CONFIRMING THE RELIABILITY AND SAFETY OF MV DISTRIBUTION NETWORK INCLUDING DG APPLYING PROTECTION APPLICATIONS FOR EARTH FAULTS

The paper describes the effects of distributed generation (DG) on the earth fault protection of medium voltage feeder and protection coordination. Neutral isolated and compensated systems were considered. The aim was to investigate the behaviour of the production unit during automatic reclosings, especially as regards electrical safety. Methods possibly feasible for clearing a temporary earth fault without voltage break were considered. Thus disturbances affecting production and customers are less than with automatic reclosings. The method of the study was dynamic simulation of the earth faults in medium voltage system. The network model including a wind power plant was implemented applying PSCAD™ simulation software.

If the DG unit connected to the MV feeder is not disconnected during the unenergized time interval of the high-speed automatic reclosing it continues to sustain the voltage of the feeder during an earth fault. The appropriate feeder remains to operate temporarily islanded and the DG unit sustains the burning of the arc. If the arc does not extinct during the open period of the feeder circuit-breaker the fault will appear to be permanent for the feeder protection.

The behaviour of the generator during the high-speed automatic reclosing of the feeder is an important matter relating to electrical safety and protection coordination. The maximum value for the operating time of the loss-of-mains protection should be defined. Thereby the unenergized time interval of the high-speed automatic reclosing can be set so that the earth fault arc has enough time to extinct and asynchronous reconnection of DG unit can be avoided. DG involves uncertainty in determining the maximum permissible touch voltage because the effective time and magnitude of the fault current are not exactly known. With DG the longest effective time of the fault current corresponding generators and the highest value for the earth fault current should be taken into account. Applying shunt circuit-breaker it is possible to reduce cost-effectively high-speed automatic reclosings due to earth faults without disturbances to customers and DG.