# SENSITIVE LINE AND CRITICAL BUS IDENTIFICATION BASED ON VOLTAGE SAG ANALYSIS BY USING POWER SYSTEM ANALYSIS TOOLBOX (PSAT) SOFTWARE

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# ABSTRACT

Voltage sags and momentary power interruptions are among the most important power quality problems affecting industrial and large commercial customers. This project report presents an analysis of the voltage sag which takes into considerations of the line outages method, 3-phase fault due to line outage method and load increase method. For this analysis, power system analysis toolbox (PSAT) software was used to simulate IEEE 30-bus system. Besides that, voltage sag analysis in the power system is implemented to identify the most sensitive line due to line outage, most sensitive line due to 3-phase fault and most critical bus due to load increase hence, the occurrence of the most voltage sag is identified. For this analysis, time domain simulation is used to obtain the results.

# TABLE OF CONTENTS

# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

Power Quality (PQ) means the ability of utilities to provide electric power without interruption [1]. In recent years, power quality becomes an important concern to customers as well as utilities and facilities. The customers require higher quality of power than ever due to the increase in critical load and electronic device. Power quality problems such as sag, swell, harmonic distortion, unbalance, transient, and flicker are affect known to the customer's devices, and hence results in lost on cost production and downtime [2].

Voltage sag is short duration reductions in rms voltage, caused by short circuits, overloads and starting of large motors [1]. The interest in voltage sags is mainly due to the problems they cause on several types of equipment (adjustable-speed drives, process control equipment and computers) for their sensitivity. Equipment trip when rms voltage decreases below 90% for longer than one or two cycles [3]. Voltage sag is not as damaging to industry as a (long or short) interruption. The difference between voltage sag and interruption are voltage sag not as damaging to industry but interruption is a damaging to industry. Moreover, voltage sag at equipment terminals (transmission system) while interruption is originate in the local distribution network. Furthermore, reducing the number of voltage sag require improve on several feeders although reducing the number of interruptions typically requires improvements on one feeder. Voltage sag also is the one which cause the majority of equipment trips.

There are two types of voltage sag which is rectangular sag and non-rectangular sag [3]. The conventional method assumes that voltage profile during the sag is rectangular. Rectangular sag is the profile of voltage sag has a sharp drop at the beginning and sharp rising at the end. However, such assumption becomes incorrect in many industrial power