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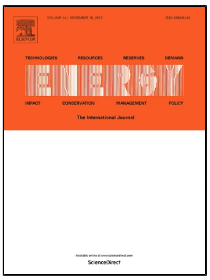

Designing a decision model to assess the reward and penalty scheme of electric distribution companies

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Abstract:

In this paper, a decision-making model for the appropriate implementation of the reward and penalty scheme (RPS) for electricity distribution companies (EDCs) is presented to be used to update the parameters of the RPS in each regulatory period and also to improve the efficiency of this scheme. In this regard, an objective function is considered in order to optimize investment costs, imposed costs, and the amounts of reward and penalty for the distribution company. This optimization is based on the failure rate of equipment and is formulated as a non-linear programming (NLP) Problem. In the optimized objective function, all existing equipment in the distribution network is divided into three categories medium-voltage, low-voltage, and substation equipment and the imposed cost on the distribution company is modeled using the Markov process. The proposed model has been applied to an electricity distribution company in Iran. Finally, the optimized values of costs incurred by the distribution company from outage, cost of investment aimed at outage reduction, and failure rates in the three named categories are obtained and can be used to determine the new parameters of the RPS in the subsequent regulatory period.

Keywords: Investment efficiency, cost of energy not supplied, reward and penalty scheme, non-linear programming, Markov model.

Nomenclature

$C_{ENS_{LV}}$	Cost of energy not supplied in the low voltage sector
$C_{ENS_{MV}}$	Cost of energy not supplied in the medium voltage sector
$C_{ENS_{SUB}}$	Cost of energy not supplied in the substation sector
$C_{EQ_{LV}}$	Cost of replaced equipment in the low voltage sector