Status and Prospects for Offshore Wind in Germany

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German Offshore Wind Energy Foundation (Stiftung OFFSHORE-WINDENERGIE, SOW)

- Founded in 2005 to promote environmental and climate protection by supporting the development of offshore wind in Germany
- Non-profit trust - multiregional, independent organization
- Communication platform for policy makers, maritime and offshore wind industry, as well as research organizations
- Offices in Varel (Lower Saxony) and in Berlin
- Ownership rights for alpha ventus (first offshore wind farm in Germany 2010); Initiated and moderated overall project with all relevant stakeholders/authorities
The German Offshore Wind Story
System Changes during the past 12 years
Many changes in support scheme provisions and grid connection regime

- TSOs obliged to provide OWF grid connection to onshore grid
- EEG reform, wind@sea law - new auctioning regime
- EEG reform – compressed FiT for OWFs
- EEG reform – revised targets for OWE
- Site development plan (FEP)

Timeline:
- 2005: Stiftung OFFSHORE-WINDENERGIE founded
- 2006: EEG reform – dedicated FiT for OWE
- 2008: Commissioning of alphaventus
- 2010: EEG reform – EEG reform
- 2011: System change in grid connection
- 2013: National el. grid development plan (onshore & offshore NEP), New liability issues
- 2014: EEG reform – revised targets for OWE
- 2017/18: EEG reform – compressed FiT for OWFs
- 2019: Site development plan (FEP)
Original Targets for offshore wind in Germany


Original Targets:

- Test & Demonstration phase: min. 500 MW (by 2006)
- Phase 1, by 2010: 2.000-3.000 MW
- Phase 2, by 2025/30: 20-25.000 MW
alpha ventus – a pioneering project

First Offshore Wind Farm (OWF) in Germany – ‘Moonlanding Project’ - Paving the way for commercial projects

- 60 km distance to shore, 30 m water depth
- First OWF with 5 MW class (12 turbines) → 60 MW
- 2 turbine manufacturers (AREVA/Multibrid, REpower)
- **Permits acquired by SOW in 2005**
- **Leased to DOTI end of 2006 (EWE, E.ON, Vattenfall)**
- **Construction start in 2008, commissioning in 2009/10**
- **Total Capex: ca. 300 Mio. € (without grid connection)**
- **RAVE – Research at alpha ventus**
  Extensive ecological and technological R&D Program funded by the German government (50 Mio €)
The Renewable Energy Act - EEG

Support for renewable energy technologies via the EEG since 2000 – specifies remuneration, technology differentiation

Issues for offshore wind during past decade (prior to 2009)

➢ No investments due to insufficient remuneration for offshore wind energy (9,1 ct/kWh)

EEG of 2008 (entered into force on 1\textsuperscript{st} Jan. 2009)

✓ Increase of initial Feed-in-Tariff (FiT) to 13.0 ct/kWh, plus starter bonus of 2 ct, granted for 12 years after commissioning (if commissioning before 1 January 2016)

EEG of 2011 (entered into force on 1\textsuperscript{st} Jan. 2012)

✓ Compressed FiT:
  Option to claim an increased initial rate of 19 ct/kWh – only granted for 8 years after commissioning, afterwards FiT drops to 3.5 ct/kWh

→ Important boost for investment decisions
### EEG 2014 – Revised targets for OWE

<table>
<thead>
<tr>
<th>Year</th>
<th>IECP* of 2007</th>
<th>§ 3 EEG 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>10 GW</td>
<td>6,5 GW (+1,2 GW)</td>
</tr>
<tr>
<td>2030</td>
<td>25 GW</td>
<td>15 GW</td>
</tr>
</tbody>
</table>

* Integrated Energy and Climate Programme of German Govt.

