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Optimal planning in active distribution networks considering nonlinear loads using the MOPSO algorithm in the TOPSIS framework

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Abstract-

In recent years, harmonic distortion has sharply increased because of injecting harmonic components caused by using nonlinear loads in the distribution system. Uncontrolled harmonic distortion can bring damage to equipment of the power system, reduce the power system efficiency, and interrupt protection and measurement devices. This parameter can be managed using various resources and control programs in active distribution networks. This paper presents active distribution networks (ADNs) with multiple objective particle swarm optimization (MOPSO) algorithm using the technique for order of preference by similarity to ideal solution (TOPSIS) framework in the presence of nonlinear loads. The presented planning model manages the sample network to minimize the total harmonic distortion (THD) of the system while minimizing the operational and investment costs. Four active management schemes, network reconfiguration, distributed generation (DG) dispatch, demand-side management (DSM), and reactive power compensation are considered for this purpose. Optimal sizing and siting of the energy storage system (ESS) is used to reduce peak load and operational costs. The IEEE 33 node distribution network is used to verify the proposed planning model.

Index Terms-

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