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Voltage Sag Characteristics during Symmetrical and Asymmetrical Faults

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Abstract : Electrical faults in transmission and distribution networks can have great impact on the electrical equipment used. Fault effects depend on the characteristics of the fault as well as the network itself. It is important to anticipate the network’s behavior during faults when planning a new equipment installation, as well as troubleshooting. Moreover, working backwards, we could be able to estimate the characteristics of the fault when checking the perceived effects. Different transformer winding connections dominantly used in the Greek power transfer and distribution networks and the effects of 1-phase to neutral, phase-to-phase, 2-phases to neutral and 3-phase faults on different locations of the network were simulated in order to present voltage sag characteristics. The study was performed on a generic network with three steps down transformers on two voltage level buses (one 150 kV/20 kV transformer and two 20 kV/0.4 kV). We found that during faults, there are significant changes both on voltage magnitudes and on phase angles. The simulations and short-circuit analysis were performed using the PSCAD simulation package. This paper presents voltage characteristics calculated for the simulated network, with different approaches on the transformer winding connections during symmetrical and asymmetrical faults on various locations.

Keywords : Phase angle shift, power quality, transformer winding connections, voltage sag propagation
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