DECOUPLED LINEAR LOAD FLOW FOR CONTINGENCY ANALYSIS

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ABSTRACT

The load flow problem can be defined as the calculation of the real and reactive powers flowing in each line and the magnitude and phase angle of the voltage at each bus of a given transmission system for specified generation and load conditions. The information obtained from the load-flow studies can be used to test the system's capability to transfer energy from generation to load without overloading lines and to determine the adequacy of voltage regulation by shunt capacitors, shunt reactors, tap-changing transformers, and the var-supplying capability of rotating machines.

From the introduction of digital load flow solution by Ward and Hale in 1956, many methods and many modifications and improvements have been proposed from time to time. The relative properties and performances of different load flow methods can be influenced substantially by the types and sizes of problems to be solved.

The following are the main techniques that have been used so far for the power system load flow calculations:

- *Gauss Seidel method.*
- *Newton Raphson method.*
- *Decoupled Load Flow method.*
- *Fast Decouplied Load Flow method.*

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CHAPTER 1

1. INTRODUCTION

Load flow (or power flow) is the solution for the static operating condition of an electric-power transmission system, and is the most frequently performed of routine digital-computer power network calculations. The data obtained from load-flow studies are increasingly being used to solve very large systems and to solve multiple cases for purposes such as for the studies of normal operating mode, contingency analysis, outage security assessment and complicated calculations such as optimization and stability. Contingency analysis is always carried out to check if a system, which is currently in normal state, will continue to be in normal state when a contingency analysis occurs.

Load-flow calculations are performed in power-system planning, operational planning and operation/control. The objective of load-flow calculations is to determine the steady-state operating characteristics of the power generation/transmission system for a given set of busbar loads. The solution is expected to provide information of voltage magnitudes and angles, active and reactive power flows in the individual transmission units, losses and the reactive power generated or absorbed at voltage-controlled buses.

The relative properties and performances of different load-flow methods can be influenced substantially by the types and sizes of problems to be solved, by the computing facilities available, and by the precise details of implementation. Every such