# The offshore playing field and Vattenfall's competitive position

London, 17 January 2017

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# AGENDA

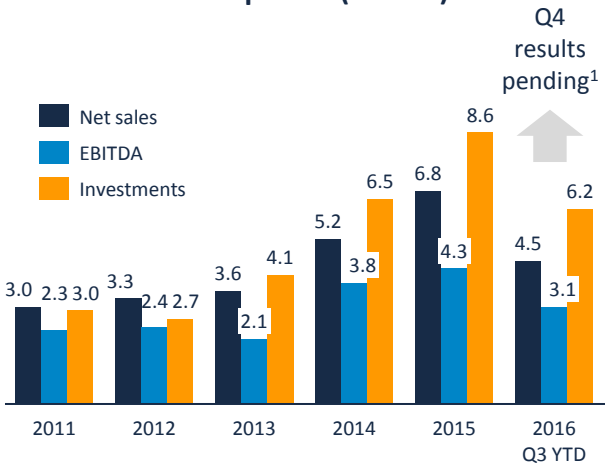
- Vattenfall’s position
- The offshore wind industry and its development
- Regulatory situation

# VATTENFALL WIND POWER

**Highlights**

- Number two in offshore wind in Northwestern Europe plus strong onshore pipeline
- Strong platform and track record to build on
- Highly experienced team managing all key processes with close supplier collaboration along the value chain

**Financial development (SEK bn)**




**Key data**

**5.8 TWh electricity generation**
in 2015

**680 employees**
FTEs as of Q3 2016

**SEK 15bn investment plan**
2016-2017

**Vattenfall is a leading developer and operator of wind power**

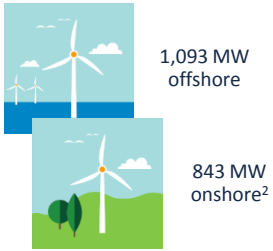
1. Q4 is generally the strongest quarter for wind power due to higher wind speeds

