



Ørsted Wind Power

**Operations and maintenance
of offshore wind farms:**
Trends and challenges

Malte Hippe, Head of Operations Germany

**Oldenburg,
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**We want to create a
world that runs
entirely on green
energy**



Ørsted at a glance



Headquarters
in Denmark

Listed in the
NASDAQ OMX
ORSTED

EBITDA in 2017
EUR **3.0** bn

5,600
employees

Revenue in 2017
EUR **8.0** bn

Phase out the
use of coal by
2023



83%*
Wind Power

- Develops, constructs, owns and operates offshore wind farms in Denmark, Germany, the Netherlands and the UK
- Development projects in Taiwan and the USA



13%* **Distribution
& Customer
Solutions**

- Power distribution grid on Zealand and sale of power and gas to customers in Northwestern Europe



4%*
**Bioenergy &
Thermal Power**

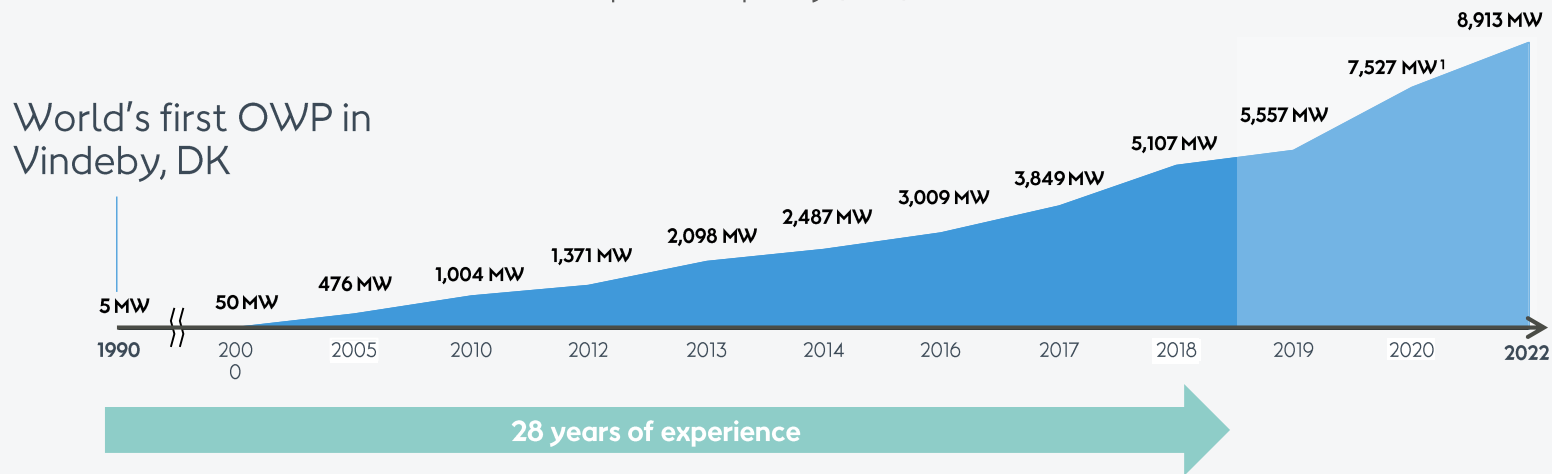
- Generates and sells power and heat to customers in Denmark and Northwestern Europe

