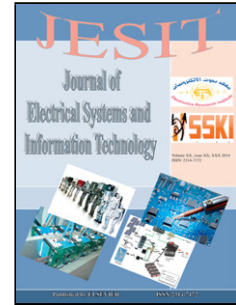


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# Optimal renewable resources placement in distribution networks by combined power loss index and Whale optimization algorithms

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## Abstract

Distributed generator (DG) resources are the emerging micro-generating technologies such as fuel cells, micro turbines, IC engines. They also make use of renewable energy sources such as PV arrays and Wind Turbines. DG units have low emission rates and are environment friendly and economical. Power loss reductions, voltage profile improvement and increasing reliability are some advantages of DG units. The above benefits can be achieved by optimal placement of DGs. Optimal DG locations are obtained from power loss index method. A novel meta heuristic algorithm called Whale Optimization Algorithm (WOA) is used to determine the optimal DG-units size in this paper. WOA modeled based on the unique hunting behavior of humpback whales. The WOA algorithm is tested on IEEE 15-bus, 33-bus, 69-bus, 85-bus and 118-bus test systems. The results obtained by the proposed WOA algorithm was compared with different types of DGs and other evolutionary algorithms. When compared with other algorithms the WOA algorithm gives better results. From the analysis best results have been achieved from type III DG operating at 0.9 pf.

*Keywords:* Whale Optimization Algorithm, Power loss index method, Distributed Generation placement, Radial distribution system, Loss reduction

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