TRENDS IN OFF-SHORE WIND ENERGY

IEPE Symposium 2017 - Vattenfall

Bo Svoldgaard/Jan - 2017

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VATTENFALL VIEWPOINT

We develop, operate power plants and trade energy

In operation or under construction On- /Offshore	Current development pipeline (2017-2025) On-/Offshore
> 3,5 GW	> 7 GW – investment plan €5BN (≈ +35 mia. DKK) until 2022

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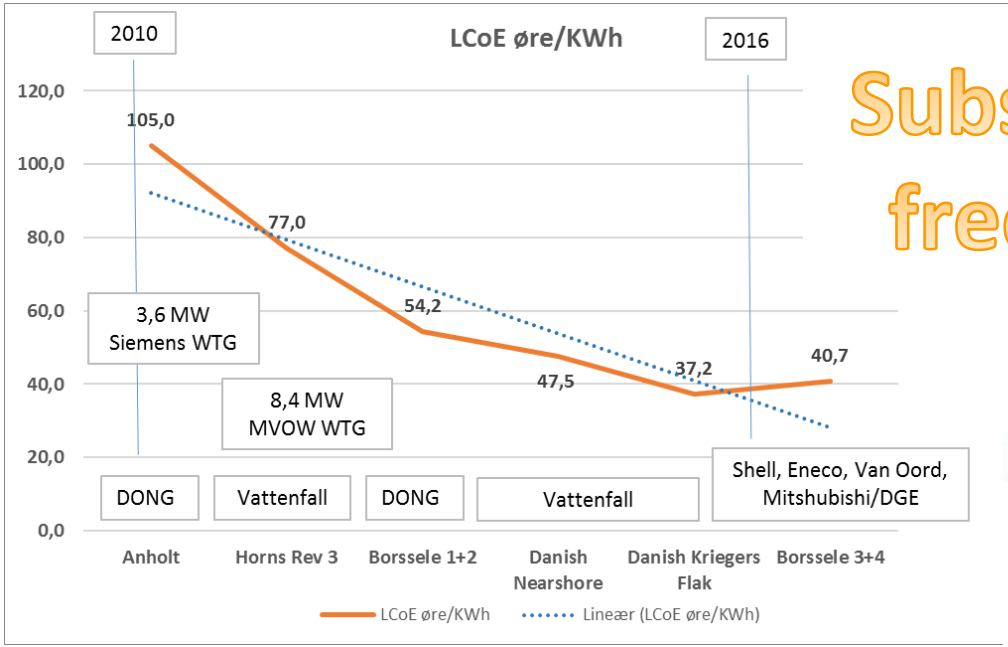
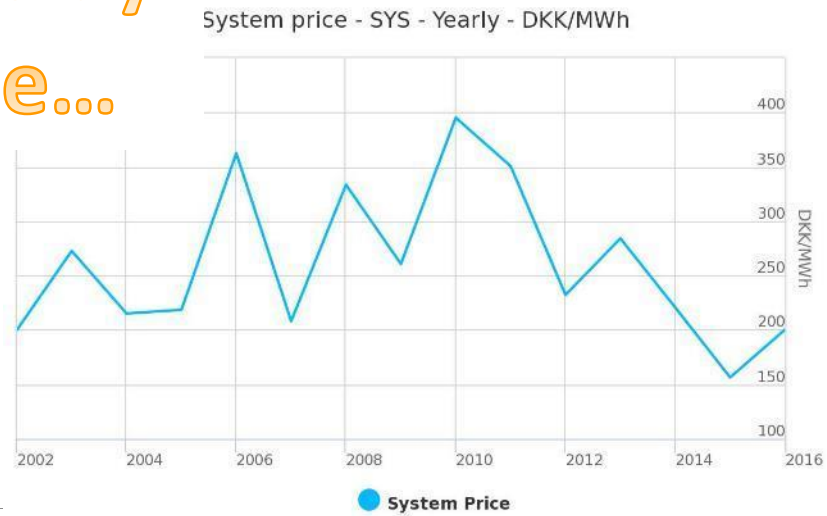
OUR WORLD IS CHANGING



Subsidy free…



- Bidding/auctions – you win/*or you loose*
- Much lower subsidies…
- Low energy prices…
- Public acceptance
- Grid capabilities and real needs

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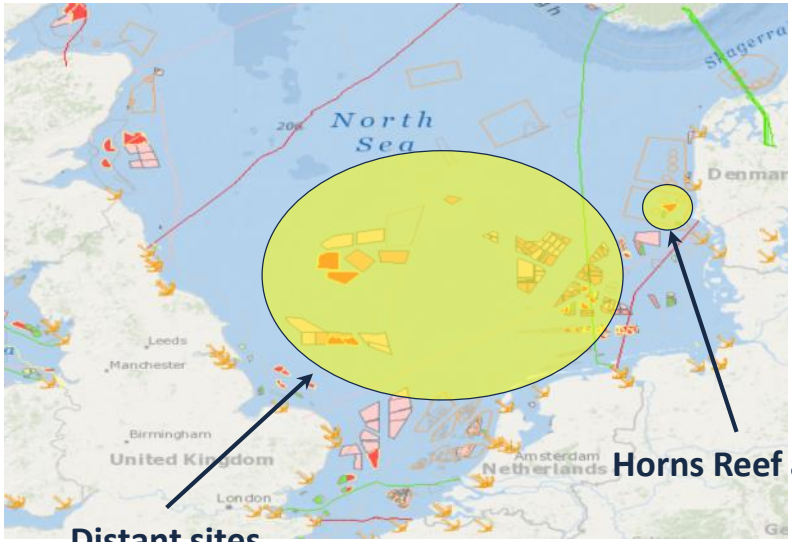
MARKETS – SITES - OFFSHORE

Condition

- Deeper waters
- Further from shore – Electrical losses
- Bigger parks – portfolio thinking



Technologies

- High voltage DC – in many markets – driven also by onshore construction constraints…
- Higher voltage AC (66kV)
- Integrated infrastructure
- Physically bigger turbines

BUSINESS PERSPECTIVE

Offshore, WTG > 50 % of the total cost

Onshore, WTG > 70 % of the total cost

$$LCoE = \frac{^{NPV}CAPEX + OPEX}{^{NPV}AEP}$$

RISK

Hits BC with a factor of 1:5 compared to CAPEX

- Service

Availability…

- Reliability, Downtime, Lifetime

Losses… Electrical Efficiency

1% AEP improvement/loss could have an NPV value of 15M€… dependent of project size

Tech Selection

No room for excess **margin** in design and technology

Understand the key value drives of the business…

Otherwise – we will never reach our industry goal

Leader in LCoE

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FUTURE READY - RENEWABLES

Business case drivers

- Standardization / Industrialization (supply chain “re”-use)
- Advanced functions to reduce e.g. “loads” and cost
  - Site/Park optimized functionality, redundancy, cost
- Reliability – Service offering
  - Supply chain / components quality
- Balancing BoP and WTG functionality (and cost)

Integration with other energy sources – and storage

- Grid – WTG requirements/grid requirements
  - Energy management, grid support – voltage/frequency…, Stand alone functionality
- Data… Data... Data… SCADA interface…

POWER ELECTRONICS IS NOT THE **SOLUTION**, BUT A KEY **ENABLER**! IT HAS TO **WORK**!

END NOTE

We need the **best compromise**,
not the most fancy thing

And not the “best” technology,
but the **low risk** implementation
enabling the **valuable** features

TECHNOLOGY MUST IMPACT OUR BUSINESS CASE – OTHERWISE WE DON´T VALUE IT…

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