

Application of a W27 single phase recloser for switching of power transformer secondary neutral point earthing from a resonant- to a low-impedance earthed system

Article describes a rather untypical use of a Nu-Lec W27 single phase recloser at earthing of a 110/20 kV power transformer secondary neutral.

Earth fault magnitudes depend on the distribution system earthing method – i.e. earthing of a 110/20 kV power transformer secondary neutral. Solidly- and low-impedance earthed systems may have high levels of phase-to-earth fault currents. These high levels typically require line tripping to remove the fault from the system.

In order to minimize the effects of earth faults, the method of earth fault compensation is being used successfully. This means that the system neutral is earthed through a high-impedance reactor, a so called Arc Suppression Coil or Petersen Coil, which is continually adjusted to the earth capacitance of the network. The advantage over the low-impedance earthed system is that it provides self-extinction of the fault arc in overhead lines for up to 80% of temporary earth faults. The downside is, that it requires highly reliable and selective protection relays in order to detect and locate permanent phase-to- earth faults.

Till recently, Slovenian distribution network was typically earthed over an 80 Ohm resistor. All phase-to-earth faults were tripped by an earth overcurrent or directional overcurrent relays. With a goal of reducing a number of outages caused by phase-to-earth faults, a shift towards a resonant-earthed system was considered. In order to reduce investments in installing highly selective protection relays and maintain compliance with existing safety and operational rules, a combination of both systems was adopted.

Under the normal circumstances, system is earthed through a Petersen coil controlled by an earth fault compensation controller. When earth fault occurs, there is a great chance that the fault arc will self-extinct due to a relatively low, compensated fault current. In this case, network would continue to operate without a trip. In case of a permanent fault, after a certain delay an existing resistor is switched in parallel to a Peterson coil by a QOR switch – in our case this is W27 vacuum switch. The system becomes low-impedance earthed so the fault will be cleared by an existing earth fault protection relay on the faulty feeder.

On the following page, a picture of a system installation at Elektro Ljubljana, Slovenija is presented.



