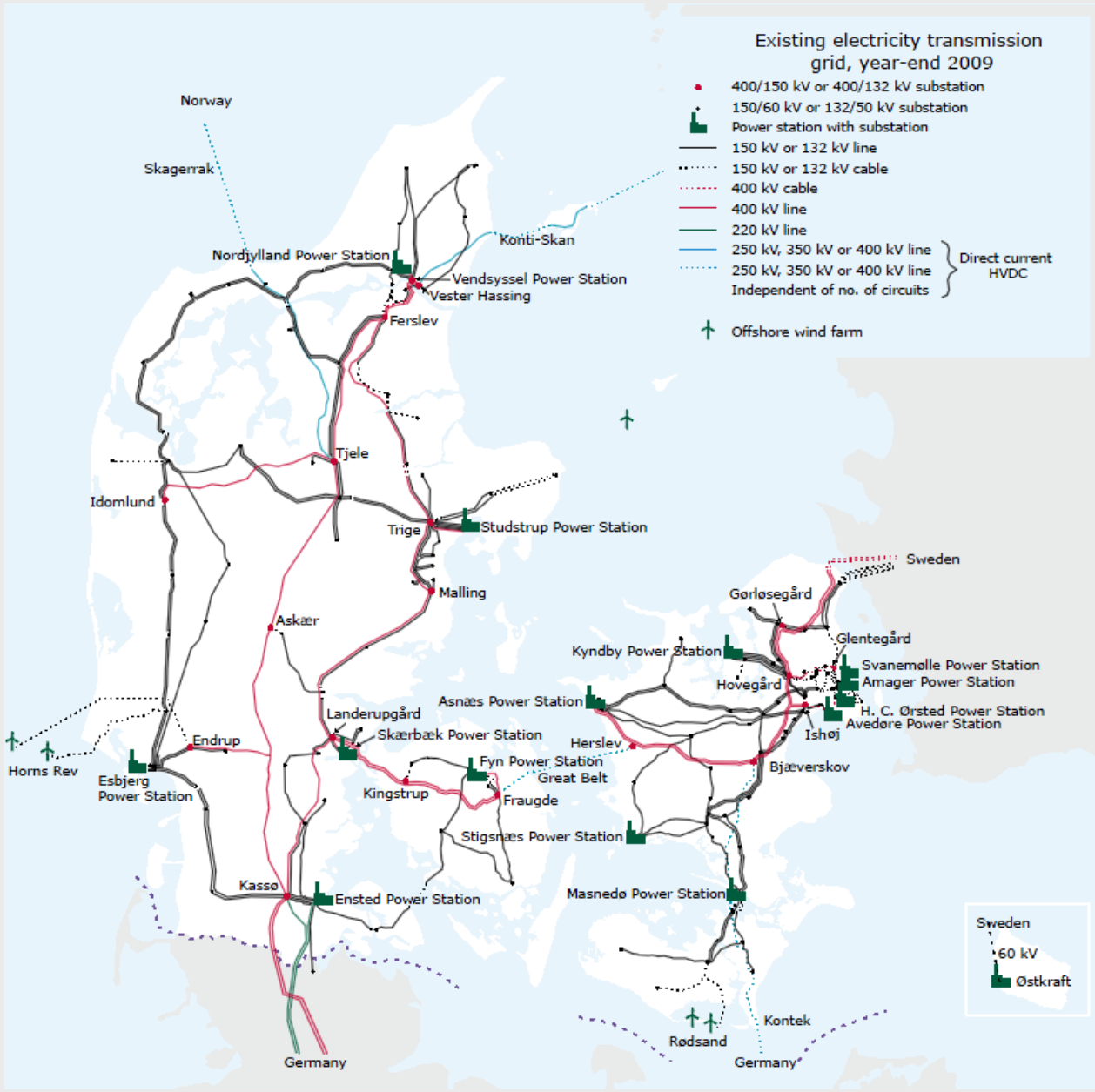
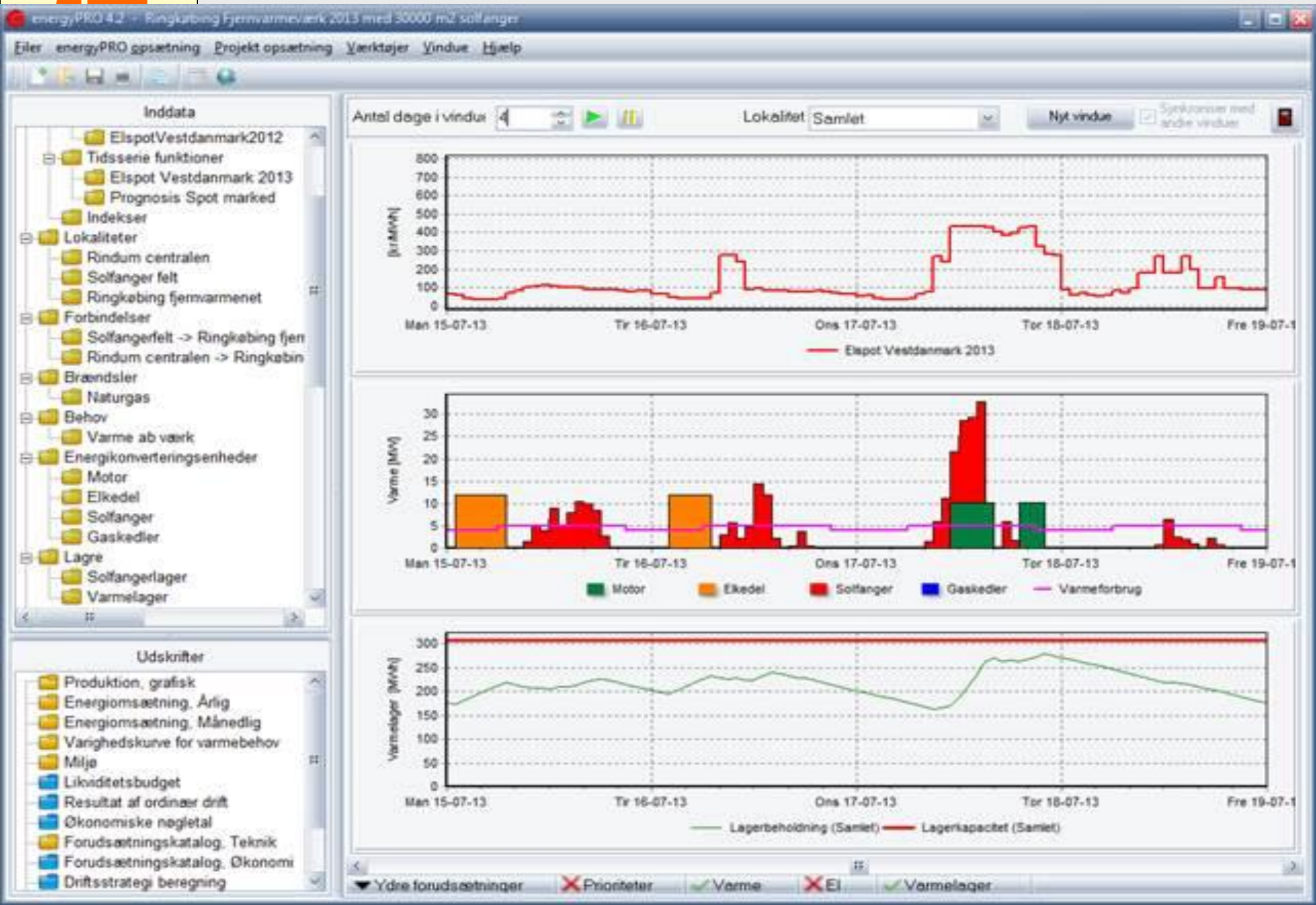
Electrical boilers was activated outside the markets.




