Electric Power Systems Research
Volume 187, October 2020, 106454

On the numerical analysis based on successive approximations for power flow problems in AC distribution systems

Oscar Danilo Montoya [a, b], Walter Gil-González [b]

Show more

https://doi.org/10.1016/j.epsr.2020.106454

Abstract

This paper proposes a new power flow formulation for alternating-current distribution networks for radial and mesh topologies. This formulation corresponds to a successive approximation based on a modification of the conventional Gauss-Seidel numerical method by using a successive approximation approach. This power flow method allows working with complex variables by reducing the number of required calculations and avoiding the transformation of the power flow model into polar coordinates. Additionally, it does not use derivatives for approximating the problem as it occurs with Taylor-based approaches. Simulation results confirm that the proposed method is faster concerning computational time, as well as in the total number of iterations required. Numerical comparisons with classical methods such as Gauss-Seidel, Newton-Raphson, Levenberg-Marquardt, graph-based methods, and linear approximations have been made and implemented in MATLAB software to demonstrate the effectiveness of the proposed approach regarding power flow solutions in radial and mesh distribution networks.