

# Voltage Stability Margin in DC Grids With CPLs: A Recursive Newton–Raphson Approximation

## Abstract

This express brief addresses the voltage collapse problem in direct-current (dc) networks by using a recursive heuristic search algorithm based on the Newton-Raphson method. The determinant of the Jacobian matrix in the Newton-Raphson method is used as a sensitivity index to determine the maximum power consumption of the dc network. The recursive solution approach corresponds to a sequential power flow approach by incrementing all values of the power consumptions uniformly. Simulation results validate the efficiency of the proposed method in comparison to the large-scale nonlinear solvers available in the general algebraic modeling system optimization package. The MATLAB programming environment was employed for implementing the proposed recursive Newton-Raphson method.

Keywords: Direct current networks, Newton–Raphson power flow, pure-algorithmic methodology, sensitivity index, voltage stability margin