



## From passive to active actors in the power market - Increasing the value of wind

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Flexible Nordic Energy Systems



# From passive to active actors in the power market

Increasing the value of wind

WindAC  
Cape Town, South Africa, November 2017

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# Outline

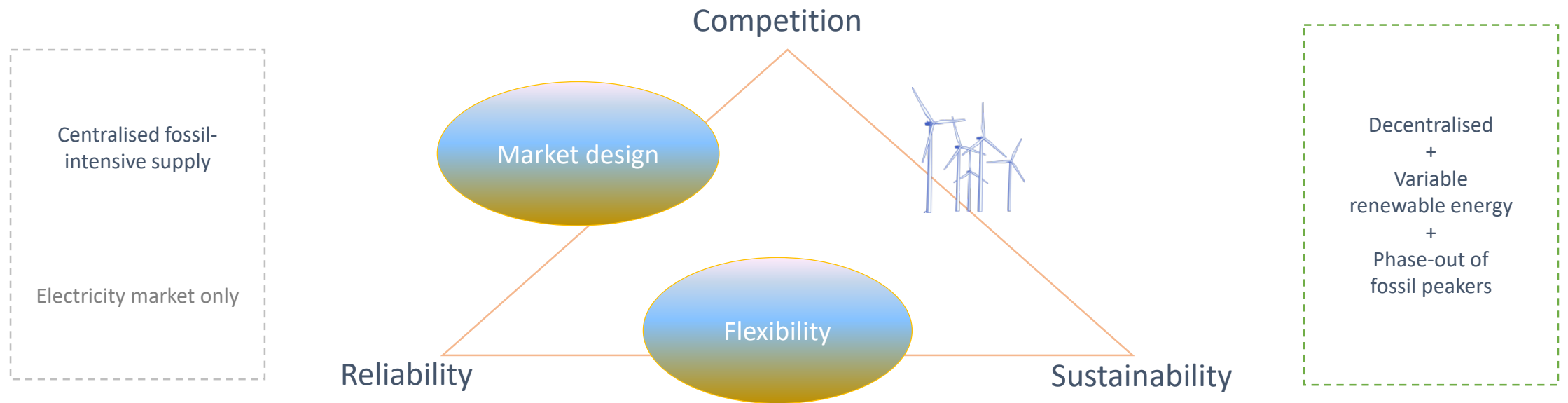


- Motivation
- Wind at the Nordic energy markets
- Optimal bidding strategies
- Analytical cases
- Takeaways

# The Future Energy System



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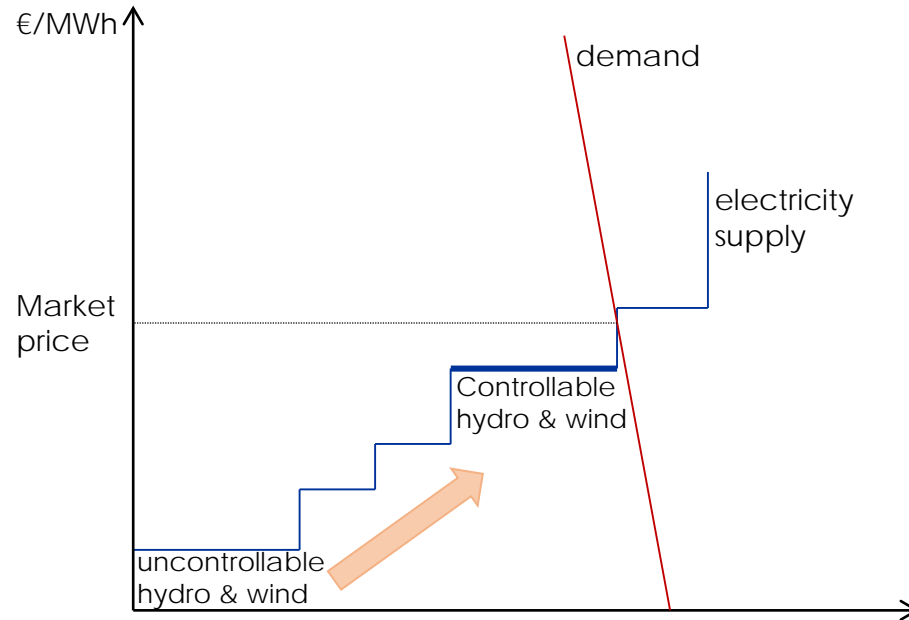


# Value of Wind - business cases



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- Similar to water, you can talk about a **wind value** when the generation becomes active at the market



