TRANSIENT OVERVOLTAGES ON DISTRIBUTION UNDERGROUND CABLE INSERTED IN OVERHEAD LINE

In recent years, an increased number of windstorms has led to a surge in damage of 22 kV and 35 kV lines caused by fallen trees. Those incidents result frequently in long power outages and increased maintenance costs of distribution networks. This paper is inspired by a recent trend consisting in the replacement of concerned sections of overhead lines by cables. This solution brings numerous changes concerning the operation of distribution networks and it can be a potential source of faults due to the increased danger of the penetration of lightning overvoltage to the cable and of the subsequent breakdown of its insulation.

The analysis of overvoltages due to a lightning stroke is based on simulations in the EMTP-ATP program. The aim of the simulating model was to create the less favourable situation in an MV distribution network with inserted cable sections that would lead to an increased risk of faults due to overvoltage. To do so, a part of a real 22 kV distribution network in a mountain region in the proximity of an already installed power cable in direction to the Lysá hora mountain where some parts of the overhead line were replaced by cables in the model. This results in three cable sections separated always by only two spans of overhead line of a length of 60 m each while keeping the actual network configuration. It can be expected that the effects of the lightning hitting the overhead line phase conductor and the subsequent overvoltages along the cables will be considerable in such a model. The electrical stress of the inserted cables due to overvoltage was analysed by means of the simulation of the transient phenomenon caused by a lightning stroke and of the subsequent propagation of lightning overvoltage.