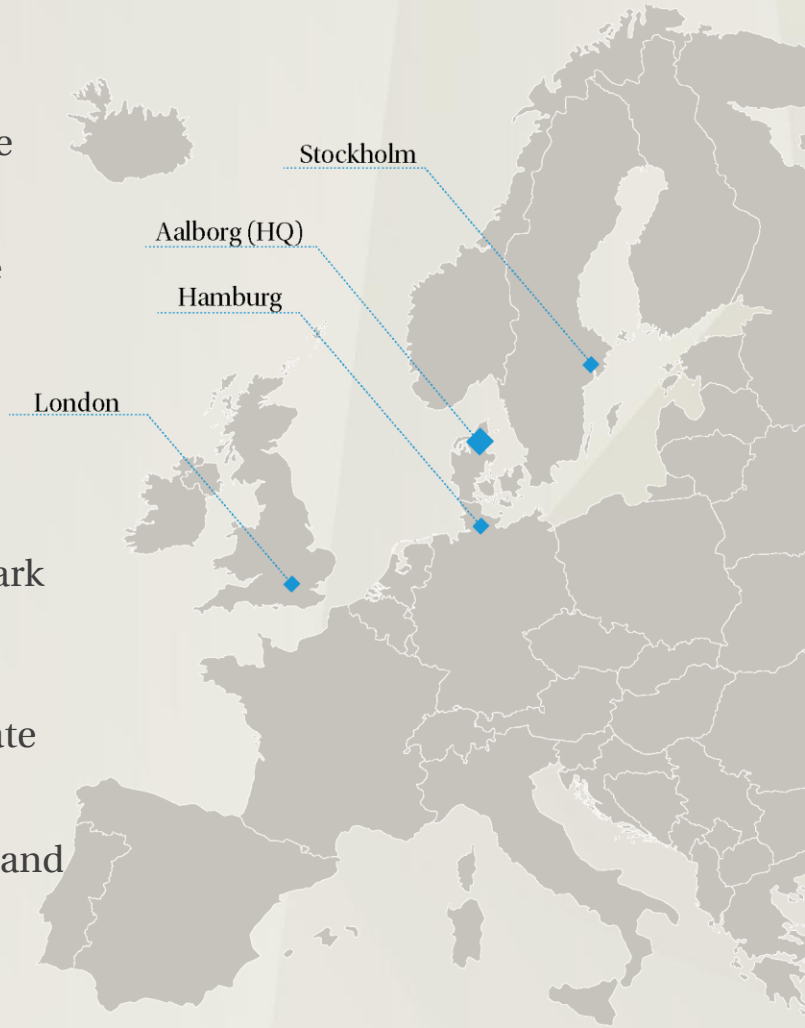
Challenges and possibilities of handling more wind power in the power system

Winterwind,Piteå 3. February 2015

NEAS ENERGY

Introduction

- Neas Energy is an independent international energy trading company operating in power, gas and certificate markets across Europe.
- We provide management of energy assets for wholesale partners in the energy sector including:
  - Utilities
  - Supply companies
  - Combined Heat and Power plants
  - Renewables (Wind, Hydro and PV)
- Neas Energy was established in 1998 in Aalborg, Denmark by four local public supply companies to purchase electricity in the newly liberalised energy market.
- In 2011, Neas Energy was purchased by a group of private equity investors including the company management.
- Neas Energy has its headquarters in Aalborg, Denmark and sales offices in London, Hamburg and Stockholm.
- Neas Energy has been a member of the UN Global Compact since 2009.



