Detection of Resistive Faults in Medium Voltage Overhead Feeders

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Abstract : Detection of downed conductors occurring with high fault resistance (reaching kilo-ohms) has always been a challenge, especially in countries like Saudi Arabia, on which earth resistivity is very high in general (reaching more than 1000 Ω -meter). The new approaches for the detection of resistive and high impedance faults are based on the analysis of the fault current waveform. These methods are still under research and development, and they are currently lacking security and dependability. The other approach is communication-based solutions which depends on voltage measurement at the end of overhead line branches and communicate the measured signals to substation feeder relay or a central control center. However, such a detection method is costly and depends on the availability of communication medium and infrastructure. The main objective of this research is to utilize the available standard protection schemes to increase the probability of detection of downed conductors occurring with a low magnitude of fault currents and at the same time avoiding unwanted tripping in healthy conditions and feeders. By specifying the operating region of the faulty feeder, use of tripping curve for discrimination between faulty and healthy feeders, and with proper selection of core balance current transformer (CBCT) and voltage transformers with fewer measurement errors, it is possible to set the pick-up of sensitive earth fault current to minimum values of few amps (i.e., Pick-up Settings = 3 A or 4 A, ...) for the detection of earth faults with fault resistance more than $(1 - 2 k\Omega)$ for 13.8kV overhead network and more than (3-4) $k\Omega$ fault resistance in 33kV overhead network. By implementation of the outcomes of this study, the probability of detection of downed conductors is increased by the utilization of existing schemes (i.e., Directional Sensitive Earth Fault Protection).

Keywords : sensitive earth fault, zero sequence current, grounded system, resistive fault detection, healthy feeder **Conference Title :** ICAPSP 2021 : International Conference on Advances in Power System Protection

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