

# Vortex Search Algorithm for Optimal Power Flow Analysis in DC Resistive Networks With CPLs

## Abstract

This express brief addresses the optimal power flow (OPF) analysis in direct-current (DC) resistive networks with constant power loads (CPLs). The OPF employs the vortex search algorithm (VSA) in conjunction with a power flow method based on successive approximations by proposing a master-slave optimization methodology. The VSA is a powerful numerical optimization method that works with Gaussian distributions and variable radius for intensive exploration and exploitation in the solution space of the OPF problem. The power flow based on successive approximations allows evaluating the objective function by solving the non-convex equality constraints related to the power balance equations. Numerical implementations in two distribution DC feeders with 10 and 21 nodes show that the proposed approach attains the optimal solution reported by convex approximations, sequential quadratic models and nonlinear optimization methods. All the simulations have been conducted in MATLAB software.

Keywords: Direct current networks, pure-algorithmic methodology, optimal power flow, vortex search algorithm