UNIVERSITI TEKNOLOGI MARA

BACTERIAL FORAGING OPTIMIZATION ALGORITHM FOR OPTIMAL LOAD SHEDDING IN POWER SYSTEMS

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 19th January 2016 to conduct the final examination of Wan Nur Eliana Afif Binti Wan Afandie on her Master of Science thesis entitled "Bacterial Foraging Optimization Algorithm for Optimal Load Shedding in Power Systems" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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ABSTRACT

Today's power grids transfer more electricity over a wider area. Present-day economic and environmental constraints push power system to be operated closer to their limits, which make them more vulnerable to disturbance. Thus, the wide-area outage has become a real threat to modern power systems. A common limiting factor for power transmission is the risk of voltage instability in recent years. As the ultimate countermeasure to voltage collapse, load shedding is normally considered the last resort, where there are no other alternatives to stop as approaching voltage collapse. It is an emergency control action in power system that can save systems from blackout. This thesis mainly focus on the widely used under voltage load shedding schemes (UVLS). There are two important things to be considered while performing load shedding. They are locations of load to be shed and the amount of load to be shed. For this research, there are two types of load shedding being tested, Random Generated Locations Load Shedding and Fixed Locations Load Shedding. Voltage stability index, L_{index}, is used in determining the load shedding locations for Fixed Locations Load Shedding. By using Bacterial Foraging Optimization Algorithm (BFOA) technique, for each types of load shedding, the simulations are tested on IEEE 30-bus system for 3 and 5 load shedding locations. 3 different load conditions and one line outage cases are tested for 3 objective function and 3 multi-objective functions. The best objective functions for each case then determined by comparing the simulation results. These simulation results are also compared to the simulation results obtained using Evolutionary Programming (EP) technique. It is proven that BFOA gives better performance when compared to EP.

TABLE OF CONTENTS

CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND STUDY

As the population around the globe keeps on growing, the demand for electricity is also growing. Something must be done to ensure the continuation of supply under a stable voltage stability condition. Problems with voltage stability arise in the deregulated environment since power systems operate closer to their stability limits. Larger amounts of energy are being transmitted on greater distance [1]. Innovative and cost-effective voltage collapse countermeasures are necessary, as the financial constraints and competition in the electric power industry increases. The most effective improvement of the voltage stability limits is building new transmission lines and generation facilities. But it is very hard to get a new corridor for transmission lines or a new location for a power plant [2]. Various methods and approaches can be used to reduce the voltage instability risks event from occurring like improving reactive power resources and its reaction, review and maintain line loading limits and implementing UVLS schemes [3].

Load shedding is one of the available methods that can be applied in maintaining the stability of a power system and also avoiding voltage collapse. Load shedding might be the last option as the solution, but it is the most cost-effective long term solution during large disturbance. It is done by taking out certain amounts of load from a power system, at certain locations so that the system can operate continuously.

Generally, there are two schemes of load shedding; Under Voltage Load Shedding (UVLS) and Under Frequency Load Shedding (UFLS). UVLS is generally applied as a safety measure in situations where voltage collapse is anticipated and can potentially result in blackout. At the stage of voltage collapse, load shedding is an effective countermeasure if all the other reactive sources have been exhausted. This study is mainly focused on UVLS in which the main part of this load shedding scheme is to determine the optimum locations and amount of load to be shed.