

Unbalanced three-phase distribution power flow using alternative Newton-Raphson method

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Abstract: This paper utilizes the newly developed approach for Newton-Raphson power flow calculation, which is based on current-balanced equations rather than a widely-used power-balanced principle, especially for power distribution systems. This concept gives the replacement of the power-balanced equations that are broadly used by conventional Newton-Raphson power flow methods. The non-linear current equations can simplify very complicated power flow problems, however new mathematical derivation of Jacobian matrices is necessary. Although the power flow equations have been modified, the alternative power flow method still has quadratic convergence. It is sufficient to enhance calculation time required by the iterative processes. To distinguish the alternative method in comparison with the conventional Newton-Raphson, 25-bus, IEEE 37-node, modified 118-node test feeders and the 159-node, 22-kV distribution feeder of Suranaree University of Technology were tested. Moreover, the results reveal that solving the power flow problems with the alternative Newton-Raphson method can considerably reduce execution time consumed by simulation programs when comparing with the conventional methods.