iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** III **Month of publication:** March 2021

DOI: https://doi.org/10.22214/ijraset.2021.33461

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue III Mar 2021- Available at www.ijraset.com

An Integrated Multiport DC - DC Converter for Renewable Energy System

Jeeva .B[1], Mrs. G. Paranjothi[2]
[1]M.E (Power System and Engineering), The kavery engineering college, Mecheri.
[2]Professor, Department of Electrical and Eletronics Engineering, The Kavery Engineering College, Mecheri,

Abstract: Traditionally, the renewable energy source is connected to the load through a traditional DC-DC converter and then the energy storage system is connected to either the input port or the output port of the traditional DC-DC converter through a bidirectional DC-DC converter for charging and discharging The main disadvantage of these traditional solutions is the low efficiency due to the utilization of the additional converter for the energy storage system. Also, the multi-stage architecture may result in increased size, low power density, and relatively high cost.

I. INTRODUCTION

A. Prologue About Theproject

Renewable sources such as solar photovoltaic (PV) and wind are increasingly being used because of the environmental concern and advances in the technology and rapidly decreasing manufacturing cost. However, the intermittent nature of the renewable sources and the unpredictability of the load demand produce a challenge for the wide promotion of these clean energy source. Therefore, power electronic converters with energy storage systems are usually used to convert the output power from the PV panels to match the load demand, to improve the dynamic and steady-state characteristics of the green generation systems, to provide control, and to integrate the energy storage system to deal with the challenge of the intermittent nature of the renewable energy and the unpredictability of the load demand.

B. Objective

1) Multiport DC-DC converters have been proposed for grid integration of renewable energy sources (RES) and micro grid systems.
2) These topologies either use too many active switches or have a negative effect on the battery lifetime due to the high-frequency charge/discharge for the battery.
3) Full bridge and half bridge topologies were used for each energy source

II. LITERATURE SURVEY

A. S. Neira, J. Pereda and F. Rojas, "Three-Port Full-Bridge Bidirectional Converter for Hybrid DC/DC/AC Systems," 2020

Applications with two dc ports connected to an ac system, as hybrid EVs powertrains or grid connected PV solutions, stand out among hybrid configurations because of its relevance in the present and future industry.

B. Z. Wang, Q. Luo, Y. Wei, D. Mou, X. Lu and P. Sun, "Topology Analysis and Review of Three-Port DC–DC Converters,"

In order to realize power flow control among photovoltaic (PV) panel port, battery port, and load port in the distributed photovoltaic power generation system, integrated three-port dc-dc converters (TPCs) are widely adopted.

C. Q. Tian, G. Zhou, M. Leng, G. Xu and X. Fan, "A No isolated Symmetric Bipolar Output Four-Port Converter Interfacing PV-Battery System," 2020,

A bipolar dc micro grid is desirable as it enhances the system reliability and efficiency. However, the conventional bipolar dc Micro grid requires multiple dc-dc converters to feed the power to the load, which leads to large volume and weight and high cost.

D. K. Mozaffari and M. Amirabadi, "A Highly Reliable and Efficient Class of Single-Stage High-Frequency AC-Link Converters," 2019,

Single-stage high-frequency ac-link power converters, which is capable of providing both voltage step up/down within a wide frequency and voltage ranges.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue III Mar 2021- Available at www.ijraset.com

E. S. Bandyopadhyay, P. Purgat, Z. Qin and P. Bauer, "A Multiactive Bridge Converter With Inherently Decoupled Power Flows," 2021

Multiactive bridge converters (MAB) have become a widely-researched candidate for the integration of multiple renewable sources, storage, and loads for a variety of applications, from robust smart grids to more-electric aircraft.

III. PROPOSED METHOD

A. Introduction

The propose converter has four ports in which two are for the input consisting of the solar and the wind sources, a bidirectional battery storage port and an isolated load port. The system employs four main switches for which zero voltage switching is realized.

