PROMOTioN
PROGRESS ON MESHED HVDC OFFSHORE TRANSMISSION NETWORKS

PRESS RELEASE

EU project PROMOTioN successfully demonstrates AC short-circuit generator based test environment for HVDC circuit breakers

Arnhem/Berlin, 19 October 2017. On 28 September 2017, an AC short-circuit generator based high power test environment for HVDC circuit breakers was successfully demonstrated. It is the first time that such a test has been conducted in an independent accredited laboratory. Tests at DNV GL's KEMA Laboratories showed that AC short-circuit generators operated at a reduced frequency below 50 Hz, can be used to safely and directly apply the current and energy stresses that can occur in HVDC circuit breaker units during the interruption of DC fault current. This successful demonstration is a major step in the development of test methods and circuits for HVDC circuit breakers, enabling independent verification of their performance and thereby increasing their technology readiness level.

Transmission of large amounts of wind power
HVDC circuit breakers are considered key components in the realisation of future meshed HVDC transmission networks which are required to reliably transmit large amounts of wind power generated in the European Northern Seas and enable EU member states to trade energy. Currently, several DC circuit breaker types have been developed by manufacturers, but standards describing test methodologies and clear test requirements to verify the required functionality and ratings of HVDC circuit breakers have not been established yet. Work package 5 of the PROMOTioN project aims to develop such a test environment to demonstrate the performance of three types of HVDC circuit breakers.

Milestone
Due to a very high speed of operation and a requirement for energy dissipation, HVDC circuit breaker testing is significantly different from testing of conventional AC circuit breakers, and new test methods must be developed. An HVDC circuit breaker test circuit should be able to apply a sequence of a rising test current within the given breaker operation period, followed by the supply of test energy, and lastly the application of a DC test voltage. The test circuit should be able to vary the test current over a range from nominal load current up to the rated interrupting current in positive and negative direction. Importantly, the test circuit must have provisions to safeguard both the test object as well as the test laboratory from damage in case of failure.
During the demonstration, bidirectional test currents of 2 kA, 6 kA, 10 kA and 16 kA and test energy dissipation duties ranging from 1 MJ to 3.6 MJ were successfully delivered to and interrupted by a prototype unit of a mechanical DC circuit breaker with active current injection. The test object, supplied by Mitsubishi Electric, has the interrupting capability of 16 kA for a corresponding breaker operation time of 8 ms and a nominal voltage level of 80 kV. The unit is considered a building block for the current development of HVDC circuit breakers with EHV ratings.
The tests have been performed at generator frequencies of 16 2/3 Hz and 30 Hz. As part of the test method, a high-speed by-pass and isolation circuit to protect the test object in case of failure has also been successfully demonstrated. Furthermore, for mechanical circuit breakers with active current injection it was shown that by isolating the test object

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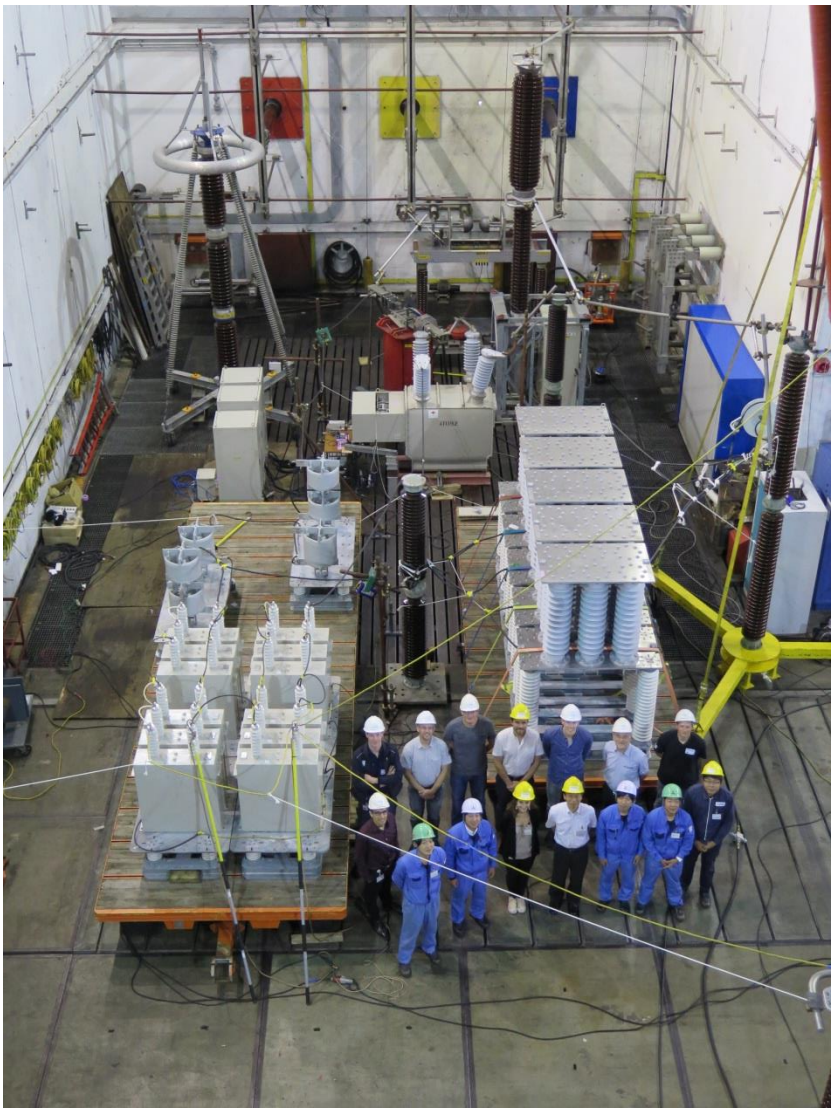
the moment the current is suppressed, a DC voltage stress can be realized, potentially obviating the need for an additional DC test voltage source.



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About PROMOTioN

The demonstration was performed as part of work package 5 of the 'Progress on Offshore Meshed HVDC Transmission Networks' (PROMOTioN) project. The PROMOTioN project aims to tackle technical, regulatory, financial and legal challenges to the implementation of offshore meshed HVDC transmission networks. The consortium consists of 35 partners ranging from all major European HVDC equipment manufacturers, TSOs and academia to test labs and consultants. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691714. For more information please visit **www.promotion-offshore.net**.

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