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Global Voltage Harmonic Index for Measuring Harmonic Situation of Power Grids: A Focus on Power Transformers

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Abstract : With the increasing deployment of renewable power plants, such as solar and wind, it is crucial to measure the harmonic situation of the grid. This paper proposes a global voltage harmonic index to measure the harmonic situation of the power grid with a focus on power transformers. The power electronics systems used to connect these plants to the network can introduce harmonics, leading to increased losses, reduced efficiency, false operation of protective relays, and equipment damage due to harmonic intensifications. The proposed index considers the losses caused by harmonics in power transformers which are of great importance and value to the network, providing a comprehensive measure of the harmonic situation of the grid. The effectiveness of the proposed index is evaluated on a real-world distribution network, and the results demonstrate its ability to identify the harmonic situation of the network, particularly in relation to power transformers. The proposed index provides a comprehensive measure of the harmonic situation of the grid, taking into account the losses caused by harmonics in power transformers. The proposed index has the potential to support power companies in optimizing their power systems and to guide researchers in developing effective mitigation strategies for harmonics in the power grid.

Keywords : global voltage harmonic index, harmonics, power grid, power quality, power transformers, renewable energy
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