# WIND PORTFOLIO OVERVIEW

**Installed capacity as of Q3 2016**

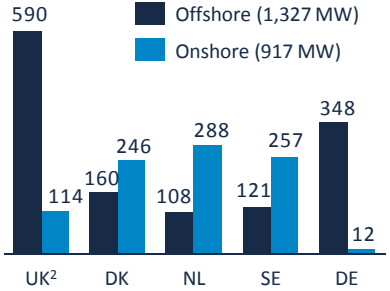
**1,936 MW**
Consolidated capacity

**2,244 MW**
Operating capacity[1]

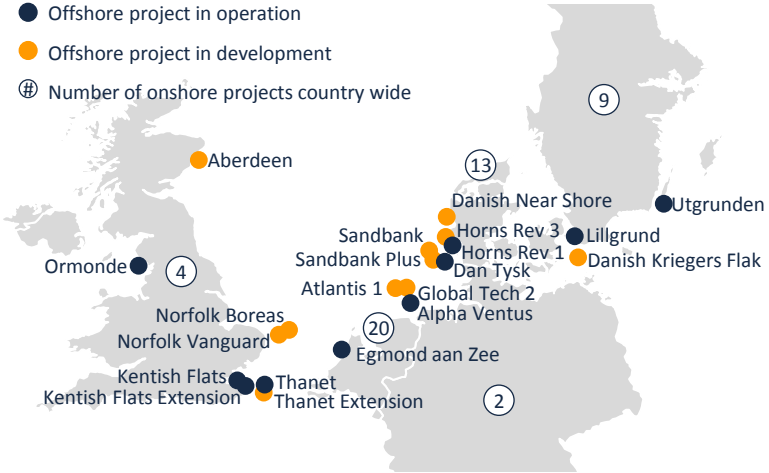


1,093 MW offshore

843 MW onshore[2]




**Geographical footprint**

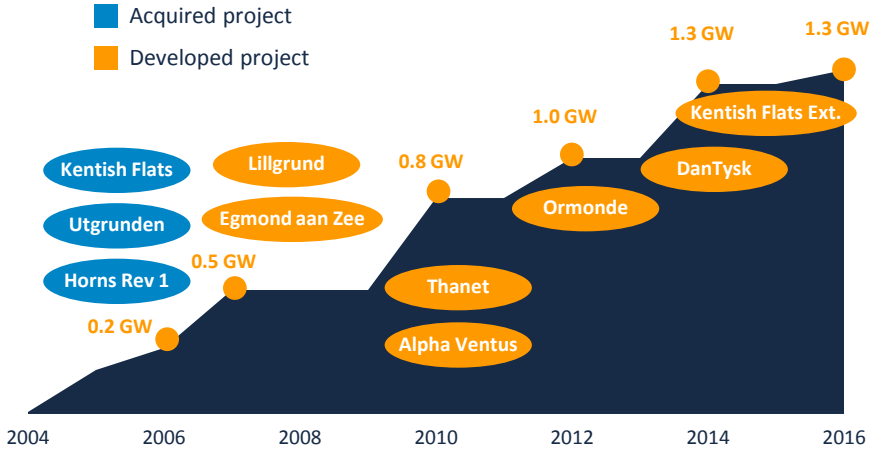



**Solid footprint with operations in all of Vattenfall's five main markets**

1. Operating capacity: total capacity of Vattenfall operated assets. Minority shares included as 100%
2. Including 5 MW solar in onshore capacity

# OUR OFFSHORE WIND JOURNEY

**A pioneer within offshore wind from the outset[1]**




**Continued growth ambitions**

- Offshore wind will be key to achieve the group's renewables growth target of **2.3 GW commissioned capacity 2016-2020**
- Combined with onshore wind, Vattenfall will **operate 4 GW by 2020 and plans to operate 7 GW by 2025**
- We aim to be a **leader in Levelized Energy Cost reduction** and have the ambition to deliver renewable power, independent of subsidy schemes

**Strong track record in offshore wind and continued ambitious growth plans**

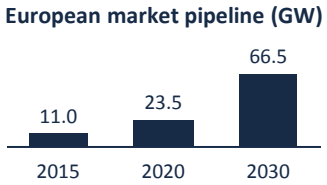
1. Operating capacity: total capacity of Vattenfall operated assets. Minority shares included as 100%

# OFFSHORE WIND FARMS AND PROJECTS

**In operation**

| Country | Name | No. of Turbines | Capacity (MW)[1] | Ownership (%) |
|---|---|---|---|---|
| UK | Thanet | 100 | 300 | 100 |
| DE | DanTysk | 80 | 288 | 51 |
| DK | Horns Rev 1 | 79 | 160 | 60 |
| UK | Ormonde | 30 | 150 | 51 |
| SE | Lillgrund | 48 | 110 | 100 |
| NL | Egmond aan Zee | 36 | 108 | 50 |
| UK | Kentish Flats | 30 | 90 | 100 |
| DE | Alpha Ventus | 12 | 60 | 26 |
| UK | Kentish Flats Extension | 15 | 50 | 100 |
| SE | Utgrunden | 7 | 11 | 100 |

**Total 1,327**




Source: EWEA

**In development and construction**

| Country | Name | No. of Turbines | Capacity (MW)[1] | Ownership (%) | Commissioning | Current status |
|---|---|---|---|---|---|---|
| DE | Sandbank | 72 | 288 | 51 | 2016-2017 | Partially operational |
| UK | Aberdeen | 11 | 92 | 100 | 2018 | Under construction |
| DK | Horns Rev 3 | 49 | 407 | 100 | 2019 | Under construction |

**Total 787**

**In development**

| Country | Name | No. of Turbines | Capacity (MW)[1] | Ownership (%) | Commissioning | Current status |
|---|---|---|---|---|---|---|
| DK | Danish Near Shore | 35-44 | 350 | 100 | 2020 | Tender won & concession signed |
| DK | Danish Kriegers Flak | 60-75 | 600 | 100 | 2021 | Tender won & concession signed |
| DE | Sandbank Plus | ~15 | <250 | 100 | 2024 | Preparing for tender |
| DE | Atlantis 1 | ≤73 | <600 | 100[2] | 2025 | Preparing for tender |
| DE | Global Tech 2 | ≤79 | <600 | 100 | 2025 | Preparing for tender |
| UK | Thanet Extension | 34 | 340 | 100 | 2021 | Concept/Early planning |
| UK | Norfolk Vanguard | 120-180 | 1,800 | 100 | 2025-2027 | Concept/Early planning |
| UK | Norfolk Boreas | 120-180 | 1,800 | 100 | TBD | Concept/Early planning |

