Section: High Voltage
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INDUCED TRANSIENT POTENTIAL IN SECONDARY UNDER LINE DISCONNECT SWITCHING

The switching of a section of EHV bus by a line disconnect gives rise to transient electromagnetic disturbance and induces high frequency common mode transient potentials in the secondary. Various factors can affect the magnitude and character of these induced transient potentials. These factors are the combination, size and configuration of the buswork and the shunt capacitance to ground of the system. Disconnect switching generates high-frequency transient currents which travel in a planar loop total combined determined by the layout of the system. The magnitude of the transient currents is in the order of kiloampers and frequency ranges from 500 kHz to 10 MHz. The presence of CVT's or coupling capacitors increases the possibility of a high transient ground potential because of the surge impedance that exists between the CVT base and ground and between the three phases. Moreover the capacitive CVT tends to increase the frequency of the transient currents generated when operating the disconnect.

These transient currents flow via the capacitor unit to the station ground. This generates magnetic fields coupling to the nearby secondary cables and thus inducing high common-mode potentials in the order of tens of kilovolts. Such high transient potentials could cause failure of secondary equipment such as relays, meters, and PLC's.

PRECAUTIONS TO BE TAKEN AGAINST SWITCHING TRANSIENTS

Unless precautions are taken to minimize the magnetic coupling between the high voltage loop and the secondary circuit, high common mode transient potentials will be induced in the secondary. Theory and actual site tests have demonstrated that the use of the shielded cable (with shield grounded at both equipment and control house ends) is very effective in reducing these transient potentials.

Additionally, the secondary cable should follow the ground conductor as close as possible between the equipment ground and the common point of the grounding grid. If corrosion is not a concern for the horizontal run into the control room the secondary cables should be in a metallic conduit running below the ground grid. Again, grounding of the conduit at both CVT and the control room ends will minimize the loop coupling. Furthermore, metallic conduit will provide electrostatic shielding and reduce the ground impedance between the CVT and the control room so that the transient potential is reduced as much as possible.

The non-polarity terminal of the secondary, if it is to be grounded, should be grounded at one point only as remote from the CVT as possible and preferably the control room. Multiple grounding tends to crate transient difference in ground potential across the secondary winding rather than from winding to ground.