Existing electricity transmission grid, year-end 2009
400/150 kV or 400/132 kV substation
150/60 kV or 132/50 kV substation
Power station with substation
150 kV or 132 kV line
150 kV or 132 kV cable
400 kV cable
400 kV line
220 kV line
250 kV, 350 kV or 400 kV line
250 kV, 350 kV or 400 kV line
Independent of no. of circuits
Direct current HVDC
Offshore wind farm
Norway
Skagerrak
Konti-Skan
Nordjylland Power Station
Vendsyssel Power Station
Vester Hassing
Ferslev
Tjele
Idomlund
Trige
Studstrup Power Station
Malling
Askær
Landerupgård
Skærbæk Power Station
Endrup
Horns Rev
Esbjerg Power Station
Fyn Power Station
Great Belt
Fraugde
Kingstrup
Kassø
Ensted Power Station
Germany
Sweden
Gørløsegård
Glentegård
Kyndby Power Station
Svanemølle Power Station
Amager Power Station
Hovegård
Asnæs Power Station
H. C. Ørsted Power Station
Avedøre Power Station
Ishøj
Herslev
Bjæverskov
Stigsnæs Power Station
Masnedø Power Station
Rødsand
Kontek
Germany
Sweden
60 kV
Østkraft

EMD

Modeling in energyPRO Ringkøbing CHP-plant.



