OFFSHORE WIND IN EUROPE
Key trends and statistics 2020
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Key trends and statistics 2020

Presented by

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Press & Comms Manager

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Analyst – Offshore Wind

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Analyst – Offshore and Sustainability
Wind Energy in Europe 2020
Free webinar

Tuesday 4 March 2021
3:00 PM (CET)

Presented by:

Ivan Komusanac
Analyst – Markets & Wind Energy Technology

Daniel Fraile Montoro
Head of Market Intelligence

Christoph Zipf
Press and Communications Manager

Wind Energy in Europe 2020: Trends, statistics and five-year outlook free webinar

Date: Thursday 4 March 2021
Time: 3:00 PM – 4:00 PM CET
Report publication date: 25 February 2021

Join us for the Wind Energy in Europe 2020: Trends, statistics and five-year outlook webinar. WindEurope analysts will discuss the latest developments within the European wind industry, outlining key installations in wind farms, supply chain activity, and investment trends. They will analyse how the covid19 pandemic has affected the sector and the outlook for the next 5 years. This will be followed by a Q&A session for participants.

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AGENDA

1. CONSTRUCTION
2. FINANCING
3. TRENDS AND SUPPLY CHAIN
4. POLICY & MARKET OUTLOOK
Got a question?

Press + to expand the question box

Type your question and hit ‘Send’
CONSTRUCTION ACTIVITY

Lizet Ramírez
Offshore Analyst
Offshore wind installations in Europe 2020

2,918 MW

356

Grid-connected turbines

9

Wind farms grid-connected

6

Wind farms under construction

Wind farm status
- Online
- Partially online
- Under construction

Source: WindEurope
National Breakdown
2020

- Netherlands: 1,493 MW; 51%
- Belgium: 706 MW; 24%
- United Kingdom: 483 MW; 17%
- Germany: 219 MW; 8%
- Portugal: 17 MW; <1%

Source: WindEurope
Offshore wind installations in Europe 2020

Wind farms with construction activity in 2020

BELGIUM
- Northwester 2
- Seamade (see p.31) (Mermaid & Seastar)

DENMARK
- Kriegers Flak (see p.12)

GERMANY
- EnBW Albatros
- Trianel Windpark Borkum 2

NETHERLANDS:
- Borssele 1&2 (see p.15)
- Borssele 5
- Borssele 3&4
- Fryslan

PORTUGAL
- Windfloat Atlantic (see p.22)

UK
- East Anglia One
- Hornsea Two
- Kincardine
- Moray East (see p.22)
- Triton Knoll

Wind farm status
- Online
- Partially online
- Under construction

Source: WindEurope
Wind farms with works at sea in 2020

With grid connection:
- Borssele 1&2
- Borssele 3&4
- Borssele 5
- Seamade
- Northwester 2
- East Anglia One

Under construction:
- Fryslan
- Hornsea Two
- Moray East
- Kincardine
- Triton Knoll

Activity in 2020:
- 4 wind farms
  - 172 grid-connected turbines
  - 89 foundations
- 2 wind farms
  - 81 grid-connected turbines
- 5 wind farms
  - 69 grid-connected turbines
  - 220 foundations
Wind farms with works at sea in 2020

With grid connection

- EnBW Albatros
- Trianel Windpark Borkum 2

Under construction

- Kriegers Flak

Activity in 2020

- 2 wind farms
- 32 grid-connected turbines

- 1 wind farm
- 72 foundations

- 1 wind farm
- 2 grid-connected turbines
FINANCING ACTIVITY

Mattia Cecchinato
Offshore and Sustainability Analyst
A record €26.3bn in new assets financed

