

**IDENTIFICATION OF AREA OF VULNERABILITY IN A POWER  
SYSTEM DUE TO VOLTAGE SAGS**

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## **ABSTRACT**

This paper presents a method to determine an area of vulnerability in power system using voltage sag analysis. The voltage sags and momentary power interruptions are among the most important power quality problems affecting industrial and large commercial customers. It may cause sensitive equipment to trip. Voltage sag analysis was used to determine the voltage sag characteristic, such as the level of the voltage sag and area of vulnerability. In this study, the fault position method is used to determine the area of vulnerability in terms of voltage sag. This report present an area of vulnerability due analysis of the voltage sag which takes consideration of apply the fault at a bus and chance in the load buses. For this analysis, power system analysis toolbox (PSAT) software was used to evaluate the voltage sag. Also fort this analysis, time domain simulation is used to obtain the results.

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# CHAPTER 1

## INTRODUCTION

### 1.1 INTRODUCTION

In a power system, the concept of area of vulnerability is useful for the evaluation of sensitive equipment when subjected to voltage lower than its voltage threshold. The threshold voltage is defined as the minimum and maximum voltage a piece of equipment withstand without failure. The area of vulnerability for sensitive equipment gives the total miles where a fault will result in voltage sag below the minimum voltage and above the maximum voltage a specified voltage threshold. This is called as power quality problem [1].

Power Quality (PQ) means the ability of utilities to provide electric power without interruption [10]. 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 problem such as sag, swell, harmonic distortion, unbalance, transient, and flicker affect known to the customer's devices, and hence results in lost on cost production and downtime [4].

Voltage sag are short duration reduction in root mean square (rms) voltage, caused by short circuit, overload, and starting large motors. Other than that, voltage sag also recognized important in the power quality problem as in industrial customer. This is because it affects the some equipment sensitive like adjustable speed drive and programmable logic controller may trip due to the sag, thus affecting industrial power losses. Such as occurrences have major economic impact on the quality of product or services. Therefore, voltage sag analysis is required to determine the voltage sag characteristics. Study as shown that when fault occurred the equipment may damaged due voltage sag results. Voltage sags at the equipment terminal (transmission system) while interruption is originate in the local distribution networks. Furthermore, reducing the