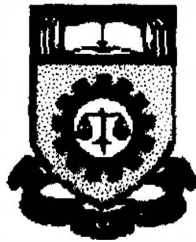


**RELIABILITY OF POWER SYSTEM – DISTRIBUTION
CASE STUDY: TENAGA NASIONAL BERHAD, KELANG**

**This is presented in partial fulfillment for the award of the
Bachelor of Electrical Engineering (Honours)
INSTITUT TEKNOLOGI MARA**



UDZAHIR BIN MOHD YASSIN

Faculty of Electrical Engineering

INSTITUT TEKNOLOGI MARA

40450 Shah Alam

Selangor

ABSTRACT

Every effort was made by the planners during the designing stage of a distribution network to ensure reliability and security of supply to the system. Due to the ever increasing electricity demand the network connecting to it tends to expand too. This phenomenon when allowed to persist without proper control and monitoring will weaken the system. Adding this to other possible causes, such as equipment wear and tear, human and natural interference, the once carefully designed network now prone to failures.

This paper will focus on the scenario and its consequences to the distribution system reliability and security. A study is carried out on an 11 kV distribution network in Tenaga Nasional Berhad (TNB) Kelang. Selection of the network or feeder for the study was based on the one that experienced the most number of outages due to system failures or breakdowns for a 12 month period between September 1997 to August 1998.

The first chapter will be the introduction and chapter two will provide general information on TNB 11 kV distribution system setup. The next chapter will focus on the profiles of the selected feeder under study. This will be followed by the system study on the feeder using Power System Simulation Advanced Distribution Engineering Productivity Tool (PSS/ADEPT) Version 1.0. The fifth chapter will be on physical onsite investigation of the feeder installations. Chapter six will provide discussion on findings gathered from the two previous chapters. The conclusion to the study will be in chapter seven which is the last chapter.

ACKNOWLEDGEMENT

I would like to thank the following for their assistance:

En. Abdul Aziz, TNB Regional Planner (Selangor); En Wan Johari Wan Ismail, En. Mohd Hadi Sohod, En. Zainal Abiden Sharif and his teams of TNB Kelang; En. Zakaria Suji and En. Mohd Ali Bakar of TNB Melaka.

I am also indebted to Tn. Haji Jani Baba, TNB Regional Manager (Selangor) for allowing me to carry out the case study in TNB Kelang which is one of the TNB stations under his administration.

Last but not least, special thanks also extended to my advisor Pn. Zuhaina Zakaria who has given great interest and concern to the success of the project.

TABLE OF CONTENTS

DESCRIPTION	PAGE
Abstract	vi
Acknowledgement	vii
Table of Contents	viii
List of Figures	xi
List of Tables	xii
Abbreviation	xiii
1. Chapter 1 - Introduction	1
2. Chapter 2 - 11 kV Distribution System	
2.1 Introduction	4
2.2 Circuit Breakers	4
2.3 Protection System	6
2.4 Underground Cables and Overhead Lines	7
2.5 Substations	8
2.6 Loads	9
2.7 Distribution Automation System	10
3. Chapter 3 – Case Study	12
3.1 Electricity Demand	12
3.2 Station Outage Record and Reliability Index	13
3.3 Feeder 8 Outage Record	14

CHAPTER 1

INTRODUCTION

The provision of uninterrupted power supply for all customers has always been one of the fundamental concerns of power system designers and operators. The reliability and security of supply is also a yardstick against which to measure the performance of a power system [1].

However, it is impractical to provide customers with an absolute 100% reliable power supply due to frequent component failures and economics constraints face by the supply authority. A prudent amount of risk therefore must be taken [2]. The relationship between reliability and various costs is shown in Figure 1.1 [3].

In the broadest sense reliability is a measure of performance. It can be divided into two general categories: system adequacy and system security [4]. In power system context system adequacy relates to the existence of sufficient facilities within the system to satisfy the customer load demand. System security on the other hand, relates to the ability of the system to response to any disturbance arising within the system. Although improving reliability would in general means incurring more cost, but the achievement of reliability usually saves many and sometimes saves life.

With regard to the application of information technology, for many years the attention of power system researchers and engineers was directed to generation and transmission systems rather than to distribution networks. This was due to the complexity and challenges of the problems associated with those systems as well as due to the very high investment, operating and outage costs for almost any unit (generation plant, transmission plant, high voltage lines) in those networks. In addition possible outages in generation and transmission systems can affect huge numbers of customers. It should also be noted that the solutions produced for generation and transmission systems often could not be directly applied to distribution systems [5].