DECLARATION

I, RITIKA GOUR (2K12/PSY/19) hereby declare that the work, which is being presented in the project report entitled, **"LIMITED CAPACITY DYNAMIC VOLTAGE RESTORER FOR VOLTAGE REGULATION IN RADIAL DISTRIBUTION FEEDER"** submitted for partial fulfillment of the requirements for the award of the degree of Mater of Technology (Power System) is an authentic record of my own work carried out under the able guidance of Dr. VISHAL VERMA, Professor, EED, DTU. The matter embodied in the dissertation work has not been plagiarized from anywhere and the same has not been submitted for the award of any other degree or diploma in full or in part.

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CERTIFICATE

This is to certify that the thesis entitled, "**LIMITED CAPACITY DYNAMIC VOLTAGE RESTORER FOR VOLTAGE REGULATION IN RADIAL DISTRIBUTION FEEDER**", submitted by Ms. **RITIKA GOUR**, Roll No. 2K12/PSY/19, student of Master of Technology (Power System) in Electrical Engineering department from Delhi Technological University (Formerly Delhi College of Engineering), is a dissertation work carried out by her under my guidance during session 2013-2014 towards the partial fulfillment of the requirements for the award of degree of Master of Technology in Power System.

The uniqueness of the thesis pertains to Autonomous Control of Distributed Dynamic Voltage Restorers, which has not been reported elsewhere.

I wish her all the best in her endeavors.

(Dr. VISHAL VERMA)
Professor, EED, DTU
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ABSTRACT

The distribution system is one of most important and critical part of power system. The variation in the voltage at load end is of great concern in the distribution system. The voltage is required to be kept regulated within a specified range in the distribution system. Series compensation is technically more suitable solution for regulating the voltage in the radial distribution feeder when compared with shunt compensators. Two vital factors which decide the quality of compensation are the location of series compensation device and the rating of the device. The optimum location of device can be found, using various algorithms optimization technique with multiple restrain. But its optimum location changes every time a fault or large transients occur on the feeder. The rating of device increases with the amount of compensation required to achieve requisite regulation.

This thesis presents an alternative for the conventional lumped series compensation devices prevalent in distribution power systems. The two measures presented in the thesis are curative measures and remedial measures. Curative measure is implemented with the distributed capacity limited DVR as a future course of action to enable efficient and cost-effective voltage regulation on radial feeder. Number of capacity limited DVR are incorporated into the feeder without affecting its power flow. An autonomous control for controlling the D-DVR is investigated to efficiently regulate the voltage on radial feeder in a cost-effective manner. The performance of the D-DVR is evaluated using MATLAB simulation environment to validate the concept of D-DVR and its autonomous control through simulated results under perturbing load and source conditions. Remedial measure is also been studied to improve the response of OLTC transformer installed on the feeder by operating it in conjunction with the capacity limited DVR for step-less operation. Control algorithm for the same is developed. The performance of duo has been investigated and validated using MATLAB/SIMULINK environment under load and source dynamics.

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ABBREVIATIONS

AC	Alternating Current
ANN	Artificial Neural Network
APF	Active Power Filter
CLC	Central Limit Control
DAFS	Distributed Active Filter System
DC	Direct Current
DFACTS	Distributed FACTS
DG	Distributed Generator
DLC	Distributed Load Control
DSI	Distributed Series Impedance
DSI	Distributed Series Inductor
DSSC	Distributed Static Series Controller
D-STATCAOM	Distribution STATCOM
DVR	Dynamic Voltage Restorer
EHV	Extra High Voltage
FACTS	Flexible Alternating Current Transmission System
GTO	Gate Turn –off Thyristor
HV	High Voltage
IDVR	Interline Dynamic Voltage Restorer
IGBT	Insulated Gate Bipolar Transistors

KVA	Kilo Volt Ampere
LV	Low Voltage
MOSFET	Metal Oxide Semiconductor Filed Effect Transformer
OLTC	On Load Tap Changer
P	Real/Active Power
PCC	Point of Common Coupling
PI	Proportional Integrator
PLL	Phase Locked Loop
PWM	Pulse Width Modulation
Q	Reactive Power
SRF	Synchronous Reference Frame
STATCOM	Static Shunt Compensation
UPF	Unity Power Factor
UPFC	Unified Power Flow Controller
UPQC	Unified Power Quality Controller
VAR	Volt Ampere Reactive
VSC	Voltage Source Converter