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# Minimize electricity generation cost for large scale wind-thermal systems considering prohibited operating zone and power reserve constraints

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**ABSTRACT**

Wind power plants (WPs) play a very important role in the power systems because thermal power plants (TPs) suffers from shortcomings of expensive cost and limited fossil fuels. As compared to other renewable energies, WPs are more effective because it can produce electricity all a day from the morning to the evening. Consequently, this paper integrates the optimal power generation of TPs and WPs to absolutely exploit the energy from WPs and reduce the total electricity generation cost of TPs. The target can be reached by employing a proposed method, called one evaluation-based cuckoo search algorithm (OEB-CSA), which is developed from cuckoo search algorithm (CSA). In addition, conventional particle swarm optimization (PSO) is also implemented for comparison. Two test systems with thirty TPs considering prohibited working zone and power reserve constraints are employed. The first system has one wind power plant (WP) while the second one has two WPs. The result comparisons indicate that OEB-CSA can be the best method for the combined systems with WPs and TPs.



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## 1. INTRODUCTION

Optimal operation of power systems plays a very important role in reaching high economy and stable operation status of all electric components such as transmission lines, distribution lines, transformers, generators, and capacitors [1, 2]. Among different power plants such as thermal power plants (TPs), hydropower plants (HPs), wind power plants (WPs), solar thermal power plants (SPs) and photovoltaic power plants (PPs), TPs are consuming huge amount of fossil fuels (FFs) with very high cost. Furthermore, FFs will be distinct in the future and electric energy power safety will not be warranted. So, the integration of using both TPs and other power plants with smaller cost should be implemented, especially with WPs, SPs and PPs. Currently, the core task of operators in TPs is to allocate the most optimal power generation to reach the lowest electric generation cost by burning FFs as much as possible [3-5]