<table>
<thead>
<tr>
<th>Year</th>
<th>Total investments (€bn)</th>
<th>New capacity financed (GW)</th>
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</thead>
<tbody>
<tr>
<td>2010</td>
<td>8.4</td>
<td>2.2</td>
</tr>
<tr>
<td>2011</td>
<td>6.1</td>
<td>1.5</td>
</tr>
<tr>
<td>2012</td>
<td>5</td>
<td>1.3</td>
</tr>
<tr>
<td>2013</td>
<td>7.2</td>
<td>1.6</td>
</tr>
<tr>
<td>2014</td>
<td>8.8</td>
<td>2.1</td>
</tr>
<tr>
<td>2015</td>
<td>13.1</td>
<td>3</td>
</tr>
<tr>
<td>2016</td>
<td>18.2</td>
<td>5</td>
</tr>
<tr>
<td>2017</td>
<td>7.5</td>
<td>2.3</td>
</tr>
<tr>
<td>2018</td>
<td>10.3</td>
<td>4.2</td>
</tr>
<tr>
<td>2019</td>
<td>6</td>
<td>1.4</td>
</tr>
<tr>
<td>2020</td>
<td>24.2</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Source: WindEurope
8 Wind farms reached Financial Investment Decision (FiD)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>WIND FARM</th>
<th>CAPACITY (MW)</th>
<th>INVESTMENT (€bn)</th>
<th>COST (€m/MW)</th>
<th>EXPECTED COMMISSIONING DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>Fecamp</td>
<td>497</td>
<td>2.4</td>
<td>4.9</td>
<td>2023</td>
</tr>
<tr>
<td></td>
<td>Saint-Brieuc</td>
<td>496</td>
<td>2.3</td>
<td>4.6</td>
<td>2023</td>
</tr>
<tr>
<td>Germany</td>
<td>Kaskasi</td>
<td>342</td>
<td>1.4</td>
<td>4.1</td>
<td>2022</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Hollandse Kust Noord</td>
<td>759</td>
<td>1.6</td>
<td>2.0</td>
<td>2023</td>
</tr>
<tr>
<td></td>
<td>Hollandse Kust Zuid 1-4</td>
<td>1,500</td>
<td>3.4</td>
<td>2.3</td>
<td>2022/23</td>
</tr>
<tr>
<td>UK</td>
<td>Kincardine</td>
<td>50</td>
<td>0.4</td>
<td>8.3</td>
<td>2021</td>
</tr>
<tr>
<td></td>
<td>Dogger Bank (A and B)</td>
<td>2,400</td>
<td>9.4</td>
<td>3.9</td>
<td>2024/25</td>
</tr>
<tr>
<td></td>
<td>Seagreen</td>
<td>1,075</td>
<td>3.3</td>
<td>3.1</td>
<td>2023</td>
</tr>
</tbody>
</table>

Source: WindEurope
Offshore PPAs in 2020

- **31 MW**
  - Race Bank

- **316 MW**
  - Borkum Riffgrund 3
  - Amrumbank West

- **375 MW**
  - Seamade (Mermaid)
  - Northwestern 2
  - Norther

Source: WindEurope
One auction took place in the Netherlands

759 MW capacity awarded to CrossWind consortium
Commissioning in 2023
TRENDS AND SUPPLY CHAIN

Lizet Ramírez
Offshore Analyst
Ownership of offshore wind farms

<table>
<thead>
<tr>
<th>Company</th>
<th>Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ørsted</td>
<td>17%</td>
</tr>
<tr>
<td>RWE Renewables</td>
<td>10%</td>
</tr>
<tr>
<td>Vattenfall</td>
<td>6%</td>
</tr>
<tr>
<td>Macquarie Capital</td>
<td>6%</td>
</tr>
<tr>
<td>Iberdrola Renovables</td>
<td>4%</td>
</tr>
<tr>
<td>Global Infrastructure Partners</td>
<td>4%</td>
</tr>
<tr>
<td>Northland Power</td>
<td>4%</td>
</tr>
<tr>
<td>SSE</td>
<td>2%</td>
</tr>
<tr>
<td>Stadwerke München</td>
<td>2%</td>
</tr>
<tr>
<td>Siemens</td>
<td>2%</td>
</tr>
<tr>
<td>Partners Group</td>
<td>2%</td>
</tr>
<tr>
<td>EnBW</td>
<td>2%</td>
</tr>
<tr>
<td>Equinor</td>
<td>2%</td>
</tr>
<tr>
<td>Eneco</td>
<td>2%</td>
</tr>
<tr>
<td>PKA</td>
<td>1%</td>
</tr>
<tr>
<td>Copenhagen Infrastructure Partners</td>
<td>1%</td>
</tr>
<tr>
<td>Parkwind</td>
<td>1%</td>
</tr>
<tr>
<td>Trianel</td>
<td>1%</td>
</tr>
<tr>
<td>Masdar</td>
<td>1%</td>
</tr>
<tr>
<td>Elico</td>
<td>1%</td>
</tr>
<tr>
<td>Enbridge</td>
<td>1%</td>
</tr>
<tr>
<td>Others</td>
<td>26%</td>
</tr>
</tbody>
</table>

