Optimization of Distributed Generation Using Mix-Integer Optimization by Genetic Algorithm (MIOGA) Considering Load Growth

Che Muhamad Asad Safwan, Norhafidzdah Mohd Saad, Mohammad Fadhil Abas, Suliana Ab-Ghani, and Abid Ali

Abstract In this paper, the planning of distributed generation (DG) is presented with a metaheuristic technique called mix-integer optimization by genetic algorithm (MIOGA). The solution of the distribution power flow is based on the backward/forward sweep method to compute the voltage at every node of the buses followed by the determination of power loss. The main idea of the proposed method is to determine the size and location for the DG to be installed in the radial distribution network (RDN). The method is tested in 69 bus RDN in MATLAB. From the simulation results, the reduction in total power loss and improvement in bus voltage magnitudes are observed for the system with the installation of DG. The results show that power loss can be reduced up to 63.03% with DG installation at bus 61 at 1.8727 MW. Apart from the reductions in losses, the installation of DG using MIOGA also helps to improve the voltage profile of the RDN. The critical bus voltage at bus 65 has successfully been improved from 0.9092 p.u. to 0.9806 p.u. The results indicate that load growth has no effect on the optimal position, and only the optimal size of the DG unit is changed. The results also reveal that load growth will increase the power losses. Since the DG in this study solely supplies active power, the impact of DG in reducing power losses is more visible for the case real power demand is increased rather than the case when the reactive power demand is increased.

Keywords Distributed generation · Mix integer optimization by genetic algorithm · Radial distribution network · Backward/Forward sweep method · Load growth

C. M. A. Safwan · N. Mohd Saad (✉) · M. F. Abas · S. Ab-Ghani
Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia
e-mail: norhafidzah@ump.edu.my

A. Ali
Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia

Z. Md. Zain et al. (eds.), *Proceedings of the 6th International Conference on Electrical, Control and Computer Engineering*, Lecture Notes in Electrical Engineering 842,
https://doi.org/10.1007/978-981-16-8690-0_23