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**ANALYSIS OF TRANSIENT BEHAVIOUR WITHIN
UNDERGROUND TRANSMISSION CABLES**

By

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**A Dissertation Submitted in Partial Fulfillment of
The Requirement for the Degree of Master of
Electrical Engineering,
College of Graduate Studies
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- ① Transient (electricity)
- ② Underground electric cables

ABSTRACT

The behaviour of voltage and current transients, when a high voltage (HV) cable is first energized, is a problem of practical significance to utility. Modelling this behaviour on a suitable simulation platform is an attractive approach, especially when the results closely match real-world behaviour. This dissertation presents modelling and analysis of behaviour of transients resulting from energisation of an unloaded cable using PSCAD /EMTDC simulation software. An assessment of the suitability of Bergeron and frequency-dependent (FD) cable models (FD-mode model and FD-phase model) during transient within transmission cables are given. The fault transient and switching transient on the cable system are simulated and then presented. In cable system modelling, system components must be accurately modelled, like main core conductor, main insulation, semiconductor, and cable sheath. The transient sources are applied to 132kV underground XLPE cable system to examine the effects of cable parameters and external factors due to the transient behaviour. The parameters and factors examined are the cable parameters and external factors affecting the cable. The cable parameters examined are (i) the effects of the core resistivity, (ii) effects of permittivity of the semiconductor screen, (iii) effects of the sheath resistivity and (iv) effects of the insulation on the transient performance. While, the external factors examined are, the surrounding ground resistivity and the burial depth. It has been identified that, the change of these parameters and factors lead to effect of the following: transient amplitude, propagation time due to change of impedance and shunt admittance.

DECLARATION

I hereby declare that this dissertation, submitted to Universiti Tenaga Nasional as a partial fulfillment of the requirement for the degree of Master of Electrical Engineering has not been submitted as an exercise for a similar degree at any other university. I also certify that the work described here is my own except for excerpts and summaries whose sources are appropriately cited in the references.

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