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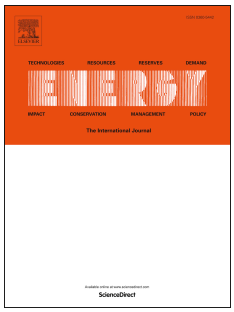

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A case study on the impact of nearly Zero-Energy Buildings on Distribution Transformer aging

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Abstract

This paper addresses the impacts introduced on Distribution Transformer (DT) aging due to the integration of nearly Zero-Energy Buildings (nZEBs) into existing Low-Voltage Distribution Grids. The study considers a neighborhood in the Portuguese municipality of Évora where buildings are set to become nZEBs using solar Photovoltaic systems. This transition is reproduced by simulation using real pre-transition electricity demand and climate data. Following the IEC 60076-7 standard to model the aging process of the considered DT, the collected results show that nZEBs can have a positive impact on the analyzed aging process. However, when relatively high nZEB integration levels are considered, this study also reveals that the subsequent reverse power flows can achieve relatively large magnitudes, especially around noon, thus accelerating the DT's aging into prohibitive values. Given the utmost importance of the nZEB concept for the European building stock, this study identifies nZEBs operation related issues that can result from excessive coincident on-site generation and presents a battery based power export limitation strategy to mitigate such impacts on DT aging.