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Ruptures in overhead ground wire - transmission line

220 kV

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Abstract

The broken strand of overhead ground wire (OGW), which is mainly caused by lightning strikes or the vibration of OGW, can lead to serious damage to the power grid system. Power-line maintenance work is generally carried out by specialized workers under extra-high voltage live-line conditions which involve great risks and high labor intensity. If the OGW or OPGW are broken and they fall, this may cause a short-circuit fault of the power transmission lines. Besides this fault, in the event of OPGW breakage, communication interruption will also occur, causing significant damage to the communication system of the electric power utility and the public. Therefore, the melting and breaking characteristics of OGW strands must be clarified. In this research, a case study of a double simultaneous rupture in an OGW, it is analyzed in the chapter 3, these simultaneous failures caused by lightning strikes were developed. The effects on the mechanical capacity and structural damaged is analyzed in the chapter 4, a discussion has been considered in the chapter 5. The calculation way will be also a good tool for developing a new OGW strand that is hard to melt and is broken by high-energy lightning strikes.

Keywords: Lightning strikes; OGW; Overhead ground wire; overhead lines.

1. Introduction

Overhead ground wires (OGWs) have been used to prevent overhead power transmission lines from being struck by lightning [1]. Although OGW are designed to withstand lightning strikes, some of their strands, even if the strand is an aluminum-clad steel, are sometimes melted and broken by high-energy lightning strikes [2]. If the OGW are broken and they fall, this may cause a short-circuit fault of the power transmission lines. Besides this fault, in the event of OGW or OPGW breakage, communication interruption will also occur, causing significant damage to the communication system of the electric power utility and the public [3].

Power-line inspection and maintenance play an important role in the normal running of power grid systems. Traditionally, power-line inspection and maintenance tasks are performed by specialized workers, special conditions as heavy pollution [14], lightning strikes [2] and seismic are the most important risk for overhead lines. To ensure that the entire power grid system runs smoothly, the workers have to work under extra-high voltage live conditions which involve great risks [4]. A vision-based OGW broken strand
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