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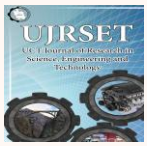

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Wind Energy Uncertainties in Multi-objective Environmental/Economic Dispatch Based on Multi-objective Evolutionary Algorithm

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ABSTRACT

This paper a Multi-objective Honey Bee Mating Optimization (MOHBMO) is proposed for Environmental/ Economic Power Dispatch (EED) problem. This paper proposes a new environmental/economic load dispatch model that considers cost and emission function coefficients with uncertainties and the constraints of ramp rate. Due to the environmental concerns that arise from the emissions produced via fossil-fueled electric power plants, the classical economic dispatch, which operates electric power systems so as to minimize only the total fuel cost, can no longer be considered alone. Actually, EED problem is the scheduling of generators which fulfill the load demand of the power plants using fossil fuel and also making combined production, in order for them to perform with minimum cost and emission. Therefore, by EED, emissions can be reduced by dispatch of power generation to minimize emissions. Which is affect on power generated, system loads, fuel cost and emission coefficients in real-world situations. The MOHBMO technique has been carried out on the IEEE 30- and 118-bus test system. This technique is compared with other techniques which reveals the superiority of the proposed approach and confirms its potential for solving other power systems problems.

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MOHBMO, Minimum cost and emission, EED, Multi-objective problem.

Introduction

The conventional economic dispatch problem mainly concerns minimization of operating cost subject to diverse unit and system constraints. However, the environmental pollution problem caused by generation has been presented in recent years. Therefore, people think more and more of how to decrease the emission of maleficent gas, and have proposed many feasible strategies. The different strategies [1-2] have been proposed to reduce the atmospheric emissions. These include installation of pollutant cleaning equipment, switching to low emission fuels, replacement of the aged fuel-burners and generator units, and emission dispatching. The literature [3] pointed out that the first three options should be as long-term options. The emission dispatching option is an attractive short-term alternative. In fact, the first three options should be determined by generation companies, but not by regulation department, especially in the environment of power market. Secondly, the target we should pursue in a long run is to reduce the emission, in other words, we should reduce the emission of the generation companies with high emission by the rule, which not only makes the generation companies do their best to reduce emission, but also embodies the impracticality principle. So, the environmental/economic load dispatch problem considering emission of maleficent gas is a kernel issue in power market.

The EED problem is formulated as a nonlinear constrained multi-objective problem with competing and non-commensurable objectives of fuel cost, emission and system loss. Consequently, single objective and conventional optimization methods that make use of derivatives and gradients, in general, are not able to locate or identify the global optimum. The considered problem in this paper is a multi-objective problem with conflicting objectives because pollution is conflicting with minimum cost of generation. Several strategies and techniques are proposed for solving the EED problem. Accordingly, multi-objective Genetic Algorithm (GA) is presented in [6-7], hierarchical system approach [1], fuzzified multi-objective particle swarm optimization algorithm [8], fuzzy linear programming [9], fast Newton-Raphson algorithm [10] and linear programming [11-12]. It is clear that for this kind of optimization problem in power system, the final cost is really important. Also, saving the cost and decreasing it using several techniques leads to bulk thrift for power system in long time.

Honey Bee Mating Optimization (HBMO) consist of the high ability, great potential and good perspective for solving optimization problems. Its main advantage is the fact that it uses mainly real random numbers, and it is based on the global