

Sizing and Implementation of Phase-Shifting Transformer for Congestion Management in Renewable-Rich Regions: A Case Study of the Croatian Power Grid

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Phase shifting transformers (PSTs) are a cost-efficient solution for controlling power flow without additional operating expenses. They can enhance power distribution in transmission systems and increase system capacity, particularly for renewable energy integration. However, existing methods for PST sizing and allocation often rely on DC power flow models, which may lack accuracy, and are typically tested on simplified networks that don't fully capture real-world conditions. Furthermore, these methods often overlook practical challenges, such as space limitations in substations. This paper presents a new methodology for PST sizing and allocation in real power networks. Unlike previous approaches, our method is based on AC power flow calculations and takes into account system requirements, space constraints, and economic factors. The goal is to determine the optimal type, size, phase angle regulation range, and location of PSTs to prevent system overloading under normal and N-1 system conditions.