DESIGNING OF RAILWAY ELECTRIFICATION NETWORK CONFIGURATION TO MINIMIZE POWER QUALITY ISSUES:
A CASE STUDY FOR PROPOSED SRI LANKAN RAILWAY ELECTRIFICATION

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DECLARATION OF THE CANDIDATE AND SUPERVISORS

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(Dr. Asanka Rodrigo)

ABSTRACT

Electrified railway system is a better solution for the rapidly increasing congestion of traffic in urban areas and railway transportation has many advantages compared with other modes of land/air transportation. In Electrified railway system ,energy delivered to the train when needed(running), unlike the other modes of transportation (land, air, sea).According to the present railway passenger flow, suburban railway stations Panadura – Veyangoda sector was selected as high passenger density area which served 44% of all railway passengers and government has decided to electrified that sector first. The total track length between Panadura and Veyangoda is 156km.

Due to the rapid acceleration and frequent starts of electric trains, there may large magnetic induction current in the power circuits and it may contribute to the grid voltage drop near urban areas. The energy flow back to the grid with regenerative braking and harmonics will added to the system. So, there are lot of power quality issues with electrified railway system and it is time to accept the challenge as Electrical Engineers.

This research titled as "DESIGNING OF RAILWAY ELECTRIFICATION NETWORK CONFIGURATION TO MINIMIZE POWER QUALITY ISSUES: A CASE STUDY FOR PROPOSED SRI LANKAN RAILWAY ELECTRIFICATION" was carried out to find out an optimum voltage configuration to feed the railway system with minimum disturbing to the available power system.

Electric train model was developed using Matlab Simulink to study the behavior of power distribution system while operating of the electric trains with current time schedule of the Sri Lankan Railways.

The results were obtained and analyzed under the critical times at proposed railway substations .According to the results, optimum voltage configuration was selected in order to minimize the power quality issues to the utility grid.

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ABBREVIATIONS

SLR : Sri Lanka Railways
DC : Direct Current
AC : Alternating Current
CEB : Ceylon Electricity Board
THD : Total Harmonic Distortion
OCS : Overhead Contact Systems
FOC : Field Oriented Control
GS : Grid Substation
FL : Fault Level
MW : Mega Watt
Mvar : Mega vars