

CHAPTER ONE

INTRODUCTION

1.1 Preface

Electrical power networks consists of generation, transmission and distribution plants. An Electrical power substation receives electric power from generating station via transmission lines and delivers power via the outgoing transmission lines. A primary grid electrical power substations are located at suitable load centers along with the primary transmission lines [1]. At these Substations high voltage (220kV or 400kV) is stepped down to secondary transmission voltages. These kind of substations consists of high voltage equipment which are:

- Power transformers
- Circuit breakers
- Bus bars
- Earthing system
- Direct current system
- Instrument transformers
- Protective relays
- Power cables

These equipment should be tested at the site before energizing the system to ensure that they work properly otherwise it will be dangerous to energize the system at high voltage because it may lead to complete failure. These sort of tests are called commissioning tests. The purpose of electrical commissioning testing on system components is two-fold. The first is to check the installation of the

equipment and its performance so that when energized, the system will function properly. The second is to develop a set of baseline test results for comparison in future testing so as to identify equipment deterioration. The system should be initially checked for damage, deterioration, and component failures using specific component checks, inspections, and tests defined by a deal between the equipment manufacturer and the customer meant by using the equipment.[2]

1.2 Problem statement

What are the commissioning tests and their procedures that should be applied to high voltage electrical equipment in a substation?.

1.3 Objectives

To study commissioning tests, their methods and their procedures for high voltage electrical equipment in substations.

1.4 Methodology

In order to achieve the project objectives the following steps are used:

- Listing the high voltage electrical equipment in a substation.
- Study high voltage test and insulation resistance test methods.
- Study commissioning test, test method and its procedure for Power transformers, Circuit breakers, Bus bars and Earthing system.
- Study commissioning test, test method and its procedure for protection system and power cables.

1.5 Project Layout:

The project consists of five chapters. Chapter one includes an introduction for commissioning test, problem statement, objectives and methodology. Chapter two includes high voltage and insulation resistance tests. Chapter three includes commissioning tests for power transformers, circuit breakers, bus bars and earthing system. Chapter four includes commissioning tests for instrument transformers, protective relays, direct current system and power cables. Chapter five consists of conclusion and recommendation.