

1 – HV, EHV and UHV Insulated power cables AC links

2 – HV, EHV and UHV insulated power cables DC links

2.1 – Geographical situation of the link:

Country : _____GERMANY_____

Area : _____NORTH SEA_____

2.2 – Characteristics of the link:

Network : _____OFFSHORE WINDFARMS_____

Link name : _____BORWIN 2_____

Nominal power (MW): _____800_____

Nominal voltage (kV): _____300_____

Link length (km) : _____125 km SUBMARINE + 75 km LAND_____

Number of circuits : _____ONE BIPOLE_____

2.3 – Characteristics of the cables and accessories:

Cable type : _____EXTRUDED INSULATION_____

Manufacturer(s) _____PRYSMIAN_____

Installation : underground (in tunnels, in ducts, in concrete, directly buried...),
submarine (embedding depth, cable protections...)

_____The submarine cable bipole is laid in bundle on the sea bottom in
trench at a depth of 1.5-3 m, the land cable bipole is laid buried in trench
at a depth of 1.5 m _____

Forced cooling:

Yes : , type : _____

No :

Insulating material : _____Extruded Polymer_____

Polymer, paper, ...

Characteristics of the accessories: _____ Outdoor terminations _____
Testing of the link (before commissioning, and during operation) : _____
_After laying the HVDC cable system is subjected to the DC voltage test according to the CIGRE TB 496.
No test during operation is planned

2.4 – What are the reasons for choosing this technology?

_The HVDC transmission technology has been chosen in reasons of the length of the connection and the power to be transmitted. In addition to the benefits offered by the HVDC transmission, the technology was also chosen to minimize the impact on the ambient. _____

2.5 – What are the difficulties of integration of the conversion station in the network and the solutions (problem of protection of the link and of the network...)?

_One of the major aspect of the offshore HVDC project is the realization of the AC-DC conversion stations having reduced dimensions. ____

2.6 – Operating results of the link:

DC link and Converters:

_The link is in service _____

2.7 – Publications or available documents concerning this link:

None

3 – General issues concerning terrestrial or submarine insulated power cables AC or DC links

3.1 – What is the logistics of major projects and planning issues in particular in the case of tunnel (e.g., the problem of routing of large drums ...)?

_One major issue of the long terrestrial cable AC or DC connections is the transportation of very large and heavy drums that requires particular innovative logistics solutions _____

3.2 – What are the results of studies on the failure rate of these links taking into account the number of joints (elementary sections related to the capacity of drums). What is the estimated reliability of these links? What repairing solutions to reduce the duration of unavailability in case of failure?

_The scope of long individual lengths is to reduce the number of joints, the consequence of the reduction of joints is not only a higher system reliability but also the reduction of the global costs and time of construction. CIGRE TB 379 published in 2009 reports on the service experience of land and submarine cable systems both AC and DC. _____

3.3 – How did react suppliers in terms of availability and responsiveness to the different phases: design, supply, repair (Question for power utilities)?

_Utilities _____

3.4 – Are there any diagnostic methods for assessing the health status of a submarine link of 100 km?

__This is an argument for future discussions, for the time being no particular recognised system is known. _____

3.5 – What are the acceptance tests for significant long length links?

_As for the IEC standards and the CIGRE recommendations AC variable frequency 10-500 Hz is considered a valid method for the testing of long AC connection, when the connection is extremely long and the variable frequency test becomes impossible then the only possibility is the soak test. DC voltage test is still valid for DC cables.

3.6 – What are the technical solutions to realize links with three ends?

_Even three ends DC connections have been already realized (Sardinia-Corsica-Italy), in order to have really functional systems this possibility will depend on the availability of DC switchgears. _____

3.7 – What is estimated cost of the investment and operation of these links (the distribution of these costs to the supply, installation work and assembly / test)?

_This is a not technical question but some answers could be find on the public press releases of some relevant projects _____

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