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#### Degression of FIT for Offshore Wind

**Compressed FIT model** (8 years initial tariff)

**Standard (base) FIT model** (12 years initial tariff)

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... **but** 2-year FIT-extension granted until Dec. 2019;

**NOTES:**
1. Initial tariff period extended, depending on waterdepth and distance to shore
2. After 2020, new tendering scheme for OWE (auctions) envisaged.
EEG 2017 / Wind @ Sea Law –
Introduction of auctions with new installation trajectories

- **Government target for OWE capacity remains at 6.5 GW by 2020, + 1.2 GW**
  for offshore grid capacity by 2020 → total OWE capacity max. 7.7 GW by

- **2030 target remains @ 15 GW**

- **Wind @ Sea Law** – Transition from FiT (feed-in tariff) to auctions.
  New installation trajectory for 2021 – 2030
  → **Total new capacity of 7.3 GW (only), 730 MW/yr**

- Offshore wind tender volume only 500 MW in 2021 (exclusively in Baltic Sea),
  plus another 500 MW in 2022 (up to 50 % for Baltic Sea), 700 MW/yr from
  2023-2025, and 840 MW/yr from 2026-2030

- **Political reasoning for low targets:**
  better sync. of onshore grid expansion and onshore wind development.
Wind@Sea Law – a new legal framework for offshore wind

Allocation mechanism – auctions

**Responsible authority:** BNetzA (electricity regulator) organises auctions

**Auction volume and rounds:**

- Two auction rounds organised for OWF for the transitional period (2021-25).
- Eligible projects are all OWF in Cluster area 1-9 (EEZ North Sea), and in area 1-3 (EEZ Baltic Sea) which have received a permit, or can prove an advanced application state prior to 1\textsuperscript{st} August 2016. This includes those projects in coastal waters with a similar permitting status.
- The first auction in transition phase was scheduled on 1\textsuperscript{st} March 2017, second one on 1\textsuperscript{st} March 2018.
- Each of the two tenders had a volume of 1.550 MW to be awarded, i.e. total of 3,100 MW capacity during transitional period until 2025. **On average, only 620 MW/yr from 2021-25.**
Installed and planned offshore wind capacity in Germany until 2030

FiT (7.7GW)  Transitional System (Auctions 3.1GW)  Centralised Auctions (4.2GW)

Σ 15 GW until 2030
Latest Statistics and auction results
Status Quo Offshore Wind Energy Germany (Dec. 2018)

22 offshore wind farms (OWF) grid connected, plus 3 OWF under construction, 1 with FID
Status of Offshore Wind Energy Germany 2018:

1,305 turbines with a capacity of around 6.4 GW are feeding in, 136 new turbines, approx. 1 GW new capacity in 2018

### Status of the Offshore Wind Energy Development

<table>
<thead>
<tr>
<th></th>
<th>Capacity</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>OWT (feeding in)</td>
<td>969 MW</td>
<td>136 OWT</td>
</tr>
<tr>
<td>Installed OWT (no feed-in)</td>
<td>276 MW</td>
<td>46 OWT</td>
</tr>
<tr>
<td>Foundations w/o OWT</td>
<td></td>
<td>124 Foundations</td>
</tr>
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<td>6,382 MW</td>
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</tr>
</tbody>
</table>
Current development and outlook until 2025

Based on current plans/targets, approx. 10.8 GW will be operational by 2025
### Auction Results (2017/18) under the Transitional Scheme – Zero Bids – A Paradigm Shift

(Note: commissioning dates 2021-25)