* Share of the Ørsted Group's capital employed

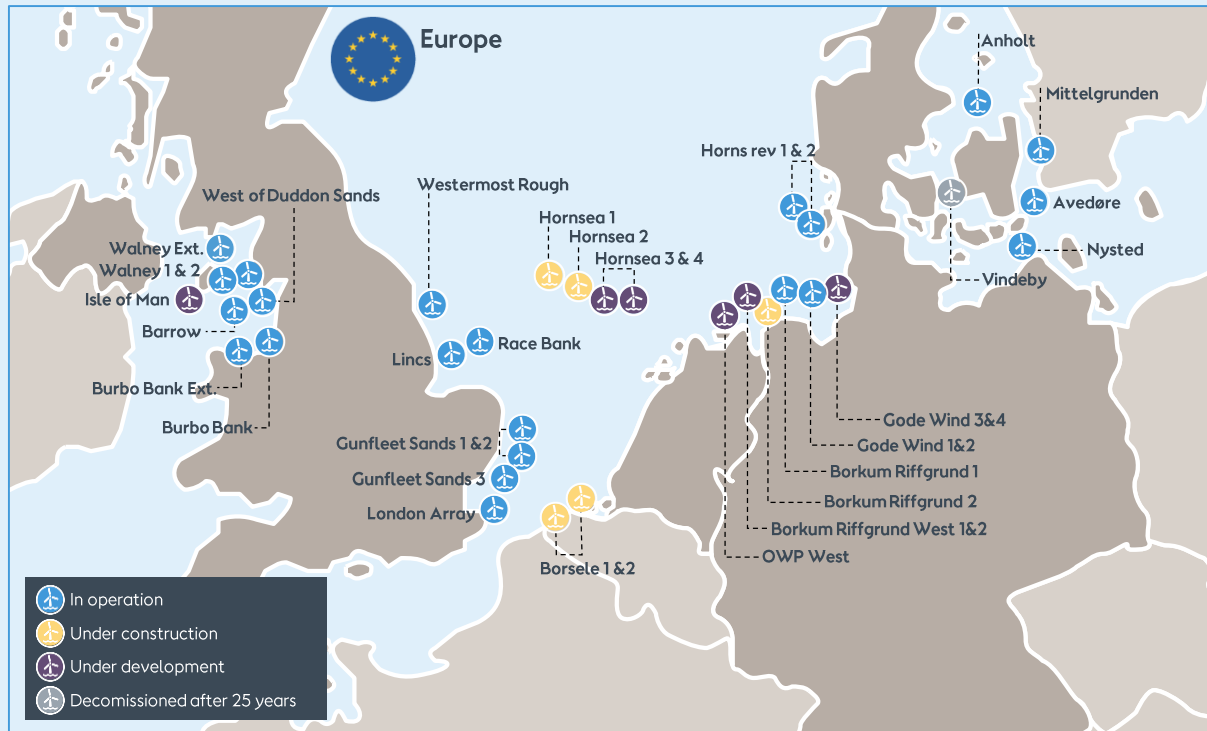
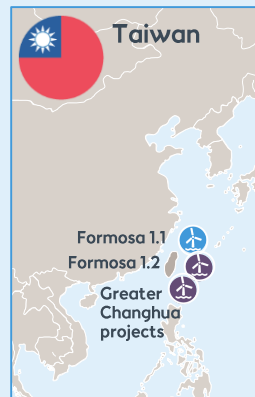
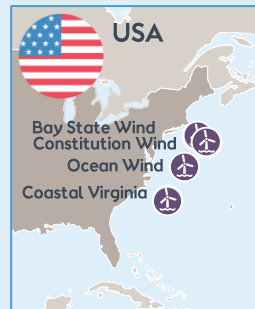
Ørsted pioneered the offshore wind industry

Unrivalled track-record in offshore wind

Ørsted cumulative constructed offshore wind power capacity (MW)



