SIEMENS

Newsletter

Power Transmission

Issue 12/07

HVDC/FACTS - Highlights

Inelfe, the France – Spain HVDC PLUS Interconnection is being realized as part of the European HVDC power freeways

Power freeways for renewable energies

Everybody is talking about generating renewable energy by offshore wind farms in the North of Europe, or by solar parks in the South, but in the end it is used by our customers in cities and villages spread over many countries with different standards. An efficient, flexible and controllable grid that can cross border is necessary to guarantee a reliable power supply.

The European HVDC transmission grid (figure 1), as the future power freeway, is growing step by step. Siemens is currently building the world's highest capacity power converter stations, using the latest technology - HVDC PLUS – in the interconnection between France and Spain (figure 2).

This project, as another important piece in Europe's future grid, is supported by the European Union in the framework of the EEPR program (European Energy Program for Recovery).

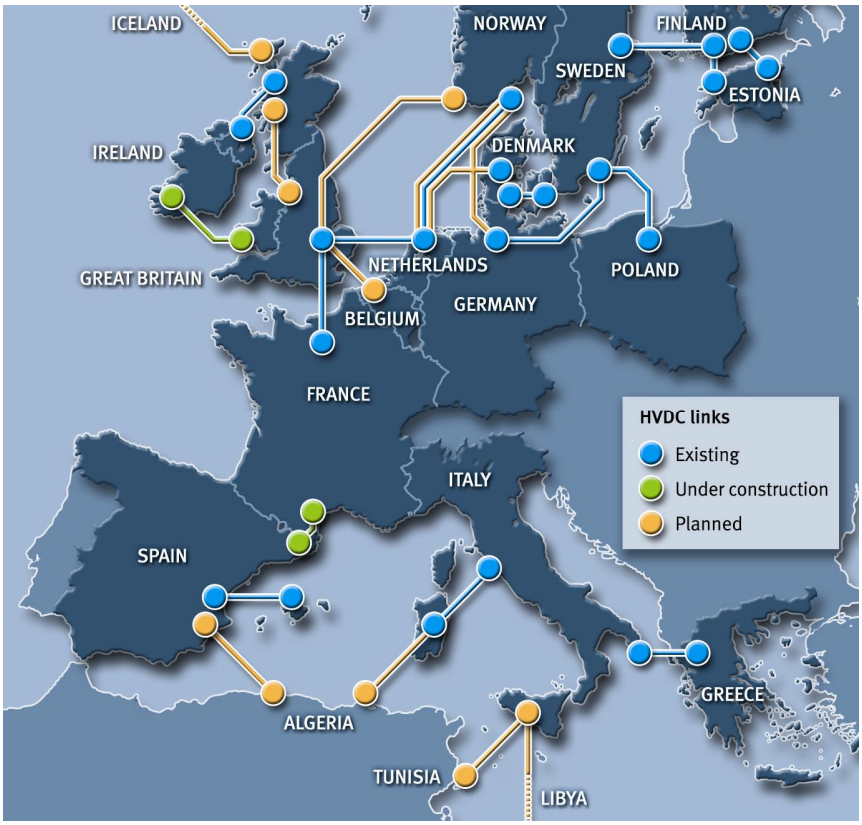

Fig. 1: European - HVDC Grid

The right solution for each customer, in every country

It was necessary to design links for energy trading across borders, and is also extremely important

for expanding and stabilizing the trans-European power grid. HVDC technology allows fast and accurate power flow control on power level and direction, coping with grid faults and disturbances in the three-phase AC network. It also incorporates special technical features like the exchange of reactive power, independent of power transmission, to keep the voltage and frequency stable and the black-start capability function which enables the HVDC system to restart a collapsed network.

Latest innovative technology

These challenges are addressed by the latest innovation of Siemens, the HVDC PLUS technology – a new generation of power converters based on self-commutated multilevel voltage-sourced converter technology in modular multilevel converter configuration (VSC MMC) [Reference: Trans Bay Project, USA].

In December 2010, Inelfe, a public company created in 2008 for the development of the interconnection and owned equally by RTE, the power transport network operator in France, and its counterpart in Spain, Red Electrica de España (REE), awarded the contract to build the converter stations using the latest HVDC PLUS technology, to Siemens.

Fig. 2: Location of the Inelfe HVDC

Until now, the power transmission capacity over the existing AC lines between France and Spain was limited, leading to a bottleneck which has been a long standing problem. The Inelfe HVDC link between Baixas, France and Santa Llogaia, Spain will increase the power exchange capacities between both countries from 1400 to 2800 megawatts (MW).

The Siemens HVDC PLUS solution, with two parallel links and four (4) cables with a DC voltage of 320 kV, will couple the two converter stations and will be connected via a 400 kV AC interface to RTE's transmission grid, as well as a 400 kV AC interface to REE's transmission grid.

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Once operational, an additional 2000 MW will be able to be transmitted at 1000 MW per link. The Inelfe project marks the first time use of VSC technology at the 1000 MW level anywhere in the world, and is clearly at the cutting edge of technology in this field.

Engineering expertise and professional project management

Implementing an innovative technology at its technical limits, and in time, requires an experienced and well qualified team of experts.

In the Fall of 2011, the civil works had just begun when an unexpected flood overwhelmed the Santa Llogaia site. In order to continue work, the water needed to be pumped out. As an added percausion, earth-made walls were built to help avoid future floods. This additional work could have caused a delay in the project timeline, but the professional Siemens project management met their milestones.

Two power transport network operators, in countries with their own standards, require different designs for their converter station. This needed to be addressed by the engineers during the design phase in order to specify the correct equipment that needed to be ordered. As a result, the first transformers (figure 3) were successfully tested in the presence of experts from RTE and REE in the Siemens transformer factory in Nurnberg, Germany in April 2012.

Figure 3: Transformer test by RTE and REE in the Siemens transformer factory in Nurnberg, Germany

Prepared for the future

The overall system test of the two turnkey converter stations including civil works with telecommunication interfaces to RTE, as well as to REE, will be completed by end of 2013. Once in operation, the HVDC PLUS system (figure 4 and 5) will strengthen the security of the power

supply at the regional and national levels. It will allow both countries to make the most efficient possible use of their complementary power-generation facilities and to further integrate renewable generation into their networks.

Figure 4: Site view of the HVDC PLUS converter station in Santa Llogaia, Spain

Figure 5: Site view of the HVDC PLUS converter station in Baixas, France