International Journal of Electrical Power & Energy Systems, vol.120, no.106042, pp.106042-1-106042-9, September, 2020.

Phase-selection algorithms to minimize cost and imbalance in U.S. synthetic distribution systems

F. Postigo Marcos; C. Mateo Domingo; T. Gómez San Román; F. Cuadra García; P. Dueñas Martínez; T. Elgindy; B.M. Hodge; B. Palmintier; V. Krishnan

Abstract-

The increasing penetration of distributed energy resources (DERs) has driven a push toward new algorithms and tools for distribution system operation and planning; however, there is a lack of publicly available electrical distribution test systems at the large scale-multi-feeder, multi-substation-which are required for realistically evaluating the performance and scalability of these new developments. This paper presents a Reference Network Model (RNM) aimed to plan large-scale, U.S.-style, synthetic distribution systems. Special emphasis is placed on two algorithms that allow multi-phase feeder design: (1) a method to select the most suitable number of phases for each section considering the connected customers, and (2) a method to assign phases to the users to provide near-balanced phasing while maintaining realistic levels of imbalance. The performance of the developed algorithms is verified by comparing the obtained system designs with the original IEEE 8,500-node test feeder and the Electric Power Research Institute (EPRI) J1 feeder.

Index Terms- Power distribution; System planning; Reference Network Model; Representative networks; Synthetic networks; Phase imbalance

Citation:
Postigo, F.; Mateo, C.; Gómez, T.; de Cuadra, F.; Dueñas, P.; Elgindy, T.; Hodge, B.M.; Palmintier, B.; Krishnan, V. "Phase-selection algorithms to minimize cost and imbalance in U.S. synthetic distribution systems", International Journal of Electrical Power & Energy Systems, vol.120, no.106042, pp.106042-1-106042-9, September, 2020.