Ørsted wind farms overview



25+ years of unparalleled experience and track record

24 offshore wind farms in operation

4 offshore wind farms under construction

5.1 GW in operation

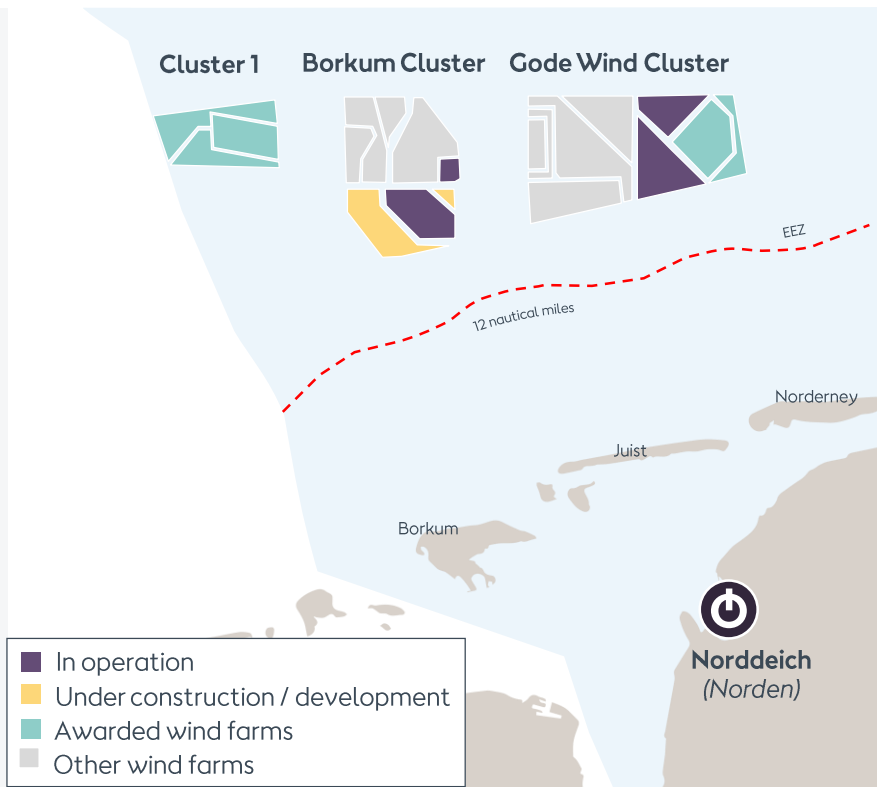
3.8 GW under construction

14 million Europeans with clean electricity

1,200 turbines leading operator

19 Partnerships

Ørsted wind farms in Germany



Our projects

Borkum Riffgrund 1	312MW	in operation
Gode Wind 1	330MW	in operation
Gode Wind 2	252MW	in operation
Borkum Riffgrund 2	450MW	under construction
OWP West	240MW	awarded
Borkum Riffgrund West 1	420MW	awarded
Borkum Riffgrund West 2	240MW	awarded
Gode Wind 3	110MW	awarded
Gode Wind 4	132MW	awarded

Our engagement:

- Offices in Hamburg and Norddeich with about 200 employees
- Investments of more than EUR 5 bn so far

Enablers to further reduce costs



Platform change

- Significantly bigger turbines will be on the market in the coming years; With bigger turbines, developers can increase electricity production while at the same time reduce the number of turbine positions



Scale/ Synergies

- Wind farms will be combined into one large-scale project with the option of adding additional volume to further increase the total size of the project
- Realizing synergies e.g. in onsite administration/logistics



Extended lifetime

- The German authorities have approved the possibility to extend the operational lifetime of the asset from 25 to 30 years

Operation and maintenance of offshore wind farms

Ørsted operation & maintenance activities in Germany

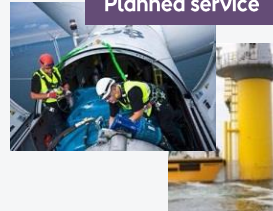
On-site activities



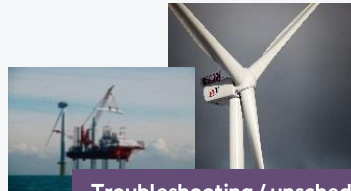
Site Management



Logistics



Planned service

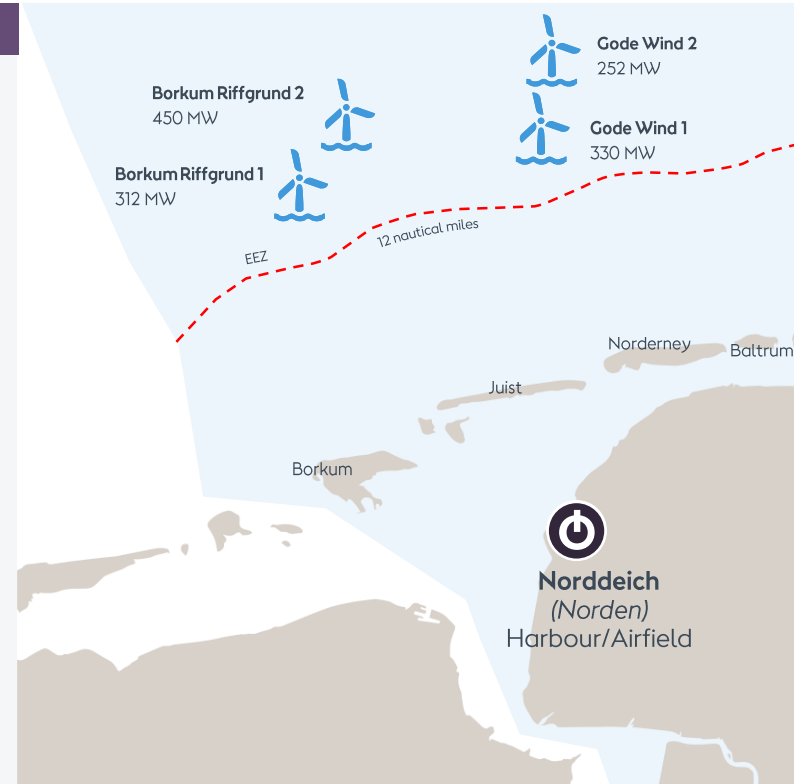


Troubleshooting / unscheduled



Service Operation Vessel

Back office activities



Challenges for wind farm operations



Accessibility

Improve access to the turbines



Cost efficiency

Identify and implement new ways of working and technologies to drive down O&M costs



