

Distance Protection Impedance Measurement for Inhomogeneous Multiple-Circuit 400/150 kV Transmission Lines with Shared Towers - DTU Orbit (09/11/2017)

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Combined transmission lines where different voltage levels shares same towers are used in transmission systems in order to save way of right. Faults between different voltage levels results in complex fault current distributions due to mutual couplings and the fact that the faulted phases no longer are interconnected in a simple way but via transformers and infeed from remaining parts of the network. Distance relay measured fault loop impedance shows wide ranges of variations for both phase-phase loops as well as phase-earth loops. No simple relations exist. Simulation models can be used to study fault loop impedance for combined faults and thereby shed light on relay trips. This study uses actual fault records, analytical method and PSCAD simulation studies to analyse combined faults in an existing 400 and 150 kV transmission line owned by Danish TSO Energinet.dk. The results clearly show that an accurate modelling followed by fault loop impedance calculation is possible. Selected results show that fault loop impedance can be located in unexpected regions of the complex R-X plane.

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