CHAPTER 11

CONCLUSION

11.1 INTRODUCTION

This chapter is aimed at reviewing the significant results obtained during the course of this work and making some suggestions for the future line of research in this area. Before reviewing the work done, the objectives of this investigation are recapitulated below.

Generation companies can now consider a schedule that produces less than the predicted load demand and create the maximum profit. This problem is referred as Profit Based Unit Commitment (PBUC) problem.

To determine the on/off status as well as the real power outputs of the 2, 3 and 10 generating unit system such that the demand, the operational and the reserve constraints, over a short-term horizon, are economically satisfied using the new artificial intelligence models for both small and large-scale system. The numerical results of the proposed techniques are compared with the techniques like LR-EP, ACO, MAS, Muller, Improved PSO and Shuffled leap Algorithm. These compared results reveal that the hybrid algorithm in proposed techniques is more effective in terms of Profit.

Profit Based Unit Commitment with emission optimization is solved using hybrid algorithm which gives the maximum profit. Hybrid algorithm is used to determine on/off status of generator with minimum emission and maximum profit. Using hybrid algorithm, multiple objective functions of minimization of emission and maximization of profit are carried out for IEEE test systems consisting 3 unit and 10 generating units.

11.2 REVIEW OF THE WORK DONE

Memory Management Algorithms and their techniques explore the means to solve PBUC. Memory Management Algorithms used Best Fit and Worst Fit allocation for allocating power to maximize profit. In PBUC, memory present in the system is equated to the maximum capacity of generator units and the process is equated to the forecasted demand. MMA dynamically chooses the algorithm, based on the number of generator units available in the system. If the number of generators is greater than five, then profit is high for Worst Fit Algorithm rather than for Best Fit Algorithm. MMA developed in Java for web based application can be monitored from anywhere if it could be hosted in the web. MMA is improved to give more accurate solution with less computational time compared to existing methods and is thus amenable for web based operation required in deregulated environment.

An algorithm based on Particle Swarm Optimization technique, which is a population based global search and optimization technique, has been developed to solve PBUC problem. The effectiveness of these algorithms has been tested on systems comprising two, three and ten units and compared for profit. It is found that the result obtained from PBUC using Particle Swarm Optimization are maximum than the results obtained from Memory Management Algorithm. But the computational time is here greater than MMA.

Gradient Descent (GD) proves to be the best possible machine learning optimization available to determine the global minima of a particular function. Similarly Logistic Regression is the recent and most efficient technique in predicting the Best Fit among binary status options, generator on/off status in this case, using a predefined criterion or a training data set. The efficiency of Artificial Neural Network which acts as a background for regression classifier in dynamically allocating adaptive learning rates also enhances the system performance. Hybrid algorithms maximize the profit with effect of probability of reserve than MMA and PSO and the computational time is greater than MMA and PSO.

Next, the effect of shut down cost and shut down time on profit and power allocation is investigated. The shut down cost is included to the objective function and the shut down time to the scheduling and the problem is solved using MMA, PSO and Hybrid algorithms. It is found that MMA has very high sensitivity, PSO has good reliability and the Hybrid algorithm has good sensitivity and reliability.

Next, Profit Based Unit Commitment with emission optimization is solved by using hybrid algorithms of GD, LR and ANN which gives maximum profit among these three algorithms. The method is tested on the 3 unit 12 hour and 10 unit 24 hour models. Effect of probability of reserve is not allocated while minimizing emission. Emission has been considered as a constraint in the previous researches but in this work, emission has been considered as an objective function. Hence comparison of the result with previous works is not feasible. Through the tests, it can be obtained that our approach can find the optimum trade-off relationship between the profit and emission. With minimum emission added, the end user can enjoy minimum emission of economic power.

Extending the above mentioned technique, the multiple objectives of maximizing the profit and minimizing the emission are combined to form a unified objective by scalarization technique. The modified objective function is optimized using various algorithms. The profit to emission ratio is considered to be the figure of merit and the maximum profit to emission ratio is obtained using Hybrid Algorithms of GD, LR and ANN. When compared with the individual objective method discussed earlier, the single-objective method is found to give a better profit to emission ratio.

Next, the spot pricing data have been replaced with the spot price models. The Switching Stochastic model has been applied and the spot prices are predicted. The predicted spot prices are applied and the PBUC problem has been solved. The results are compared with the spot price data results and it is found that the implemented model is an optimistic estimate of the spot prices.

11.3 FUTURE LINE OF RESEARCH

As a continuation to the results obtained in the present investigation, the following future line of research seems to be worth pursuing.

11.3.1 Maximizing profit including Ramp Limit Constraint

A generator cannot suddenly increase its power from hour to hour. There are physical parameters that govern the rate of increase of power in a generator. These are called ramp limit constraints. Including the ramp limits may contribute to a more accurate modeling of a real world scenario.

11.3.2 Including Optimal Power Flow and Available Transfer Capability

The current research focuses on the operation of a GENCO alone. But the generated power has to wheeled and distributed to the consumers. The Available Transfer Capacity of the bus system to which the GENCO is delivering the power has an impact on the wheeling of the power. The impact of ATC on the power allocation could be considered. Also, there is an optimal power which when flowing through the Transmission bus system, causes minimum power losses, subject to the power flow constraints. The effect of this Optimal Power Flow could also be considered when the GENCO generates power for each hour.