Comprehensive Evaluation and Testing of Multi-Phase Line-Wise Power Flow Method for Unbalanced AC Power Systems

Shima Bagher Zade Homayie[1], Bala Venkatesh[1]

[1]Toronto Metropolitan University

In response to the growing complexity and unbalanced nature of future distribution systems, this paper presents a comprehensive evaluation of the recently proposed multi-phase line-wise power flow (MPLW PF) method across various benchmark systems. The MPLW PF approach effectively models unbalanced power systems with different topologies and phase configurations. This study extends the application of MPLW PF by testing its accuracy, convergence, and computational efficiency on a wide range of AC multi-phase and three-phase systems, including radial and meshed configurations. The MPLW PF method is tested on several benchmark systems, demonstrating its accuracy, scalability, and significant run-time reduction compared to traditional bus-wise (BW) method and OpenDSS as a commercial software.

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