# SINGLE PHASE FIVE LEVEL MULTISTRING MULTI-LEVEL INVERTER FOR DISTRIBUTED ENERGY RESOURCE (DER)

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# ABSTRACT

Nowadays most inventors and scientist are addicted to research on renewable energy especially solar photovoltaic (PV) energy to connect it into the grid system. This system consists of main parts such as inverter, transformer, filters and others. This paper presents the new simplified single phase five level multistring multi-level inverter especially for distributed energy resources (DER). In this paper, the aim is to construct the simplest topology of inverter to replace the conventional inverter in order to reduce the cost and size as well increase the performance. MOSFET was used as the main switching devices because of the higher switching frequency and can operate at higher power. Besides, it's easier to control since it is a voltage control component. This proposed inverter can generate five level output waveform to obtain smoother output AC consequently reduces the filter size. The LC filter also included in this design to regulate the AC output waveform. The powerful software such PSIM used in this design to simulate the circuit. Besides, the total harmonic distortion, THD also been considered in order to achieve the best performance of this proposed inverter.

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# CHAPTER 1

# INTRODUCTION

## 1.1 OVERVIEW

Nowadays, renewable energy resources became most of the important electrical energy supplies. As a prove, based on statistic of Germany, from years 1990 to 2001 capacity of solar PV has been increased more than 50% per year while production of solar PV electricity has been increasing nearly 60% per year [1]. The statistic showed that the use of solar energy has been increased abruptly due to higher cost and limited fuel for gas power generation. Besides, the renewable energy such solar can be applied at home since it can be in small power generation unit.

The solar PV system is one of the renewable energy resources that convert solar energy directly into electrical energy. The basic device that used in the conversion solar PV system is known as solar cell which first produced in 1954. Solar cell principally converts flux of radiation into a current source [2]. Since PV panel consist of multiple solar cell that only generates power during sunlight, the energy storage is required to power up the loads during the non sunlight time. Usually battery was used as energy storage for the output source of the solar system and it is in DC [3, 4]. Therefore, inverter required to convert the DC source into the AC source in order to connect it into the grid system.

The inverter is one of the most important parts in solar PV system. Inverters are also known as DC-AC converter where it receives DC powers as input and convert it to AC powers as output [5-7]. In practice, the AC output voltage is not in sinusoidal