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Portfolio

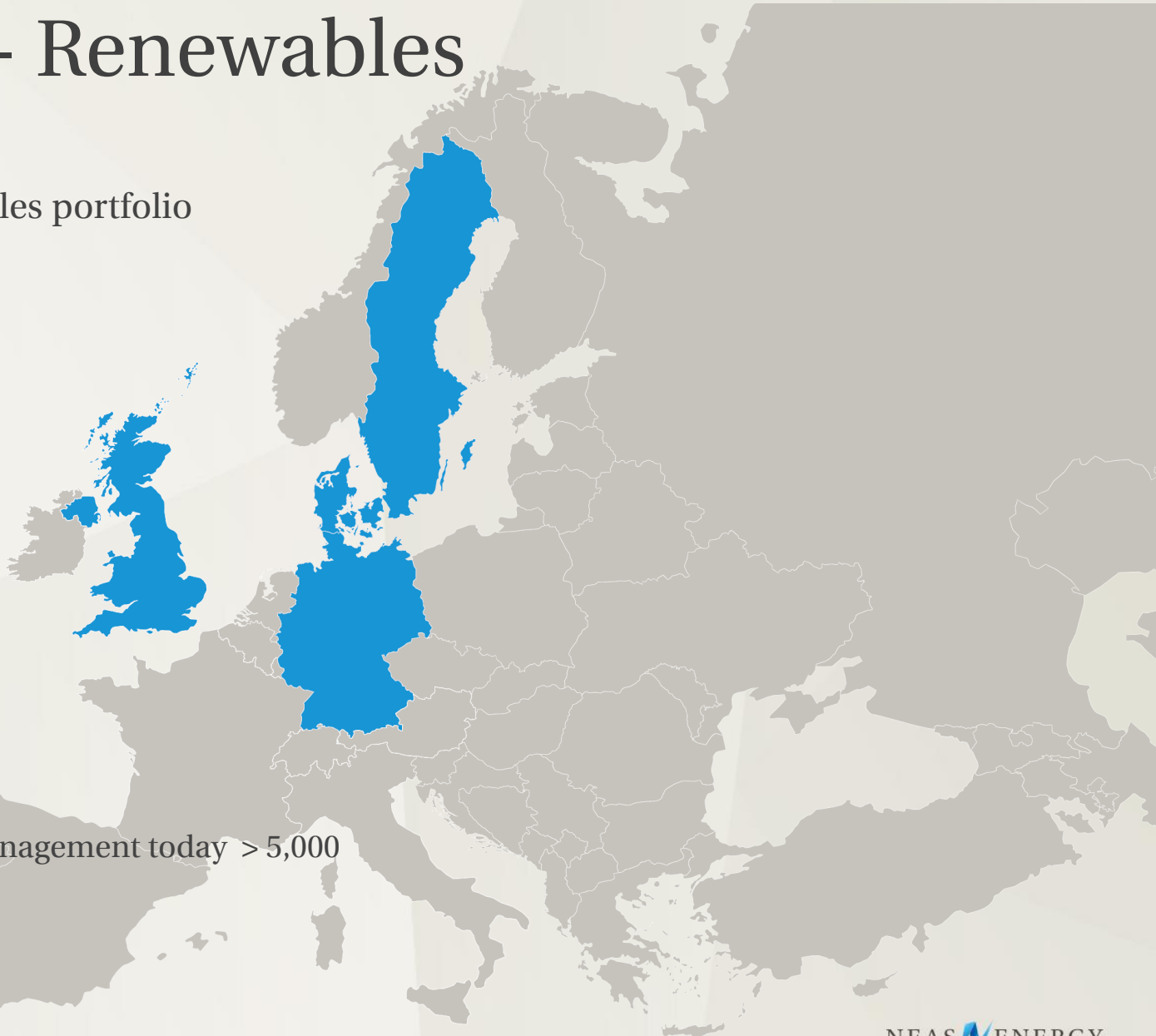
Neas Energy's portfolio includes:

- Combined Heat & Power > 1,600 MW installed capacity
- Renewables > 5,000 MW installed capacity
- Supply & large scale consumption 2.3 TWh
- Natural gas trading 36,000 MWh turnover daily (avg.)
- Renewable energy certificates (GoO, EECS, CERs, VERs, Elcerts, LECs)

Portfolio - Renewables

Neas Energy renewables portfolio

- Denmark:
  - Wind
- Sweden:
  - Wind
  - Hydro
- Germany:
  - Wind
  - PV
- UK
  - Wind
  - PV



Total portfolio under management today > 5,000 MW.