Firefox

Ringkøbing Fjernvarme

www2.emd.dk/plants/rfvv/

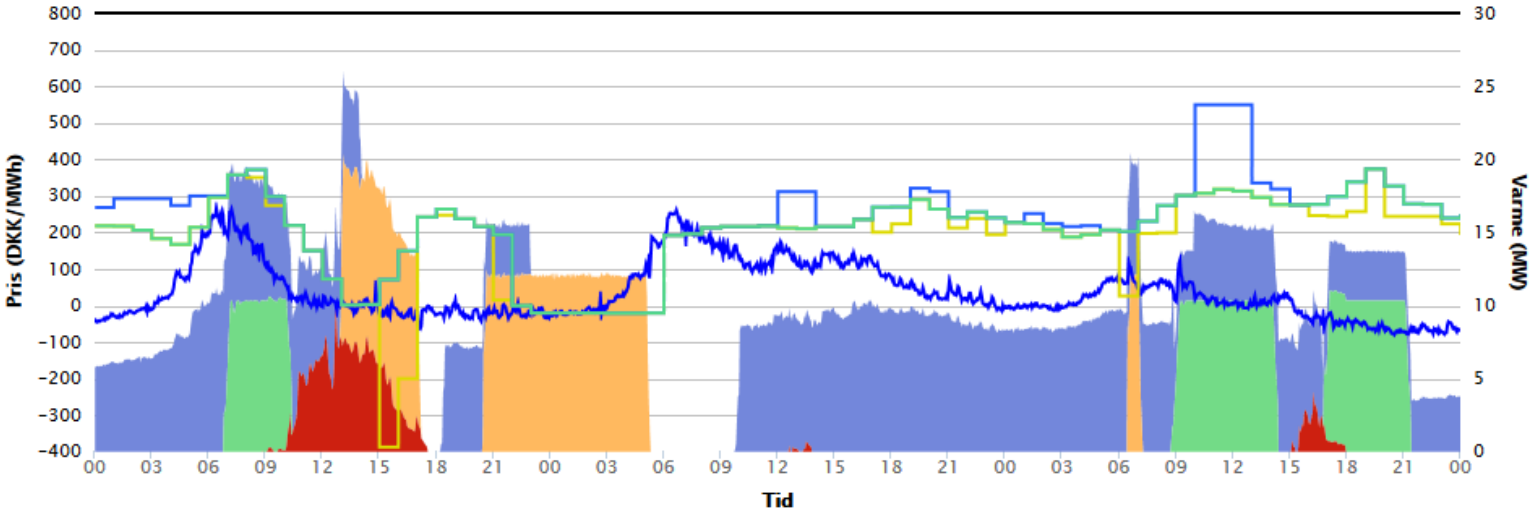
Google

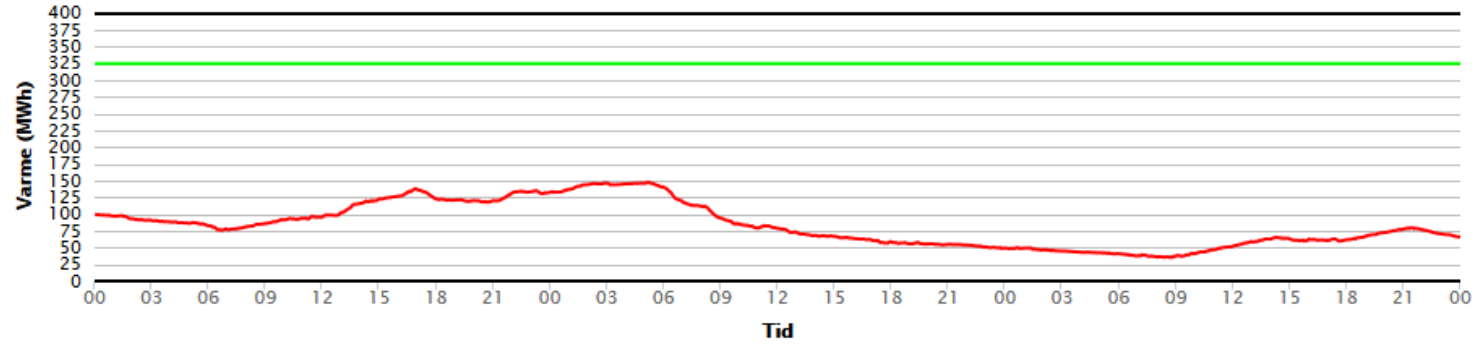
Mest besøgte | I gang med Firefox | Seneste nyheder

