MODELING AND TRANSIENT STABILITY ANALYZING THE GAS-TURBINE GOVERNOR (GAST GOVERNOR) USING DCPS

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ABSTRACT

This paper presents the modeling of gas-turbine governor for transient stability analysis in power system. This paper covers the modeling and the transient stability analysis of the six bus test system using Dynamic Computerize of Power System (DCPS) software. The DCPS programming will be used to model the GAST governor. After modeling the model of GAST governor, analyze it to show the governor can maintain system stability and preserve station operations. The modeling components of GAST governor and transient stability will be discussed. The transient stability analysis shows the speed, rotor angle, electrical power output and voltage magnitude for the generator. A three-phase fault is located at the bus, to analyze the effect of fault location and critical clearing time on the system stability.

Keywords: DCPS, Transient Stability, Critical Clearing Time.

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CHAPTER 1

INTRODUCTION

1.0 BASIC CONCEPT

Power system stability is the ability of the system, for a given initial operating condition, to regain a normal state of equilibrium after being subjected to a disturbance. Stability is a condition of equilibrium between opposing forces; instability results when a disturbance leads to a sustained imbalance between the opposing forces [1].

The power system is a highly nonlinear system that operates in a constantly changing environment; loads, generator outputs, topology, and key operating parameters change continually. When subjected to a transient disturbance, the stability of the system depends on the nature of the disturbance as well as the initial operating condition. The disturbance may be small or large. Small disturbances in the form of load changes occur continually, and the system adjusts to the changing conditions. The system must be able to operate satisfactorily under these conditions and successfully meet the load demand. It must also be able to survive numerous disturbances of a severe nature, such as a short-circuit on a transmission line or loss of a large generator.

Following a transient disturbance, if the power system is stable, it will reach a new equilibrium state with practically the entire system intact; the actions of automatic controls and possibly human operators will eventually restore the system to normal state. On the other hand, if the system is unstable, it will result in a run-away or run-down situation; for example, a progressive increase in angular separation of generator rotors, or a progressive decrease in bus voltages. An unstable system condition could lead to cascading outages and a shut-down of a major portion of the power system.

The response of the power system to a disturbance may involve much of the equipment. For instance, a fault on a critical element followed by its isolation by protective relays will cause variations in power flows, network bus voltages, and machine rotor speeds; the voltage variations will actuate both generator and transmission network