IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 5, May 2025
Impact Factor: 7.67

Dual-Stage Grid Connected PV System with LUO Converter and Easy Power Regulation

G. Divya[1], K. Ajay Kumar[2], A. Yashwanth[3], M. Nagaraju[4] , B. Lakshman[5]
[1]Assistant Professor, Department of EEE
[2,3,4,5]UG Students, Department of EEE
TKR College of Engineering and Technology Medbowli, Hyderabad, Telangana, India

Abstract: *The increasing demand for renewable energy integration into modern power systems has driven significant advancements in photovoltaic (PV) technology. This project proposes a dual-stage grid-connected PV system incorporating a Luo converter and an efficient power regulation mechanism to enhance power conversion efficiency and ensure stable grid interaction.*

In the first stage, the PV array output, characterized by low and variable DC voltage, is boosted using a Luo converter a high performance DC-DC converter known for its ability to provide high voltage gain, improved efficiency, and reduced output ripple compared to conventional boost converters. The Luo converter is operated with Maximum Power Point Tracking (MPPT) algorithms to extract maximum power under varying environmental conditions.

In the second stage, the regulated DC output is fed into a Voltage Source Inverter (VSI), converting DC to AC suitable for grid synchronization. An intelligent control strategy is implemented for easy power regulation, managing both active and reactive power flow to maintain grid stability and meet power quality standards.

The proposed control schemes were tested on a 250 Wp solar panel feeding power to a 230 V, 50 Hz single-phase grid through a two-stage converter. The entire scheme was modeled using the Matlab/Simulink platform, and the same was validated by hardware experimentation using Chroma Solar Simulator and NI myRIO controller under varied irradiation, temperature, and reserve fractions. The simulation and hardware results are compared and reported.

Keywords: MPPT,SPV,PV PANEL, POWER REGULATION, LUO CONVERTER

DOI: 10.48175/IJARSCT-26661