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Comparative Performance of Artificial Bee Colony Based Algorithms for Wind-Thermal Unit Commitment

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Abstract : This paper presents the three optimization models, namely New Binary Artificial Bee Colony (NBABC) algorithm, NBABC with Local Search (NBABC-LS), and NBABC with Genetic Crossover (NBABC-GC) for solving the Wind-Thermal Unit Commitment (WTUC) problem. The uncertain nature of the wind power is incorporated using the Weibull probability density function, which is used to calculate the overestimation and underestimation costs associated with the wind power fluctuation. The NBABC algorithm utilizes a mechanism based on the dissimilarity measure between binary strings for generating the binary solutions in WTUC problem. In NBABC algorithm, an intelligent scout bee phase is proposed that replaces the abandoned solution with the global best solution. The local search operator exploits the neighboring region of the current solutions, whereas the integration of genetic crossover with the NBABC algorithm increases the diversity in the search space and thus avoids the problem of local trappings encountered with the NBABC algorithm. These models are then used to decide the units on/off status, whereas the lambda iteration method is used to dispatch the hourly load demand among the committed units. The effectiveness of the proposed models is validated on an IEEE 10-unit thermal system combined with a wind farm over the planning period of 24 hours.

Keywords : artificial bee colony algorithm, economic dispatch, unit commitment, wind power
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