# SIMULATION STUDY ON LINE SURGE ARRESTER AND PLACEMENT OF SURGE ARRESTER

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# ABSTRACT

Lightning is a very impressive phenomenon that occurs in nature. The amount of energy contained in a lightning stroke is very high and it can be extremely destructive. Electric distribution networks are particularly vulnerable to lightning strokes. A single stroke to a distribution line can be sufficient to cause a blackout throughout a feeder. To prevent this, power systems are protected with lightning rods, ground wires and surge arresters. This paper is to presents the analysis on effects of lightning and surge arrester in power distribution system. Lightning surge is modelled using equation and will be use to analyze its effects to the system. In order to investigate the effects of lightning and surge arrester in power distribution system, a simulation using PSCAD simulation software has been carried out. Simulation results have illustrated the output waveform of lightning surge, the model of fast front surge arrester and the effects of lightning and surge arrester in test system. This project also presents the PSCAD based transient modelling of a three phase transmission line circuit for analysing their performance during lightning. The method used to analyze the increase in voltage due to lightning. Circuit model is developed for a three phase model and the same is used for simulation studies. This study generalizes the modelling details and performing the analysis of lightning surge on surge arrester placement using the PSCAD software. The outcome of this paper would be the effect of surge arrester placement in terms of voltage level measured at particular points.

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# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

A lightning flash or stroke only becomes a surge when its charge is transferred onto a power system. At that point it takes a wave shape partly dependent on the stroke characteristic and partly due to the system impedance. The lightning surge represents the highest surge risk to insulation on power systems. Even low stroke currents can generate a 1000 kV surge on the power system which is more than enough to flash over most insulators or puncture most equipment insulation. The lightning stroke can cause a lightning surge in two ways on a power system. The first is by a direct strike to the phase, and the second by a nearby strike to earth that results in an induced surge on the system. In the second case, the lightning surge is much lower in amplitude [1].

The surge arrester protects the power systems from both the direct and indirect lightning surge by diverting the charge and energy to ground. In the process of diverting, it clamps the surge on the system from the arrester clamped can still do damage to the system. This is especially true in the case where the surge comes to an open circuit and is doubled due to reflections. If the ground resistance is too high, the surge can break down the insulation between phases and cause a phase to phase fault. It is a continuous effort of the utility to keep the ground resistance as low as possible to affect the best lightning surge protection onward [1].