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

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Answers for energy.
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**

- Double-T connection
- Ring connection
- Single-T connection

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>
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<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>
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<tr>
<td>SIMOSEC</td>
<td>24.0</td>
<td>20.0</td>
<td>1,250</td>
<td>1,250</td>
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<tr>
<td>8DJH</td>
<td>24.0</td>
<td>20.0</td>
<td>630</td>
<td>630</td>
</tr>
</tbody>
</table>
### Offshore projects

#### Middelgrunden, Denmark
- **Position:** Wind turbines
- **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

#### Greater Gabbard, United Kingdom
- **Position:** Collector substation and reactive power compensation
- **Switchgear type:** NXPLUS, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- **Electrical data:** 40.5 kV, 31.5 kA, 2,000 A
- **Scope of supply:** 31 panels

#### Walney, United Kingdom
- **Position:** Wind turbines
- **Switchgear type:** NXPLUS C Wind, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- **Electrical data:** 36 kV, 20 kA, 630 A
- **Scope of supply:** 51 panels

<table>
<thead>
<tr>
<th>Scheme 1</th>
<th>Scheme 2</th>
<th>Scheme 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>
Onshore projects

**Lamèque, United States of America**
- Position: Wind turbines
- Switchgear type: Simosec, fixed-mounted circuit-breaker switchgear, single busbar
- Electrical data: 15 kV, 16 kA, 630 A
- Scope of supply: 60 panels

**Bisdorf, Germany**
- Position: Collector substation
- Switchgear type: NXPLUS, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- Electrical data: 36 kV, 31.5 kA, 1,250 A
- Scope of supply: 12 panels

**Germinon, France**
- Position: Wind turbines
- Switchgear type: 8DJH, fixed-mounted circuit-breaker switchgear, gas-insulated, single busbar
- Electrical data: 24 kV, 20 kA, 630 A
- Scope of supply: 32 panels
Worldwide references

**Offshore projects**

- **A** Baltic 1, DE, 2010
  - 21 panels
- **B** Belwind, BE, 2010
  - 14 panels
- **C** Walney, GB, 2010
  - 51 panels
- **D** Lincs, GB, 2010
  - 26 panels
- **E** London Array, GB, 2010
  - 20 panels
- **F** Greater Gabbard, GB, 2009
  - 37 panels
- **G** Thanet, GB, 2009
  - 30 panels
- **H** Offshore 1, DE, 2009
  - 120 panels
- **I** Lynn and Inner Dowsing, GB, 2007
  - 10 panels
- **J** Lillegrunden, SE, 2006
  - 10 panels
- **K** Arklow Bank, IE, 2003
  - 47 panels
- **L** Middelgrunden, DK, 2000
  - 59 panels

**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** Puuska, FI, 2010
  - 22 panels
- **6** Alto Contada, PT, 2010
  - 18 panels
- **7** Tøftedal, 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
- **13** Brown Hill, AU, 2009
  - 14 panels
- **14** Westereems, NL, 2008
  - 6 panels
- **15** Amherst, CA, 2008
  - 27 panels
- **16** Hallet, AU, 2007
  - 18 panels
- **17** St. Karścino, PL, 2007
  - 16 panels
- **18** Zhangbei, CN, 2006
  - 99 panels
- **19** Fröhden, DE, 2006
  - 13 panels
- **20** Parc Eolien, MA, 2006
  - 209 panels
- **21** Red Tile, GB, 2006
  - 7 panels
- **22** Turbowinds, CR, 2002
  - 5 panels
- **23** Darlowo, PL, 2001
  - 12 panels
- **24** Carno, UK, 1996
  - 3 panels