3 dage

Lige nu

Ringkøbing Fjernvarmeværk, torsdag, 3. okt 2013 til lørdag, 5. okt 2013





Denne side hostes og vedligeholdes af EMD International A/S

The 12 MW electrical boiler at http://www.emd.dk/plants/rfv/ is using the net reserves.

This is an example of smart grid operation/DSO-market !!

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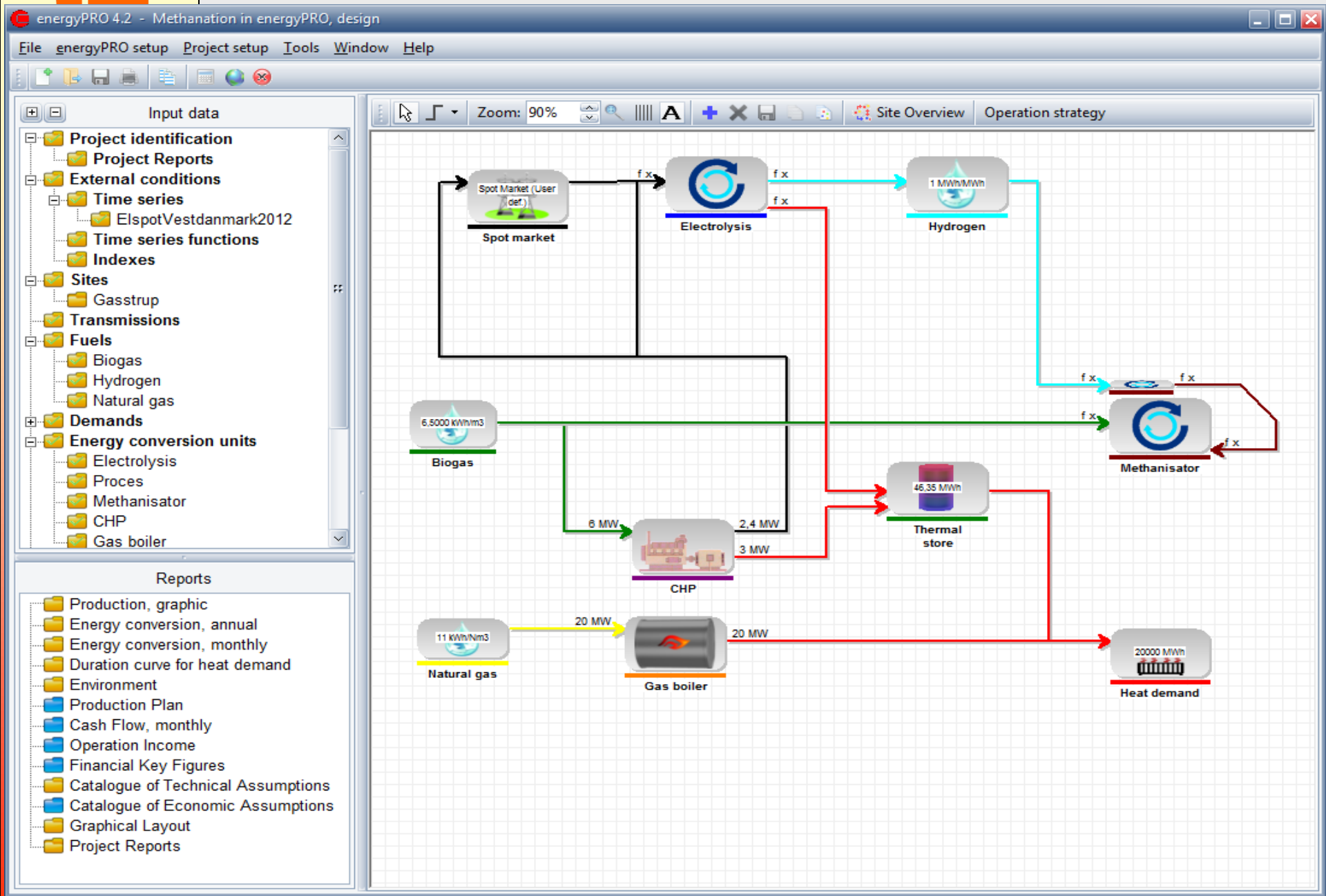
CITIES: Increased flexibility within the system through storage, substitution of energy carriers and flexibility of consumption.

