

Energy Sector Power Transmission Division

Erlangen, Germany, January 12, 2011

Ready for the future: Siemens erects power converter stations for HVDC link between France and Spain as part of the Trans-European Network

Siemens Energy is currently erecting the power converter stations for a high-voltage direct-current (HVDC) transmission link between Baixas, to the west of Perpignan in France, and Santa Llogaia, south-west of Figueras in Spain, as important components of the Trans-European Network for electrical power. The installation can transmit a rated power of 2000 megawatts (MW) – enough to transport large amounts of electric power with a minimum of transmission losses. The stations use the new HVDC technology HVDC Plus with a transmission voltage of ± 320 kilovolts (kV). The distance between the two converter stations is around 65 kilometers. The power will be transmitted through cables placed underground, in trenches and in a tunnel under the Pyrenees Mountains for some eight kilometers. The purchaser is Inelfe (Interconnecteur Electrique France-Espagne), a project joint venture between the grid operators Réseau de Transport d'Electricité (RTE), Paris, and Red Eléctrica de España (REE), Madrid. The order booked by Siemens accounts for just under half of the total project value of around EUR700 million. The project is partly funded by the EU and is scheduled for commissioning in late 2013.

The new HVDC link between France and Spain will not only raise the hitherto low power transmission capacity between the two countries. At two times 1000 MW, it is also designed to handle, with low losses, the largest volumes of electrical power that are expected for the future. This makes the HVDC project an important stage in the expansion of the Trans-European network. The HVDC Plus technology used here is a new generation of power converters based on self-commutated multilevel voltage-sourced-converter technology in modular multilevel-converter configuration (VSC MMC). "We are clearly at the cutting edge of technology in this field. The Inelfe project marks the first time we are using our HVDC Plus technology at the 1000 MW level anywhere in the world," says Udo Niehage, CEO of the Power Transmission Division within Siemens' Energy Sector.

The centerpiece of the HVDC Plus power converter stations is a converter based on IGBT (insulated gate bipolar transistors) which transforms the alternating current into direct-current and back again. By contrast with grid-commutated power converter technology, the HVDC Plus system works with turn-off power semiconductors, so that the commutation processes in the power converter are completely independent of the grid voltage. Very fast control and protective intervention in the power converter makes for a highly dynamic system, which is essential especially for coping with grid faults and disturbance in the three-phase a.c. network.

In taking on the France-to-Spain HVDC project, Siemens has accepted the challenge of boosting the capacity of this modern converter technology into a hitherto not achieved order of magnitude – to match the d.c. voltage of the underground cables used. At 320 kV, this is at the boundary of what is technically feasible for extruded cables today. It also calls for incorporation of special technical features that can be provided in the required form only by this modern converter technology. This applies, for instance, to the exchange of reactive power, independent of power transmission, between each converter and the three-phase a.c. network at the two converter stations. Last but not least, the black-start capability function enables the HVDC system to restart a collapsed network.

The new HVDC technology has already proven its merit in practice: Just recently the world's first HVDC system in VSC-MMC technology commenced commercial operation: the HVDC Plus installation with its project name Transbay, likewise erected by Siemens Energy, transmits 400 MW of electrical output at a transmission voltage of ± 200 kV with low losses and high energy efficiency via an 88 kilometer marine cable link from Pittsburg, California, to San Francisco. Here the HVDC Plus technology is helping to enhance the safety and reliability of San Francisco's power supply.

Energy-efficient high-voltage direct-current transmission technology (HVDC) is 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.



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Caption:

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