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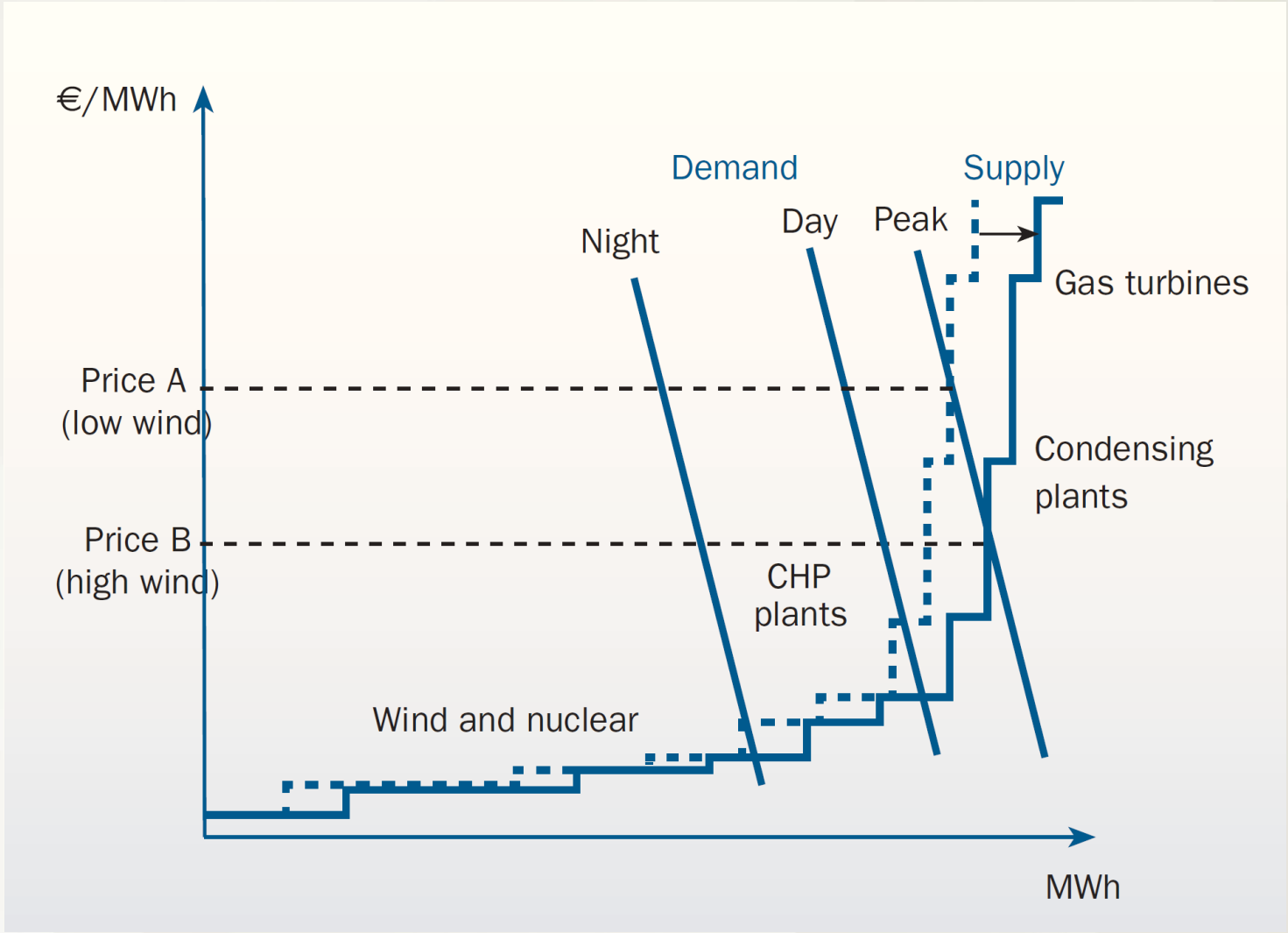
Challenges and possibilities of handling more wind power in the power system

- Increased amount of wind power will demand increased flexibility from wind
- Wind turbines must take part in the market as other types of generation