<table>
<thead>
<tr>
<th>Project</th>
<th>Tender Round</th>
<th>Developer/Owner</th>
<th>Accepted Capacity</th>
<th>Expected Year of Commissioning</th>
<th>Awarded Bids Support on top of market price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North Sea</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaskasi II</td>
<td>2018</td>
<td>Innogy</td>
<td>325.00 MW</td>
<td>2022</td>
<td>unbekannt</td>
</tr>
<tr>
<td>OWP West</td>
<td>2017</td>
<td>Ørsted</td>
<td>240.00 MW</td>
<td>2024</td>
<td>0,00 ct/kWh</td>
</tr>
<tr>
<td>Borkum Riffgrund West 2</td>
<td>2017</td>
<td>Ørsted</td>
<td>240.00 MW</td>
<td>2024</td>
<td>0,00 ct/kWh</td>
</tr>
<tr>
<td>Gode Wind 3</td>
<td>2017</td>
<td>Ørsted</td>
<td>110.00 MW</td>
<td>2024</td>
<td>6,00 ct/kWh</td>
</tr>
<tr>
<td>Borkum Riffgrund West 1</td>
<td>2018</td>
<td>Ørsted</td>
<td>420.00 MW</td>
<td>2024/25</td>
<td>0,00 ct/kWh</td>
</tr>
<tr>
<td>Gode Wind 4</td>
<td>2018</td>
<td>Ørsted</td>
<td>131.75 MW</td>
<td>2024/25</td>
<td>9,83 ct/kWh</td>
</tr>
<tr>
<td>EnBW He Dreihit</td>
<td>2017</td>
<td>EnBW</td>
<td>900.00 MW</td>
<td>2025</td>
<td>0,00 ct/kWh</td>
</tr>
<tr>
<td><strong>Baltic Sea</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arcadis Ost 1</td>
<td>2018</td>
<td>Parkwind NV</td>
<td>247.25 MW</td>
<td>2021</td>
<td>unbekannt</td>
</tr>
<tr>
<td>Wikinger Süd</td>
<td>2018</td>
<td>Iberdrola</td>
<td>10.00 MW</td>
<td>2022</td>
<td>0,00 ct/kWh</td>
</tr>
<tr>
<td>Baltic Eagle</td>
<td>2018</td>
<td>Iberdrola</td>
<td>476.00 MW</td>
<td>2022</td>
<td>6,46 ct/kWh</td>
</tr>
</tbody>
</table>
Recent auction results across Europe reflect diversity

Plenty of variation in recent offshore wind auction results
Delivery year, auction year and local specifics hold more explanatory power than size
Key Drivers for cost reductions

Technological developments

• Progress in offshore technology expected, which is meant to bring cost of energy further down

A GROWTH IN CAPACITY

Rotor diameter offshore turbines at sea

2000
76 m

2005

2010

2016
145 m

2020

2025
200 m

~13–15 MW

2.0 MW

4.8 MW

Average installed capacity of new wind turbines in Europe (in megawatts): Forecasts by manufacturers and operators up to 2025

Infographics: Ahnen&Enkel
Key Drivers for cost reductions

Economies of scale

• Wind farms are growing in size, Currently under construction: e.g. 1200 MW at HornSea (UK)
Reasons for massive cost reductions in auctions

Mature offshore markets with a strong learning curve (DK, DE, NL, UK), plus

Electricity market price assumptions

Experts forecast an electricity market price of 5.3 ct/kWh in 2025 and 7.6 ct/kWh by 2035.

Average wholesale price in Germany was at 3 ct/kWh during 2017, increasing to 4.5 ct. in 2018 (compared to 8 ct/kWh in 2011)
Current energy policy developments in Germany
Cuxhavener Appell 2.0 (Sep. 2017) and Wind Energy Call Hamburg (WindEnergy, Sep. 2018) – Alliance of the Coastal States with the offshore wind industry
Cuxhavener Appell 2.0 (2017) and Wind Energy Call of Hamburg (WindEnergy 2018) – Positions and political demands

- Increase expansion volume to at least 20 GW until 2030 and to at least 30 GW until 2035
- In the short term, use free grid capacities (around of 1.5 GW)
- Create legal foundations for future technological and organisational innovations that can implement tender results
Targeted efforts required to promote offshore wind in Germany

1. Rapid implementation of special tenders with at least 1.5 GW of offshore wind power required (dedicated short-term contribution)

2. **Raise offshore wind target to at least 20 GW by 2030** to meet new government targets for 2030 → 65 % RES and -55 % CO2 reduction

3. Speed-up grid expansion, better use of existing grids (optimization), and accelerate sector coupling (Power-2-X)

4. Secure employment in the offshore wind sector and create added value

5. Enable the realization of test sites/demo areas for offshore wind
Bedankt!

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