Abstract

This paper proposes a new Hybrid Particle Swarm Optimization (HPSO) algorithm that integrates the features of Evolutionary Programming (EP) and Particle Swarm Optimization (PSO) to solve the Profit Based Unit Commitment (PBUC) problem in deregulated power market with emission limitations. The twin objective optimization problem is formulated to maximize the profit of the generation companies and minimize the emission of gaseous pollutants into the atmosphere by satisfying all the system constraints. In this paper, the EP method is applied to solve the 1-0 part of the PBUC problem and PSO method optimizes the economic load dispatch (ELD) which is a sub-problem of PBUC. The concepts of Tabu list (TL) and Aspiration criteria are applied to fine tune the search process in the more promising region of the solution space. The proposed algorithm is verified on IEEE 39 bus system having 10 generating units for 24 hour load pattern. The results obtained are quite encouraging and useful in deregulated power market. The solution of traditional UC and PBUC with and without emission limitations is compared with Improved Artificial Bee’s Colony (IABC) algorithm, Shuffled Frog Leaping Algorithm (SFLA), Muller’s method and Ant Colony Optimization (ACO) method which are
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presented in the literature. The comparison of results demonstrates the ability of the proposed algorithm for obtaining maximum profit with minimum emission level.

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Index Terms

Computer Science  Power Systems
Keywords

Evolutionary Programming, Particle Swarm Optimization, Emission Limitations, Economic Load Dispatch, Profit Based Unit Commitment, Tabu List.