

Energy Sector Power Transmission Division

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Green power from the North Sea: Siemens to install grid link for DanTysk offshore wind

Following the grid connections for the offshore wind farm clusters BorWin2 and HelWin1, Siemens Energy will also install a turnkey grid connection in the North Sea for the SylWin cluster. Purchaser is the Dutch-German transmission grid operator TenneT. In a consortium with the Italian cable manufacturer Prysmian Powerlink, Siemens will connect DanTysk, located west of the island of Sylt as the first wind farm to be connected via the SylWin collective connection. Equipped with 80 Siemens wind turbines, DanTysk will have a total capacity of 288 megawatts (MW) and supply up to 500,000 German households with clean electricity. The wind farm will be connected to the mainland grid via a high-voltage direct-current (HVDC) transmission link using subsea and underground cable. Including its internal efforts, TenneT estimated the total investment volume at nearly one billion euros. More than a quarter of this sum has been awarded to Prysmian for supply of the cables. The Siemens share is significantly higher. The grid connection is scheduled to be ready for operation by early 2014.

“With this order we’re once again underscoring our market leadership in grid connections for offshore wind farms. For SylWin, too, we’re contributing our know-how and many years of experience – particularly in the field of high-voltage direct-current transmission,” said Udo Niehage, CEO of the Power Transmission Division of Siemens Energy. Siemens is erecting the DanTysk wind farm as part of the SylWin cluster approximately 70 kilometers west of the North Sea island of Sylt in the vicinity of the maritime boundary with Denmark. Through the connection of more windfarms it will be possible to transmit a total of 864 MW via the cable link to the grid, which would be enough to supply up to 1.5 million German households with wind-generated power. This offshore link will have the highest transmission capacity, for which an order has been placed to date. The Siemens HVDC system HVDC Plus will be deployed. With a length of 160 kilometers the subsea cable will be the longest ever used to connect offshore wind farms. A further 45 kilometers of underground cable will be deployed.

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The HVDC system, transformers and gas-insulated high-voltage switchgear will be installed on an offshore substation platform for energy-efficient transmission of the electrical energy generated by the wind farm to the mainland. The alternating current produced by the wind turbines will be converted to direct current on the platform, which will be later be located directly adjacent to the wind farm in the North Sea. The direct current will be brought to a transmission voltage of 320 kilovolts (kV). The power will then be transmitted to Büttel, which is located in the estuary of the river Elbe. This is the grid feed-in point on the coast, where the electricity will be converted back from direct to alternating current in a converter substation.

HVDC significantly reduces transmission losses. For high-voltage cable links covering distances of more than 80 kilometers HVDC is necessary for power transmission because a large amount of the electrical energy in the form of reactive power would be lost in a three-phase line of that length. Siemens has developed its new HVDC system HVDC Plus for applications like this. This technology features a new generation of converters based on voltage-sourced converter technology in modular multilevel converter (VSC MMC) design. Siemens is technology leader in this field. The modular, multilevel VSC technology reduces system complexity and thus space requirements – key requirements for deployment on offshore platforms. HVDC Plus ensures an almost ideal sinusoidal AC waveshape and smoothed direct voltage along the transmission line. That makes the installation of high-frequency and harmonic filters practically superfluous.

This is the second major order for HVDC Plus technology secured by Siemens within a short space of time. At the beginning of the year, Siemens received an order from a consortium comprising the French and Spanish grid operators Réseau de Transport d'Électricité (RTE) and Red Eléctrica de España (REE) for an underground cable link designed to transmit 2000 MW.

Energy-efficient solutions for connecting offshore wind farms to the grid are part of Siemens' Environmental Portfolio. In fiscal 2010, revenue from the Portfolio totaled about EUR28 billion, making Siemens the world's largest supplier of ecofriendly technologies. In the same period, our products and solutions enabled customers to reduce their carbon dioxide (CO₂) emissions by 270 million tons, an amount equal to the total annual CO₂ emissions of the megacities Hong Kong, London, New York, Tokyo, Delhi and Singapore.

The **Siemens Energy Sector** is the world's leading supplier of a complete spectrum of products, services and solutions for the generation, transmission and distribution of power and for the extraction, conversion and transport of oil and gas. In fiscal 2010 (ended September 30), the Energy Sector had revenues of approximately EUR25.5 billion and received

new orders totaling more than EUR30.1 billion and posted a profit of more than EUR3.6 billion. On September 30, 2010, the Energy Sector had a work force of more than 88,000. Further information is available at: www.siemens.com/energy.