Goal to create adequate regulatory framework conditions and market designs that facilitate and stimulate active wind participation

- Reach the highest wind value possible





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## Case: Energy strategy in Denmark

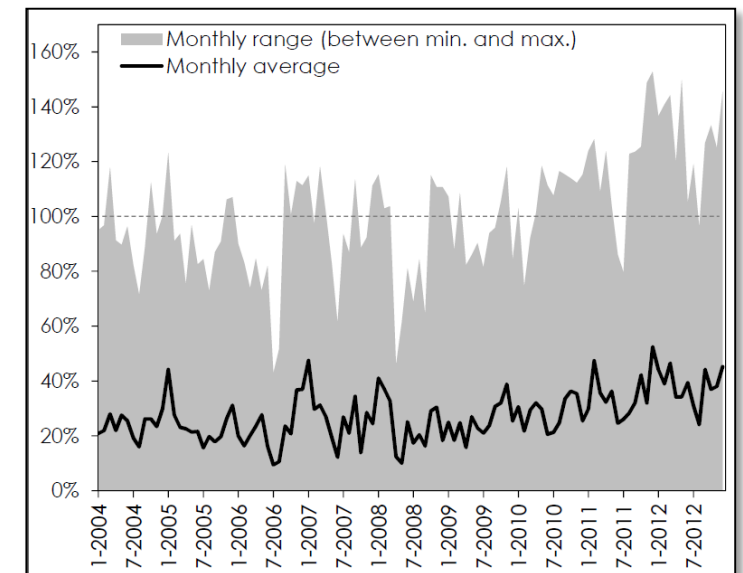
Wind 42% share (2015).

### Political targets:

- **2020:** 50% of traditional electricity consumption covered by wind power
- **2035:** *All electricity and heat based on renewable energy (Obs. the previous governmental position)*
- **2050:** The total\* energy supply based on renewable energy  
\*Total energy system incl. heat, gas, transport, industry, etc.



Wind production share in DK-West



# RE-think

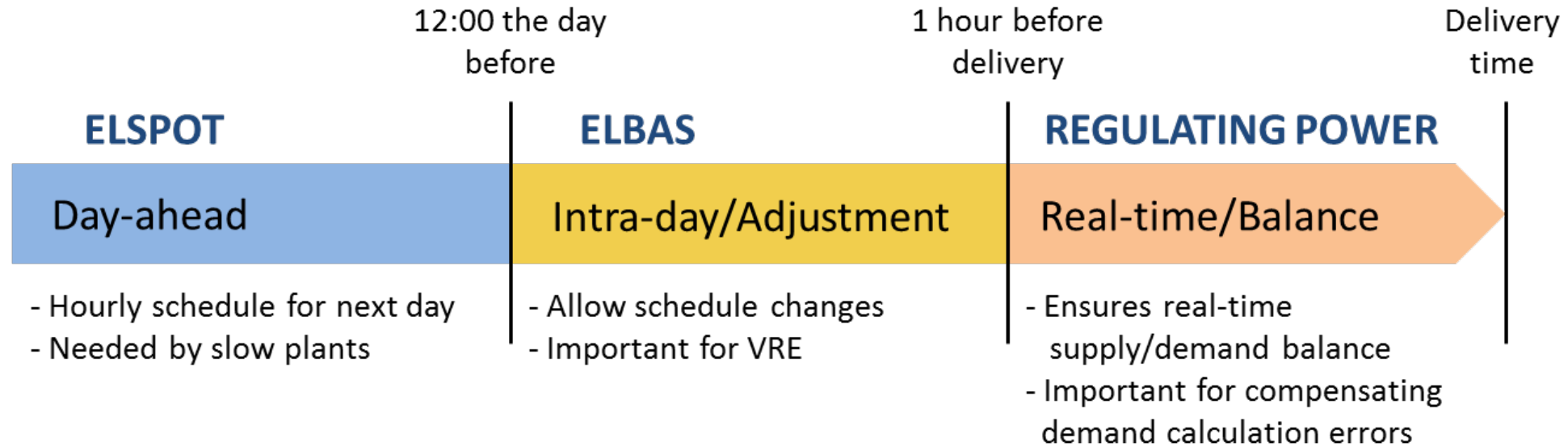
Making markets RE ready versus RE market ready



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Market-driven deployment of renewables:

- no priority/splitting of the market
- market based support until RES are competitive
- *allow for new business cases*



