Assessing Cost Reduction Potentials of Offshore Wind Energy in Germany until 2023

Andreas Wagner, MD

German Offshore Wind Energy Foundation

Dublin, 21st June 2013

13th Inter-Parliamentary Meeting on Renewable Energy and Energy Efficiency
German Offshore Wind Energy Foundation

- Founded in 2005 as an independent, non-partisan institution to support the development of offshore wind energy
- Platform for offshore wind (and maritime) industry, policy and research-oriented stakeholders
- Board of Trustees with key offshore wind stakeholders (e.g. developers, manufacturers & suppliers, banks, government authorities, trade associations, etc.)
- Public relations, public acceptance activities
- Policy initiatives & studies, moderator
2. Cost Reduction Potential Study
3. The Crown Estate‘s Pathways Study
4. Scope of Recommendations / Study in Context
Current Political Debate on RES in Germany

- Intensified Discussion about cost of RE support - 2 years after Fukushima
- Loosing sight of the bigger picture (security of supply and sustainability)?
- Major policy changes after Fed. Elections? (market design, future of EEG)
Current State of the Industry

First wave of offshore wind projects under construction BUT delays have increased costs

Difficulties due to changes in grid regime and political uncertainty

Key stakeholders underline importance of stable & continuous development
Energy Economical Role and Cost Reduction Potentials of Offshore Wind Energy in Germany

- **Study on Energy Economical Role** (by Fraunhofer IWES)
  
  **Key Objectives:** Explain and specify the impact/characteristics offshore wind power generation has for the overall energy system and demonstrate its contribution to the future German (and EU) energy supply system based on increasing RES levels.

- **Goals Cost Reduction Study** (by Prognos AG & Fichtner Group):
  
  **Key Objectives:** Industry’s joint view of prospects/prerequisites for reducing offshore wind levelised cost of energy (LCOE)
  
  - Recommendations for industry and for further development of regulatory and market framework

- Both studies are closely coordinated with steering committee of representatives from partner corporations and associations

- Results will be expected in summer 2013
Our Partners

initiator/moderator
Offshore wind cost reduction potentials in Germany until 2023
Which prerequisites have to be met to reduce offshore wind LCOEs in Germany over the next ten years? Which scope of LCOE reduction is possible? Which are the key levers to drive down costs?
Two scenarios, three sites, four dates (IBN 2013, 2017, 2020, 2023)
Consideration of specific geographical, regulatory and industrial framework conditions in Germany
Approach compatible with Crown Estate’s 2012 “Offshore Wind Cost Reduction Pathways Study“ to ensure international comparability
## Major LCOE components of a German OWF

### CAPEX

<table>
<thead>
<tr>
<th>Component</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserve</td>
<td>7 - 11%</td>
</tr>
<tr>
<td>Converter Plattform</td>
<td>3 - 6%</td>
</tr>
<tr>
<td>Foundation / Substructure</td>
<td>16 - 20%</td>
</tr>
</tbody>
</table>

### OPEX

<table>
<thead>
<tr>
<th>Component</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>O &amp; M</td>
<td>20 - 24%</td>
</tr>
</tbody>
</table>

### Decommissioning

<table>
<thead>
<tr>
<th>Component</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decommissioning</td>
<td>3 - 5%</td>
</tr>
</tbody>
</table>

### Szenario 2 in Euro2012/MWh

<table>
<thead>
<tr>
<th>Year</th>
<th>LCOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>164.4</td>
</tr>
<tr>
<td>2017</td>
<td>170.5</td>
</tr>
<tr>
<td>2020</td>
<td>100.2</td>
</tr>
<tr>
<td>2023</td>
<td>84.5</td>
</tr>
</tbody>
</table>

Basis: 4 MW Standort B, 80 Anlagen
The Crown Estate’s Pathways Study

- Study presented in 06/2012
- Input for Dept. of Energy & Climate Change CR Task Force
- In three out of four scenarios, LCOE of £100 per MWh or less can be achieved by FID 2020 (from £140/MWh for FID 2011)
- LCOE, incl. grid connection cost
Results UK Pathways Study