B. Block Diagram

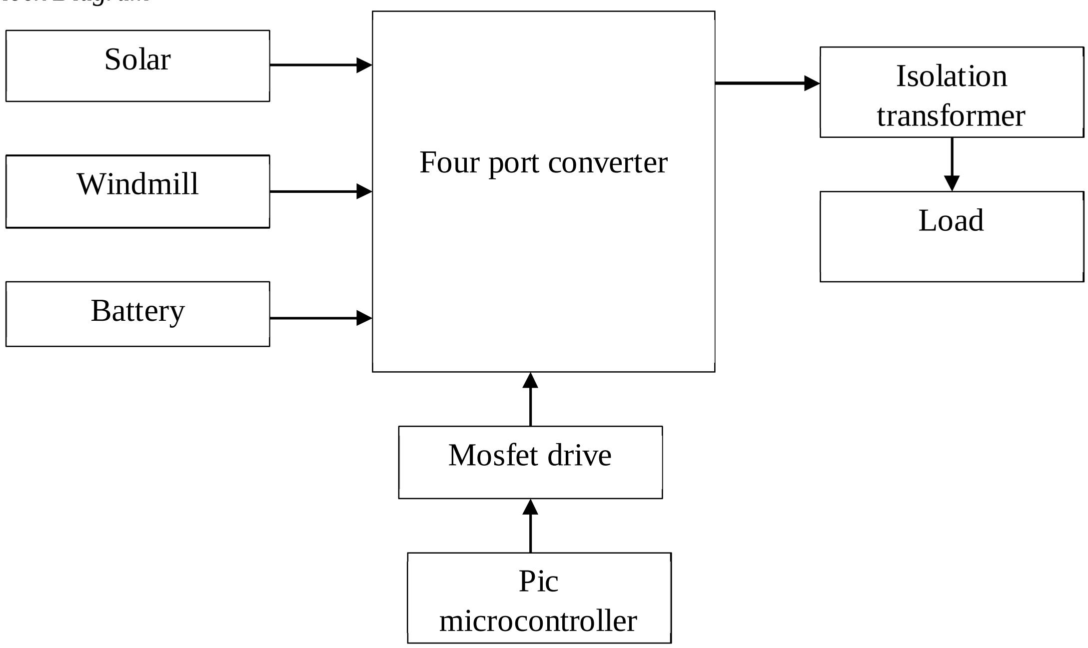


Figure4.1 proposed block diagram

C. Block Diagram Explanation

These input voltages from the PV module, wind mill the battery are together given to the multiport converter which is obtained by with two switches and two diodes to the traditional half bridge technology. The converter is made up of four main primary MOSFET switches – S1, S2, S3 and S4. Zero voltage switching is grasped for four main switches. SOLAR PANEL

Figure 4.2: solar panel

IV. SOFTWARE REQUIREMENT

A. *Introduction To Matlab*

Simulink is a block diagram environment for multi domain simulation and Model-Based Design. It supports system-level design, simulation, automatic code generation, and continuous test and verification of embedded systems. Simulink provides a graphical editor, customizable block libraries, and solvers for modeling and simulating dynamic systems. It is integrated with MATLAB, enabling you to incorporate MATLAB algorithms into models and export simulation results to MATLAB for further analysis.

B. *Simulation And Model-Based Design*

1) *Key Features*
a) Graphical editor for building and managing hierarchical block diagrams
b) Libraries of predefined blocks for modeling continuous-time and
c) Discrete-time systems
d) Simulation engine with fixed-step and variable-step ODE solvers
e) Scopes and data displays for viewing simulation results
f) Project and data management tools for managing model files and data
g) Model analysis tools for refining model architecture and increasing
h) Simulation speed
i) MATLAB Function block for importing MATLAB algorithms into models
j) Legacy Code Tool for importing C and C++ code into models

2) *Model Based Design Process*

There are six steps to modeling any system:
a) Defining the System
b) Identifying System Components
c) Modeling the System with Equations
d) Building the Simulink Block Diagram
e) Running the Simulation
f) Validating the Simulation Results
g) Start The Simulink Software

