Arcteq Innovation:
Intermittent Earth Fault Protection

Background

Underground cabling of the distribution networks makes them less vulnerable to disturbances, but at the same time leading to higher earth fault currents. Networks are compensated with Petersen coils to keep earth fault currents on lower level. Typically an intermittent earth-fault is a 0.05-1 millisecond self-extinguishing flash-over fault from phase to ground causing heavy transient spikes into the electric network. Traditional non-intermittent directional earth fault protection is unable to operate correctly in this type of fault since it is typically based into FFT (Fast Fourier Transformation) processing results based on fundamental frequency RMS values.

Arcteq patented solution

Arcteq's breakthrough IED technology in AQ 200 series with patented very accurate measurement technology (better than 0.2% for energy and power measurement) combined with up to 3.2kHz sampling rate lays the foundation for accurate algorithms of fast phenomenon such as intermittent earth-fault protection.

The algorithm makes use of the accurate measurement and sampling technology by searching for spikes in I_0 and U_0 generated by intermittent earth fault strike through. Algorithm is able to remove all unnecessary and confusing data and concentrate only on the spikes. By calculating the delta of raw samples using an innovative patented admittance based formula the polarity of the spikes in I_0 and U_0 is determined accurately distinguishing effectively a faulty feeder over healthy background feeder. The algorithms have been proven effective in extensive field tests with electrical utilities, and have been installed in networks since 2014.

The AQ-F215 feeder terminal is equipped with the intermittent earth fault protection. The protection algorithm combined with 0.2S measurement class and 3,2 kHz sampling frequency, enables it to detect and isolate intermittent earthfaults with high accuracy.

The triptime of the intermitten earth fault protection is set to 500 ms. Fom this disturbance record from AQ-F215 relay can be read that the relay detects the intermittent earth faults and trips within the set time.

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