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Optimal Simultaneous Sizing and Siting of DGs and Smart Meters Considering Voltage Profile Improvement in Active Distribution Networks

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Abstract : This paper investigates the effect of simultaneous placement of DGs and smart meters (SMs), on voltage profile improvement in active distribution networks (ADNs). A substantial center of attention has recently been on responsive loads initiated in power system problem studies such as distributed generations (DGs). Existence of responsive loads in active distribution networks (ADNs) would have undeniable effect on sizing and siting of DGs. For this reason, an optimal framework is proposed for sizing and siting of DGs and SMs in ADNs. SMs are taken into consideration for the sake of successful implementing of demand response programs (DRPs) such as direct load control (DLC) with end-side consumers. Looking for voltage profile improvement, the optimization procedure is solved by genetic algorithm (GA) and tested on IEEE 33-bus distribution test system. Different scenarios with variations in the number of DG units, individual or simultaneous placing of DGs and SMs, and adaptive power factor (APF) mode for DGs to support reactive power have been established. The obtained results confirm the significant effect of DRPs and APF mode in determining the optimal size and site of DGs to be connected in ADN resulting to the improvement of voltage profile as well.

Keywords : active distribution network (ADN), distributed generations (DGs), smart meters (SMs), demand response programs (DRPs), adaptive power factor (APF)
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