Electric Power Systems Research
Volume 159, June 2018, Pages 9-16

Analysis of the effectiveness of shield wires in mitigating lightning-induced voltages on power distribution lines.

Piantini, Alexande
Alexandre Piantini, University of São Paulo, Institute of Energy and Environment, Lightning and High Voltage Research Center – CENDAT/USP, Av. Prof. Luciano Gualberto, 1289, 05508-010, São Paulo, Brazil

ABSTRACT

The use of multi-grounded shield wires constitutes one of the methods that can be applied to improve the lightning performance of overhead power distribution lines. Although the effectiveness of this measure against direct strokes is quite limited, the line performance against indirect strokes can be greatly improved. However, the degree of improvement varies from case to case, as the magnitudes of the induced surges are significantly affected by many lightning and network parameters, as well as by the soil resistivity. In addition, the presence of a shield wire or a neutral conductor has different effects on the phase-to-ground and phase-to-shield wire (or phase-to-neutral) voltages. In this paper, an analysis is presented of the effectiveness of shield wires in reducing the magnitudes of lightning-induced voltages on medium-voltage power distribution lines considering various realistic situations. A discussion is provided on the influence of the most important parameters on the effectiveness of the shield wire in terms of both phase-to-ground and phase-to-shield wire voltages..