DETERMINING INRUSH CURRENT LIMITING REACTOR FOR CAPACITOR SWITCHING USING PSCAD

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ABSTRACT

The switching of shunt capacitor banks at utility substations and on distribution feeders creates voltage and current transients in the power system which may be damaging to power system equipment. Transient overvoltages due to the energizing of capacitor banks are the most common source of overvoltages on many power systems. The high incidence of capacitor-switching induced overvoltages is a result of a marked increase in the number of shunt capacitor banks used on transmission and distribution systems as well as the frequent switching thereof (in most instances at least one close open operation per day).The utility industry has undergone many changes over the years and one of the major power quality problems to utilities and their consumers is the transient voltages that are a result of capacitor bank switching. The energizing transient is important because it is one of the most frequent system switching operations. Distorted waveforms along with the harmonic pollution introduced to the system, may cause undesirable effects such as instability of converter control, increased system losses, an increase in motor losses, overheating in transformers, switchgear, capacitors and miss operation of protective relays, fuses, and metering devices. This paper explores the suitable calculated value for reactor in capacitor switching and the effect of inrush current in power distribution substation.

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CHAPTER 1

INTRODUCTION

This thesis explores the suitable calculated value for reactor and LC circuit in capacitor switching and the effect of inrush current in power distribution substation. The analysis is to analyze the data resulting from calculation method and will be compared to simulation result from PSCAD.

1.1 OVERVIEW

Power quality has been an important issue in power system engineering with the increased number of power electronic device and sensitive electronic loads. Capacitor banks are place in the power distribution system to provide voltage support and correct displacement power factor. However, capacitor switching in power distribution systems results in a transient overvoltage with oscillation which is one of the most common and critical power quality events [4].

The impact of the capacitor switching on customer systems was recognized in the early 1990s. Transient overvoltages and overcurrents related to capacitor switching are frequently classified by peak magnitude, frequency and duration. These parameters are useful quantities for evaluating potential impacts of these transients on power system equipment [4].

The application of utility capacitor banks has long been accepted as a necessary step in the efficient design of utility power systems. Capacitor switching is generally considered a normal operation for a utility system and the transients associated with these operations are generally not a problem for utility equipment. These low frequency transients however can be magnified in a customer facility (if the customer has low voltage power factor correction capacitors) or result in nuisance