

OPTIMAL CONDUCTOR SELECTION IN RADIAL DISTRIBUTION SYSTEMS USING WHALE OPTIMIZATION ALGORITHM

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Abstract

Nowadays, electrical power system networks are driven harder, and they are required to deliver more energy. Electrical losses reduction is one of the most important ways to conserve the generated energy, especially in the distribution systems. In this regard, the optimal conductor selection can reduce the electrical power losses, while enhancing the voltage profile in a cost-effective manner. In this paper, a novel approach based on a recent meta-heuristic algorithm, known as whale optimization (WO) algorithm is proposed to solve the optimal conductor selection problem of radial distribution networks. An updated practical conductor's library is introduced. Further, practical techno-economic aspects are considered such as load growth considerations and payback period calculations. The objective function is to minimize the combined cost of energy loss and conductors' investment cost. The considered constraints are the bus voltage limits and the conductors' current carrying capacities. The proposed approach is applied to two different systems; the first one is a 16-bus small-scale system and the second is a large-scale 85-bus system. The obtained results are compared with other results available in the literature, and showed the effectiveness of the proposed algorithm in reducing the network losses, maximizing the overall saving, while maintaining the specified constraints over almost a five-year period while taking into account high annual load growth rate.

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