C. *Open The Simulink Library Browser*

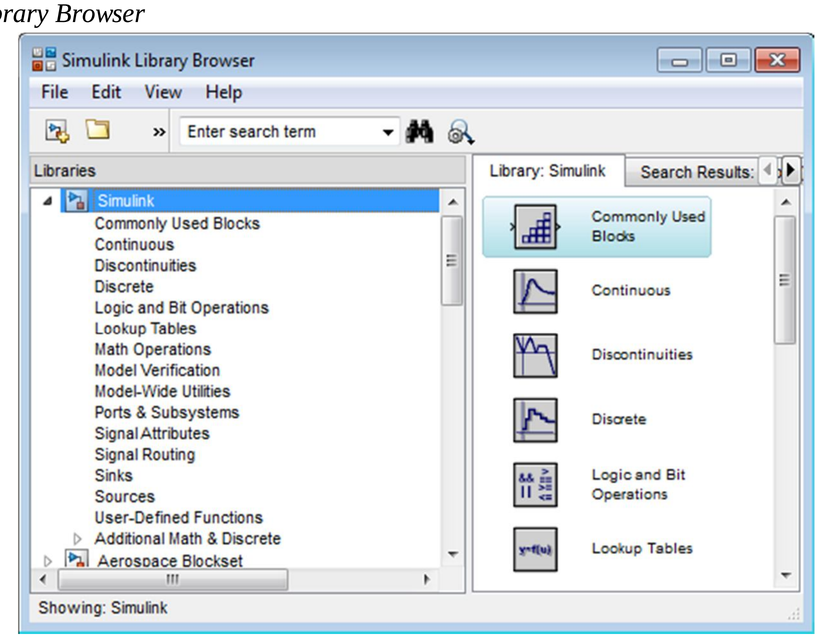


Figure 5.1: Simulink Library Browser

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue III Mar 2021- Available at www.ijraset.com

