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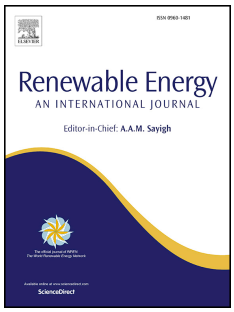

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Review of Optimization Techniques Applied for the Integration of Distributed Generation from Renewable Energy Sources

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Abstract

Several potential benefits to the quality and reliability of delivered power can be attained with the installation of distributed generation units. To take full advantage of these benefits, it is essential to place optimally sized distributed generation units at appropriate locations. Otherwise, their installation could provoke negative effects to power quality and system operation. Over the years, various powerful optimization tools were developed for optimal integration of distributed generation. Therefore, optimization techniques are continuously evolving and have been recently the focus of many new studies. This paper reviews recent optimization methods applied to solve the problem of placement and sizing of distributed generation units from renewable energy sources based on a classification of the most recent and highly cited papers. In addition, this paper analyses the environmental, economic, technological, technical, and regulatory drivers that have led to the growing interest on distributed generation integration in combination with an overview about the challenges to overcome. Finally, it examines all significant methods applying optimization techniques of the integration of distributed generation from renewable energy sources. A summary of common heuristic optimization algorithms with Pro-Con lists are discussed in order to raise new potential tracks of hybrid methods that haven't been explored yet.

Keywords: Distributed Generation (DG); Optimization methods; Renewable Energy Sources (RES); Heuristic Methods; Power System Losses

GLOSSARY OF TERMS	
ACROMYMS	**DEFINITION**
ABCA	Artificial Bee Colony Algorithm
ACO	Ant Colony Optimization
AGA	Adaptive Genetic Algorithm
BBO	Biogeography Based Optimization
BPSO	Binary Particle Swarm Optimization
CHP	Combined Heat and Power
CIGRE	International Council on Large Electric Systems
CO_2	Carbon dioxide
COP	COnférence des Parties
CSA	Cuckoo Search Algorithm
DER	Distributed Energy Resource
DG	Distributed Generation
DSI	DG Suitability Index
DSM	Demand Side Management
DSO	Distribution System Operator
EPRI	Electric Power Research Institute
FA	Firefly Algorithm
FL	Fuzzy Logic
GA	Genetic Algorithm
GHG	Greenhouse Gas
HS	Harmony Search
ICA	Imperialist Competitive Algorithm
IEA	International Energy Agency
IPSO	Improved Particle Swarm Optimization
LP	Linear Programming
MADM	Multi-Attribute Decision Making
MILP	Mixed Integer Linear Programming
MINLP	Mixed Integer Nonlinear Programming
NDC	Nationally Determined Contribution
OPF	Optimal Power Flow
PGSA	Plant Growth Simulation Algorithm
PSI	Power Stability Index
PSO	Particle Swarm Optimization
PSO-CF	PSO with Constriction Factor
PSO-IW	PSO with Inertia Weight
PV	Photovoltaic
R&D	Research & Development

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