

VALUE-BASED ANALYSIS ON MICROGRID RELIABILITY AND POWER QUALITY

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ABSTRACT

The present paper focuses on economic feasibility of micro-grid in terms of maximisation of benefit-to-cost ratio (BCR), from owner side, based on optimal deployment of CHP-based distributed energy resources (DER) with respect to their locations, capacity-sizes and types. For selection of optimal locations of DERs, Loss Sensitivity Index (LSI) of each bus has been taken into account. As it is a value-based planning study, optimal size and its separation between micro-turbines, and diesel generators at each bus location are done on the basis of maximum benefit-to-cost ratio (BCR), obtained using particle swarm optimisation (PSO) technique and in respect of Power quality and reliability (PQR) constraints as well as a unique constraint of zero slack bus injection. The last constraint helps plan a micro-grid of self-sufficient optimal DER capacity for running under islanding from utility. Two separate case studies, one with 6-bus meshed and other with 14-bus radial micro-grids, have been done, here. Load profiles, tariff structure, micro-grid construction cost in addition to all relevant costs of CHP-based DERs, heat recovery equipments, and storages have been considered to formulate cost and benefit in the present study, which is based on tracking of electric demand profile.