

## High Capacity HVDC Subsea Link for the UK

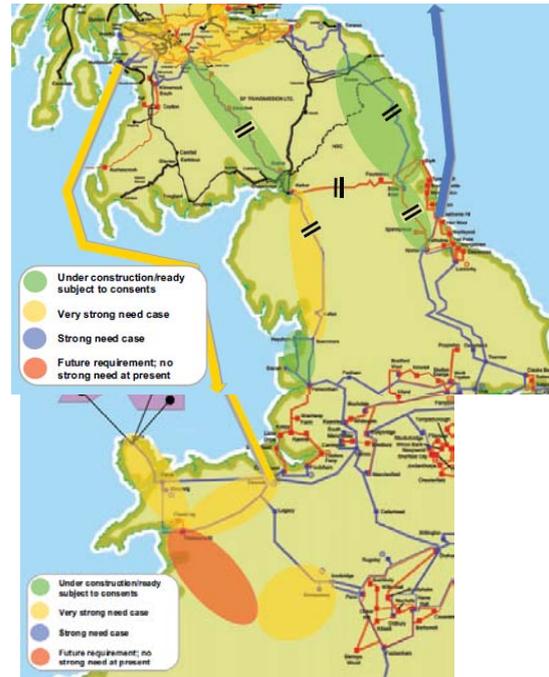
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In response to the European Union target for 15% of the UK's energy to be produced from renewable sources by 2020 an analysis of future requirements for the UK power grid has been carried out. The Energy Networks Strategy Group (a working group comprising industry experts as well as government and regulatory bodies) has produced recommendations aimed at upgrading and modernizing the UK transmission network in line with the predicted generation and load growth scenarios through to 2020.

One of the key recommendations of the working group is a requirement for a new high capacity subsea HVDC link connecting Western Scotland with North Wales to help manage the increasing North – South power flows anticipated from expansion of renewable generation sources in Scotland.



The HVDC link will form part of the main interconnected transmission network rather than a bi-lateral trading interconnector. As such, it is important to optimise the system to fully exploit the cable's short term and dynamic ratings. Distributed temperature sensing will be employed to provide a dynamic rating capability in order to maximise the cable's value for wider transmission system planning and operation.

The basic requirements for the Western Link are:

- Capacity – approximately 2 GW
- Subsea Length – approximately 360km
- Land length – approximately 40km
- Commissioning date - 2015

The HVDC link will be a bi-pole configuration and at this time 2 - cable options and 4 - cable options are being evaluated against what is a challenging 2015 in service date. It is acknowledged that a 2cable solution is significant technical challenge and would require a cable design beyond the limits of currently installed technology and significantly beyond the capabilities of modern HVDC polymeric insulations. If a 2cable solution were adopted, it would make this the highest rated mass impregnated HVDC cable project in the world. Operating voltages in excess of 500kV, conductor cross sections greater than 2000mm<sup>2</sup>copper and new insulation technologies are being considered to develop the most technically and economically viable means of achieving power transfers of this level.

There are no international standards for HVDC cables and guidance on test requirements is taken from CIGRE publications. Similarly, CIGRE publications are the only test reference for power cables intended for subsea applications.

In addition to the technology challenges, the route itself is also demanding. The subsea section requires consideration of many factors including:

- Maximum depth ,< 200m
- Multiple crossings including oil, gas, electricity, munitions dumps etc.
- Busy sea traffic, surface and subsea.
- Intertidal distance is almost 5km at the southern end.
- Compass deflection must be restricted to less than 5 degrees.
- Wide range of near sea bottom temperature

The land routes in themselves also represent a significant cable project. The southern land route runs for 35km through urban and rural areas and includes a major river crossing. As a consequence, the design will require approximately 70 joint bays along the route and a long horizontal directional drilled (HDD) section.

Following detailed technical assessment of the cable options, a technical specification for the cable system will be completed in 2010. A competitive tender resulting in letting of a construction contract will be completed during 2011 to achieve commercial operation of the link in 2015.