AN EDUCATIONAL TOOL FOR THE UNDERSTANDING OF THE STABILITY CHARACTERISTICS OF TNB POWER SYSTEM (INERTIA-SPRING MODEL)

Thesis is presented to fulfil the requirement of Advanced Diploma in Electrical Engineering of MARA Institute of Technology

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SYNOPSIS

The evergrowing of complexity of transmission network due to the rapid increase in power demand further complicate the already massive task of performing stability analysis.

With the help of digital computer, stability studies and planning of power system has become more convenient to undertake. In this study the dynamic stability characteristics is simulated using POWER SYSTEM SIMULATION FOR ENGINEERS (PSS/E) intergrated set of computer programs by POWER TECHNOLOGIES INC.. The program handles the following calculations:-

power flow
balanced and unbalanced fault analysis
network equivalent construction
dynamic simulation

The objectives of this studies are to :-

i) assess the maximum permissible critical fault clearing times
ii) assess the effects of generation trippings

By simplifying the large power system of TENAGA NASIONAL BERHAD using Dynamic Equivalent, the performance of the full system can be preserved and represented with a Mechanical Analogy i.e. Inertia Spring Model. Understanding the mechanical aspect of power system could lead to a better understanding of the power system behaviour.

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1.0 SYSTEM BEHAVIOUR AND THE POWER SYSTEM SIMULATOR

1.1 INTRODUCTION

An electric power system converts energy from a raw form (principally heat) into electricity, transmits it from the generation site to load site, and delivers it to consumers. The power generation and transmission system is not designed to store energy. Its operation requires the rate of conversion of energy at the generating plants to be equal, within a very tight tolerance, to the rate of consumption of loads. Nevertheless, the power system does store some energy in its electrical and mechanical components.

The energy stored in the power system, while insignificant in relation to the demands of loads is a critical factor in the dynamics behaviour of the system.

Energy is stored by the power system in:

i) the inductance and capacitance of the transmission lines, transformers, and other capacitances.

ii) the rotating inertia of the turbine-generators and motor driven loads.

iii) the thermo-dynamic process of the power plants, particularly within the boiler drums.

Our scope of studies is primarily concerned with power system dynamic behaviour associated with the energy stored in the rotating