

Optimal management of a microgrid Li-Ion battery considering non-linear losses using the Integer Zig-Zag formulation

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Abstract-

This paper presents a model for optimizing the management of a Li-Ion battery in a microgrid, considering the presence of nonlinear losses during the charging and discharging processes. The paper examines the nature of these losses and proposes updated nonlinear expressions that depend on the state of charge and on the charging or discharging power. The piecewise linear approximations of the losses bivariate functions are implemented using the novel integer zig-zag (ZZI) formulation. The corresponding ZZI constraints are integrated into an optimization model to determine the optimal schedule for a residential isolated microgrid comprising a solar panel, a diesel generator, and a Li-Ion battery. The case study compares different triangulation strategies regarding their impact on the quality of the obtained solution and the computational burden.

Index Terms- Energy management system; Microgrid; Non-linear losses; Steady-state; Zig-zag

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