DEVELOPMENT OF AN ELECTRIC SPRING FOR VOLTAGE MANAGEMENT IN LV NETWORK AS A CONSUMER LEVEL SOLUTION

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Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Electrical Installation

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January 2023

DECLARATION OF THE CANDIDATE AND SUPERVISORS

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ABSTRACT

LV consumers are encouraged to invest on roof top solar and wind turbines to reduce the stress on the utility side. Due to the intermittent nature of these distributed generators the stability of the power system and the power quality has become the major concerns for the utility companies to control. Electric Spring is a modern power quality improvement device which is able to support and regulate voltage events caused mainly due to distributed generators such as wind and solar to the LV feeders without the need of restrictions and control by the modern utility providers.

A detailed literature content is presented to give a brief understanding of the applications of electric springs and comparison with other similar devices available at present market.

The study was performed in MATLAB/Simulink platform for feasibility of a developed customized electric spring tested for an LV network consumer considering its future load expansions. The study was tested for voltage disturbances such as voltage fluctuations and for voltage sags and swells. A detailed comparative simulation was performed mainly for voltage management in LV consumers for this study. The behaviour of the system was found to be more rewarding with many electric spring arrangements rather having a single electric spring.

Keywords: Electric Spring, Low Voltage (LV), Demand Side Management, Renewable Energy Sources, Voltage Regulation, Critical & Noncritical loads

ACKNOWLEDGEMENT

First and foremost, I would like to express my sincere gratitude to my supervisors Dr. J.V.U.P Upuli Jayatunga & Dr. Thushara Rathnayaka, being my supervisors and giving me the opportunity to carry out the research with continuous guidance. With their support I managed to overcome so many challenges starting form preparing for the project proposal through progress reviews and finally up to the thesis preparation. I take this opportunity to convey my heartfelt thanks for the motivation and timely guidance given to me throughout the project.

I would also like to thank my former masters' programme coordinator Dr. Prasad and all the staff members at department of electrical engineering of University of Moratuwa for providing valuable advice and suggestions in progress reviews.

Secondly, I would also like to remember my parents, my two sisters and all my colleagues for their encouragement & motivation given to me all the time.

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LIST OF ABBREVIATIONS

Abbreviation	Description
LV	Low Voltage
RES	Renewable Energy Sources
DPQI	Distributed Power Quality Improvement
FACTs	Flexible Alternating Current Transmission devices
PV	Photo Voltaic
ES	Electric Spring
VR	Voltage Regulation
MS	Mechanical Spring
CL	Critical Load
NCL	Non-Critical Load
SSSCs	Static Synchronous Series Compensators
STATCOM	STATic COMpensator
UPFC	Unified Power Flow Controllers
APF	Active Power Filter
MV	Medium Voltage
HV	High Voltage
DSM	Demand Side Management
MOSFETS	Metal–Oxide–Semiconductor Field-Effect Transistor
THD	Total Harmonic Distortion