# A world record in direct current transmission

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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. 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)

Siemens is building power converter stations for a high-voltage direct current (HVDC) transmission system with a record capacity of 2 x 1,000 megawatts. Beginning in 2013 the new HVDC PLUS technology will transmit 2,000 megawatts (MW) as direct current over a distance of 65

kilometers underground. This system, which is being partially funded by the EU, connects the French and Spanish grids between Baixas and Santa Llogaia. At present the two countries' grids are linked only by low-capacity lines.

Power grids will have to be substantially upgraded throughout Europe before more renewable energy can be used. The Desertec power generation project, in particular, will require high-performance electricity highways. Alternating current is commonly used for overhead lines, but it isn't suitable for transmitting high capacities over long distances underwater or underground. In non-overhead systems, losses would be very high due to the charging and discharging of the cable capacities. In an HVDC system, on the other hand, transmission losses are 30 to 40 percent lower than in a comparable three-phase alternating current transmission line.

By 2013, developers at Siemens Energy will have constructed a system that can transmit 1,000 MW through each of two cables. The power will be transmitted at the highest voltage possible for today's cables: +/-320 kilovolts. The new HVDC PLUS power converter stations use VSC-MMC technology, which is not only more flexible and robust than today's systems, but also less prone to faults. At the heart of the new system is a converter that uses insulated gate bipolar transistors (IGBTs), which are semiconductor devices that convert alternating current into direct current and vice-versa. The system is very flexible since IGBTs can be switched at any time, no matter how high the voltage. A reactive power exchange is possible between each power converter and the three-phase alternating current network, which helps to stabilize overloaded grids. In addition, MMC technology causes few high-frequency faults, which diminish voltage quality. So there is no need for high frequency filters. The system also has a black start capability, which means the grid doesn't require external assistance to gradually restart after a blackout. Another advantage of the system is that the energy converters don't have

to change their polarity if the direction of the transmission is reversed, thus reducing wear and tear.

A 1,000-MW HVDC cable was recently put into operation along a 260-kilometer underwater line between the Netherlands and the UK. HVDC systems are part of Siemens' environmental portfolio, with which the company generated about €28 billion in sales in 2010.

Source: Siemens