General Analysis of Vacuum Circuit Breaker Switching Overvoltages in Offshore Wind Farms

Understanding mechanisms of switching transient overvoltages in modern electrical power systems is a necessity to ensure a proper design of power plants and switchgear and the required level of reliable and secure system operation. High fidelity plant modelling and accurate transient analysis is a prerequisite for understanding the mechanisms of how overvoltages are created and whether or not the voltage withstand capabilities of system components will be exceeded. This research is focused on switching overvoltages typical for an offshore wind farm power collection grid configuration that comprises vacuum circuit breakers (VCBs), cables and transformers. An in-depth understanding of the prestrike effects in VCBs is a prerequisite for studying switching transient overvoltages. In this paper, the impact of VCB parameters (e.g., stray capacitance and withstand voltage ability) and cable length on the transformer terminal voltage during closing operation was studied. A wind farm power collection system was modelled in ATP-EMTP environment. To validate the results obtained through computer simulation, field measurements from an actual system were used.

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