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**Trends and challenges in Grid-Tied Inverter for Photovoltaic Applications**

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**Abstract**

Grid-Tied inverter has gained the attention of many researchers and power generation industry due to its capability of integrating distributed power generation systems using renewable energy resources with the existing centralized power generation system. Yet the inclusion of a transformer in the Photovoltaic (PV) inverter makes it bulkier, heavier and more expensive. A primary solution to the aforementioned problems is the transformerless PV Grid-Tied inverter. This paper presents a review of different transformerless, single-phase Grid-Tied inverter topologies. The objective of this paper is to study parameters such as leakage current, common-mode voltage, total harmonic distortion, and the efficiency of transformerless Grid-Tied inverters. The paper also provides a discussion on existing Grid-Tied inverter topologies, such as H5, oH5, Novel H5, H5-D, FBDC, H6D2, Hybrid H6, High-efficiency MOSFET H6, Improved H6, 3L H6, H6-A, B, High-Efficiency H6, H6-N, Improved H6, H6-active clamping, Active clamped snubber based H6, Heric, oHeric, Enhanced Heric, Heric-with mid-DC-link, Active clamping, PN-NPC, Improved FBNPC, T-Type 3L, ANPC, HBNPC, NIFB-NPCI, VNIIFBC, M-NPC, Virtual DC bus based inverter, Active Virtual Ground, Type I, Type II, Type III Common Ground, Flying Capacitor and Multilevel Common Ground. Though it is found that many topologies available in the literature, other new topologies can be proposed to improve the performance of the inverter. Furthermore, it is also noted that the performance analysis of the inverter must be carried out in the presence of junction capacitance and shoot-through problem so that new strategies can be introduced in the existing typologies to address these issues.

**Keywords:**

Grid-Tied Inverter, Transformer-less Inverter, Photovoltaic

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