Abstract

Power system scheduling is an important aspect both from the economic and environmental safety viewpoints. Mathematical optimization methods have been used over the years for many power systems planning, operation, and control problems. An optimization problem is a mathematical model where main objective is to minimize undesirable things i.e. cost, energy loss, errors, etc. or maximize desirable things i.e. profit, quality, efficiency, etc. subject to some constraints.

In this thesis, intelligent control like differential evolution, quasi-oppositional differential evolution, evolutionary algorithm, genetic algorithm, simulated annealing, opposition based differential evolution, improved real coded genetic algorithm, teaching-learning based optimization, modified teaching-learning based optimization, heat transfer search algorithm, meta-heuristic techniques have been applied to solve different complex power system optimization problems such as multi area economic dispatch, dynamic economic dispatch, combined heat and power economic dispatch, short-term hydrothermal scheduling problem of fixed head and variable head hydro thermal power systems. Results obtained from all the techniques were compared with the results obtained from other computational intelligent technique. It has been found that the results are competitive and quite encouraging**.**

Power generation system largely depends on fossil fuels to generate electricity. Due to various reasons, the reserves of fossil fuels are **declining** and will become too expensive in near future. At the same time, generation of power from fossil fuels causes hazardous gases and particulates to emit, which pollutes the air and causes significant and long term **damages** on **the** environment. For this reason, extensive research works have been conducted for last few decades from different perspectives to reduce **both** the fuel cost as **well as the** emission of hazardous gases in power generation system. This power

generation problem is commonly referred to as the economic emission dispatch (EED) problem.

The proposed method has been validated by application of three types of EED problems. These are (i) Multi-objective Economic Environmental Dispatch of Variable Hydro-Wind-thermal Power System (ii) Economic Environmental Dispatch of Wind Integrated Thermal Power System (iii) Application of NSGA II in Economic Environmental Dispatch of Thermal-wind-solar power system.

In this study, also two different algorithms have been applied to solve combined heat and power economic dispatch (CHPED) problem.

1. NSGA II
2. WOA

Simulation results attained from the recommended technique i.e. NSGA II are compared with those attained from SPEA 2. It is seen that the recommended technique proffers a cutthroat performance.

Again WOA is recommended to solve complex multi-region combined heat and power economic emission dispatch problem. For testing purpose, two plants are considered from each type. All plants are taken in cascaded form. This mixed system is tested to verify the performance of WOA. The result obtained from the proposed WOA is compared with NSGA II. The numerical results obtained from the comparison shows that the value of fuel cost and cost of emission are minimum for the proposed method. It is also verified from the results that very less CPU time is required for this method as compared to other method.

This work introduces a new approach based on new optimization algorithm to study power system Economic Dispatch problems with valve-point and dynamic effects, formulated as a constrained optimization problem.

The proposed method has been applied to several test cases and compared with other methods in the literature.

The results suggest that proposed algorithms performs a better optimal solution and significant reduction of computing times in most of the cases.