51% of the offshore wind capacity

Source: WindEurope
BORSSELE 1&2

The Netherlands

Ørsted’s first wind farm in the Netherlands

Status:
Fully Commissioned

Capacity:
752 MW

No. of turbines:
94

Owners:
Ørsted (100%)

Turbine model:
SG 8.0-167 DD
(SGRE)

Inter-array cable:
Nexans

Export cable:
NKT Group

Foundation type:
Monopiles

Foundation supplier:
EEW (50%) & Sif (50%)
Turbines are getting larger

8.2 MW average in 2020

Source: WindEurope
Turbine model highlights

**Vestas Wind Systems V164-9.5 MW**
- Rotor: 164m
- Height: 197m
- Largest turbine installed in 2020

**Siemens Gamesa Renewable Energy SG 8.0-167 DD**
- Rotor: 167m
- Height: 212m
- Most used turbine in 2020

**GE Renewable Energy GE Haliade-X 13 MW**
- Rotor: 220m
- Height: 260m
- Largest turbine order recorded

*Heights are indicative only

Source: WindEurope
Two manufacturers supply nearly all operating wind farms in Europe

- Siemens Gamesa Renewables Energy: 68% (16.9 MW / 3,674 Turbines)
- Vestas Wind Systems: 23.9% (5.7 MW / 1,290 Turbines)
- Senvion: 4.4% (1.4 MW / 238 Turbines)
- Bard Engineering: 1.5% (0.4 MW / 80 Turbines)
- GE Renewable Energy: 1.4% (0.4 MW / 74 Turbines)
- Others: 0.8% (0.07 MW / 46 Turbines)

**TOP 2 REPRESENT 92% OF ALL CAPACITY CONNECTED**

*Only grid-connected turbines

Source: WindEurope
SEAMADE
(Seastar & Mermaid)

Belgium
Largest Belgian offshore wind farm.

Status:
Fully commissioned

Capacity:
487 MW

No. of turbines:
58

Owners:
Otary* (70%), Ocean Winds (17.5%) & Eneco (12.5%)

Turbine model:
SG 8.4-167 DD(SGRE)

Inter-array cable:
JDR Cable systems

Export cable:
Hellenic Cables

Foundation type:
Monopiles

Foundation supplier:
Sif (100%)
Two companies supplied 423 monopiles across 3 countries

Source: WindEurope
MORAY EAST

UK
DEME Offshore developed a special underwater drilling tool to cope with hard and rocky layers.

Status:
Under construction

Capacity:
950 MW

No. of turbines:
100

Owners:
Ocean Winds (56.6%), Diamond Green Limited (33.4%) & The China Three Gorges (10%)

Turbine model:
V164-9.5MW
(Vestas Wind Systems)

Inter-array cable:
JDR Cable Systems (66 kV)

Export cable:
NKT Group

Type of foundation:
Jackets

Foundation supplier:
Smulders (55%) & Lamprell (45%)

© Courtesy of Moray East
Two suppliers taking over half of 2020 cable installations

Inter-array cables

- TFKGroup: 145
- Prysmian Powerlink: 76
- Nexans: 94
- NSW Technology: 39

Two supply 68% of the cables

Export cables

- TFKGroup: NKT Group
- Prysmian Powerlink: 1
- Hellenic Cables: 2
- Nexans: 3

Two supply 66% of the cables

*TKF Group represents cables supplied by JDR Cable Systems and TFKable

Source: WindEurope
Two companies installed most foundations and turbines in 2020
## Floating projects coming online in the next three years

