

PS1-7 – Multi-Terminal & Hybrid (LCC+VSC) HVDC Systems

Question 1.11: Paper 10520 proposed a DC-side connection, via HVDC circuit breakers, of adjacent point-to-point HVDC links to de-risk VSC MTDC systems. *Are there other projects around the world to help de-risk MTDC systems?*

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There are several projects globally aiming at de-risking MTDC technology.

In Europe, a number of projects, funded by the European Union, focusing on various aspects relating to interoperability within MTDC systems have been carried out, or are planned for the coming years. For instance, the BestPATHS project looked into interoperability issues in a multiterminal HVDC system with three nodes and converters from two different vendors. More recently, the PROMOTioN project investigated protection systems for HVDC grids. In addition, full-scale testing of DCCBs for HVDC was performed and suitable testing methods elaborated. A currently running project, the READY4DC will coordinate efforts aiming at achieving multivendor interoperability in HVDC systems. It will be followed by a much larger project where TSOs and vendors will collaborate to find methods to achieve interoperability. It will run during 2023-2026, and, furthermore, prepare for a full scale MTDC pilot installation.

In terms of actual installations, several projects included in the German grid development plan for the coming ten years will include multiterminal connections with DC switching stations. This concerns the *Heide West* and *Rastede* projects in northern Germany for instance. These projects are due to be commissioned within ten years. However, it is uncertain to what extent that fully selective protection with DCCBs will be implemented.

In China, several MTDC projects with selective protection systems have been executed. Most notable is the Zhangbei project, which was commissioned in 2020 and has four converters rated at 1.5 GW and 3 GW respectively. While impressive, these multiterminal projects, are not multivendor projects in the real sense of the word since some critical functions, such as the control systems for all of the converters are provided by one single vendor. Such a setup might not be feasible in other jurisdictions due to anti-trust legislation.

In general, the components required to implement MTDC with selective protection (mainly DCCBs) are available and have reached sufficient maturity by now. The remaining issue impeding the deployment of MTDC systems are the uncertainties concerning interoperability among equipment from different manufacturers. The mentioned coming EU projects aim to address this issue.