The electric power distribution usually operates in a radial configuration, with tie switches between circuits to provide alternate feeds. The losses would be minimized if all switches were closed, but this is not done because it complicates the system’s protection against overcurrents. Whenever components fail, some of the switches must be operated to restore power to as many customers as possible. As loads vary with time, switch operations may reduce losses in the system. All of these are applications for reconfiguration.

The reconfiguration problem is a combinatorial problem, which precludes algorithms that guarantee a global optimum. Most existing reconfiguration algorithms fall into two categories. In the first, branch exchange, the system operates in a feasible radial configuration and the algorithm opens and closes candidate switches in pairs. In the second, loop cutting, the system is completely meshed and the algorithm opens candidate switches to reach a feasible radial configuration. Reconfiguration algorithms based on neural network, heuristics, genetic algorithms, and simulated annealing have also been reported, but not widely used. These existing reconfiguration algorithms work with a simplified model of the power system, and they handle voltage and current constraints approximately, if at all.

The objective of the thesis presented in this work is to make a Tabu Search (TS) based algorithm for multi-objective programming to solve the network reconfiguration problem in a radial distribution system. With the appearance of the Tabu Search, by Fred Glover in 1986, diverse applications have arisen from the procedure to solve diverse problems as for the classic problem of the route of the vehicle (also known as the travelling agent problem) and the allocation of a plant. Here six objectives are considered in conjunction with network constraints. The main objective of research is allocation of optimal switches to reduce the power losses of the system. It is tested for 33 bus systems. Simulation results of the case studies demonstrate the effectiveness of the solution algorithm and proved that the TS is suitable to solve this kind of problems.