Abstract:

The efficacy of transmitting energy from high voltage transmission power lines to low voltage distribution power lines is vital in electrical power networks. Nevertheless, distribution systems often encounter substantial I2R losses as a result of elevated R/X ratios, heightened current levels, and insufficient voltage circumstances. Distribution power businesses are incentivized to minimize losses, since the financial repercussions are contingent upon the disparity between real and anticipated losses. Strategies to reduce losses include feeder grading, allocation of distributed generation (DG), reconfiguration of the network, allocation of capacitors, and novel methods for high voltage distribution systems. The purpose of this work is to use an evolutionary algorithm called particle swarm optimization to identify the optimal allocation of photovoltaic production, using a multi-objective function and many constraints. The efficacy of these algorithms was evaluated using MATLAB R2022a on standard radial 33 and 69 IEEE bus systems, offering a comprehensive assessment of their performance in real-world situations. The main objective is to improve strategies for minimizing losses in distribution networks by using advanced optimization methods to strategically place photovoltaic distributed generation.

Keywords: DG allocation, Distribution network optimization, Solar PV, Decentralized generation, Evolutionary algorithm.