TECHNIQUES TO MINIMIZE TRANSFER POTENTIAL NEAR THE SUBSTATION BOUNDARIES

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DECLARATION OF THE CANDIDATE AND SUPERVISORS

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The above candidate has carried out research for the Masters thesis under my supervision.

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Dr. Asanka S. Rodrigo

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ABSTRACT

In Sri Lanka, the demand for electricity is growing at a rate of 5-6% each year. Transmission Infrastructure development is an essential task to cater this growing demand. Construction of grid substations and transmission lines are the major projects in transmission infrastructure development. It is very difficult and costly to find suitable lands for construction of grid substations in urban areas such as Colombo and Kandy. The designs of these grid substations are complex and congested, since they are confined to very small land extents.

It is vital to ensure electrical safety in a grid substation. Grid substation grounding system plays a major role in electrical safety. The grid substation grounding system carries the electric current to the earth at normal and faulty conditions. This flow of electric currents into the earth increases the ground potential not only in the premises of the grid substation, but also in the neighboring lands. Grid substation grounding system ensures the minimum grounding resistance, safe step potential and touch potential levels in the premises of the grid substation, but it does not cover the area beyond the boundary of the grid substation.

Soil structure of a land could be with a uniform soil resistivity or non-uniform and when it is non-uniform, it is considered as multiple layered with different soil resistivity in each layer. The flow of current in the earth depends on the resistivity of the soil layers. Accordingly current flow could be outwards from the land extent of the grid substation or to flow downwards from the surface. This behavior has been tested in this research with an artificially introduced vertical layer of Asphalt around the grid substation to reduce the flow of electric currents towards the adjacent lands from the land of the grid substation. The reduction of flow of electric currents in the upper soil layer of the adjacent lands, reduces the ground potential rise and the electric shock hazard beyond the boundary of the grid substation. The results show that with the increase of the depth and width of the vertical Asphalt layer, the ground potential rise of the adjacent land drops and hence the risk of electric shock reduces.

Keywords*: Grounding, Potential Rise, Reflection Factor, Step Potential.*

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AC : Alternating Current

CEB : Ceylon Electricity Board

GPR : Ground Potential Rise

GSS : Gird Substation