CP23: Fault location in resonant-earthed MV distribution systems

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Background & Objective

Resonant-earthed systems

– The transformer neutral is connected to the earth through Petersen coil that is tuned to minimize the fault current through the fault location
– Transient faults become self-extinguishing: + good reliability
– Difficulties arise to locate earth-faults: - longer downtime

Main objectives

– Study the existing solutions and find their limitations for resonant-earthed system
– Propose a reliable and cost-effective fault location method for these systems
Proposed solution

Method

– If the network is not tuned at the resonant point, the changes in phase-currents due to earth-faults are not equal on the fault passage

– The changes are (ideally) equal if the measurement location is not on the fault passage

– Number of devices are installed along the feeder and each device independently determines that is on the fault passage or not using only current information

– Faulty section is determined after collecting the information from devices
Results (1/3)

Good performance for mixed feeders with both overhead line and underground cables (fault resistance 5 kΩ)
Results (2/3)

** Traditional Watt-metric method needs resistive current through the neutral

No requirement of resistive current through the neutral (fault resistance 5 kΩ)
Results (3/3)

Negligible impact of natural unbalance in the network, ±1% (Comparison with the watt-metric method)

Watt-metric ($I_0 \cos \theta$, $\theta = \angle V_0 - \angle I_0$)

Proposed method (5 kΩ)
Conclusions

– Traditional fault location methods struggle to provide acceptable performance in resonant-earthed distribution systems

– The proposed fault location method provides reliable decision in various fault conditions

– The proposed method should be cost-friendly since it does not require any voltage or high-frequency measurements

Queries?

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