D. Open The Simulink Editor

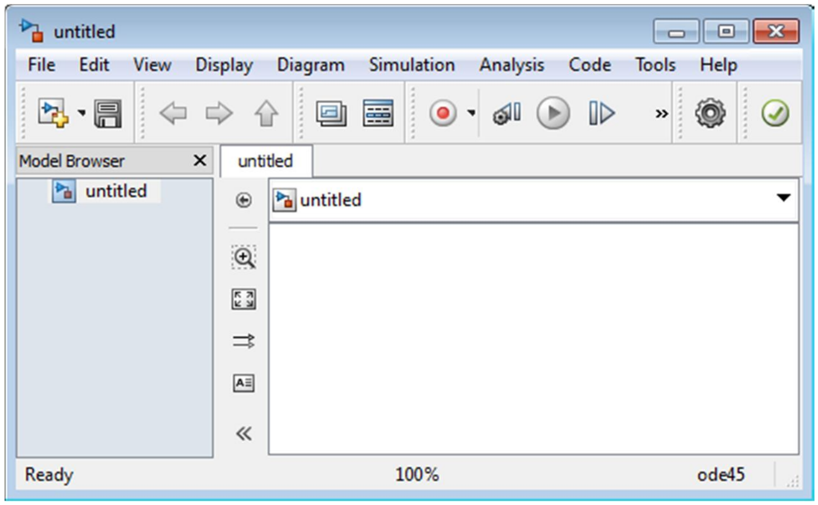


Figure 5.2: Simulink Editor

E. Draw Signal Lines Between Blocks

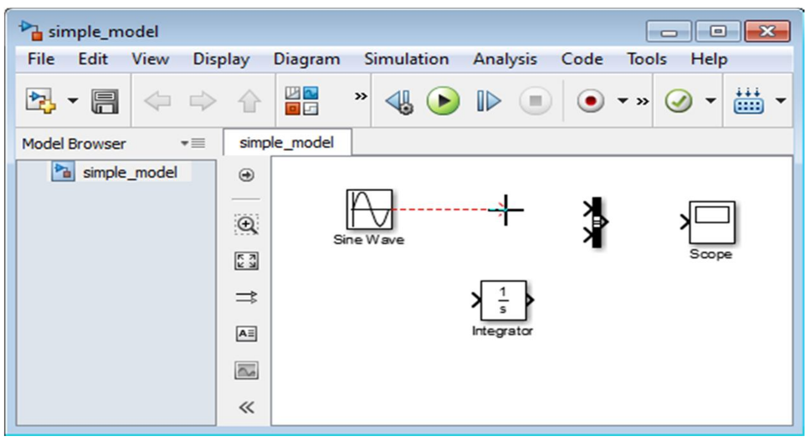


Figure 5.3: Draw Signal Lines between Blocks

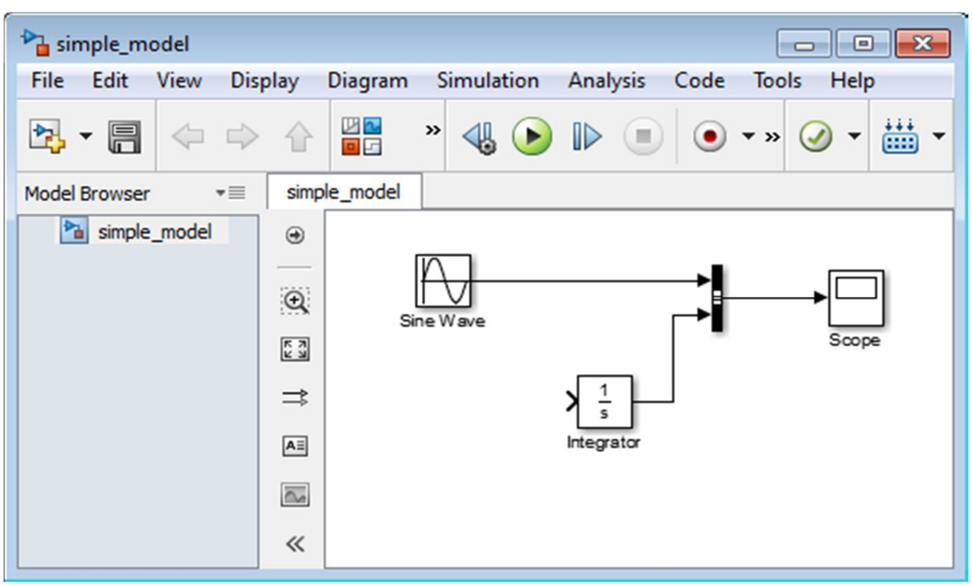


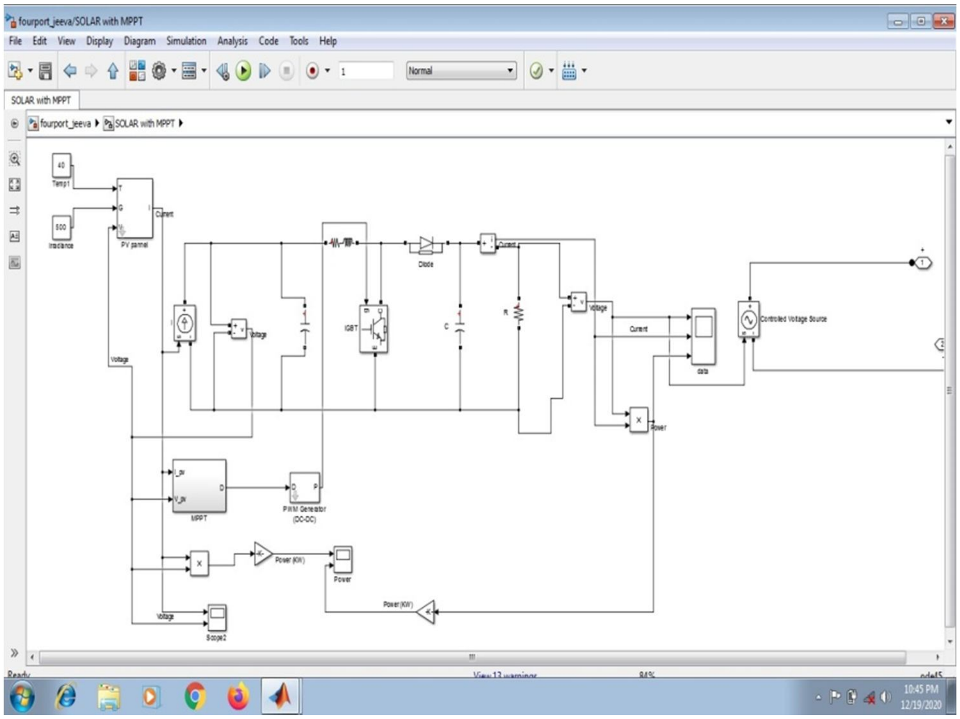
Figure 5.4: Draw Signal Lines between Blocks

