

## Documents

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**Optimal placement and sizing of photovoltaic based distributed generation considering costs of operation planning of monocrystalline and thin-film technologies**

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**Abstract**

Distributed generation (DG) technology has been growing rapidly in industries as this technology can increase the overall efficiency to the power systems. Improper placement and sizing can lead to power losses and interrupt the voltage profile of distribution systems. Studies have been done to solve the DG placement and sizing problem considering several factors, and one of the common factor is minimizing the power losses. However, it is not adequate by only considering the power losses, whereas, the costs of the generation, investment, maintenance, and losses of the distribution system must be taken in consideration. In this research, DG chosen to study is photovoltaic (PV) type which is monocrystalline and thin-film. Costs of operation planning with respect to the power losses is considered which include the costs of investment, maintenance, power loss, and generation that are determined for optimal placement and sizing of DG. The proposed method improved gravitational search algorithm (IGSA) is used in the MATLAB environment to find the optimal placement and sizing of DG and is tested with the IEEE 34-bus system. The performance of IGSA is then compared with gravitational search algorithm (GSA) and particle swarm optimization (PSO) to find out which algorithm gives the best fitness value and convergence rate. The purpose of this research is to identify the operation planning cost based on the optimization results and improves the optimal placement and sizing of DG in future, to provide maximum economical, technical, environmental benefits, and increase the overall efficiency to the power system. Copyright © 2019 by ASME.

**Index Keywords**

Distributed power generation, Efficiency, Electric losses, Investments, Learning algorithms, Particle swarm optimization (PSO), Thin films; Distributed generation technologies, Distribution systems, Environmental benefits, Gravitational search algorithm (GSA), Gravitational search algorithms, Operation planning, Optimal placement and sizings, Thin-film technology; Costs

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