The Nordic Market - The Merit Order



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The new scenario

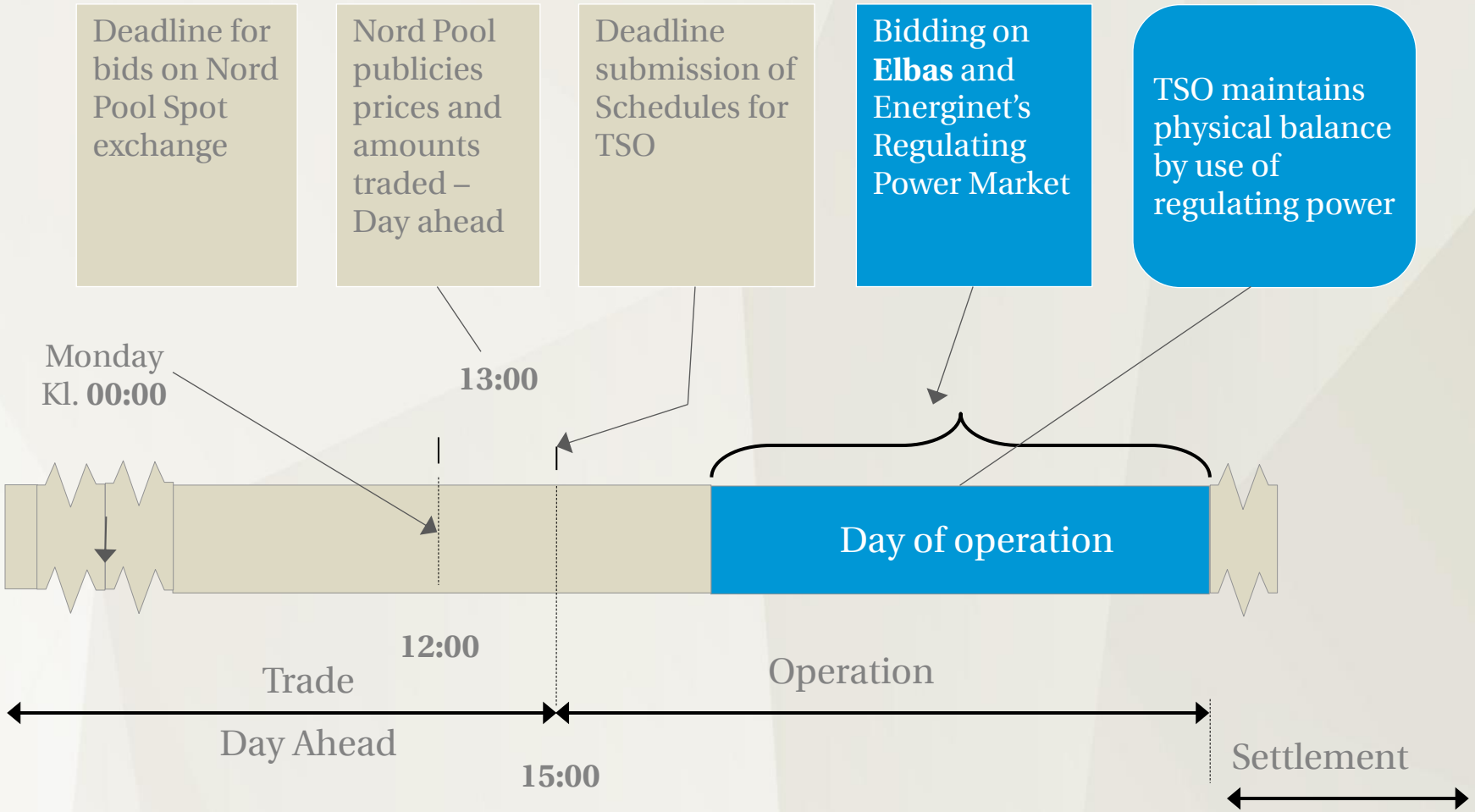
- Wind penetration in Denmark 2014 - 39%
- Danish wind is flexible – adaptive also to German market
- Negative prices – a result of increased wind (and PV)
- Protection against negative spot prices
- Potential for extra earnings in the market for regulating power

Wind turbines must take active part in the market as other types of generation

- Must act on market signals in order to:
  - Increase earnings
  - Handle risks
  - Improve the acceptance of wind (TSO and public)

- Must participate in all markets available
  - Day Ahead
    - Protection against negative spot prices
  - Intra day
    - Protection against negative balance prices and possible earnings
  - Regulating power
    - Potential extra earnings
    - It will lower balance costs for wind

