A RESEARCH PROPOSAL ON MULTI-OBJECTIVE BASED ECONOMIC EMISSION DISPATCH PROBLEM USING THERMAL-WIND: A HYBRID TECHNIQUE

Mridula Tiwari, Achala Jain
Shri Shankaracharya college of engineering and technology

ABSTRACT **-**Here, I have proposed a multi objective based hybrid methodology to apply unit commitment problem incorporating with wind power. The hybrid methodology will be the combination of both the improved fruit fly optimization algorithm (IFOA) and artificial neural network (ANN). The IFOA is a novel method for searching global optimization. It originated from the research on food hunting behaviors of fruit fly swarm. Fruit fly is an excellent food hunter with sharp osphresis and vision . In IFOA, to better balance exploitation and exploration, the parallel search is adopted. In addition, aiming to make full use of swarm intelligence, the searching behaviour of the fruit fly will be modified by using the efficient neighbourhood search functions like crossover and mutation to add communication among swarms in IFOA. In light of the wind power uncertainty the IFOA will be optimizing the combination of the thermal generators. By the probability occurrence of wind power and production cost of thermal units the multi objective function will be formed. ANN will be used to predict the uncertainty events of wind power. Thus the system will be guaranteed the high wind power utilization. Subsequently, the proposed optimization approach solution will be minimized the total cost of the generating units. The proposed method will be implemented in MATLAB working platform and the results will be examined with considering generation units and will compared with existing model.

Keywords **-Economic dispatch , Thermal Generator , wind Generator , IFOA , ANN**

INTRODUCTION

Significant research has been conducted throughout the world for development of sustainable, renewable and efficient energy systems in order to meet the requirements of increased population and to reduce the extensive use of fossil fuels [1]. Increasing energy prices, environmental concerns and rapid depletion of the known fuel reserves have significantly increased the scope of renewable energy sources (RES). RES are employed in the networks of power system to meet environmental, economic, industrial, and community level needs [2]. Recently, the wind power, solar and thermal power attracted much attention like promising renewable energy resources [3]. The energy resources have various characteristics in terms of operational costs and reliability. Wind energy generation has changed into alternative source of energy to the traditional resources [2]. Because of the wind discontinuity and unpredictability the penetrations of wind power have expanded, more inventive and refined methodologies are embraced in the planning of existing generating limit, procedures and operating protocols [4, 5].

Even though its power generation marginal cost is zero because of this, WEGs imposes an extra burden of costs on the power system [6]. Along with the additional reserves coordination to guarantee a reliable and economical power supply, ancillary services should be scheduled properly [7]. The economic and environmental problems in the power generation have received considerable attention. Economic Dispatch (ED) is a vital and most frequent step in power system operational planning [8]. ED is an optimization problem that allocates power to each committed generating unit so as to minimize the total operational cost, subject to constraints. Various constraints include power balance, power limits of generators, prohibited operating zones, ramp rate limits etc. The problem is formulated as a multi-objective optimization problem [10, 11]. It consists in distributing the active and renewable productions between the power stations of the most economic way, to reduce the emissions of the polluting gases and to maintain the stability of the network after penetration of renewable energy. The number of decision variables of the problem is related to all the nodes of the network. Several optimization techniques with equality and inequality constraints have been used for ED. The optimization techniques are PSO [14], Tabu search [17], Sequential Quadratic Programming (SQP), Enhanced PSO (EPSO) [16], Artificial Bee Colony (ABC) [12, 13], Genetic Algorithm (GA) [9], hybrid Shuffled Differential Evolution (SDE) [15]], Neural network [18, 19] and so on. All above-said techniques can solve EED problem but a number of samples required are large and hence the complexity of the algorithm is high enough so as not to allow it to work in real-time [20].

MOTIVATION FOR THE RESEARCH WORK

ED with renewable energy plays significant role since the problem is depends on the operating cost of the generation units. The review shows that, the formulation of economic dispatch problem with renewable energy is directly improving the solution methodology. In renewable energy, wind power is sustained more in power system. For that reason, the unit commitment problem is complicated and more challenging task because of the uncertainty power generation of wind energy system. Therefore, the

multi objective optimization is formed as problem with uncertainty. Different methods are used to accommodate wind and solar power variability including advanced unit commitment, and balancing wind and solar power variations. The purpose of this model is improved the formulated model by considering wind power uncertainty will lead to a better solution which can withstand the estimate errors in the real time. Numerous methods are available to solve the unit commitment problem such as improved fireworks algorithm with non-uniform operator (IFWA-NMO), modified harmony search (MHS) algorithm, Euclidean Affine Flower Pollination Algorithm (eFPA), Binary Flower Pollination Algorithm (BFPA), Enhanced Moth-Flame Optimization (EMFO) and so on. But those methods only concentrate the thermal generation into account and did not consider the impact of wind power uncertainty. In literature very few works are presented to solve this problem and the drawbacks of the work have motivated to do this research work.

SOLUTION METHODOLOGY

Here, I have intended to propose a multi objective based hybrid methodology to apply unit commitment problem incorporating with wind power. The hybrid methodology will be the combination of both the improved fruit fly optimization algorithm (IFOA) and artificial neural network (ANN). The IFOA is a novel method for searching global optimization. It originated from the research on food hunting behaviors of fruit fly swarm. Fruit fly is an excellent food hunter with sharp osphresis and vision [21]. In IFOA, to better balance exploitation and exploration, the parallel search is adopted. In addition, aiming to make full use of swarm intelligence, the searching behaviour of the fruit fly will be modified by using the efficient neighbourhood search functions like crossover and mutation to add communication among swarms in IFOA. In light of the wind power uncertainty the IFOA will be optimizing the combination of the thermal generators. By the probability occurrence of wind power and production cost of thermal units the multi objective function will be formed. ANN will be used to predict the uncertainty events of wind power. Thus the system will be guaranteed the high wind power utilization. Subsequently, the proposed optimization approach solution will be minimized the total cost of the generating units. The proposed method will be implemented in MATLAB working platform and the results will be examined with considering generation units and will compared with existing model.

POSSIBLE OUTCOME

By using the proposed methodology, the optimal combination of the thermal generating units under various load conditions will be determined. Also it will be minimizes the total cost functions by properly utilizing the derived multi-objective function and the renewable resource availability such as wind.

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