Health and Safety

Further improving the working environment

Operational robustness from site sharing across Europe

Ørsted Northern Europe wind farm regions

- 1 East Irish Sea – Barrow, Burbo, Walney and WoDS (+1GW)
- 2 UK East coast – Gunfleet Sands, London Array, Lincs and WMR (+1GW)
- 3 German North Sea – GOW01, GOW02, BKR01 and BKR02 (+1GW)
- 4 Danish waters – Horns Rev II, Middelgrunden, Nysted and Anholt (+700MW)



Advantages of Site Sharing

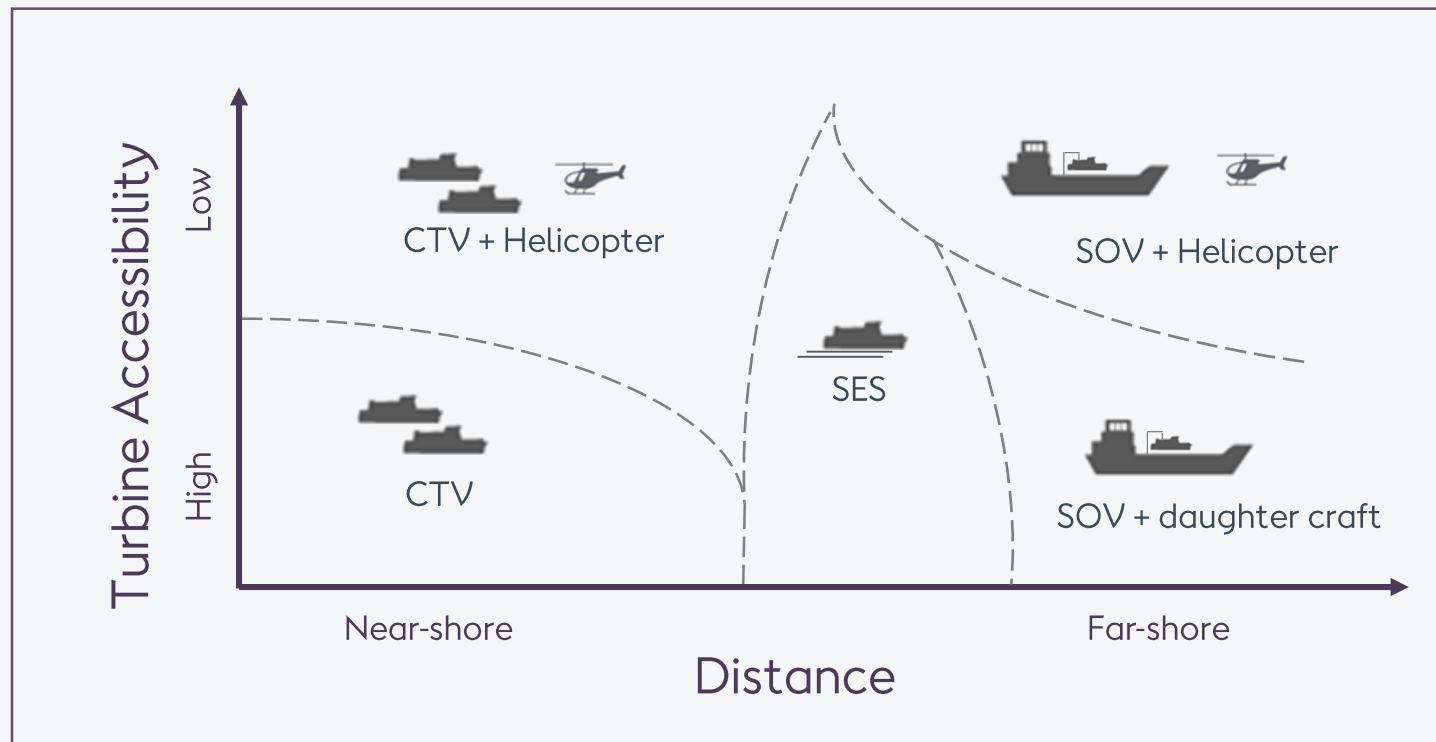
Shared onshore administration

Share onsite administration

Sharing of logistics

Potential sharing of technical services (subj. to WTG model)