Time-line electricity market



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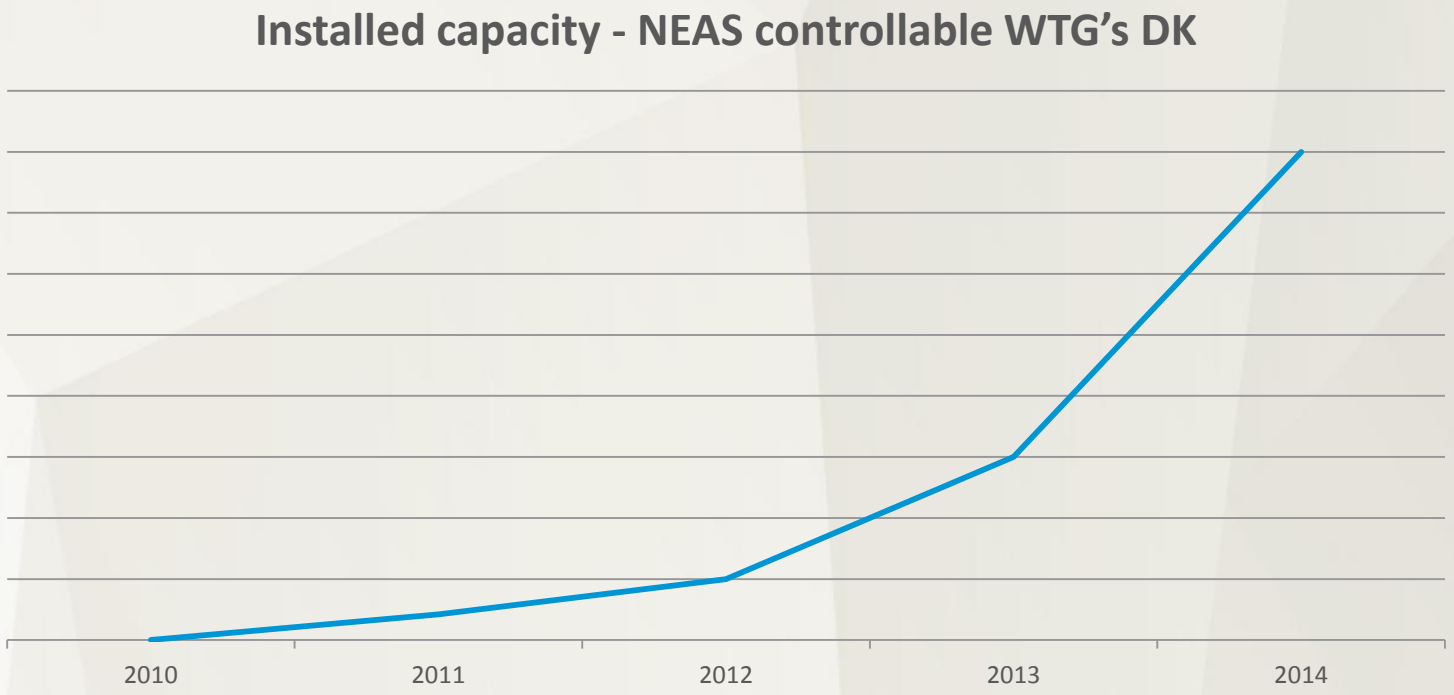
Portfolio Characteristics - Denmark

- During the last four years a quickly growing amount of installed capacity in Denmark can be controlled (turn off/on) by Neas Energy



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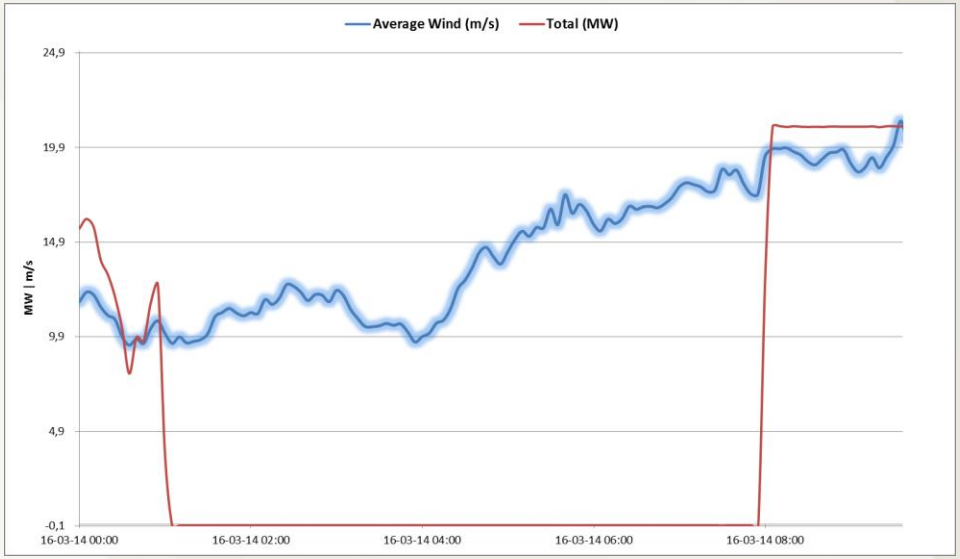
Managing Negative Spot Prices

Case: Sund & Bælt wind farm – 16. March 2014



Elspot prices

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- further details -

Please note that changes in the Norwegian bidding areas comparison between present and historical data might not the area change log pdf.

EUR/MWh

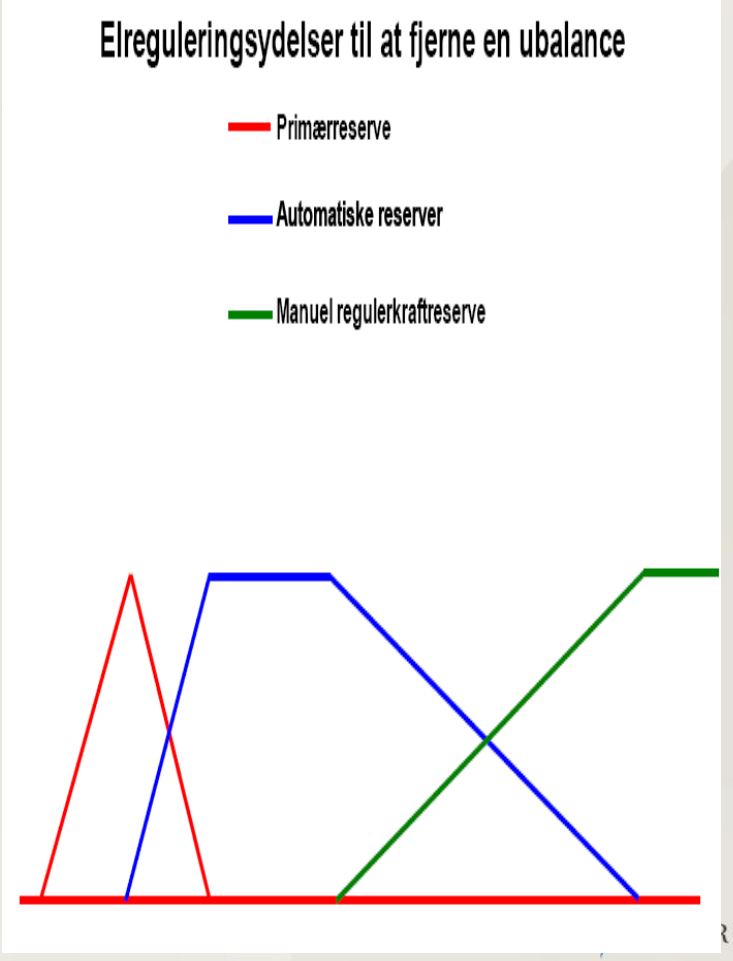
	DK1	DK2
16-03-2014		
00 - 01	-0,02	-0,02
01 - 02	-25,08	-25,08
02 - 03	-25,06	-25,06
03 - 04	-60,26	-60,26
04 - 05	-50,65	-50,65
05 - 06	-50,12	-50,12
06 - 07	-25,08	-20,08
07 - 08	-25,00	23,91
08 - 09	0,05	24,03
09 - 10	10,77	24,69

Savings for WTG owners

- 16th of March 2015 S&B wind farm – 21 MW
  - 7 hours with negative spotprices
  - Average spotprice – 37 EUR/MWh
  - Average production 15 MWh for 7hours = 105 MWh's
  - Savings in 7 h period = 3.885 EUR = 35.742 SEK.

