CHAPTER 6

CONCLUSION AND SCOPE FOR FUTURE WORK

Wind speed prediction presents to be one of the challenging tasks to the researchers due to its variable nature. One hour-ahead prediction is suitable for small power systems operations and one hour electricity markets. However, one day prediction is appropriate for interconnected power system operations such as unit commitment, conventional generators scheduling, as well as one day electricity markets. Therefore, 24 hours (short term prediction) forecasting model is developed for wind speed. A new improved ANN prediction tool such as WNN is proposed for prediction of average wind speed and is compared with CFBP, PNN, KNN and GRNN. The proposed hybrid WNN model has proven to be an effective way for wind speed forecasting.

With the forecasted results and with the integration of wind generators, the ED problem is solved using PDIP, DE, BFT and SFLA. Conventional technique such as PDIP and AI techniques are used for solving non-smooth economic dispatch problems. Test systems namely 3,13,40, Indian utility 66 bus system (12 unit) and IEEE 118 bus (54 unit) system along with three wind generators are considered for analysis. The generation costs and execution times for the test systems are obtained and are compared. In case of simple ED, PDIP converges very quickly and always the obtained results are consistent. But while considering prohibited zones in ED, PDIP undergoes several combinations of prohibited areas and hence takes more computational time. AI techniques search for the global optimum and converge to the optimal solution. Among the different AI techniques applied,
SFLA is superior than other AI techniques discussed. Since the algorithm is based on swarm intelligence heuristic computing technology, it has a highly efficient computing performance and good global search capability. The population is made of frogs which can communicate with each other. Each frog can be a meme vehicle. The frog population evolves by population communication. The advantages of SFLA are simple steps, few parameters, quicker convergence and easy realization.

Further an attempt has been made at optimal scheduling of wind powered units with conventional units in an OPF framework, while considering the variable nature of wind. The work not only optimizes the generation cost of wind–thermal generators, but also focuses on obtaining a generation schedule which could operate the system reliably with variation of wind power. To achieve this reliability, energy storage systems are integrated and the optimal location and sizing of energy storage systems are found using SFLA. Demand response is becoming a promising field of study in operation and planning of restructured power systems. Customers can contribute to the operation of power systems by deployment of demand response. It is also shown that reducing just 20% of the volunteered customers’ demand (due to price elasticity) resulted in a good benefit.

Future research can focus on investigating alternative solving techniques with the aim of further improving convergence and also for forecasting of wind speed. Further an algorithm that integrates wavelet transform, adaptive genetic algorithm and fuzzy systems with generalized neural network can be applied for load forecasting. Short term load forecasting can also be carried out by a new method called as group method of data handling (GMDH). This GMDH can also be combined with WNN for better forecasting of load.

There are also challenges how to maintain the stability and reliability of a grid with highly penetrated renewable energy. Solar energy is also another
renewable source in which researchers are focusing. Development of hybrid (solar-wind) could be one of the emerging area for research. Several researches are going on in the area of energy storage devices. This research can also be extended to highlight the big data issues and challenges faced by the DEM employed in smart grid networks. Different ESSs are available such as flywheels, batteries, pumped hydro, compressed air storage etc. Depending upon the requirement, environment, area of installation, cost etc energy storage devices are to be chosen optimally.