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Issues And Challenges In Modelling And Performance Of Fuzzy Based Distributed Generation

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Abstract : Numerous advantages attained by integrating Distributed Generation (DG) in distribution systems. These advantages include decreasing power losses and improving voltage profiles. Such benefits can be achieved and enhanced if DGs are optimally sized and located in the systems. In this thesis, the optimal DG placement and sizing problem is investigated using two approaches. First, the optimization problem is treated as single-objective optimization problem, where the system's active power losses are considered as the objective to be minimized. Secondly, the problem is tackled as a multi-objective one, focusing on DG installation costs. These problems are formulated as constrained nonlinear optimization problems using the Sequential Quadratic Programming method. A weighted sum method and a fuzzy decision-making method are presented to generate the Pareto optimal front and also to obtain the best compromise solution. Single and multiple DG installation cases are studied and compared to a case without DG, and a 15-bus radial distribution system and 33-bus meshed distribution system are used to demonstrate the effectiveness of the proposed methods. Classical view of power system is characterized by a unidirectional power flow from centralized generation to consumers. Power system deregulation gave impetus to a modern view by introducing distributed generations (DGs) into distribution systems, leading to a bi-directional power flow. Several benefits of embedding DGs into distribution systems, such as increased reliability and reduced system losses, can be achieved. However, when a zone of the distribution system remains energized after being disconnected from the grid, DGs become islanded and early detection is needed to avoid several operational issues. In response to this call, a wavelet-based approach that uses the mean voltage index is proposed in this work to detect islanding operation in distribution systems embedding DGs. The proposed approach has been tested in several islanding and non-islanding scenarios using IEEE 13-bus distribution system. The results have shown the effectiveness of the proposed approach compared to other islanding approaches previously published in the literature.