IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 4, Issue 2, December 2024
Impact Factor: 7.57

Design of Reliable Protection Schemes for Converter-Dominated Grids: A Review

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Abstract: *The growing presence of converter interfacing with generation resources, such as renewable energy systems, and HVDC transmission is greatly changing what we view as "the grid" today. Converter interfacing in a traditional sense means that the way faults behave on the system has changed and so have the ways in which fault currents interact with the protection systems of the system. Synchronous generators are being replaced by converters and thus traditional protection methods that were developed for synchronous generators are no longer sufficient to protect the grid. This comprehensive review paper examines both the challenges associated with developing reliable protection methods in converter interfaced systems and identifies state of the art solutions. It describes the different types of faults that occur in converter interfaced systems, discusses some of the issues with existing protection methods, presents examples of new or emerging protection technology, and provides an overview of future areas of study and potential standards development needed to support the rapidly evolving nature of our electric grid*

Keywords: Converter-dominated grid, protection schemes, inverter-based resources, fault current characteristics, adaptive protection, renewable energy integration, grid-forming converters