Fault ride-through control of grid-connected photovoltaic power plants: A review

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ABSTRACT

Over the recent years, the photovoltaic (PV) system generation and integration with utility grid became the most widely used energy resource among other renewable energies worldwide. Thereon, the integration of PV power plants (PVPPs) to the power grid and their dynamics during grid faults had become a critical issue in the new grid codes requirements. In line with this, the fault ride through (FRT) capability control of grid-connected PV power plants (GCPPPs) became the most important issue related to grid codes. In order to fulfill the FRT requirements imposed by grid codes, various approaches have been proposed in the last years. This paper presents an overview and comparison of several FRT capability enhancement approaches during grid fault conditions. A novel feature of this paper is to categorize FRT capability enhancement methods into two main groups depending on the control type and connection configuration including external devices based methods and modified controller based methods and then discuss their advantages and limitations in detail. A comparison between these methods in terms of grid code compliance, controller complexity and economic feasibility are also analyzed in this paper. According to the literature study, the FRT strategies based on external devices can be more effective. However, some of these methods come with significant increased cost. On the other hand, the modified controller-based FRT methods can achieve the FRT requirements at a minimal price. Among various types of control approaches, the modified inverter controller (MIC) is the highly efficient FRT capability approach.

Keywords: Fault ride-through (FRT) requirements; Grid codes; low voltage ride through (LVRT); Photovoltaic (PV) system; Solar energy