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>WIND FARM</th>
<th>CAPACITY (MW)</th>
<th>FLOATER TYPE</th>
<th>NUMBER OF TURBINES</th>
<th>TURBINE MODEL</th>
<th>EXPECTED COMMISSIONING DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>Éoliennes Flottantes de Groix</td>
<td>28.5</td>
<td>Semi-sub</td>
<td>3</td>
<td>V164-9.5 MW</td>
<td>2022</td>
</tr>
<tr>
<td></td>
<td>EFGL</td>
<td>30</td>
<td>Semi-sub</td>
<td>3</td>
<td>V164-10.0 MW</td>
<td>2023</td>
</tr>
<tr>
<td></td>
<td>EolMed</td>
<td>30</td>
<td>barge</td>
<td>3</td>
<td>V164-10.0 MW</td>
<td>2023</td>
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<tr>
<td></td>
<td>Provence Grand Large</td>
<td>25</td>
<td>TLP</td>
<td>3</td>
<td>SWT-8.4-154 DD</td>
<td>2023</td>
</tr>
<tr>
<td>Norway</td>
<td>Hywind Tampen</td>
<td>88</td>
<td>Spar</td>
<td>11</td>
<td>SWT 8.0-154 DD</td>
<td>2022</td>
</tr>
<tr>
<td>UK</td>
<td>Kincardine</td>
<td>50</td>
<td>Semi-sub</td>
<td>5</td>
<td>V164-9.6 MW</td>
<td>2021</td>
</tr>
</tbody>
</table>
The Offshore Renewable Energy Strategy (ORES)

 Released on November 19, 2020

60 GW by 2030
300 GW by 2050
How to scale up?

1. Maritime Spatial Planning
2. Grid Infrastructure
3. An EU regulatory framework
4. Private-public investments
5. Research and Innovation
6. Supply and value chain

WindEurope’s in-depth analysis
Regional Cooperation

- July 6, 2020
  Joint Statement of North Seas Countries and the European Commission

- September 30, 2020
  Offshore Wind Declaration signed by the 8 Baltic States
## Wind farms coming online 2021/2022

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>WIND FARM</th>
<th>FOUNDATIONS INSTALLED IN 2020</th>
<th>TOTAL NUMBER OF FOUNDATIONS</th>
<th>TURBINE MODEL</th>
<th>TYPE OF FOUNDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>Fryslan</td>
<td>89</td>
<td>89</td>
<td>SWT-DD-130 4.4 MW</td>
<td>Monopile</td>
</tr>
<tr>
<td>UK</td>
<td>Hornsea Two</td>
<td>29</td>
<td>165</td>
<td>SG-8.0-167 DD</td>
<td>Monopile</td>
</tr>
<tr>
<td></td>
<td>Moray East</td>
<td>100</td>
<td>100</td>
<td>V164-9.5 MW</td>
<td>Jacket</td>
</tr>
<tr>
<td></td>
<td>Kincardine</td>
<td>1</td>
<td>5</td>
<td>V164-9.6 MW</td>
<td>Semi-Sub</td>
</tr>
<tr>
<td></td>
<td>Triton Knoll</td>
<td>90</td>
<td>90</td>
<td>V164-9.5 MW</td>
<td>Monopile</td>
</tr>
<tr>
<td>Denmark</td>
<td>Kriegers Flak</td>
<td>72</td>
<td>72</td>
<td>SG 8.4-167 DD</td>
<td>Monopile</td>
</tr>
</tbody>
</table>
Offshore Outlook to 2025

Annual Installations (GW)

Source: WindEurope
Europe needs to install a constant 11 GW to deliver 111 GW

Source: WindEurope
New markets

**Offshore Wind Act.** The 1st phase will allocate 5.9 GW this year with a fixed price CfD to pre-developed projects. The 2nd phase will include two auctions in 2025 and 2027, both for 2.5 GW of capacity.

Approved the **Marine Planning and Development Management (MPDM) Bill** and fast-tracked at least 3.5 GW worth of projects. It also committed to a higher offshore target: 5 GW by 2030.

**New Institutional framework for offshore wind energy** is expected this year. EU focus on the Mediterranean Sea basin.

**Offshore Wind Energy Roadmap** had consultations this year and the framework aims to speed up permitting process and allow a first auction in the Canary Islands this year.
Takeaways

2020

1. Record €26.3bn for financing new offshore wind assets
2. Offshore wind industry resilient
3. Installations increase in the next five years and need to sustain 11 GW after 2025 yearly to meet 2030 targets
4. Clarity in regulatory framework for existing and new markets is critical
Q&A

policy@windeurope.org
Did you miss something? Recording will be available

Wind energy today

- 15% of Europe’s electricity
- cheaper than other energies
- 300,000 jobs in Europe
- benefits local communities

Workshops and webinars...
Wind Energy in Europe 2020
Free webinar

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- Copenhagen, Denmark
- windeurope.org/ElectricCity2021
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