SYSTEM AND LOAD POINT INDICES IN THE POWER SYSTEM RELIABILITY ASSESSMENT

This thesis is presented in partial fulfillment for the award of the

Bachelor of Electrical Engineering (Honours)

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ACKNOWLEDGEMENT

In the name of almighty God, I would like to express my sincere gratitude and appreciation to my supervisor, Encik Muhammad Murtadha Othman for his guidance, patience and encouragement during my graduate education. His advice and assistance in preparation of this thesis is thankfully appreciated.

I would like to thank my father,

for their advice, patience and consistent encouragement.

Appreciation also goes to all my friends, both inside and outside the Electrical Engineering department.

ABSTRACT

Reliability is the ability of the power system to provide an adequate supply of electrical energy to the customer. The function of a power system is to supply electrical energy on demand, economically and within acceptable levels of reliability and service quality. Power equipment such as generator units and transmission lines are generally considered as the system components. In the life time of their services, these components can be considered in many states such as running, fault repair, planned maintenance and temporary upon the power system reliability. This paper introduces the methodology to evaluate the composite system reliability of generation and transmission system by using the system reliability indices such as expected load curtailed (ELC), expected number of load curtailments (ENLC), expected energy not supplied (EENS), and expected duration of load curtailment (EDLC). These reliability indices are determined based on yearly peak load. The system reliability indices are evaluated on a case study of 3 bus system.

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CHAPTER 1

INTRODUCTION

1.1 Composite System Adequacy Indices

In the probabilistic approach to reliability assessment, appropriate indices are defined in order to evaluate the reliability performance of the system. The basic system reliability indices can be divided into two categories [1]. The first category is a set of load point indices and the second is a set of overall system indices. The load point indices are calculated for the major load points in the system and are necessary to identify weak point in the system. It is very useful to establish optimum response to system design changes for comparing alternate system configurations and modifications [1]. It is also useful on the adequacy evaluation of distribution systems [2].

The system indices are indicators of the overall adequacy of the composite system to meet the total system load demand and energy requirements and quite useful for both the system planner and the utility management. It is important to understand the two sets of indices which do not replace each other. The load point indices and the overall system indices are required in a complete assessment of power system reliability. The severity of an outage event depends on the components under outage, their relative importance and their location in the network. An outage event may affect only a small area (bus) of the system or a large area (several buses). It is important to identify the areas of the system which have poor reliability and are prone to disturbances.