Logistics setup driven by site characteristics



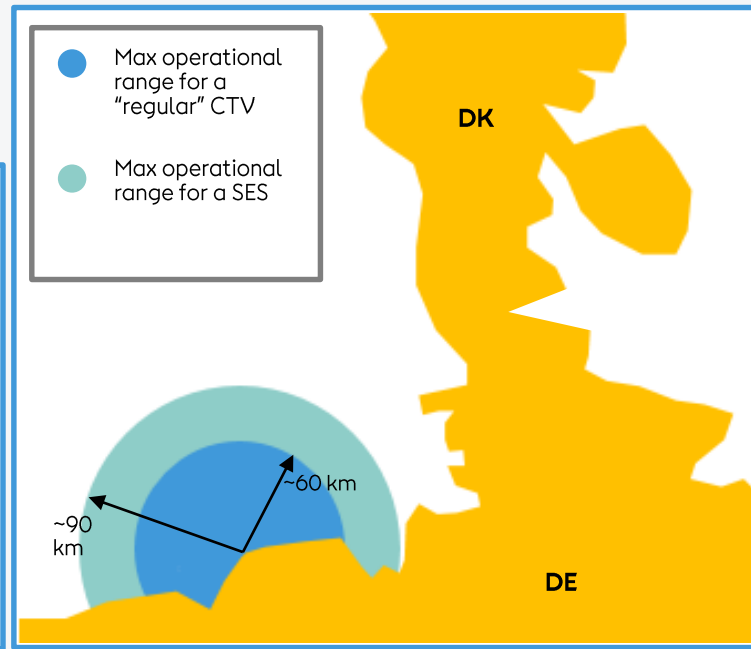
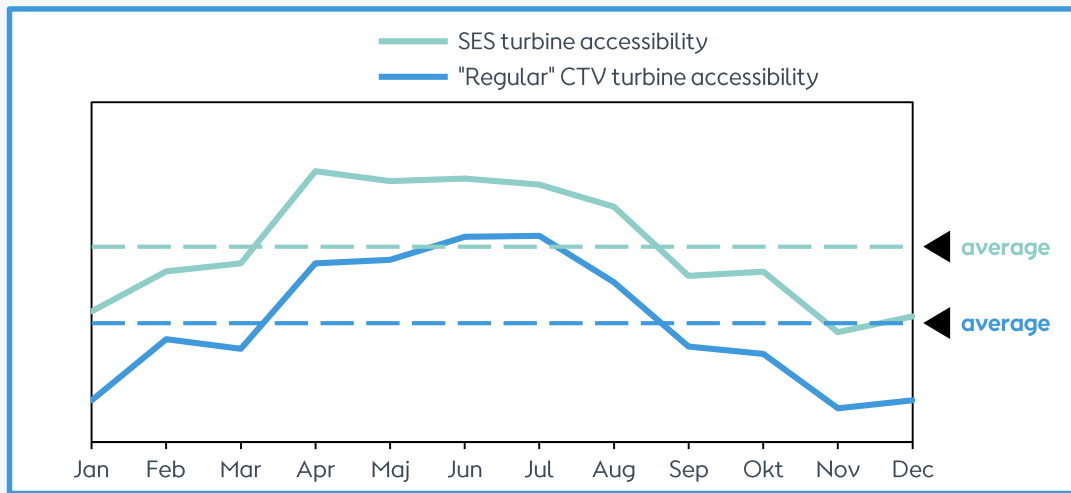
Surface Effect Ship (SES)

High speed and accessibility

High-speed crew transfer air-cushion catamaran that provides a combination of high speed and excellent seakeeping.

Main characteristics:

- High turbine accessibility
- High transit speed



Service operation vessel (SOV)

Service Operation Vessel (SOV)

- The SOV is shared between the German projects, **performing all scheduled maintenance service for the year, one park at a time**
- Allows for **service technicians to stay near the site**, working in shifts and thereby **reducing transfer times**
- Additionally, the SOV is **supporting troubleshooting** in the project where it is located for scheduled service
- New vessel expected to be ready for operations in **January 2019**

Storage of components and spare parts

Access to WTG in adverse weather conditions

Fully integrated daughter craft crew transfer vessel

Accommodation for personnel, minimising transport



Recap: Factors enabling world-class O&M



Q&A