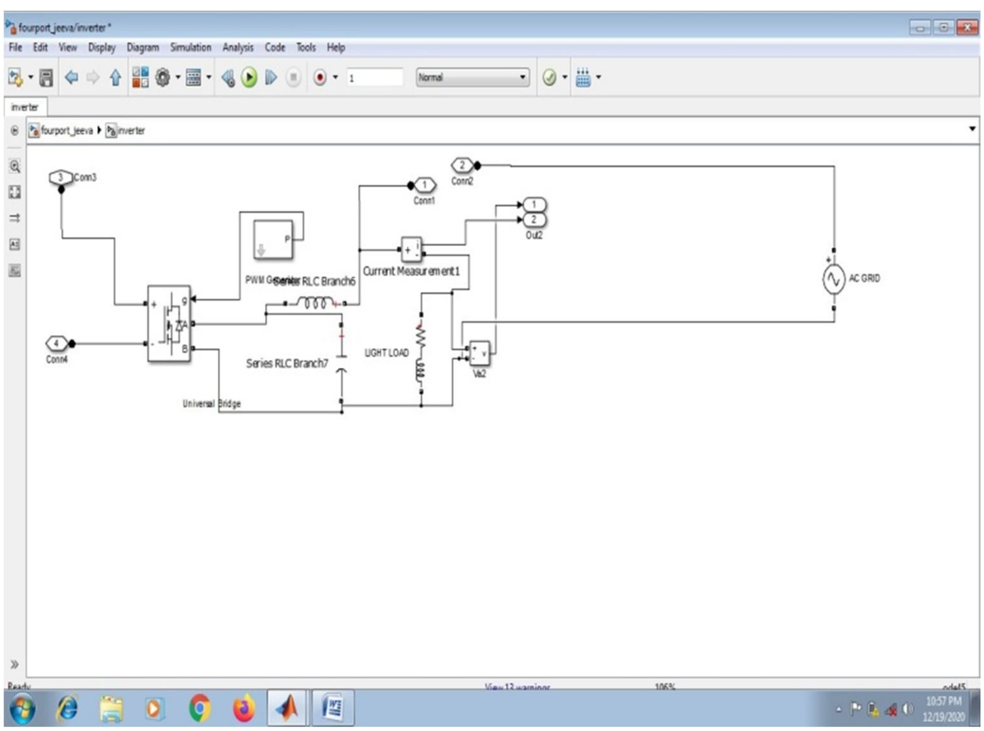
International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue III Mar 2021- Available at www.ijraset.com

