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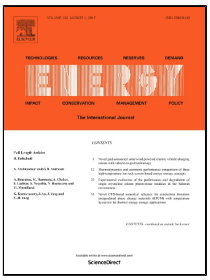

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An efficient cost-reliability optimization model for optimal siting and sizing of energy storage system in a microgrid in the presence of responsible load management

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Abstract

This paper proposes a bi-objective optimization model for optimal siting and sizing of an energy storage system (ESS) in a microgrid in the presence of demand response program (DRP). The proposed bi-objective optimization model includes two different objective functions: 1) minimization of total investment cost as well as operation cost 2) minimization of loss of load expectation (LOLE). In order to solve the proposed bi-objective optimization model, ε-constraint method is utilized and the best solution among the obtained solutions is determined by fuzzy satisfying technique. Also, DRP is employed to reduce total cost of microgrid. DRP flattens load curve by shifting some percentage of load from peak periods to off-peak periods. Optimal siting and sizing problem of ESS in the microgrid is modeled by a mixed-integer non-linear program (MINLP) and solved by GAMS software. A sample system is analyzed and the obtained results are compared.

Keywords: Siting and sizing of ESS, reliability index, bi-objective optimization, demand response program, ε-constraint method, fuzzy satisfying technique.

Nomenclature

Indices	
s	Scenario index
h	Day index
t	Hour index
i, j	Bus indices
Parameters	
ICP_B	Installation cost of ESS
$P^R_{B,j}$	Rated power of ESS in bus j