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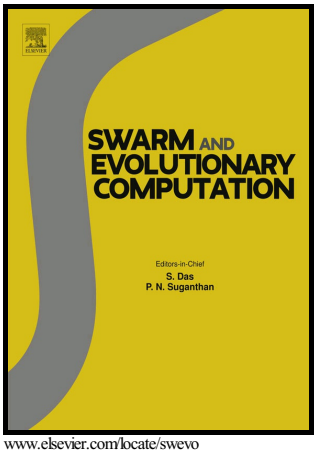

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Optimal Planning of Distributed Energy Resources in Harmonics Polluted Distribution System

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Abstract:

In this study, harmonics related to power quality issue and energy demand growth are considered simultaneously towards the realistic planning of medium voltage radial distribution system. Mostly, harmonics of distribution networks are produced in the presence of non-linear loads. Therefore, Distributed Energy Resource (DERs) can be placed to mitigate the harmonic distortions and to supply the required system energy demand. This paper presents a Modified Group experience of Teaching Learning Based Optimization approach, which can deal with allocation of DERs efficaciously in distorted and non-distorted radial distribution networks. The effectiveness of the proposed approach is validated on standards 33-bus and 69-bus test systems along with 83-bus (Taiwan Power Company) practical radial non-distorted distribution system. The results are compared with already well-established existing methods as suggested in the literature. Further, the proposed algorithm is applied to DER planning considering harmonics generating loads in above-mentioned test systems. The results with linear as well as non-linear loads on all three test systems prove that the proposed strategy can be a robust approach to enhance the system performance towards mitigating increased load demand within the constraints of the distribution system.

Keywords: Distributed energy resources; distribution load flow; harmonics spectrum; power quality; teaching learning based optimization.

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