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Optimal placement of the superconducting fault current limiter in substation

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ABSTRACT

In recent years, due to grid interconnection by independent power producers, expansion of power system has become an inevitable situation accompanied by increasing fault current level. Under such conditions, suppression of fault current is an important subject. One of the promising solutions is the super conducting fault current limiter (SFCL). SFCL has risen on new alternatives to large fault current problems. However, it is necessary to select the optimal location of SFCL. In this paper, the model of a resistive type of SFCL based on characteristics of electric field (E) in terms of current density (J) has been investigated in the electromagnetic transient program (EMTP). Case Study is proposed on 400KV substation with single and double buses. In addition to find the favorable current limit, the results specify the optimal location of RSFCL installation.

Keywords: *superconducting fault current limiter, optimal placement, EMTP, HTS, single & double bus bar.*

1. INTRODUCTION

The growth of electric power systems has resulted in a corresponding increasing in the fault current levels. At the same points, the available short- circuit current may exceed the maximum short circuit ratings of the switchgear. Traditionally, to alleviate the cost of switchgear and bus replacements, the most common ways to limit high level fault currents are: uprating of switchgear and other equipment, splitting the power grid and introducing higher voltage connections, using current limiting fuses or series reactors or high impedance transformers, and using complex strategies such as sequential network tripping [1-3].

One of the electric devices which has a significant impact on the fault current limiting is Superconducting Fault Current Limiter(SFCL). SFCL is a power electronic device which is quenched when electric currents became more than the critical value flowing to the superconductor. SFCL can detect fault currents as quick as possible without additional equipment. It does not act in the case of loss of power, because it has zero impedance at normal state [2-4].

There are several researches that have been performed on the types of SFCL, which can be categorized into two groups: the resistive and inductive types [1-9]. Studies on the SFCL position in power systems are discussed [6-7]. In this paper, by evaluating different laces for the resistive type SFCL, the best location for RSFCL installation in the single and double buses is recommended.