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Ofgem
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Dear Geoff,

Re: Project TransmiT: Impact Assessment of industry's proposals (CMP213) to change the electricity transmission charging methodology

This response is submitted on behalf of Scottish Hydro Electric Transmission plc (SHE Transmission).

We noted Ofgem's request for further evidence in relation to the wider strategic benefits of HVDC convertor stations (on page 43 of the consultation paper) and believe it is appropriate for us to respond solely in relation to this request for evidence.

In light of our current work developing a number of Strategic Wider Works projects that are likely to utilise HVDC technology, we have given significant consideration to the wider system and strategic benefits that this technology may bring to the GB system.

It is our current view that there are a number system functions and services that can potentially be fulfilled by High Voltage Direct Current (HVDC) technology. When equivalent functions/services are provided from AC equipment then these assets are categorised for wider transmission system requirements and this feeds into the calculation of transmission charges.

Accordingly, we believe that there may be grounds for socialising some of the costs associated with HVDC convertor stations to the extent that such wider benefits are being provided. For example, HVDC VSC converter stations can be used to provide voltage support which would otherwise be provided by an Alternating Current Static Var Convertor (AC SVC) installation. In the event that an SVC installation is used, its costs for TNUoS purposes would be socialised and this would suggest that a similar approach should be adopted for HVDC technologies. As such, further work by the industry is likely to be required to quantify the proportion of such costs that are appropriate to socialise.

The following are examples of the range of wider benefits that may be attributed to these solutions:

- Black start capability – currently only provided by generating stations, although does require the system at one end of the link to be energised;
- Dampen power system oscillations;
- Fault current limitation – in the event of an AC fault, HVDC convertors could be used to limit fault current;
- Frequency stabilisation and voltage support, including provision of leading or lagging reactive power – the nature of the support is dependent on the type of convertor used but frequency stabilisation, voltage control and/or voltage regulation can be provided by HVDC convertor stations in dynamic timescales; and
- Prevention of cascading failures in an AC grid – i.e. by allowing sections of the system to be decoupled to preserve supplies that may otherwise be affected.

We appreciate Ofgem is looking for evidence to understand the extent of wider system benefits and would therefore recommend that, in addition to the research commissioned by Ofgem earlier this year on the Worldwide Experience of VSC HVDC Installations[1], the information on these wider system benefits in the following publications be considered:

ABB, 'HVDC technologies for the future onshore and offshore grid', 2012[2];

Alstom, 'Applications for High-Voltage Direct Current Transmission Technologies', 2013[3];

Barnes & Beddard (University of Manchester), 'Voltage Source HVDC - Overview', unknown[4];

ENTSOE, 'Offshore Transmission Technology', 2011[5];

Jardini & Nolasco, 'Impacts of HVDC Lines on the Economics of HVDC Projects', 2008[6];

Mohamed et al, 'Performance Analysis of a VSC based HVDC Transmission System under Faulted Conditions', 2009[7];

Siemens, 'HVDC Station Layout, Equipment LCC & VSC and Integration of Renewables using HVDC', 2012[8];

SKM, 'Calculating Target Availability Figures for HVDC Interconnectors', 2012[9]

Yang & Xu, 'Transmission Network Support using VSC-based HVDC systems', 2009[10];

[1] https://www.ofgem.gov.uk/electricity/transmission-networks/integrated-transmission-planning-and-regulation

[2] http://www05.abb.com/global/scot/scot221.nsf/veritydisplay/0734892d7ef80ddfc1257ab600463388/$file/Grid%20of%20the%20future_HVDC.pdf

[3] http://energy.gov/sites/prod/files/2013/05/f0/HVDC2013-Kirby_0.pdf

[4] http://www.sintef.no/project/Deepwind%202012/Deepwind%20presentations%202012/B1/Barnes_M.pdf

[5] https://www.entsoe.eu/publications/system-development-reports/north-seas-grid-development/

[6] http://sites.ieeechile.cl/sb-usach/Brochure%20JWG%20B4%20B2%20C1%2017%20Impacts%20of%20HVDC%20lines%20on%20the%20economics%20of%20HVDC%20projects.pdf

[7] http://ljs.academicdirect.org/A15/033_046.pdf

[8] http://www.ptd.siemens.de/Cigre_AUS_2011_HVDC_&_GridAccess_tutorial_Re.pdf

[9] https://www.ofgem.gov.uk/ofgem-publications/59247/skm-report-calculating-target-availability-figures-hvdc-interconnectors.pdf

[10] http://www.icee-con.org/papers/2009/pdf/2.08_I9FP0305_E.Pdf

Based on our understanding of these benefits, we believe that there is evidence available to support the socialisation of some of the costs associated with HVDC convertor stations, particularly when such convertor stations are incorporated into the Main Integrated Transmission System. However, further analysis is likely to be required to more fully assess the extent of these benefits and therefore the degree of socialisation that is appropriate in relation to the benefits that can be achieved.

If you have any further questions in relation to this response, then please feel free to contact us.

Yours sincerely,

Jen Carter
Networks Regulation