Artificial Intelligence Based Reduced Switch Multilevel Inverter For Grid Connected PV Applications

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Abstract— **Due to the rise in computer power, tools, and data collection, artificial intelligence (AI) is becoming more and more prevalent in diverse photovoltaic (PV) system applications. The basics of grid-connected multilevel inverters for PV systems is provided, together with information on the drivers, characteristics, evaluation criteria, topologies, modulation schemes, and selection criteria for various applications. The results of a thorough reliability investigation of basic 15L multilevel inverter (MLI) are examined in this study. The inverter is the most crucial component of a grid-connected PV system. This study provides a survey of the system topologies and grid-connected PV inverters utilized for PV systems linked to the grid.**

Key words: MPPT – Maximum Power Point Tracker, PV – Photovoltaic, ANN – Artificial Neural Network, SEPIC – Single-ended primary-inductance converter.

I. INTRODUCTION

The worldwide population is significantly impacted by global warming and environmental harm caused by an overreliance on renewable energy sources like coal, oil, and gas. Photovoltaic sources of energy are by far the greatest among renewable energy sources when thinking of how they contribute to the world's power output [1]. The photovoltaic standalone system is becoming increasingly important, especially for rural applications like solar illumination, battery charging, and PV water pumping. Given the consequences of fossil fuels on the environment and their scarcity, a movement towards using a growing amount renewable energy has emerged [2]. This has led to the widespread use of solar panels installed on residential roofs and PV farms next to country highways. Over 99% of PV installed capacity is accounted for by grid-connected solar power plants, as opposed to individual panels, that require batteries. Since all of the electricity produced by the PV plant is uploaded to the grid for immediate transfer, distribution, and use, storage are not required in grid-connected PV systems. [3].

In order to set themselves apart from rivals and gain a competitive edge in the expanding PV converter industry, makers of exclusive technology have also been driving forces behind the creation of innovative PV converter designs. This has resulted in a variety of fresh and distinctive power converter designs that have been especially created for PV applications and will be discussed in this session [4]. When employing a grid-connected inverter, the power line receives and distributes the energy produced by a PV plant directly. Compared to a stand-alone system, the configuration takes up less room and needs less maintenance because batteries and other power storage options are no longer required [5]. Due to the growing importance of grid-connected PV uses, international and national committees continually maintain a number of standard standards and rules to ensure the safety and efficient transfer of electricity into the grid [6].

The increased usage of PV inverters in residential and commercial settings has driven down losses and increased efficiency. With the intention of decreasing the size and cost, several companies have developed transformer less inverters with effective topologies and control strategies that do not detect zero crossing. This non-isolated set of converters consists of five basic kinds, commonly mentioned to as the boost, buck, buck-boost, Sepic, Cuk and zeta converters. In contrast to the boost converter, which is used for voltage step-up, the buck converter is applied for voltage step-down [7]. The buck converter's disadvantage is its slow response to fast load steps. It is necessary to compensate for error amplifiers has to take slope into consideration. The buck boost converter is employed to enhance this mistake. A more effective option is provided by buck-boost converters, which have fewer, shorter external elements. The 'Cuk converter, which has the benefit of low wave current at both the effort and the output, is similar to a buck-boost converter in that the voltages of the input and output are inverted [8].

According to the findings of earlier research, the Sepic Converter performs with an efficiency of at least 88%.Right-half plane zero, non-isolated topology, a complicated control

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