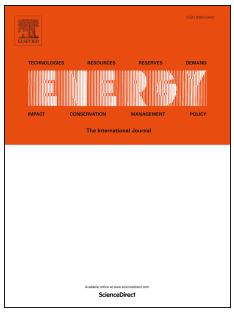
Accepted Manuscript



Improved harmony search algorithm for electrical distribution network expansion planning in the presence of distributed generators

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PII: S0360-5442(18)30428-6

DOI: 10.1016/j.energy.2018.03.030

Reference: EGY 12488

To appear in: *Energy*

Received Date: 28 March 2017

Revised Date: 6 February 2018

Accepted Date: 5 March 2018

Please cite this article as: Rastgou A, Moshtagh J, Bahramara S, Improved harmony search algorithm for electrical distribution network expansion planning in the presence of distributed generators, *Energy* (2018), doi: 10.1016/j.energy.2018.03.030.

Improved harmony search algorithm for electrical distribution network expansion planning in the presence of distributed generators

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Abstract

Distribution network expansion planning problem is carried out to supply the forecasted demand of distribution network in a certain time in which optimal size and location of distribution substations and feeders should be determined. In this paper, this problem in the presence of different types of distributed generators is addressed. For this purpose, a new approach is applied to model several practical aspects such as pollution, investment and operation costs of distributed generators, purchased power form the main grid, dynamic planning, and uncertainties of load demand and electricity prices. The uncertainties are modeled using the probability distribution function and Monte-Carlo simulation is applied to insert them into the planning problem. Because the problem involves many variables and constraints and is a non-convex and large-scale one, improved harmony search algorithm is used to solve it. To show the effectiveness of the proposed model and solving approach, it is applied to the 9-node and 69-node standard radial distribution networks and a real system of western part of Iranian national 20 kV distribution grid. The results show that the harmony search algorithm can solve the problem in a better manner in comparison with other methods such as genetic algorithm and particle swarm optimization.

Keywords: Distribution network expansion planning, Distributed generators, Improved harmony search algorithm, Sensitivity analysis, Monte Carlo simulation.

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