Connecting wind power to the grid
Gas-insulated medium-voltage switchgear for wind farms

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Wind power is booming – now and in the future

The international targets for reducing greenhouse gases have led to a boom in renewable energies, with a special focus on wind power. Since the start of the new millennium, the newly installed capacity has increased by up to 30 percent per year. The European Union’s goal is to obtain 20 percent of generated electricity from renewable energy sources by 2020, with the largest share coming from wind power at almost 35 percent. To reach this goal, new wind power capacities with a total output of around 100 GW need to be installed in the EU by 2020.

Market prospects are also promising in other parts of the world. The need and demand for wind power is constantly growing, not just in industrialized but also in emerging countries.
Gas-insulated medium-voltage switchgear (GIS) are used for various applications in wind farms. Depending on the operator’s requirements, different configurations of medium-voltage GIS allow the individual wind turbines to be safely connected to the wind farm’s own power grid.

Cables transmit the generated power to a collector substation where another medium-voltage GIS protects the wind farm on the one hand and the power transformer on the other, and therefore ensures a safe connection of the sustainably generated power to the high-voltage transmission grid. Within larger wind farms, reactive power compensation is used to minimize reactive power flow. This system is also connected with the wind farm via gas-insulated medium-voltage switchgear.

Typical layout of wind farms

Arrangement of the gas-insulated medium-voltage switchgear in wind farm applications
For the optimal operation of your system

Gas-insulated medium-voltage switchgear for wind farm applications

- Wind turbine: NXPLUS C Wind, 8DJH, SIMOSEC, NXPLUS, 8DA
- Collector substation: 8DA, NXPLUS, NXPLUS C, 8DJH
- Reactive power compensation: 8DA, NXPLUS, NXPLUS C, 8DJH

<table>
<thead>
<tr>
<th>Switchgear type</th>
<th>Voltage (kV)</th>
<th>Short-circuit current max. (kA)</th>
<th>Rated current busbar max. (A)</th>
<th>Rated current feeder max. (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8DA</td>
<td>40.5</td>
<td>40.0</td>
<td>5,000</td>
<td>2,500</td>
</tr>
<tr>
<td>NXPLUS</td>
<td>40.5</td>
<td>31.5</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>NXPLUS C Wind</td>
<td>36.0</td>
<td>25.0</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>NXPLUS C</td>
<td>24.0</td>
<td>25.0</td>
<td>2,500</td>
<td>2,000</td>
</tr>
<tr>
<td>SIMOSEC</td>
<td>24.0</td>
<td>20.0</td>
<td>1,250</td>
<td>1,250</td>
</tr>
<tr>
<td>8DJH</td>
<td>24.0</td>
<td>20.0</td>
<td>630</td>
<td>630</td>
</tr>
</tbody>
</table>
## Offshore projects

<table>
<thead>
<tr>
<th>Position</th>
<th>Switchgear type</th>
<th>Electrical data</th>
<th>Scope of supply</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Walney, United Kingdom</strong></td>
<td>NXPLUS C Wind, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar</td>
<td>36 kV, 20 kA, 630 A</td>
<td>51 panels</td>
</tr>
<tr>
<td><strong>Greater Gabbard, United Kingdom</strong></td>
<td>NXPLUS, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar</td>
<td>40.5 kV, 31.5 kA, 2,000 A</td>
<td>31 panels</td>
</tr>
</tbody>
</table>

### Scheme 1
- Switchgear type: 8DA10, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- Electrical data: 24 kV, 40 kA, 2,500 A
- Scope of supply: 6 panels

<table>
<thead>
<tr>
<th>Position</th>
<th>Switchgear type</th>
<th>Electrical data</th>
<th>Scope of supply</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Middelgrunden, Denmark</strong></td>
<td>NXPLUS, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar</td>
<td>36 kV, 31.5 kA, 1,600 A</td>
<td>59 panels</td>
</tr>
</tbody>
</table>

### Scheme 1
- Switchgear type: NXPLUS, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- Electrical data: 36 kV, 20 kA, 630 A
- Scope of supply: 51 panels

### Scheme 2
- Switchgear type: 8DA10, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- Electrical data: 24 kV, 40 kA, 2,500 A
- Scope of supply: 6 panels

### Scheme 3
- Switchgear type: NXPLUS, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- Electrical data: 36 kV, 31.5 kA, 1,600 A
- Scope of supply: 59 panels
## Onshore projects

<table>
<thead>
<tr>
<th>Location</th>
<th>Position</th>
<th>Switchgear type</th>
<th>Electrical data</th>
<th>Scope of supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamèque, United States of America</td>
<td>Wind turbines</td>
<td>Simosec, fixed-mounted circuit-breaker switchgear, single busbar</td>
<td>15 kV, 16 kA, 630 A</td>
<td>60 panels</td>
</tr>
<tr>
<td>Bisdorf, Germany</td>
<td>Collector substation</td>
<td>NXPLUS, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar</td>
<td>36 kV, 31.5 kA, 1,250 A</td>
<td>12 panels</td>
</tr>
<tr>
<td>Germinon, France</td>
<td>Wind turbines</td>
<td>8DJH, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar</td>
<td>24 kV, 20 kA, 630 A</td>
<td>32 panels</td>
</tr>
</tbody>
</table>
Worldwide references

Onshore projects

1. Oaxaca, MX, 2010
   22 panels

2. Te Uku, NZ, 2010
   6 panels

3. Lamèque, US, 2010
   60 panels

4. Cernavoda, RO, 2010
   28 panels

5. Puuskä, FI, 2010
   22 panels

6. Alto Contada, PT, 2010
   18 panels

7. Töftedal, SE, 2010
   60 panels

8. Mont Crosin, SZ, 2010
   24 panels

9. Germinon, FR, 2010
   32 panels

10. Fossa del Lupo, IT, 2010
    35 panels

11. La Fatarella, ES, 2010
    21 panels

12. Velika Popina, HR, 2010
    13 panels

    14 panels

    6 panels

15. Amherst, CA, 2008
    27 panels

    18 panels

    16 panels

18. Zhangbei, CN, 2006
    99 panels

19. Fröhden, DE, 2006
    13 panels

20. Parc Eolien, MA, 2006
    209 panels

    7 panels

22. Turbowinds, CR, 2002
    5 panels

23. Darlowo, PL, 2001
    12 panels

    3 panels

Offshore projects

1. Baltic 1, DE, 2010
   21 panels

2. Belwind, BE, 2010
   14 panels

3. Walney, GB, 2010
   51 panels

4. Lincs, GB, 2010,
   26 panels

5. London Array, GB, 2010
   20 panels

6. Greater Gabbard, GB, 2009
   37 panels

7. Thanet, GB, 2009
   30 panels

8. Offshore 1, DE, 2009
   120 panels

9. Lynn and Inner Dowsing, GB, 2007
   10 panels

10. Lillegrunden, SE, 2006
    47 panels

11. Arklow Bank, IE, 2003
    10 panels

12. Middelgrunden, DK, 2000
    59 panels

13. Zhangbei, CN, 2006
    99 panels

    13 panels

15. Parc Eolien, MA, 2006
    209 panels

    14 panels

17. Westereems, NL, 2008
    6 panels

18. Amherst, CA, 2008
    27 panels

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    7 panels

22. Turbowinds, CR, 2002
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23. Darlowo, PL, 2001
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    3 panels
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