ABSTRACT

The aim of this thesis is to perform studies on some issues on proper planning and operation of DGs in distribution systems.

Inherent unbalanced nature of power distribution networks necessitates application of 3-phase load flow analysis for proper studies and investigations. To study the impacts of DGs on distribution system operation, DG models are required to be included in the load flow programs. The existing distribution load flow methods are not properly equipped to consider the unbalanced loading of the generators, and to fulfill the essential requirement of maintaining balance in the 3-phase internal voltage of the generators. In this thesis, two different load flow methods have been proposed to mitigate the above problems. One method uses PSO is to take necessary corrective actions for achieving internal voltage balance, and in the second method, necessary corrections are introduced based on the mismatch of relevant quantities.

During unbalanced operation of distribution systems, DGs are subjected to the problem of partial overloading. a condition in which one or two of the three phases of the generator get overloaded even if the total 3-phase power output of the generator is within its rated capacity. Partial overloading of generators beyond certain limits is undesirable and must be avoided. In this thesis, a load flow technique based on N-R algorithm has been proposed to deal with the problem. A second method is also suggested based on the improved load flow method already presented in the thesis.

The problem of network power loss minimization by proper DG placement has been addressed by many researchers considering various operational and design constraints. But these studies do not consider any constraint on partial overloading. An investigation has been done in this thesis to incorporate partial overloading constraints in the problem of DG placement.

Finally, a conclusion has been drawn and a brief note on further scope of studies is also included.