V. RESULT&DISSCUSSION

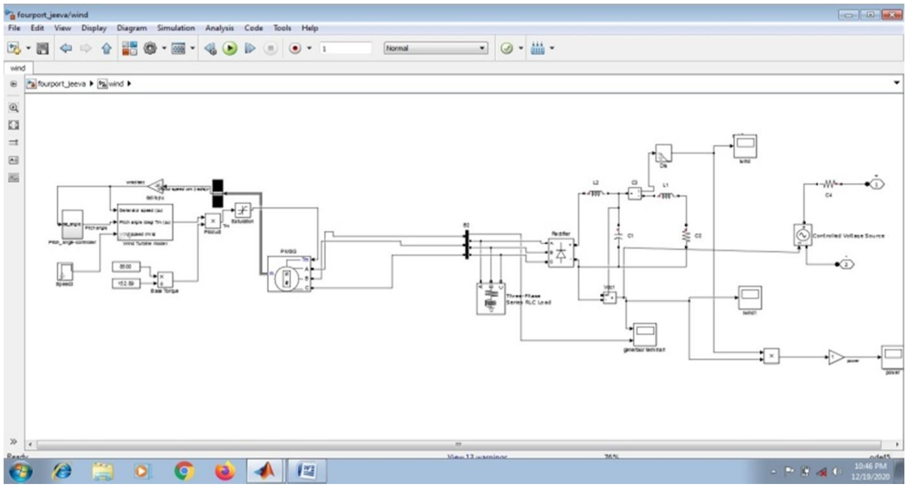
Simulation Digram And Output Result

A. Simulation Diagram

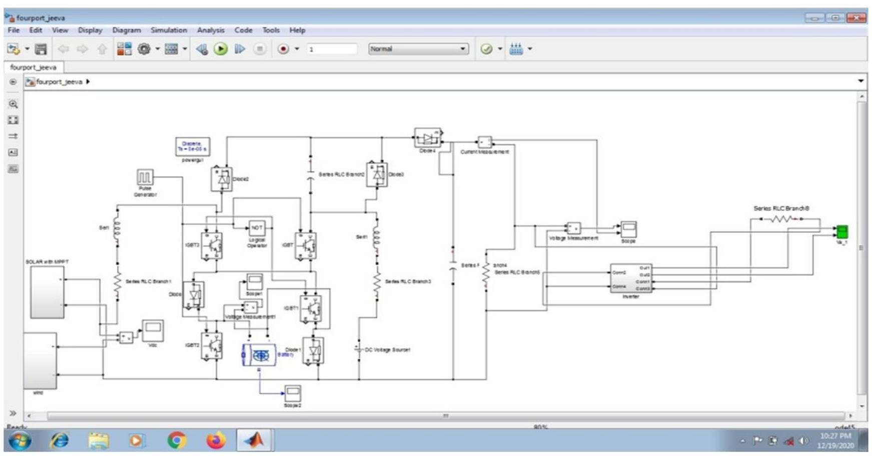




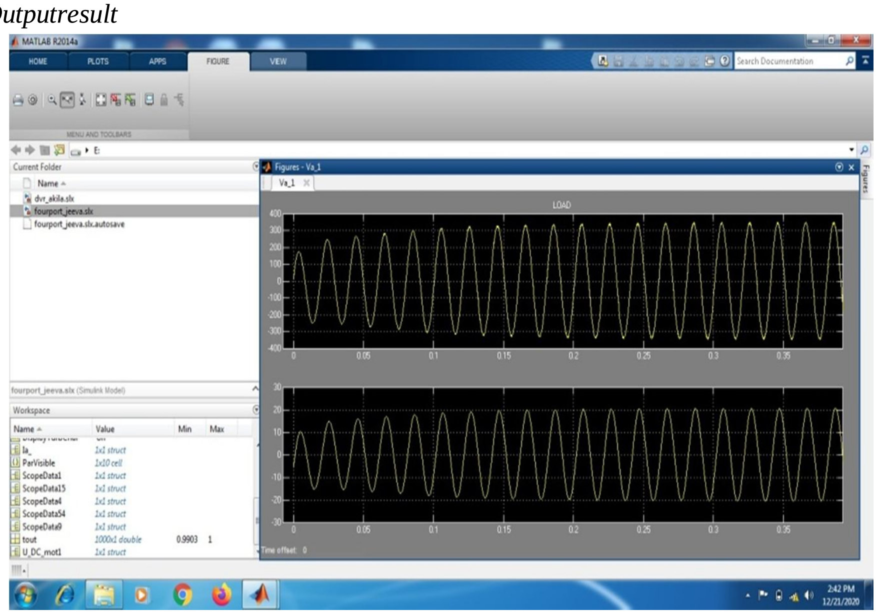
International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue III Mar 2021- Available at www.ijraset.com



