HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

MVAR DEMAND ON EAC SYSTEM AND THE USE OF CAPACITOR BANKS

E.1172

BY

CHRISTOS NICOLAOU

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PROJECT REPORT

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SUMMARY

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The main objective of this project is to realise the problems that are created due to the use of inductive loads by consumers utilities and the high demands of MVARs which are arising.

An introduction to this problem is made in order to give the real meaning of the problem, and understand the sources that are available to meet this need.

Also an attempt has been made, so that the consumers will understand the benefits they will have from the power factor correction.

The project identifies the benefits from using static MVAR generation and possible sources of problems that can arise from excessive usage of static MVAR generation.

Finally, the remaining is to understand the practices of EAC including special relay controls for effective use of MVAR switchable capacitor banks. Also a description of the EAC project is given with substations which were installed with capacitor banks . Locations of installations are given , too .

INTRODUCTION

The rapid growth of electrical loads on utility systems offers a challenge to management to serve these loads with electrical power while conserving as much energy as possible and yet maintain efficient operation. The cost of supplying the electric power involves generation, transmission and distribution.

A review of the power consumed will indicate that it is necessary to supply two types of power: active power (kW) and reactive power (kvar). The active power must be generated at central stations. The reactive power can be supplied from either the central station or by the use of static shunt capacitors. It has been demonstrated that shunt capacitors are the most economical source for the reactive power (kvar) required by the loads and transmission lines when operating at less that unity power factor.

A study of the transmission of power will reveal that the transmission and distribution lines require reactive power (kvar) in addition to the consumer's electric load. If the only reactive power source is the central station generation, this reactive current must be generated by the generators and then transmitted over the lines to the load. The transmission lines and equipment must be correctly sized to carry this reactive current load. It affects the size of the conductors, transformers, switchgear, protective equipment, etc. Any item on the system that carries current must be increased in current capacity.

There is also a corresponding power loss associated with the transmission and distribution of the reactive power current to the consumers load. These losses create undesirable voltage reductions. Since shunt capacitors affect a voltage rise when connected to the system, the addition of switched capacitors not only improves voltage levels, but also provides effective means for controlling the voltage levels.

The installation of power capacitors enables a utility to realise savings on their generation, EHV transmission, sub-transmission and distribution system. The following benefits are available:

a) Improvement of power factor
b) Released generation capacity
c) Released system capacity
d) Reduction of system losses
e) Raised voltage levels
f) Regulation of voltage levels