

## ABSTRACT

Conventional energy sources will not be sufficient to meet future electrical demands, and also pollute the environment. Therefore, to meet their electrical energy needs, and maintain clean and green environmental conditions, people are focusing more on renewable energy sources. Small-scale PV solar standalone AC loads or grid integration applications need high voltage at a desired level, transformer/inductor less operation, high gain DC-DC front-end converters, and DC-AC converters. To achieve all the above objectives, this paper proposes a step-up quadruple boost nine-level inverter focusing on enhancing its performance using an advanced control strategy that combines Space Vector PWM (SVPWM) with Neutral-Clamped H-Bridge inverter topology. Standalone inverters are critical in applications like off-grid solar systems, battery-based backup solutions, and portable power systems, where efficient and stable AC power conversion from DC sources is essential. While traditional PWM techniques often lead to higher harmonic distortion and reduced efficiency, SVPWM offers a more efficient control strategy, reducing harmonics and improving voltage regulation. This research aims to design an inverter that leverages the Neutral Point Clamped (NPC) and cascaded H-Bridge inverter topology, a promising solution for improving voltage gain and efficiency while reducing the system's overall complexity and size. The methodology involves modeling and simulating the inverter system using tools like MATLAB/Simulink to optimize performance with the SVPWM technique. The inverter will then be prototyped and tested under varying load conditions to validate its performance. The research will compare the new inverter's efficiency, harmonic distortion, and voltage regulation with conventional methods, ultimately contributing to more efficient and compact power conversion systems for renewable energy-based standalone applications.