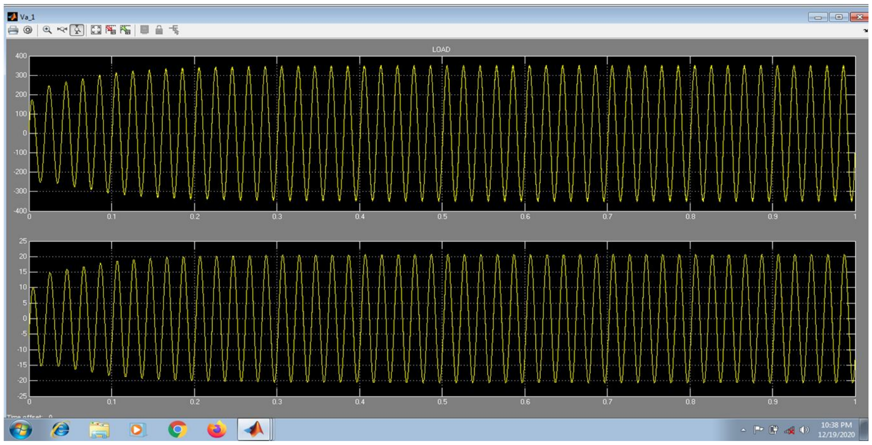
B. Proposed Simulationoverall



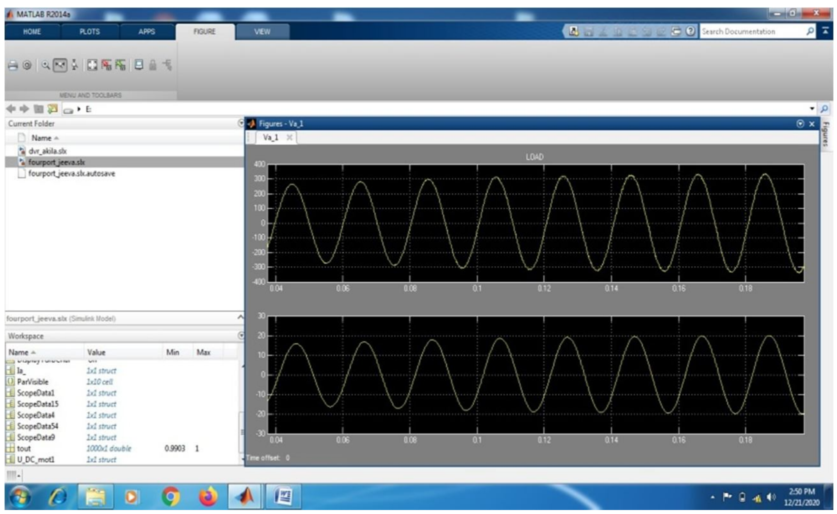
C. Overall Simulation Outputresult



D. Simulation Filtering Outputresult



E. Final Output Andresult



VI. CONCLUSION

The proposed system consists of four ports out of which two ports are for solar and wind source respectively, one port is a bi-directional battery port and another is an isolated load port. The system has been tested with simulation, zero voltage switching had been adopted for all main switches. The converter has been shown to achieve a constant output voltage for variable input voltage. The simulation results have been shown to variable the feasibility of the proposed system. It can be inferred that the proposed system provides continuous and constant output with better power flow management.