# Regulatory framework challenges

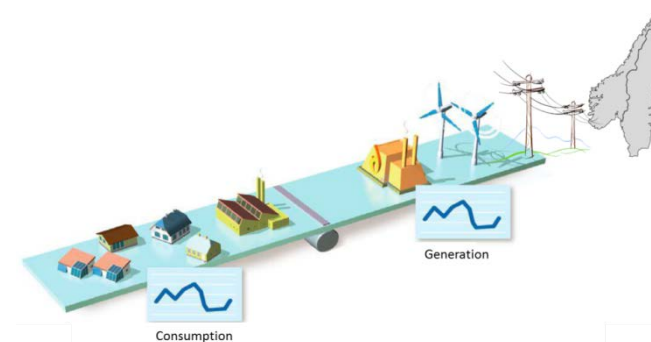
## Incentive to act flexibly



### Market integration and flexibility

#### From passive to active dynamic generation / market actors

- Act to negative prices at the spot market (day-ahead)
  - Case: Change in market design from 2009: negative prices at NordPool
    - Close down of wind turbines in hours with neg prices = saved costs
- Active at the balancing markets  
Close down of wind = down regulation



☺ **Case Denmark:** New wind turbines gets a Feed In Premium in certain full load hours (depending on size). When curtailed, the not "used" full load hour with support can be used later.

☹ **Case Denmark:** Some existing off-shore tenders have no incitements for WTs to curtail when negative prices.  
☺ One (Anholt) doesn't receive FIT when negative prices.

☹ **Case Norway & Sweden:** The green certificate system is market based, but the implemented design gives limited incentive to act flexible.



# Managing Negative Spot Prices



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

## Eisport prices ?

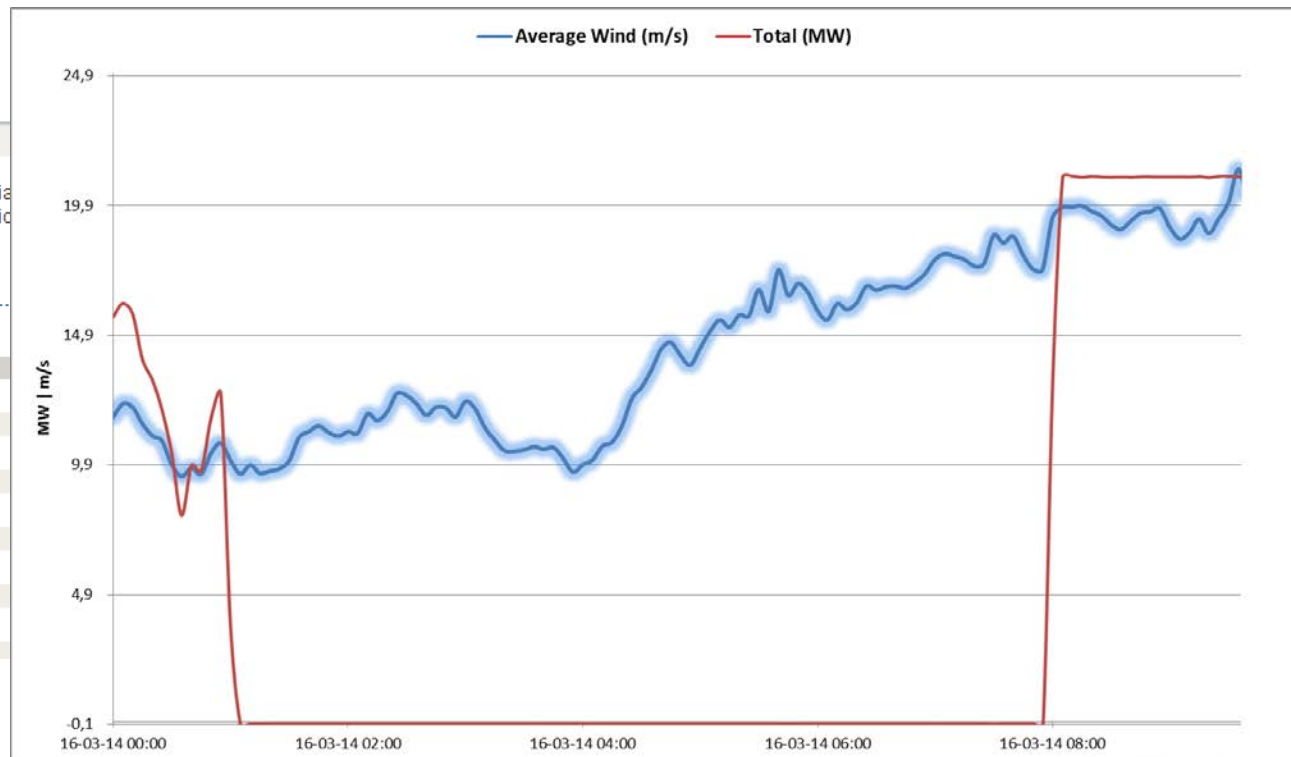
ALL SYS NO SE FI DK EE LT  
LV

- further details -

Please note that changes in the Norwegian comparison between present and historic the [area change log pdf](#).

EUR/MWh

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



Source: NEAS Energy

# Managing **Negative** balancing Prices



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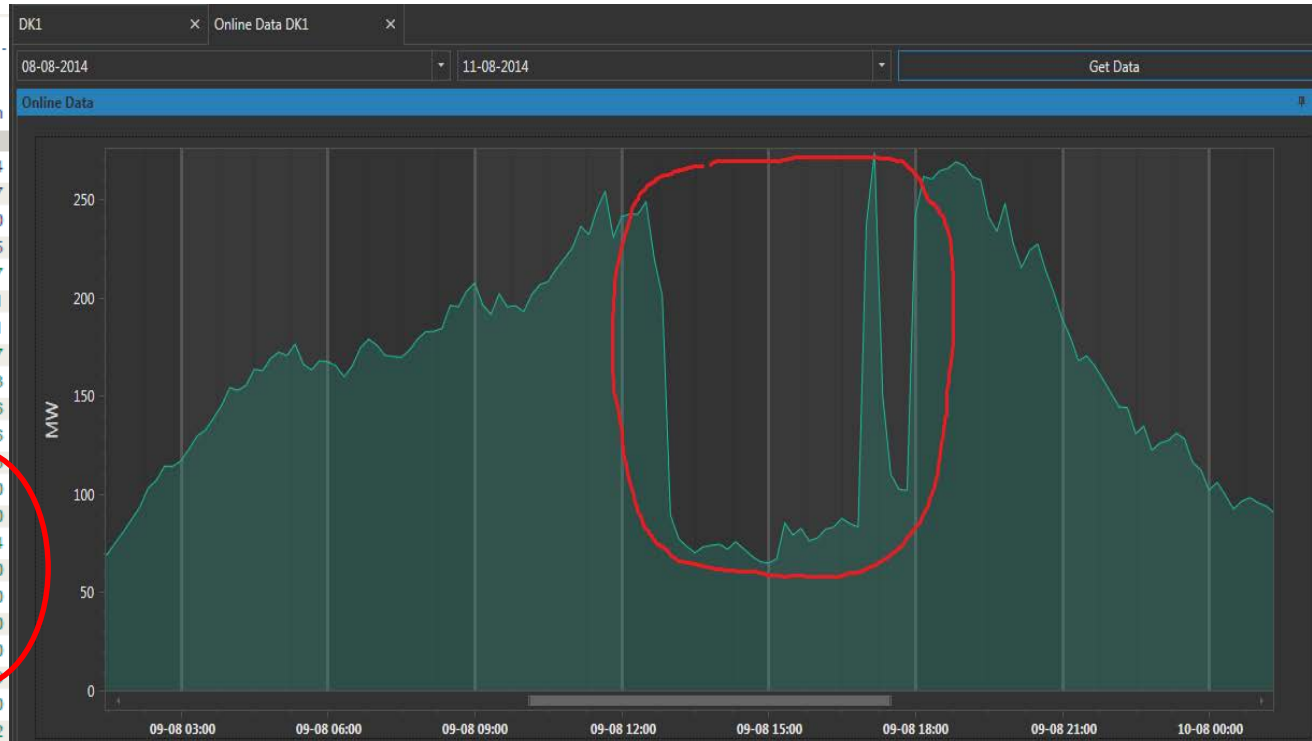
Case: Down ward regulation – 9 August 2014

## Regulating prices

ALL NO SE FI DK

DKK/MWh

	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	155,86
20 - 21	246,22	182,70
21 - 22	249,20	193,82



Source: NEAS Energy



# Analytical cases

Reference: passive

a) Active at the spot market only.

b) Active at both the spot and balancing markets.

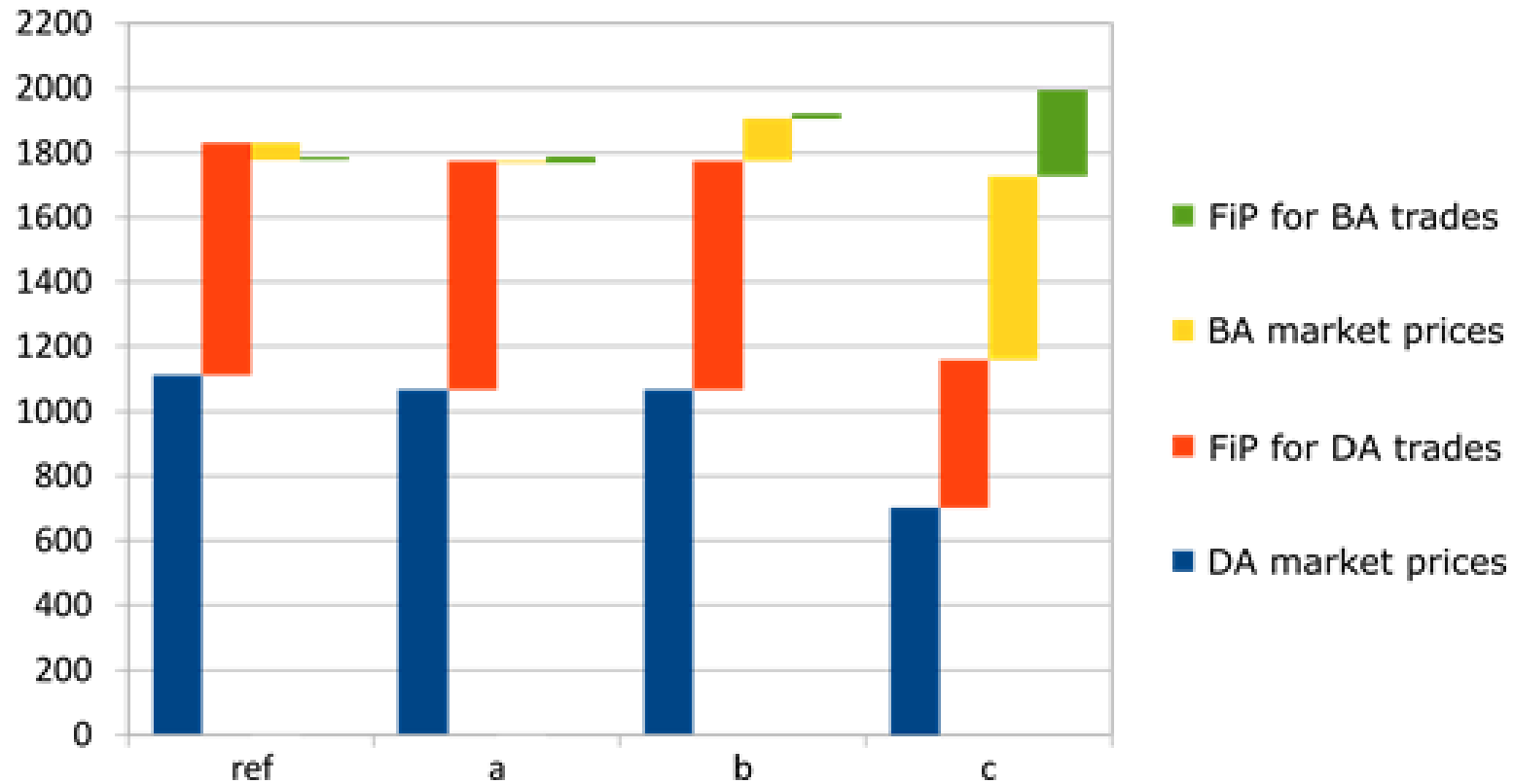
c) Active at both the spot and balancing markets + perfect foresight



# Findings



Average revenue [DKK/h]



- Less than 1% increase in total revenue when the WPP is making strategic offers in the day-ahead market (from *Ref* to case *a*)
- WPP is witnessing around 8% revenue increase by actively participating in the balancing market. (from *Ref* to Case *b*)



# Takeaways

- Trend to more market integration and need of more *flexibility*
- Need to find business cases - increase the value of wind - simultaneously with the phase out of support.
- Become active players - at both the day-ahead and balancing markets
- Asymmetry in prices => optimal to make strategic bids at the different markets
- Important inputs for the design of future power markets

Thank you for your interest



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Questions ?



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# Value of Wind



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+ *Market value*

+ *Capacity value*

÷ *Forecast error value*

÷ *Ancillary services value*