UNIVERSITI TEKNOLOGI MARA

ARTIFICIAL INTELLIGENCE

for Source Identification of Excessive Neutral-to-Ground Voltage

UiTM Professorial Lecture

AHMAD FARID ABIDIN

TABLE OF CONTENTS

PREFACE

All praise to Allah SWT, whose guidance has enabled me to complete this book, which generally touches on the Power Quality (PQ) area streamlined to the Neutral-to-Ground issue. The PQ area is one of the important topics nationwide as well as in the global environment due to the flourishing of the industrialisation sector and the current age of Industrial Revolution 4.0. Issues related to PQ have arisen since the early 1990s, when the proliferation of the usage of electronic devices and equipment in humankind's activity for their daily lives occurred. The high sensitivity of such devices and equipment leads to high demand for a resilient and clean electrical supply for electrical users. The resilient and clean electrical supply is very difficult to quantify, as there are many parameters that need to be considered in the electrical environment. In an electrical system, voltage and current play a very important role in ensuring the sustainable electricity supply for electrical users. The characteristics of voltage and current have been identified as important factors to ensure the sustainable operation of highly sensitive electronic devices and equipment. The study of these characteristics of electrical parameters related to the electrical system performance has been clustered as the PQ area.

The PQ is one of the main concerns for various electrical stakeholders for optimal operation in their businesses. The inability to facilitate the electrical system with a required PQ can deter the

CHAPTER 1

Electrical Power System

INTRODUCTION

Power Quality (PQ) is one of the areas in power engineering studies which focuses on problem-solving in power system issues related to the electrical waveform (voltage and current) irregularity. Basically, the PQ studies can generally be divided into three main areas: monitoring, problem identification, and mitigation techniques. These areas primarily concentrate on the process of solving the PQ issues in the electrical system. The sequence of processes needs to start with monitoring activity, followed by problem identification based on the data acquired during the monitoring phase. The final part of solving the PQ issues is to implement the mitigation technique after the actual PQ problem has been identified. All of these processes are equally important, as every process could facilitate systematic and comprehensive problem-solving for PQ issues.

When discussing the PQ issues, one of the predominant topics in this area is tackling them through Power Quality Disturbance (PQD) identification. In general, PQD can be described as the voltage and/or current waveform that leads to PQ issues in the electrical system. There are various PQDs which have been identified to cause problems in the electrical system. Excessive Neutral-to-Ground Voltage (ENTGV) is one of the frequent PQDs experienced in local

This book focuses on addressing power quality (PQ) issues through the Excessive Neutral-to-Ground Voltage (ENTGV) source identification approach. From a PQ perspective, there are various causes that lead to the occurrence of ENTGV. The source of ENTGV can be identified or even localised with systematic knowledge acquisition. The formulation of systematic knowledge acquisition in this book is developed through the incorporation approach of the data acquisition, signal processing technique, and Artificial Intelligence (AI). This approach is one of the common approaches which has been developed to tackle different PQ issues worldwide. Data acquisition involves real data monitoring and the development of distribution electrical system modelling. As for ENTGV source identification, the decision-making scheme, which is also known as the output processing scheme, is adopted via the AI-based technique. This resilient approach has been proven to be reliable in tackling PQ issues, as demonstrated by various prominent researchers.

Ahmad Farid Abidin is a Professor in electrical engineering at Universiti Teknologi MARA (UiTM). He received a PhD in Electrical Engineering from Universiti Kebangsaan Malaysia in 2011, a Master of Science in Electrical Engineering from Universiti Teknologi MARA in 2005, and a Bachelor of Engineering (Hons) in Electrical, Electronic, and System Engineering from Universiti Kebangsaan Malaysia in 2000. He has held various managerial positions at UiTM and is currently the Dean of the Faculty of Electrical Engineering, Universiti Teknologi MARA. He is actively participating in the Institute of Electrical and Electronics Engineers, Power Engineering Society (PES), where he has served various portfolios in the PES Malaysia Chapter. Additionally, he has been actively involved in the Engineering Accreditation Council (EAC) and Engineering Technology Accreditation Council (ETAC) as an accreditation panel since 2017. To date, he has published over 100 publications, including journal proceedings, technical papers, books, and chapters in books. His research interest is in power quality, signals, and artificial intelligence in power engineering and engineering education.

ISBN 978-629-496-146-3

Harga / Price : RM 86.00

9 786294 961463

PENERBIT PRESS
UNIVERSITI TEKNOLOGI MARA