REFERENCE

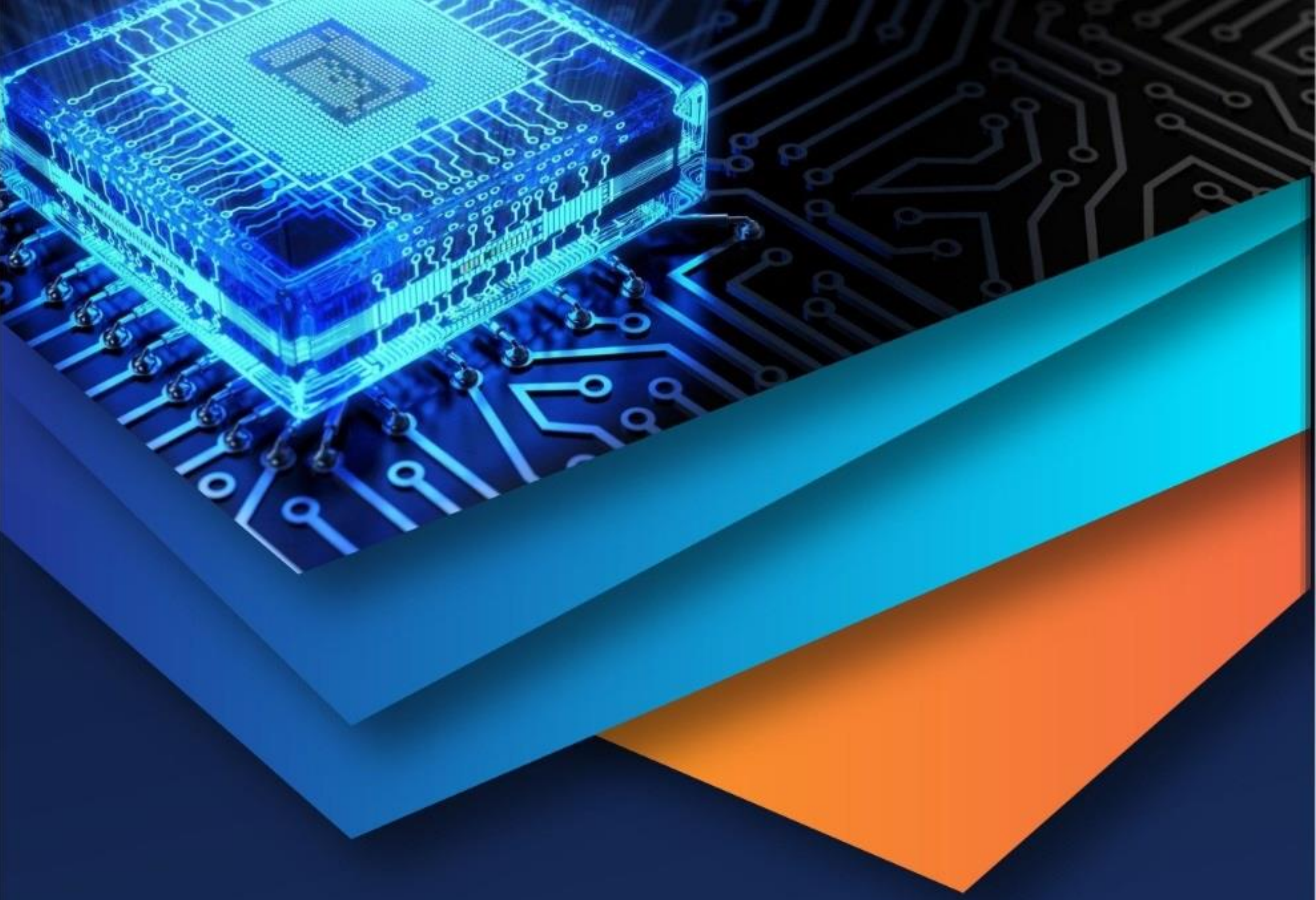
[1] S. Neira, J. Pereda and F. Rojas, "Three-Port Full-Bridge Bidirectional Converter for Hybrid DC/DC/AC Systems," in IEEE Transactions on Power Electronics, vol. 35, no. 12, pp. 13077-13084, Dec. 2020, doi: 10.1109/TPEL.2020.2990667.

[2] Z. Wang, Q. Luo, Y. Wei, D. Mou, X. Lu and P. Sun, "Topology Analysis and Review of Three-Port DC–DC Converters," in IEEE Transactions on Power Electronics, vol. 35, no. 11, pp. 11783-11800, Nov. 2020, doi: 10.1109/TPEL.2020.2985287.

[3] Q. Tian, G. Zhou, M. Leng, G. Xu and X. Fan, "A Nonisolated Symmetric Bipolar Output Four-Port Converter Interfacing PV-Battery System," in IEEE Transactions on Power Electronics, vol. 35, no. 11, pp. 11731-11744, Nov. 2020, doi: 10.1109/TPEL.2020.2983113

[4] K. Mozaffari and M. Amirabadi, "A Highly Reliable and Efficient Class of Single-Stage High-Frequency AC-Link Converters," in IEEE Transactions on Power Electronics, vol. 34, no. 9, pp. 8435-8452, Sept. 2019, doi: 10.1109/TPEL.2018.2888583

[5] S. Bandyopadhyay, P. Purgat, Z. Qin and P. Bauer, "A Multiactive Bridge Converter With Inherently Decoupled Power Flows," in IEEE Transactions on Power Electronics, vol. 36, no. 2, pp. 2231-2245, Feb. 2021, doi: 10.1109/TPEL.2020.3006266.



10.22214/IJRASET

INDEX COPERNICUS 45.98

ISRA JIF IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

ISI

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY