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Establishment of the Security Apparatus Against Damage Caused by Lightning on a Transmission line of Electrical Energy

Daas Abdelhakim[a]* , Haddouche Ali[b], Dib Djalel[c]

[a] Electrotechnical Laboratory of Skikda, University of Skikda, 21000, Algeria

[b]Laboratory of Electromechanical Systems, University of Annaba, 23000, Algeria

[c]Department of Electrical Engineering, University of Tebessa, 12000, Algeria

Abstract

Lightning is the visible discharge of static electricity within a cloud, between clouds, or between tile earth and a cloud. Scientists still do not fully understand what causes lightning, but most experts believe that different kinds of ice interact in a cloud. Updrafts in the clouds separate charges so that positive charges moves end up at the top of the cloud while negative flow to the bottom. A lighting protection system provides a means by which this discharge may enter or leave earth without passing through and damaging non-conducting parts of a structure, such as those made of wood, brick, and tile of- concrete. A lightning protection system does not prevent lightning from striking; it provides a means for controlling it and preventing damage by providing a low resistance path for the discharge of lightning energy.

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Keywords: Lightning, discharge, protection system, damage, transmission ,energy.

1. Introduction

The Lightning is a significant disturbance of the functioning of all electrical installations for several reasons: - All the power and voltage levels are concerned (since the energy transport high voltage to integrate circuits through the low power supply voltage and data transmissions); - It may cause temporary disruption in the continuity of service, thus degrading the quality of power supplies; - It may cause destruction of equipment and as a result of long interruptions of service facilities; - It is a danger to persons (not voltage, elevated potential of the masses and circuit ground); - It generates the phenomenon of the corona which causes loss of energy. The Lightning has always been a cause of disruption in electricity use, but it is worth noting the relatively new requirement and increasing the quality

* Corresponding author. Tel.: +21-366-210-9393; fax: +2-133-870-1724.
E-mail address: unidtrhakim@yahoo.fr.

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of electrical systems (reliability, availability, and continuity of service) and Standing order to minimize production costs and use of electricity. This leads to the finding that lightning is a "hard spot" in the improvement of all these factors. A study of the effects of lightning takes place in two stages, these two steps are intended to: -Predicting what might happen to a device and recommend solutions for improvement; - Can make a technical and economic coordination of isolation taking into account the cost of facilities, maintenance and service interruptions. The protection with devices (arresters, spark gaps, guard wires and rods and mesh cages) is very local. Thus, it is not enough to know the parameters of these devices for the voltage actually applied to protect equipment.

The electric transmission line in Eastern Algeria [El Hadjar (EHR) - EL Khroub (EKB) - Skikda (SKD) - Ramdane Djamel (RDL) - El Hadjar (EHR)] at high voltage 220 KV needs these devices, and the new line between Ramdane Djamel (RDL) and El Hadjar (EHR)] at very high voltage 400KV needs these devices.

2. Method

According to the World isokeraunics curves (Fig.01) it was noted that the number of thunderstorm days per year, which means thunder in Northern Algeria is 20. So the kéraunic level for the region of Annaba N_K = 20 (thunderstorm days / year). The Density of Lightning Strike the Ground is equal to:

$$N_s = N_k / 7(1Km^2.years), \tag{1}$$

The number of lightning stroke (N_l) on the line is calculated using the following empirical formula:

$$N_l = N_k (h_p / 1m)^{0,5} / 400Km, (stroke / year.Km), \tag{2}$$

The results of many lightning stroke (N_l) on each section of the loop (line) studied are presented in Table I.

Table1. Number of lightning stroke (N_l) on the line

Level keraunic; N_K = *20 (thunderstorm days / year)*	
Density of lightning strikes the ground; N_S = *2.86 (1Km² years)*	
Number of lightning stroke (N_l) on the line on the line *(stroke / year)*	EHR- EKB ; N_{l1} =28,72
	EKB- SKD ; N_{l2}=18,83
	SKD- RDL ; N_{l3}=4,19
	The old line RDL-EHR; N_{l4} = 17,88
	The new line HER-RDL; N_{l5} = 20,36
	Loop ; N_l = 18

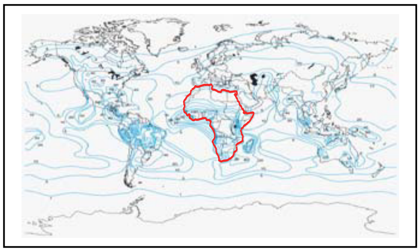

Fig.1. Global Isokeraunics Curves. [01]

The problem of choosing an arrester in the silicon carbide and Spark gap or a zinc oxide arises only because, very quickly, the arrester in zinc oxide replaced their counterparts in Silicon Carbide and spark gap especially for high and very high voltage. The arrester in zinc oxide is, usually considered more reliable and more economical. The arrester Oxide Zinc metal casing is only justified in the electrical-insulated metal-enclosed gas (usually in much polluted areas).The arrester Zinc oxide synthetic envelope is now fully part of industrial supply, at least with regard to the surge distribution network. The arrester in integrated zinc oxide, rare and very high voltage, has the