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Dynamic Performance Analysis of Distribution/ Sub-Transmission Networks with High Penetration of PV Generation

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Abstract : More PV systems have been connected to the electrical network each year. As the number of PV systems increases, some issues affecting grid operations have been identified. This paper studied the impacts related to changes in solar irradiance on a distribution/sub-transmission network, considering variations due to moving clouds and daily cycles. Using MATLAB/Simulink software, a solar farm of 30 MWp was built and then implemented to a test network. From simulations, it has been determined that irradiance changes can have a significant impact on the grid by causing voltage fluctuations outside the allowable thresholds. This work discussed some local control strategies and grid reinforcements to mitigate the negative effects of the irradiance changes on the grid.

Keywords : reactive power control, solar irradiance, utility-scale PV systems, voltage fluctuations
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