COMPARATIVE ANALYSIS BETWEEN STATIC COMPENSATOR (STATCOM) AND DYNAMIC VOLTAGE RESTORER (DVR) FOR VOLTAGE SAG MITIGATION

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ABSTRACT

Voltage sags is the most common type of power quality disturbance in the distribution system. Voltage sag can be caused by abrupt increases in loads such as short circuits or faults, motor starting, or electric heater turn on, or caused by increase in source impedance, typically caused by a loose connection. Dynamic Voltage Restorer (DVR) and Static Compensator (STATCOM) is one of the mitigation techniques used to mitigate voltage sag. The main objective of this analysis is to compare the mitigation techniques between Static Compensator (STATCOM) and Dynamic Voltage Restorer (DVR) to determine the best technique to improve the voltage sags. Static Compensator (STATCOM) and Dynamic Voltage Restorer (DVR) is based on Voltage Source Converter (VSC) principle. The well developed graphic and facilities available in an industry standard power system package, namely PSCAD/EMTDC, are used to conduct all aspects of model implementation and to carry out the simulation studies. Both of the mitigation techniques will be tested on different type of fault which is three phase fault and double line to ground fault. The analysis will focus on the effectiveness of Static Compensator (STATCOM) and Dynamic Voltage Restorer (DVR) techniques in mitigating the voltage sags. And the study also investigates the effect of harmonic for different type of fault for each mitigation techniques. At the end of the project the Dynamic Voltage Restorer (DVR) is more effective to improve voltage sag than Static Compensator (STATCOM) whilst is the best solution for the effect of harmonic.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

The issue of power quality is now recognized as an essential feature of a successful electric power system. This is mainly due to the rapid increase of loads, which generate noise and, at the same time are sensitive to the noise present in the supply system. As a result, power quality monitoring has become an important issue in modern power systems. New power quality problems such as sag, swell, harmonic distortion, unbalance, transient, and flicker may impact on customer devices, caused malfunctions and cost on lost production and downtime [1-3]. Voltage sag, voltage swells and interruption is categorized under short duration voltage variation. Usually voltage sag is caused by fault in utility system, or fault within the customer's facility. Besides that, large increase in the load current, like starting a motor or transformer energizing is also caused by voltage sag. The interests in voltage sags are increasing because can cause the detrimental effects on several sensitive equipments such as adjustable-speed drives, process-control equipments, and computers. Although voltage sag is not as damaging to customers as an interruption, the total damage due to sags is still larger than that of interruptions because there are far more voltage sags than interruptions. Moreover, voltage sags at equipment terminal can