ABSTRACT

The primary sources of electrical energy in our country are coal based thermal power stations and the hydro electric power stations. The main objective of the electric power utilities is to provide high quality reliable power supply to the consumers at the least possible cost. In order to achieve this objective, the power engineers have to sort out the problems associated with Indian power Industry and the issues related to all such problems should be addressed technically. The important problems associated with the Indian power industry are the economic load dispatch, the combined economic and emission dispatch, the economic load dispatch with the prohibited operating zones, the unit commitment problem and the short term hydro thermal coordination. The economic load dispatch finds the optimal power output of all the generating units at a particular hour such that the total fuel cost is minimum provided all the system constraints are satisfied. Due to the Clean Air Act Amendments of 1990 (CAAA) and the Kyoto protocol, the thermal power generating utilities have to abide by the emission limits. The problem of combined economic and emission dispatch deals with the minimization of both fuel cost and emission of pollutants such as oxides of Nitrogen and oxides of Sulphur.

The scheduling of thermal power generating units is affected by the prohibited operating zones of generating units due to valve point loading. The problem of economic load dispatch with prohibited operating zones poses challenges to power engineers for efficient solutions. The unit commitment deals with finding the on / off status of all the available generating units such that the total production cost is minimum provided all the system constraints are satisfied. The short term hydrothermal scheduling problem needs efficient solution methods due to the fact that the hydro and thermal constraints are highly nonlinear in nature.

The conventional solution methods such as lambda iterative method, linear programming, quadratic programming, branch and bound technique and dynamic programming method can be applied to the solution of the above said problems. But due to the nonlinear nature of the problems, these methods may get struck at local optimal solution. Recently there is an upsurge in the use of non conventional
methods like genetic algorithms, simulated annealing, tabu search and evolutionary programming. These methods are having the advantages of searching the solution in the search space with a population of chromosomes and climbing many peaks in parallel in the solution space. So the possibility of obtaining the global or near global optimal solution is more compared with other methods.

In this thesis, an evolutionary programming method has been proposed to solve the economic load dispatch of systems with combined cycle cogeneration plants, combined economic and emission dispatch of a thermal system, economic load dispatch of a thermal system by considering prohibited operating zones, unit commitment of a test system by considering all system and thermal constraints and short term hydrothermal scheduling of test systems by considering all thermal and hydro constraints. The standard IEEE test systems have been taken for study and solved by the proposed evolutionary programming method. The solution obtained by the proposed method has been compared with the results obtained by other methods. The comparison of results demonstrates that the proposed evolutionary programming method is efficient in solving the nonlinear power system problems and has been proved in the aspects of solution quality and computational efficiency.