Market for regulating power

1. **Primary reserves**
   - Response time is 15-30 seconds.
2. **Automatiske reserves (LFC)**
   - Response time 30 seconds to 15 minutes.
3. **Manual reserves**
   - 15 min activation
   - Hourly auction
   - Marginal price market (last price is valid for all)
   - Paid per activation
     - Upward regulation price > Spot price
     - Downward regulation price < Spot pris



Bidding in the market for regulating power

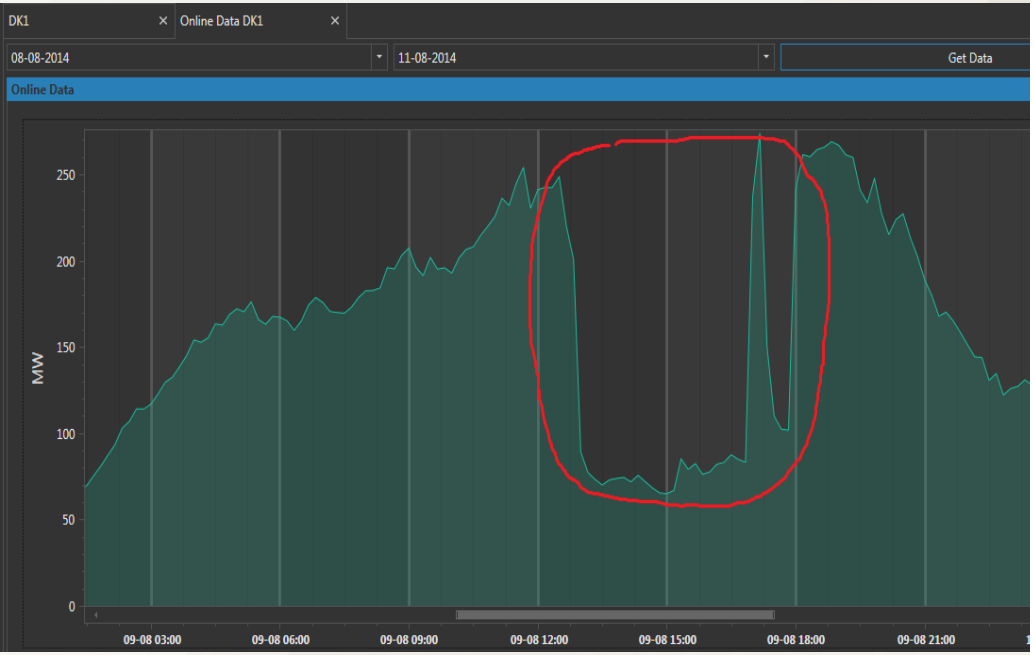
Which bids are possible?

- Bids on Downward regulation – bids are submitted 1 hour before the hour
- Bids on Upward regulation – bids are submitted 1 hour before the hour of operation
- Smallest bid is 10 MW - highest bid is 30 MW

- (Making the production capacity available (CHP) - Auction day before the operating day – this is not possible WTG's)

Managing Negative balancing Price for regulating power

Case: Down ward regulation – 9. August 2014



Regulating prices

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	DK1	
	Up	Down
09-08-2014		
00 - 01	248,34	247,34
01 - 02	213,27	213,27
02 - 03	200,90	200,90
03 - 04	196,95	196,95
04 - 05	188,60	138,07
05 - 06	183,38	124,71
06 - 07	179,65	124,71
07 - 08	194,04	138,07
08 - 09	200,15	151,43
09 - 10	204,25	178,16
10 - 11	207,91	178,16
11 - 12	207,31	178,16
12 - 13	200,68	-90,00
13 - 14	189,05	-90,00
14 - 15	186,06	-541,94
15 - 16	200,75	-90,00
16 - 17	200,82	-90,00
17 - 18	191,88	-90,00
18 - 19	225,42	-50,00
19 - 20	240,26	155,89
20 - 21	246,22	182,70
21 - 22	249,20	193,82

Potential earnings for WTG owners

- 9th of August 2015 downward regulation
  - 250MW downward regulation to 80 MW
  - 170 MW in a 7 hour period

Spot price	DW Reg price	MW's regulated	Extra earnings Compared to SP	Marginal price of op.	Total earnings
200	-90	170	90	-50	6800
189	-90	170	90	-50	6800
185	-541	170	541	-50	83470
200	-90	170	90	-50	6800
200	-90	170	90	-50	6800
191	-90	170	90	-50	6800
225	-50	170	50	-50	0
			Total earnings 7 hours		117470

Market opportunities

- Market opportunities for Independent Power Producers (IPP's)
  - Reduce costs for IPP's
  - Extra earnings in a market where regulating power prices are low.

- Market oppertunities for Aggregators (NEAS)
  - Handling of Renewables in balancing pool becomes more dynamic.
    - Act on market signals
    - Dynamic handling => better possibility to manage risks related to handling

Thank you for your attention

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