**Total >6,000**

**Vattenfall is successfully securing its share of future offshore wind capacity in the European market**

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1. Operating capacity: total capacity of Vattenfall operated assets. Minority shares included as 100%
2. Pending closing of transaction

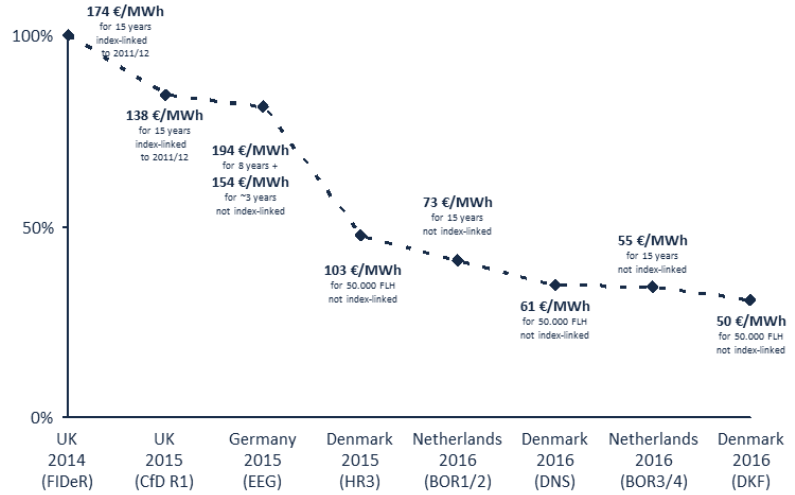
# OFFSHORE WIND FITS WITH VATTENFALL

| | |
|---|---|
| Portfolio transformation | ▪ Represents large share of accessible renewable energy<br>▪ Potential to be lowest cost renewable energy source |
| Regional fit | ▪ A dominant part of recent growth worldwide in Vattenfall's markets (DK, NL, GER, UK, SWE) |
| Highly de-risked cash flows | ▪ All offshore wind farms with fixed levels until ~2030<br>▪ Increased predictability of cash-flows provides a broader base for sector investments |
| Profitability | ▪ Higher IRR outlook than onshore/PV due to CAPEX-needs, complexity, and entry barriers<br>▪ Further consolidation will likely lead to a reduced number of small developers |
| Vattenfall business | ▪ Capacity volumes, CAPEX-levels and project complexity fit Vattenfall's core competences<br>▪ Competitive advantage due to scale and experience |

**Multiple reasons for continued focus on offshore wind**

# INDUSTRIALISATION DRIVES COSTS AND REVENUES TO SUSTAINABLE LEVELS

**Decreasing revenue levels[1]**




**Key takeaways**

- The industrialisation of offshore wind is rapidly changing the competitive environment
- Winning bid levels of 372 DKK/MWh (Vattenfall – Danish Kriegers Flak) and 54.50 EUR/MWh (Shell consortium – Borssele 3/4) considered new industry benchmarks
- Offshore wind is experiencing a learning curve similar to other renewable technologies, from learning to fine-tuning
- The development over the last years ensures offshore wind a long term position in the energy production mix, with benefits for the customers/consumers and the most competitive operators

**Vattenfall's competitive advantage is based on three pillars: fast adaptation to the tender landscape, ability to decrease O&M costs applying latest business standards, lean and agile organisation set-up**

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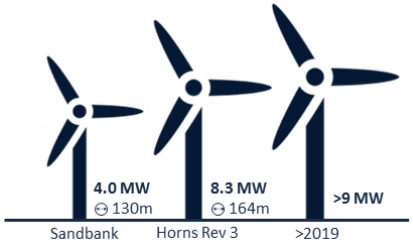
1. Figures are only considering revenue streams and are not scope-adjusted, e.g., UK OFTO and grid charges. This might lead to 5-15% correction factor, which does not question the trend as such

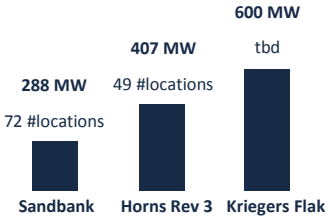
# AN INDUSTRY IN RAPID CHANGE

### Larger turbines



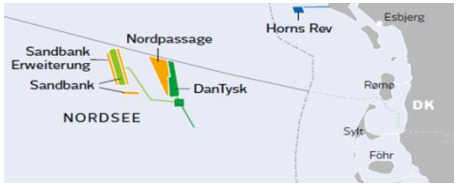

- Less locations but bigger capacity
- Less resources (concrete, steel etc.) and cables
- Less charter-times for vessels
- Shorter construction periods