EMD

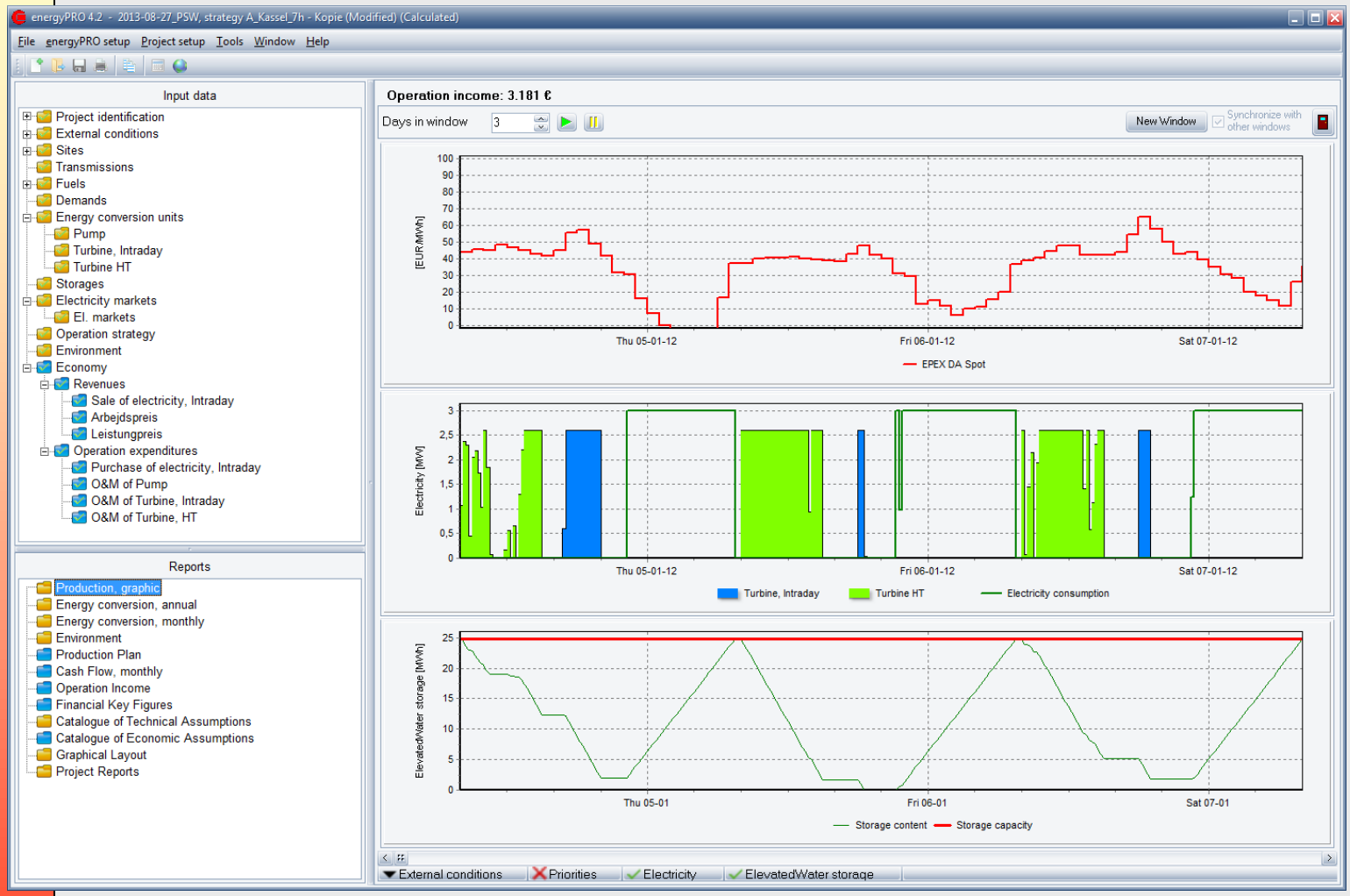
Modeling in energyPRO methanation plants delivering heat to CITIES.



