LIGHTNING PERFORMANCE IMPROVEMENT OF 132 kV TRANSMISSION LINE BY USING LINE SURGE ARRESTERS

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SCHOOL OF ELECTRICAL SYSTEM ENGINEERING

UNIVERSITI MALAYSIA PERLIS

2011

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by

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Report submitted in partial fulfillment
of the requirements for the degree
of Bachelor of Engineering

MAY 2011

ACKNOWLEDGEMENT

First and foremost, I would like to express my sincere appreciation and special thanks to my final year project supervisor, Cik Noor Shahida Jamoshid, for his support, advices, encouragement, and guidance in carrying out my final year project; Lightning Performance Improvement of 132 kV Transmission Line by Using Line Surge Arresters. With her expertise, I got her supported from the initial to the final level which is enable me to develop understanding of this project until it completely finish and success.

To Mr. Walied b. Hassan, I would like to thank for his cooperation and willingness to help me find some information from his friend which is working with Tenaga Switchgear Berhad, Kuala Lumpur. Also special thanks to my parents who have always been very understanding and supportive both financially and emotionally.

Last but not least, I offer my regards and blessings to all of those who supported me in any respect during the completion of the project. Most importantly, the Almighty God, who never cease in loving us and for the continued guidance and protection.

DECLARATION SHEET

I hereby declare that my Final Year Project Thesis is the result of my research work under supervision of Cik Noor Shahida binti Jamoshid. All literature sources used for the writing of this thesis have been adequately referenced.

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APPROVAL AND DECLARATION SHEET

This project report titled Lightning Performance Improvement of 132 kV Transmission Line by Using Line Surge Arresters was prepared and submitted by Mohd Ammar Hakimee b. Ismail (Matrix Number: 071090429) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Electrical System Engineering) in Universiti Malaysia Perlis (UniMAP).

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April 2011

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ABSTRACT

Lightning is a natural phenomenon and this condition of lightning surge may cause the travelling waves and cause the temporary increase in voltage in the transmission line system. The line voltage increase is harmful because it can destroy the equipment in transmission line system. One of the methods to improve the lightning performance of transmission lines in services is by applying the transmission line arresters. Therefore, it is necessary to analyze such as the increase voltage in order to design surge arrester that suitable for investment and select the best configuration to ensure the good performance for lightning performance improvement in transmission line system. One of the applications of ATP/EMTP simulation software are design, analyze and study the lightning activities and performance in 132 kV transmission line circuit. J.Marti model is one of the overhead lines model while Heidler model is used for simulation for fast front lightning surge. Tower model for this study is referred to model proposed by Masaru Ishii. Therefore, it is important to analyze the surge arrester configuration for the good performance of the transmission line system. The best lightning performance is configuration produced zero backflashover voltage and used less transmission line arrester.

MEMPERBAIKI PRESTASI PANAHAN PETIR PADA TALIAN PENGHANTARAN 132 kV DENGAN MENGGUNAKAN TALIAN PERLINDUNGAN PETIR

ABSTRAK

Panahan petir merupakan fenomena alam semulajadi dan keadaan panahan petir secara meluru boleh menyebabkan pengaliran gelombang dan menyebabkan peningkatan sementara voltan dalam sistem talian penghantaran.. Peningkatan voltan dalam talian adalah berbahaya kerana boleh merosakkan peralatan pada sistem talian penghantaran. Salah satu cara untuk meningkatkan prestasi panahan pada talian penghantaran perkhidmatan adalah dengan mengaplikasikan penggunaan talian perlindungan petir. Oleh kerana itu, adalah perlu untuk menganalisis seperti peningkatan voltan untuk merancang pelindung petir yang sesuai untuk pelaburan dan memilih tatarajah terbaik untuk memastikan prestasi yang baik untuk peningkatan prestasi panah petir pada sistem talian pengahantaran. Salah satu aplikasi ATP / perisian simulasi EMTP adalah mereka, menganalisa dan mengkaji aktiviti panahan petir dan mempelajari aktiviti-aktiviti panahan kilat dan prestasinya dalam litar talian penghantan 132 kV J. Model Marti adalah salah satu model talian atas sementara model Heidler digunakan untuk simulasi untuk panahan petir pantas kehadapan. Model menara untuk kajian ini dirujuk pada model yang dicadangkan oleh Masaru Ishii. Oleh kerana itu, adalah penting untuk menganalisis tatarajah pelindung petir untuk prestasi yang terbaik untuk sistem talian penghantaran. Prestasi petir terbaik adalah tatarajah menghasilkan sifar pancaran voltan kebelakang dan mengunakan kurang pelindung kilat.

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LIST OF SYMBOLS

A	Ampere
C	Capacitance
Hz	Hertz
I	Current
kA	kilo-Ampere
kg	Kilogram
kV	kilo-Volt
L	Inductance
m	meter
mA	mili-Ampere
mm	millimeter
mm sq.	millimeter square
ηs	nanosecond
pF	piko-Farad
p.u.	per unit
R	Resistance
T	time
V	Voltage
Zt	Surge Impedence
Iprop	propagation length
α	Damping Coefficient
Ω	Ohm
ρ	Soil resistivity
μs	micro-Second

γ	Attentuation coefficient
Π	3.142

LIST OF ABBREVIATIONS

ATP	Alternative Transient Program
BFR	Back Flashover rate
BIL	Basic Insulation Levels
CIGRE	International Conference on Large High- Voltage Electric System.
EMTP	Electromagnetic Transient Program
EHV	Electric High-Voltage
HFS	Harmonic Frequency Scan
IEC	International Electro-Technical Commission
IECC	International Electrical and Electronic Engineers
LCC	Line Cable Constant
LSA	Line Surge Arrester
MOV	Metal Oxide Varistor
TACS.	Transient Analysis of Control System
TFR	Tower Footing Resistance
TLA	Transmission Line Arrester
TNB	Tenaga Nasional Berhad
Vref	Reference Voltage
V-I	Voltage versus Current
W.G	Working Group
ZnO	Zink Oxide

LIST OF APPENDICES