ABSTRACT

The solution to the Optimal Power Flow (OPF) problem gives the optimal active and reactive power dispatch for static loading conditions of power system. Another aspect is that the increase in peak load demands and power transfer between utilities have elevated concerns about system voltage Stability. The OPF challenge could be defined as the best possible allotment of energy structure controls to gratify the precise purpose of fuel expenditure, energy loss, as well as bus voltage divergence. The main objective of OPF is improvement in voltage stability. There are many conventional methods to calculate load flow problems such as Gauss Seidel (GS) Method, Newton-Raphson (NR) Method, Linear Programming (LP) Method, Fast De-Coupled (FD) Method, Non-Linear Programming (NLP) Method, Quadratic Programming (QP) Method, Interior Point (IP) Method, etc. All these methods have certain drawbacks.

Particle Swarm Optimization (PSO) optimizes a difficulty by comprising a group of candidate answers, referred to as simple numerical procedures over the particle's location and speed. In this research various intelligent and optimizations techniques are proposed to overcome drawbacks of the PSO in OPF. The performance of Particle Swarm Optimisation based optimal power on the IEEE 30 bus system is analyzed. In this analysis the objective function of PSO is programmed in order to attain voltage stability
with minimum cost function. Voltage stability performance of PSO based OPF is analysed by the comparison of each bus voltage before and after PSO based OPF. Bat algorithm is an optimization algorithm inspired by the echolocation of bats. Bats perform echolocation for updating their position. Bat echolocation is a system in which a series of loud ultrasound waves are emitted to create echoes. To minimize the best cost and total losses in this research BAT algorithm is proposed for the same IEEE 30 bus system.

Genetic algorithms (GAs) are the main paradigm of evolutionary computing and inspired by Darwin's theory of evolution- the "survival of the fittest." GA is proposed for OPF not only to minimize the best cost and voltage stability; it is proposed to minimize the execution time for voltage stability for the same system. Finally, for controlling the power flow and enhancing system stability, the research includes FACTS device of UPFC. UPFC provides control of power system parameters, such as terminal voltage, line impedance, and phase angle, thereby providing necessary real and reactive power flow control. DC link voltage controller in UPFC plays a vital role in control of terminal voltage and power. PI and Simulated Annealing (SA) methods are used as DC link voltage controller and analysed. Performance of UPFC by proposed SA method is compared with PI in the aspects of DC link voltage, real and reactive power, and THD.