<table>
<thead>
<tr>
<th></th>
<th>LCOE (£/MWh)</th>
<th>CAPEX (£m/MW)</th>
<th>OPEX (£000s/MW p.a.)</th>
<th>Net Capacity Factor</th>
<th>WACC (pre-tax, real, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FID 2011</strong></td>
<td>140-144</td>
<td>2.6 - 2.9</td>
<td>95-98</td>
<td>40-42%</td>
<td>9.20%</td>
</tr>
<tr>
<td><strong>FID 2020 – R1/2</strong></td>
<td>94 (range 81 -113)</td>
<td>2.1 (range 1.9 – 2.6)</td>
<td>79 (range 65-88)</td>
<td>46% (range 42% - 51%)</td>
<td>7.90% (7.8% – 8.5%)</td>
</tr>
<tr>
<td><strong>FID 2020 - R3</strong></td>
<td>97 (range 93 -124)</td>
<td>2.2 (range 2.0 – 2.6)</td>
<td>80</td>
<td>50% (range 46% - 52%)</td>
<td>8.40% (8.3% – 8.6%)</td>
</tr>
</tbody>
</table>

Source: The Crown Estate

© 2012 The Crown Estate
Roland Berger Study – Offshore Wind Toward 2020

LCoE 2012 European generation mix [EUR ct/kWh]

- Competitive cost level
- Nuclear: 3-4
- Lignite: 4-6
- Hard coal: 5-7
- Natural gas: 4-6
- Onshore: 6-8
- Hydro: 3-5
- Biomass: 6-12
- PV: 15-21
- Offshore: 11-18
- CSP: 18-26

Offshore target: 9 ct/kWh by 2020

RECENT STATEMENTS

"A cost reduction of 20-30% in offshore by 2017 is realistic"
(DONG Energy)

"Our LCoE target for all wind energy is 5-9 EUR ct/kWh in the medium term"
(Siemens Wind Power)

"Our target: 40% reduction of offshore CAPEX by 2015"
(E.ON Climate & Renewables)

Note: Competitive cost level as a non-weighted average of non-renewable energy sources is 4.9 ct/KWh

© 2013 Roland Berger
Roland Berger Study – Offshore Wind Toward 2020

LCoE forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>LCoE (ct/kWh)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>13</td>
<td>-17%</td>
</tr>
<tr>
<td>2016</td>
<td>11</td>
<td>-19%</td>
</tr>
<tr>
<td>2020</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisites**

**WTG SIZE**
- Average rated power of newly installed WTG: 3 MW
- Average rated power of newly installed WTG: 6 MW
- Average rated power of newly installed WTG: 8 MW

**FOUNDATION**
- Currently available foundation types
- Initial savings from improved foundation concepts
- Serial production effects for selected foundation types

**O&M**
- Limited experience with far-shore O&M
- Far-shore experience leads to reduced O&M costs
- Mature O&M concepts with minimized cost structures

**COMMENTS**

- Cost level of 9 ct/kWh should be reached for new additions in 2020
- Offshore will not match the competitive cost levels of conventional energy by 2020
- Offshore is on the pathway to cost competitiveness, but further time-consuming efforts are required
- Political support and a joint industry effort will be essential for offshore to meet the prerequisites and reach the targets

1) Idealized LCoE model calculation for newly installed WTGs on global average

© 2013 Roland Berger
Roland Berger Study – Offshore Wind Toward 2020

Offshore – Conclusion

MARKET STABILITY
Offshore is a policy-driven market and depends on public support schemes

- Ensure reliability of regulation and stability of political support

LCoE COMPETITIVENESS
Offshore needs to become independent of public support mechanisms (e.g., Renewable Energy Act) to maintain political support

- Reduce LCoE to 11 ct/kWh by 2016 and 9 ct/kWh by 2020

TECHNOLOGY
Offshore is still at an early stage and combines technologies from different industries – optimized integration possible

- Maintain Europe’s technology leadership and boost innovation

OEM COMPETITION
New players are entering the market and competition will increase significantly

- Achieve cost competitiveness driven by product excellence

RISK-RETURN RATIO
Achievable margins do not yet compensate for potential risks

- Improve risk-return ratio and develop new investment models

© 2013 Roland Berger
Scope of Recommendations / Study in Context

- Studies and corporate initiatives towards cost reduction
- SOW German Study to provide broad-based industry view:
  - Comprehensive overview for industry and stakeholder discussions and potential joint initiatives
  - Basis for well-founded policy recommendations
  - Foundation for international exchange (particularly UK)
THANK YOU!

Andreas Wagner

Stiftung OFFSHORE-WINDENERGIE
Büro Berlin
Schiffbauerdamm 19
10117 Berlin
Tel: +49 30 275 95 241
a.wagner@offshore-stiftung.de
www.offshore-stiftung.de

Source of Information for German Offshore Wind Energy: www.offshore-windenergie.net