### Park size development




- Increasing Operational Efficiency
- Economies of scale in procurement and project management

### Clustering of assets




- Increasing Operational Efficiency
- O&M form shared Offshore Accommodation Platform
- Strategic Spare Parts Management
- Lessons Learned from past construction operations in the area

**The offshore industry is maturing, leading to significant cost reductions**

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# AN INDUSTRY IN RAPID CHANGE – SPECIFIC EXAMPLE

| Sandbank | | Horns Rev 3 | | Δ |
|---|---|---|---|---|
| Project Size | 288 MW | Project Size | 407 MW | +119 MW (+41%) |
| Turbine Capacity (Type) | 4.0 MW (Siemens SWT 4.0-130) | Turbine Capacity (Type) | 8.3 MW (Vestas V164-8.3) | +4.3 MW (+108%) |
| # of Locations | 72 Locations | # of Locations | 49 Locations | -23 Loc. (-32%) |
| Rotor Diameter | 130 m | Rotor Diameter | 164 m | +34 m (+26%) |
| Swept Area per WTG | 13,273 m² | Swept Area per WTG | 21,124 m² | +7,851 m² (59%) |
| Hub Height | 94 m | Hub Height | 102 m | +8 m (+9%) |
| Wind Speed @ Hub Height | 10.2 m/s | Wind Speed @ Hub Height | 9.7 m/s | -0.5 m/s (-5%) |
| Water Depth | 25 – 34 m | Water Depth | 10 – 20 m | -15m |
| Distance to Shore | ~90 km | Distance to Shore | ~30 km | -60 km |

**Whilst technology developments lead to cost reductions, each project needs to be viewed in isolation due to different characteristics**

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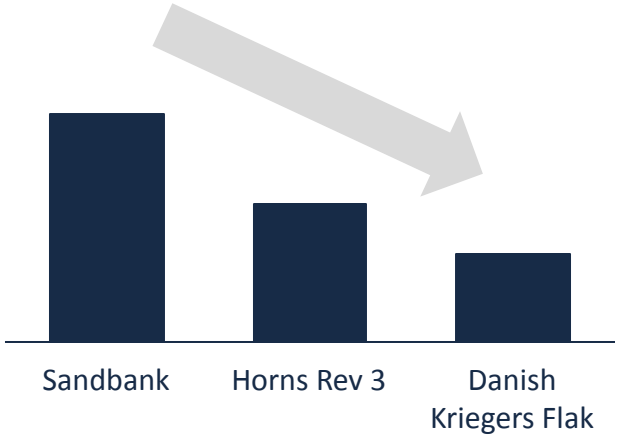
# DANISH KRIEGERS FLAK ILLUSTRATES THE DEVELOPMENT OF THE INDUSTRY

**Illustrative development of Levelized Energy Cost**



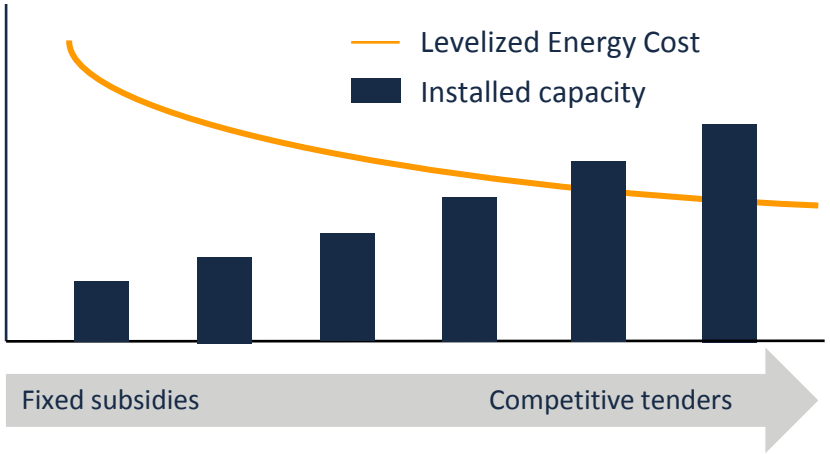

**Key facts**

- Attractive site specifics with wind speeds comparable to North Sea projects
- Economies of scale: 600MW site offering a good size for project synergies in terms of procurement, project management and operational optimization
- 372 DKK/MWh for the first 50,000 Full Load Hours instead of a defined timeframe
- Favourable regulation around turbine selection and installation
- Long installation window (3 years)