http://www.store-project.eu/

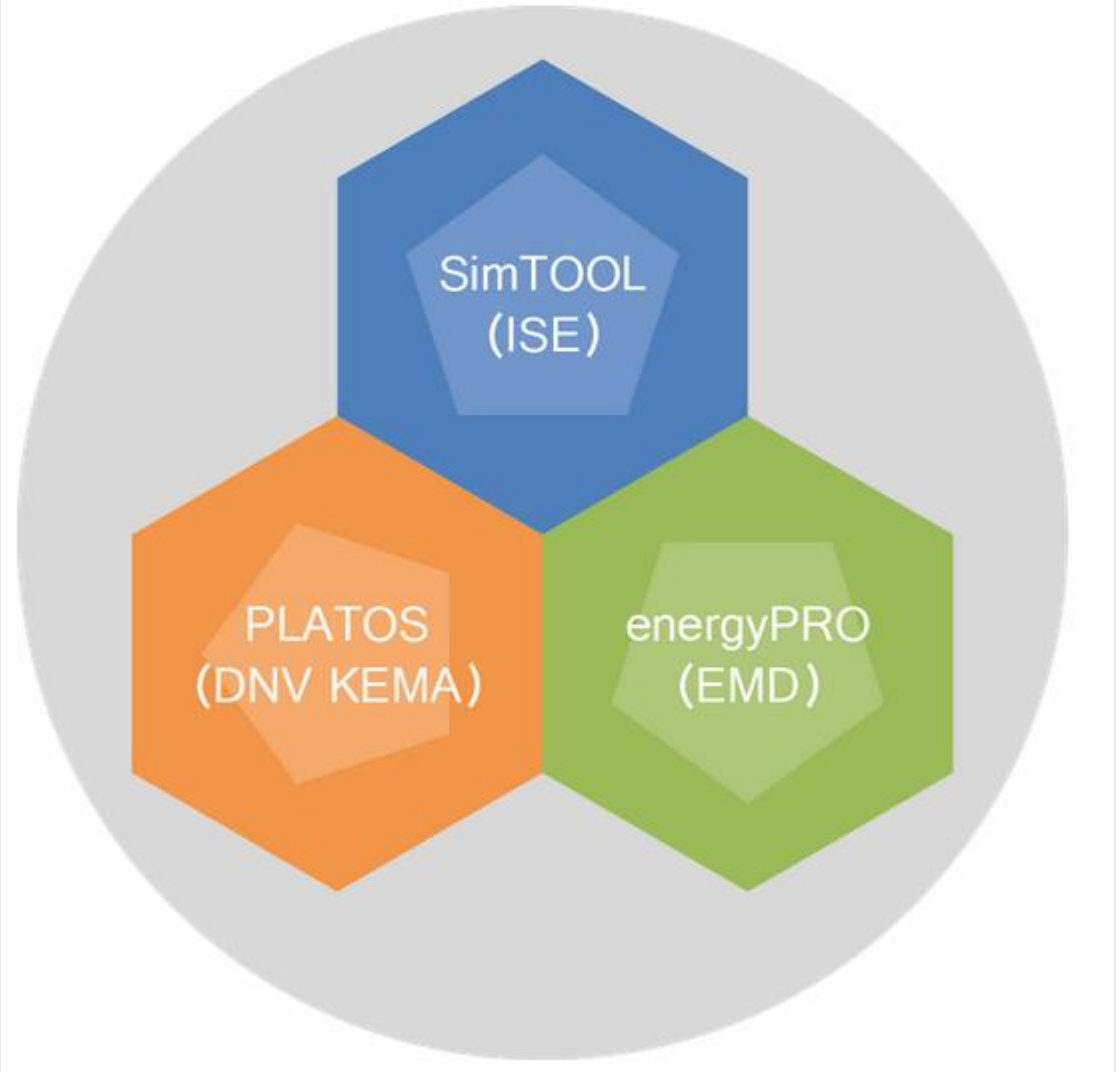
EMD

http://www.store-project.eu/



EMD

http://www.nemo-project.eu/



EMD

Thank you for your attention !

EMD