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Title:

Safe replacement of the electrochemical cells of a prosumer energy storage device in an emergency while maintaining its uninterrupted operation

Abstract:

The article discusses prosumer energy storage featuring a dedicated DC/DC converter, utilizing a multi-winding dual active bridge (DAB) converter. The research focuses on the connection of battery cells. Unlike existing solutions where cells are connected either in series or parallel, in the proposed device, each cell is linked to an individual winding of the DAB converter. This approach enables the integration of cells with varying types, voltage characteristics, or degrees of degradation into a single storage unit. Furthermore, unlike currently available models, the device can continue operating even if one or more cells are damaged. A damaged cell can be replaced with another during uninterrupted operation. The article includes a detailed description of the developed solution, including the control algorithm, a comparative analysis of current energy storage solutions, and research findings.

Keywords: Storage system, utility grid, dual active bridge