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An Improved Model for Lightning Induced Voltages Calculations

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Abstract - Overvoltages induced on overhead distribution lines by nearby lightning are responsible for a significant number of supply interruptions, due to their high frequency of occurrence. The importance of the phenomenon has motivated several researches, aiming at a simple and reliable model that can be used for the analysis of the lines performances concerning indirect strokes. This paper presents initially some comparisons between lightning induced voltages recorded in Japan simultaneously with the associated stroke currents - and those calculated according to some of the existing theories. The results show the consistency of the Extended Rusek Model (ERM), a method derived from Rusek's theory but with the ability to take into account the finite lengths of line and stroke channel, the occurrence of upward leaders and the effects of lightning incidence to tall structures. Then the effects of these parameters are discussed in order to illustrate the application of the ERM on the analysis of lightning induced voltages.

Index Terms - electromagnetic induction, lightning, power distribution lines.