Offshore wind leadership and the EU

Giles Dickson, CEO
Our members make wind energy work

<table>
<thead>
<tr>
<th>Category</th>
<th>Members</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind turbine manufacturers</td>
<td>e.g.</td>
<td>GE Renewable Energy</td>
</tr>
<tr>
<td>Wind farm developers</td>
<td>e.g.</td>
<td>acciona Energy</td>
</tr>
<tr>
<td>Power utilities</td>
<td>e.g.</td>
<td>e.on</td>
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<tr>
<td>Component manufacturers</td>
<td>e.g.</td>
<td>ABB</td>
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<tr>
<td>Installation / logistics</td>
<td>e.g.</td>
<td>DHL</td>
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<td>Financial &amp; legal services</td>
<td>e.g.</td>
<td>Allianz</td>
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<tr>
<td>Research institutes</td>
<td>e.g.</td>
<td>CATAPULT</td>
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</tbody>
</table>

+ NATIONAL WIND ASSOCIATIONS
Wind will become the largest power source in the EU by 2027

according to IEA
Wind will become the largest power source in the EU by 2027

Share of electricity generation by source in the EU, 2017-2040

according to IEA
Wind power across Europe

189 GW by December 2018

Of which:
18.5 GW offshore

14% of 2018 EU power demand

GW installed
Wind share of demand

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Of which:
18.5 GW offshore

14% of 2018 EU power demand

GW installed
Wind share of demand
European Wind Energy Generation in 2018

- Wind Energy Production: 362 TWh
- Onshore Wind CF: 22%
- Offshore Wind CF: 37%

8 December Record in wind production

Graph showing onshore and offshore wind energy production from 01-Jan to 31-Dec.
European offshore wind sector in 2018

18.5 GW
+4,500 Turbines connected
105 Sites
+40,000 Jobs
The wind value chain is everywhere
Regenerating communities

Green Port Hull
£310m invested, 1000 jobs
Wind energy globally

Central scenario

- **Europe**: 25%
- **Asia**: 47%
- **North America**: 18%
- **Latin America**: 5%
- **Middle East & Africa**: 3%
- **Pacific**: 2%

**2018-2022 net additions**

Sources: WindEurope, GWEC
Europe’s bottom-fixed windfarms
Europe’s floating windfarms
Offshore wind share by sea basin

-European cumulative offshore wind installed capacity

18.5 GW

North Sea: 70%
Irish Sea: 16%
Baltic Sea: 12%
Atlantic Sea: 2%
The cost of offshore wind is decreasing

Levelised revenue of electricity, incl. transmission costs
EUR/MWh, 2016-prices
Offshore turbines are getting larger

Yearly average of newly-installed offshore wind turbine rated capacity

- 6.8 MW in 2019
- 15% larger than in 2017

Wind Europe
Larger blades and higher towers
Low wind speeds
Lower energy density

(Generator to rotor ratio (W/m²)

Turbines are getting larger

ONSHORE 2017
2-5 MW
100m
100-140m

OFFSHORE 2019
9.5 MW
140m
164m

EIFFEL TOWER: 324m

1990
0.3 MW
30m
33m

STATUE OF LIBERTY: 93m

Nameplate Capacity
Hub Height
Rotor Diameter
2016 and 2030 offshore wind installations per sea basin
National Energy & Climate Plans
2030 Outlook for offshore wind

*Combination of known projects and government ambition
Why is regional cooperation so important?

- Continue cost reduction
- Develop supply chain smoothly – avoid stop-and-go
- Retain global leadership
Why is regional cooperation so important?
Happy coexistence
Happy coexistence

Thames sailing barge Kitty and Thanet Wind Farm off Broadstairs, Kent
Happy coexistence
IN 2019 JOIN US IN BILBAO, SPAIN

2-4 April 2019
Bilbao Exhibition Centre (BEC)

Find out more at: windeurope.org/confex2019
Green Port of Hull
Siemens Gamesa blade factory

- €400m invested
- 1,000 direct jobs
- Social initiatives

Promoting local benefits
Contributing to other sectors

- Electrical equipment: €52
- Machinery and equipment: €38
- Basic metals: €36
- Construction: €31
- Engineering services: €17
- Rubber and plastic products: €15
- Other sectors: €61

€250 for other sectors
€1000 earned by wind

Source: Deloitte for WindEurope
Offshore outlook to 2030

Optimal target of 6 GW/yr
Offshore capacity factors are increasing

<table>
<thead>
<tr>
<th>Offshore wind farm</th>
<th>Capacity factor</th>
<th>Duration</th>
<th>COD</th>
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</thead>
<tbody>
<tr>
<td>Hywind floating</td>
<td>65%</td>
<td>Last 3 months of 2017</td>
<td>2017</td>
</tr>
<tr>
<td>Dudgeon</td>
<td>65%</td>
<td>Last 3 months of 2017</td>
<td>2017</td>
</tr>
<tr>
<td>Walney phase II</td>
<td>45%</td>
<td>2017</td>
<td>2013</td>
</tr>
<tr>
<td>Anholt 1</td>
<td>49%</td>
<td>2017</td>
<td>2013</td>
</tr>
<tr>
<td>Sheringham Shoal</td>
<td>41%</td>
<td>2017</td>
<td>2012</td>
</tr>
</tbody>
</table>

Source: [http://energynumbers.info/uk-offshore-wind-capacity-factors](http://energynumbers.info/uk-offshore-wind-capacity-factors)

The First Floating Wind Farm Is Ridiculously Efficient

World’s First Floating Offshore Wind Farm Achieves 65% Capacity Factor After 3 Months

Scotland’s floating wind farm is showing how powerful offshore wind can be