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ATP Analysis of Tower Footing Resistance Effect in 220kV High voltage Transformers Insulation Level for Protection Against the Direct Lightning Strokes

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ABSTRACT

The study of lightning behavior and overvoltage resulting from it is an important factor in protection of different tools of substations and power plants. Lightning seldom directly collides with a transmission line. Lightning almost collides on top of tower of transmission line or shield wires and lightning currents flow on top of tower downward. This major current increases its voltage considering impedance of the tower. With increase of tower voltage, ignition may be created between the arms of the tower and earth and between two arms of the tower. Lightning causes many outages due to back flash over. The aim of this paper is to study the effect of the tower footing resistance in 220kV high voltage transformers insulation level for protection against the direct lightning strikes. Hence this study, the performed analysis for assessing single phase ignition and back flash over, The testing system consists of three towers and a substation, The paper illustrates the benefit of Alternative Transient Program / Electromagnetic (ATP / EMTP) to finding the best value of tower footing resistance against the lightning. This circuit where exposed to lightning current strikes ranging between (150 to 200kA) on ground wire and transmission line directly after change the tower footing resistance from 10 Ω to 70 Ω . The results showed that if the increased tower footing resistance at 50 Ω for 150KA lightning current is going to happen breakdown of the substation. Whereas find that if the increased tower footing resistance at 15 Ω for 200KA lightning current is going to happen breakdown of the substation. To avoid the problem of transient waves change the transmission lines system protection and of which choosing good lightning arrester as well as reduce the tower footing resistance near the arrester and transformer.

Keywords: lightning currents, tower footing resistance, ATP/EMTP, BIL insulation level.