The main objective of this research is the development of an evolutionary programming approach for solving several categories of power system economic dispatch problems that are difficult to solve by classical optimization methods. A common evolutionary programming approach has been proposed for the power dispatch problems such as economic dispatch of generators with prohibited operating zones, economic dispatch of generators with multiple fuel options, combined environmental / economic dispatch with conflicting objectives and multi-area economic dispatch with tie-line constraints. The proposed approach takes into account the different constraints associated with each category of the above mentioned economic dispatch problems. It can be adapted to any category of economic dispatch problem which involves optimization of objective function that is non-linear, discontinuous and non-convex in nature. It considers the power balance equality constraint and inequality constraints such as unit generation limits, reserve constraints, ramp rate limits and tie-line constraints.

The power system economic dispatch problem with prohibited operating zones leads to discontinuities in the input-output characteristics. This kind of problem can be directly solved using the proposed approach without any additional computations.
The popularity of the proposed unconventional evolutionary programming approach is due to its significant property of dealing with optimization problems without any restriction on the shape of the function to be optimized. This property has been utilized in the present study to optimize the piecewise quadratic function pertaining to economic dispatch problem with multiple fuel options. This approach takes into account the power-balance constraint and capacity-limits constraint. It is direct, simple and easy to implement, as it needs no additional computations to deal with piecewise quadratic cost curves.

The proposed approach has also been applied for solving the power dispatch problem with two objectives viz., minimization of fuel cost and minimization of emission. The second objective makes the power dispatch problem a combined environmental/ economic dispatch problem. To demonstrate the effectiveness of the approach in solving the bi-objective problem, a sample system of six generating units with nitrogen oxide emission is considered. The results obtained using the proposed approach are found to be exactly the same as those obtained using the existing techniques.

The proposed approach is extended for solving multi-area economic dispatch problems with tie-line constraints. It is observed that the inclusion of tie-line constraints in the multi-area economic dispatch problem does not complicate the proposed approach. The global or the near global optimal results obtained for the test cases considered indicate the applicability and
validity of the proposed approach for solving multi-area economic dispatch problems.

This proposed method of initialization, avoidance of generating infeasible solutions in the subsequent generations, and the proper weight assignment for selection leads to convergence within a few generations with less population size and less computing time. To demonstrate the effectiveness of this approach, it has been applied to several power system economic dispatch problems of various categories with different sets of operating constraints. The study showed that the evolutionary programming approach is a more flexible and powerful tool for solving power system economic dispatch problems.