MTDC systems have numerous advantages over the point-to-point dc connections due to the reliable and continuous system operation and the power dispatch flexibility. With a MTDC network it is possible to have more than two interconnected ac networks, as well as to link an increased number of remote generation to the main grid. The common practice is the interconnection of each offshore wind-farm with one independent dc transmission line. Consequently, any installation requires the construction of a new dc line. This is considered as an obstacle for new installations, both for financial and environmental reasons. The concept of MTDC networks provides the opportunity to connect any new installation to the nearest existing dc line, a feature that reduces the investment and operational costs. Such a system could be combined with HTS cables, leading to applications with even lower losses and more techno-economic advantages.

CASE STUDY – VEM ANALYSIS

To study an HTS-based MTDC system, the four-terminal system of Fig. 1 is examined. For the HTS cables the distributed parameters model is used and the configuration is the one of EPRI. The same cross-section is used also for the conventional dc cable. An overview of the high voltage direct current (HVDC) power transfer technology along with the possibilities it enables, as well as an introduction to the concept of multi-terminal topology are presented. The operation principles of the superconducting technology are described and the control strategy of HTS-based MTDC networks is presented. To validate the performance and the dynamic response of the system under steady state as well as under fault and load change conditions, a typical four-terminal MTDC network in ring topology is developed in MATLAB/Simulink.

Feasible modeling of a four-terminal MTDC network utilizing HTS cables to interconnect stiff ac systems is developed and presented. Feasibility study of control techniques applied on conventional MTDC systems are also presented and discussed. Steady-state operation as well as faults are studied. Modeling approaches are not implying themselves better results, however indications on how more efficient control is to be structured are stated. It is observed that by the proposed control approach, the system, despite its low-damping characteristic, presents a well-damped behavior. The proposed structure indicates that HTS-based MTDC grids are technically feasible.