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## **ANALYSES OF EXISTING PROTECTION OF 400/110 KV POWER TRANSFORMERS AND PROPOSAL FOR PROTECTION CHANGING**

### **ABSTRACT**

This paper gives a short explanation of the existing system of the 400/110 kV power transformers protection in the Republic of Macedonia.

Proceeding with the paper, an explanation of the calculation of the distance protection of the power transformer in SS Skopje5 is elaborated showing a difference between this calculation and the previous calculations performed for the other 400/110 kV power transformers in the Republic Macedonia. The main difference is taking the inter-power coefficient of the bus bar at 110 kV and 400 kV and in the calculation of the earth fault coefficient dependent on the zero and the direct impedance of the line and power transformer. Using the numerical protection enables for this coefficient to be different for the different zones of distance protection.

The third section of the paper gives a more detail description of the restricted earth-fault protection. The restricted earth-fault protection finds its most common use in the directly earthed networks or via small resistance. This protection in fact is earth-fault differential protection connected to the current transformer at the star where the power transformer is earthed and the star of the phase current transformers of the power transformer. The advantage of the restricted earth-fault protection is its sensitivity, which varies between 2 and 8% unlike the standard differential protection with a sensitivity range between 20 and 40%. This protection is also faster thanks to, most of all, its simple measuring and calculation of the differential current method.

The last part of this paper gives a suggested solution for the future protection of the new power transformer on the 400 kV side in the Republic of Macedonia. Before all, it concerns the type of the relays. One of the possible ways to protect the transformers is with two differential relays, unlike the present experience with differential relay as a main protection and a distance protection relay as a back up.

**Keywords:** power transformer, restricted earth-fault protection, distance protection, differential protection, electrical protection, fault.