

User-friendly tool for power flow analysis and distributed generation optimisation in radial distribution networks

ABSTRACT

The intent of power distribution companies (DISCOs) is to deliver electric power to their customers in an efficient and reliable manner – with minimal energy loss cost. One major way to minimise power loss on a given power system is to install distributed generation (DG) units on the distribution networks. However, to maximise benefits, it is highly crucial for a DISCO to ensure that these DG units are of optimal size and sited in the best locations on the network. This paper gives an overview of a software package developed in this study, called Power System Analysis and DG Optimisation Tool (PFADOT). The main purpose of the graphical user interface-based package is to guide a DISCO in finding the optimal size and location for DG placement in radial distribution networks. The package, which is also suitable for load flow analysis, employs the GUI feature of MATLAB. Three objective functions are formulated into a single optimisation problem and solved with fuzzy genetic algorithm to simultaneously obtain DG optimal size and location. The accuracy and reliability of the developed tool was validated using several radial test systems, and the results obtained are evaluated against the existing similar package cited in the literature, which are impressive and computationally efficient.

Keyword: Distribution networks; Distributed generation; Graphical user interface; PFADOT; Fuzzy genetic algorithm; Optimisation