Abstract

Introduction:

The grid-connected inverters are the significant interfaces between the PV panels and utility grid, which are generally classified into the galvanic isolation system and nonisolation system. A high-frequency compact transformer in the dc side or a line frequency (LF) bulky transformer in the ac grid side is usually employed to provide the galvanic isolation and improve the safety issue. Unfortunately, the whole efficiency declined due to the additional losses caused by the transformers and other auxiliary components. If the transformer is removed, the nonisolation or transformerless system can have 1%–2% efficiency improvement. Furthermore, the power density is improved, and the cost is reduced by removing the transformers and isolated sensors. Moreover, in order to better lift the competitiveness of PV grid systems, some world-leading manufactures announce over 20 years of warranty for PV systems. Unfortunately, the average lifetime for PV inverters is
approximately five years. As a result, the replacement of inverters over three to five times is necessary to guarantee the required warranty. It greatly burdens the system investments. From the market statistics, the PV inverters account for 37% of the unscheduled maintenance and 59% of the associated cost. How to enhance the reliability and flexibility is becoming a big concern.

**Existing system:**

Half bridge converter topology is an isolated dc-dc converter which is widely used in power electronics and drives application. This topology can be used for an output power capability up to 500W. One of the main features of half bridge converter is, it reduces the OFF-stage voltage requirement of the primary side switches to \( V_i \) apart from maintaining the bi-directional flux swing in the core. Thus the voltage stress and cost of the power switches is significantly reduced as compared to the push-pull topology. The secondary side of the half bridge converter is exactly same as the push-pull converter. In addition to battery charging application half bridge converter can be used for many other applications like UPS etc due to the reduced complexity of the converter.
Proposed system:

The generation mechanism and suppression principle for the leakage current in the single-phase transformerless PV inverters are briefly analyzed, and the classification, survey, and comparison for state-of-the-art transformerless PV inverters are addressed to give an insightful cognition. Moreover, the dc-based and ac-based decoupling networks are proposed to not only cover the published transformerless inverters with symmetrical inductors but also establish an innovative way to derive the next-generation inverters. Furthermore, the topology transformation principle between dc-based and ac-based decoupling inverters is disclosed to make a systematic and unitary picture. More importantly, a family of clamped highly efficient and reliable inverter concept (HERIC)-based inverters is derived.
Advantages:

- Cost-effective, easy control, and mature technology

Applications:

- Photovoltaic sources.
Block diagram:

INPUT DC supply → Single phase voltage source Inverter → Active clamp circuit → Filter → Load

- Gate driver circuit
- BUFFER circuit
- PIC controller circuit

12 V DC → 5 V DC

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Tools and software used:

- MPLAB – microcontroller programming.
- ORCAD – circuit layout.
- MATLAB/Simulink – Simulation.