ABSTRACT

With the recent advantages in technologies, use of DG in the distribution systems is increasing. In this thesis the analysis incorporating DG into Radial Distribution Systems (RDS) and its impact on total power losses, voltage profile and Probability Indices such as SAIFI, SAIDI, CAIDI and AENS are discussed and presented. The different methods are developed for prime position and capacity of DG units. In this case, studies on distributed load flow and backward-forward sweep algorithms are employed.

In Chapter 2, position and capacity of DG units are analyzed with distribution load flow. Further, Probability Indices are evaluated by increasing number of DG units and analysis of DG at each position with COPT is assessed and presented. The above method is tested on RDS and results are presented.

In Chapter 3, Photovoltaic (PV) system model is developed in SIMULINK which is a new approach applied for a radial network is presented. The algorithmic procedure is used to develop the SIMULINK model and PV with Incremental Conductance Method has been presented. The position of DG units is analyzed based on voltage profile and sizing of DG units is done with series and parallel cells of PV system. Further, the PV system is interconnected to RDS and the influence of DG units on total active power losses, voltage profile and Probability Indices are analyzed and presented. To check the performance of the proposed method a 10 and 15 Bus RDS is considered and results are presented.

In Chapter 4, Wind Energy Conversion System (WECS) is modeled in SIMULINK with doubly fed induction generator. To track the wind speed and to control the maximum power output incremental conductance method with Cuk converter is employed. An algorithmic procedure to develop the SIMULINK model of WECS is presented. Further, this WECS is interconnected with RDS to check the performance on total power losses, voltage profile and Probability Indices. The above method is trialed on RDS and results are presented.

In Chapter 5, optimization method namely Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) is applied for position and capacity of DG unit and Capacitor Bank. The multi-objective functions with power loss index, reliability index and voltage sensitivity index are considered for analysis. For finding voltage
profile at each node and total active power losses, backward-forward sweep load flow algorithm has been employed. The impact of DG unit and capacitor bank on total system active and reactive power losses, voltage profile, VSI and reliability parameters such as Expected Interruption Cost (EIC) and Energy Not Supplied (ENS) index are analyzed and presented. To check the performance of above proposed method, 10 and 15 Bus RDS are considered and results are presented.

In Chapter 6, the summary of above proposed methods with comparisons on different radial networks and scope of the future work are presented. The line, load and reliability data for test systems employed in the analysis are presented in Appendix.