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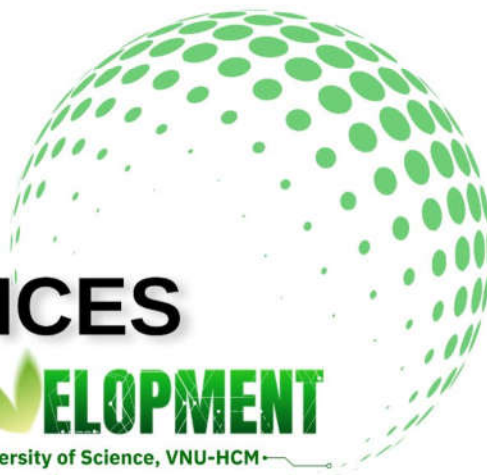
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**A NEW APPROACH ON MAINTAINING THE OPERATION OF RECLOSER
AND IMPROVING THE SENSITIVITY OF OVER-CURRENT DIGITAL
PROTECTIVE RELAYS IN MV SKELETON DISTRIBUTION GRIDS
INTEGRATED WITH DG**

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Abstract

The integration of a substantial number of distributed generation (DG) sources into distribution networks significantly modifies both the magnitude and direction of short circuit currents. These modifications are not only substantial but also perform a level of complexity that is particularly challenging when dealing with medium-voltage grids equipped with automatic reclosing devices, or reclosers. The potential adverse effects include the failure of reclosers to operate correctly, a degradation in the sensitivity of relay protection systems, and even instances of misoperation. As a result, the requirements for primary line protection-specifically overcurrent protection and the coordination across different protection levels-become increasingly intricate, demanding meticulous consideration during both the design and operational stages.

In this paper, first the authors delve into the impact of DG on power flow and the direction of short-circuit currents, thereby identifying the implications for the operation and coordination of reclosers and overcurrent relays. The resulting impacts are meticulously tailored according to the complexity of the network structure, taking into account the degree of DG penetration and the precise locations of connection points. Based on this analysis, grid configurations and adaptive protection schemes are proposed that are well-suited to the new challenges posed by DG. In particular, the paper recommends adjustments to relay settings to sustain sensitivity and ensure robust coordination with reclosers. These theoretical proposals are rigorously validated through simulations conducted on a typical 22 kV radial distribution network using ETAP software. The simulation outcomes confirm that the proposed approach secures effective relay coordination and reliable recloser operation. The proposed method effectively maintains the coordination time interval (CTI) within an acceptable range and ensuring reliable operation of reclosers. Importantly, the methodology advocated is designed to be broadly applicable to skeleton distribution networks in any region where distributed generation sources are increasingly prevalent.

Keywords: protective relay, distributed system, distribution generation.

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Ma Thi Thuong Huyen, Le Xuan Thanh. A new approach on maintaining the operation of recloser and improving the sensitivity of over-current digital protective relays in MV skeleton distribution grids integrated with DG