

Economic Evaluation of BESS on the Generation Side for Frequency and Peak Regulation Considering the Benefits of Unit Loss Reduction

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Abstract

The indirect benefits of battery energy storage system (BESS) on the generation side participating in auxiliary service are hardly quantified in prior works. Nevertheless, the configuration of BESS could be affected by its indirect benefits. In this paper, we propose a quantitative economic evaluation method of BESS considering the indirect benefits from the reduction in unit loss and the delay in investment. First, we complete further the cost model of BESS for frequency and peak regulation based on the whole life cycle theory. Second, we quantify the indirect benefits of BESS in thermal power plants based on the theory of rotor fatigue life loss and establish a benefits model that considers the unit loss reduction during frequency regulation and the delay in investment during peak regulation. Finally, we propose a set of indexes for economic evaluation of the thermal power plant with BESS. The simulation results show that the total benefits of BESS can be improved effectively by considering the indirect benefits from unit loss reduction and the delay in investment, proving the effectiveness of the proposed approach which can be meaningful for the future investment in BESS on the generation side.

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