

A New Iterative Power Flow Method for AC Distribution Grids with Radial and Mesh Topologies

Abstract

This brief discusses the classical problem of power flow analysis in alternating current (ac) distribution networks through Taylor series expansion. The main advantage of this approach is that it can work with radial and mesh configurations without modifications in its formulation. This method can deal with the hyperbolic relation between voltages and currents at k node, i.e., $I_k = S_k/V_k$, by transforming this into a linear approximation. To minimize the error in this linear transformation, an iterative procedure is implemented by updating the linearizing point, which allows reaching the same solution of the classical power flow methods for distribution systems in less processing time. Numerical results confirm the effectiveness of the proposed approach when compared to classical Gauss-Seidel, Newton-Raphson, and Backward/forward methods that can work with radial and mesh distribution network structures. All the numerical validations are conducted in MATLAB software.