**Favourable site specifics and market conditions make Kriegers Flak a highly attractive project for Vattenfall**

# REGULATORY REGIMES ARE BECOMING MORE MARKET-ORIENTED

**Illustrative transition**




**Difference in tender set ups**

a) Central vs decentral
b) Prequalification vs. no prequalification
c) Lead time between bid and commissioning
d) Fixed bidding level vs. marketing responsibility + premium

**Competitive tenders with an increasing number of participants have resulted in strong competition and continued cost reductions**

# KEY SUCCESS FACTORS FOR VATTENFALL IN OFFSHORE WIND

**A) Supply chain interaction**

- Technical experience sharing on existing construction projects and running assets feeding into future projects
- Supplier market addressed with portfolio approach

**B) Portfolio focus**

- Strong advantage on the learning curve given our size and findings from past projects
- Optimization of resource and skill allocation to projects in different stages

**C) New O&M concepts**

- Digitalization of O&M processes
- Reduced unplanned maintenance

**Vattenfall is well positioned to lead the offshore industry development**

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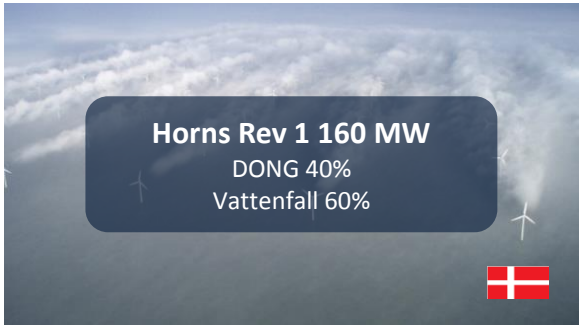
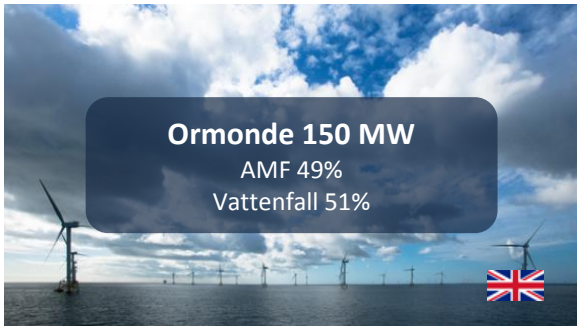
# OVERVIEW OF REGULATORY REGIMES

| | Sweden | Denmark | Germany | Netherlands | UK |
|---|---|---|---|---|---|
| Subsidy System | Certificate System: Certificate price paid on top of electricity spot price | Auctioning system 4x700 MW until 2023 – projects awarded to developer with lowest feed-in premium on a full load hour basis | New auction scheme to be introduced; transition (2x1.55 GW) 2016 and 2017 to centralised auction system (0.84 GW annually) starting 2018 | Auctioning system 4x700 MW until 2023 – projects awarded to developer with lowest feed-in premium | Post-Brexit: New Department for Business, Energy and Industrial Strategy (DBEIS). Contracts for Difference and Capacity Market auctions |
| Duration | Price determined in certificate market, Currently 15-20 EUR/MWh, for 15 years | Current results: Kriegers Flak 372 DKK/MWh and Danish Near Shore 475 DKK/MWh | 20 years and 25 years license | 20 years, Borselle 1+2: 72.70 EUR/MWh Borselle 3+4: 54.50 EUR/MWh | In March 2016, the government announced further auctions for contract allocation up to GBP 730 million available for offshore wind and other less established technologies. The first of these auctions will be worth GBP 290 million |
| Comment | New renewables target: 100% Renewables in 2040 without Nuclear, No offshore-specific subsidy yet | Grid costs covered by the government<br><br>No tenders announced in the near future | Allocation of grid connection by Federal Network Agency, OSS including in project scope | Grid costs covered by the government | Offshore support announced to continue (target 10 GW installed before 2020 + 10 GW after 2020) |

# VATTENFALL STRATEGIC PARTNERSHIPS








1. Hjuleberg, Högabjär, Höge Väg and Juktan