OPTIMIZATION OF REACTIVE POWER PRICING BY USING ANT COLONY ALGORITHM

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ABSTRACT

Reactive power involves optimal placement and sizing of capacitors in a network such that operating and investment costs are reasonable. The amount of reactive power necessary to be supplied must follow system reliability in a way to guarantee that the transmission voltage is at the required level.

In this research, reactive power dispatch is planned by using Newton-Raphson Load Flow equation and Economic Dispatch problems. Then, by using Ant Colony Optimization technique, the optimal problem is expected to be solved. The algorithm is based on ant's behaviour. Ant tends to use the shortest routes between their nest and food source. During exploration, the left behind chemical trail namely as "pheromone" trail. The trail guides other ants along the routes. Unpopular routes will have the pheromone trail evaporated. The algorithm has enhanced the power flow and the fees were comprehensively decreased.

The analysis was performed on two types of bus system; IEEE 9-Bus system and IEEE 30-Bus system. The calculation was simulated by using MATLAB software. The obtained results display the reduced cost of reactive power. The results should helps to determine the best price that energy provider can use to represent the cost of reactive power dispatch. In the future, the reactive power planning can be enhanced further by running several optimization techniques. The results should be compared to indicate the most optimum reactive power pricing.

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CHAPTER 1

INTRODUCTION

1.1 REACTIVE POWER

Reactive power can be translated as the ratio of real to apparent power. Reactive power existed in alternating current system. It is during the moment that voltage and current flows out of phase that reactive power is transmitted along with real power. Reactive power is measured in VAR unit. Reactive power has an inimitable and confusing characteristic. Very few people really recognize the concept of reactive power. The amount of reactive power energy that flows in one direction will be equal to the energy that flows in the opposed direction. In other words, reactive power is neither produced nor consumed. To simplify the case, reactive power is measured as losses, introduced by numerous electric equipments. Motor loads and several other loads necessitate reactive power to convert the flow of electron into useful work. If there is insufficient amount of reactive power supply, it would lead to voltage sag event and it is unfeasible to push the power demanded by loads through the lines.

Reactive power is a by-product of alternating current (AC) system. Reactive power is crucial for the operation of transformer, transmission line, and several types of motors. Electric motors require reactive power to produce magnetic field for their operation. Reactive power is present when the voltage and current is out of phase. If the current waveform leads voltage waveform, it is known as the reactive power with leading power factor. On the other hand, if the current waveform lags the voltage waveform, it is known as the reactive power with lagging power factor.