

Advanced Hybrid Particle Swarm Optimization for Congestion and Power Loss Reduction in Distribution Networks with High Distributed Generation Penetration through Network Reconfiguration

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Abstract : Renewable energy sources and distributed power generation units already have an important role in electrical power generation. A mixture of different technologies penetrating the electrical grid, adds complexity in the management of distribution networks. High penetration of distributed power generation units creates node over-voltages, huge power losses, unreliable power management, reverse power flow and congestion. This paper presents an optimization algorithm capable of reducing congestion and power losses, both described as a function of weighted sum. Two factors that describe congestion are being proposed. An upgraded selective particle swarm optimization algorithm (SPSO) is used as a solution tool focusing on the technique of network reconfiguration. The upgraded SPSO algorithm is achieved with the addition of a heuristic algorithm specializing in reduction of power losses, with several scenarios being tested. Results show significant improvement in minimization of losses and congestion while achieving very small calculation times.

Keywords : congestion, distribution networks, loss reduction, particle swarm optimization, smart grid

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