IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 2, February 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

9940 572 462 6381 907 438 ijareeie@gmail.com www.ijareeie.com

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE)

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 2, February 2021||

DOI:10.15662/IJAREEIE.2021.1002013

Control Strategy of Interlinking Converter in Hybrid AC/DC Microgrid

Shivani Nihaliya, Dr. Fani Bhushan Sharma

Research Scholar M.Tech.(Power System Engineering), Govt. Mahila Engineering College, Ajmer, India

Assistant Professor (EE), Govt. Mahila Engineering College, Ajmer, India

ABSTRACT : Electricity is the greatest gift of science to humanity reached for civilization where electricity is used for all purposes. However, in recent times a paradigm shift is evolving in the generation of electrical energy from the concept of using major generating plants to minor generating units allied to the distribution systems in the form of microgrids with alternative energy sources called renewables. Around the world renewable energy use is on the rise and these alternate energy sources can generate pollution-free electrical energy to the society. Although these are new centers and units with diminishing cost, there are still many challenges in operation and control of islanded and grid-connected microgrids configured in both AC and DC. In This paper proposes the coordinated control of a hybrid AC/DC power system with renewable energy source, energy storages and critical loads. The hybrid microgrid consists of both AC and DC sides. A synchronous generator and a PV farm supply power to the system's AC and DC sides, respectively. A bidirectional fully controlled AC/DC converter with active and reactive power decoupling technique is used to link the AC bus with the DC bus while regulating the system voltage and frequency. The high frequency electronic power processor is used for DC-DC power conversion.

I. INTRODUCTION

The global energy crisis provides new impetus for growth and use of clean and renewable energy. Solar photovoltaic (PV) power generation is becoming progressively more important as a renewable energy source due to benefits such as no fuel costs, low maintenance costs and no noise and wear caused by moving parts. The trend of hybrid ac/dc subgrids (ACS/DCSs) is evolving to minimize the power conversion stages, improving reliability and reducing losses by locating distributed generation (DG) near load demand [1] [2]. In hybrid systems, a parallel operation of bi-directional interlinking converter (IC) is involved to transfer the power in between the ACS and DCS [3]. Each subgrid can be either operated in grid-connected or islanded mode and a review on power control schemes for the operation of ACS od DCS is presented in [4]. The decentralized control methods based on the conventional droop characteristics are widely utilized for power sharing in a predetermined manner [5]. However, the power management schemes presented in the literature are mainly focused on either ACS or DCS conditions. The concept of droop controller for ACS is introduced in [6]. In [7], decentralized control strategy with an additional droop gain is proposed to preserve power sharing in ACSs. To improve the system performance, an adaptive droop gain method based on virtual voltage and frequency frame is presented in [8]. The method effectively control the power flow independently. Similar to ACS or DCSs, sharing the power between ACS and DCS can be achieved by the conventional droop methods [9] [10]. However, the small ac frequency and voltage output deviations could result in increased circulating currents between subgrids. Furthermore, the factors such as the power penetration, control schemes, loads, line parameters etc. have been reported to affect the frequency and voltage in [11]. In order to enhance the ac frequency and voltage, a phase compensation transfer function has been added to the unified power control loop in [12]. A droop method to coordinate power flows and to cover acceptable power sharing among multiple subgrids is proposed in [13].

II. EXISTING SYSTEM

Energy storage systems have been generally used in numerous submissions, such as renewable power arrangement, electric vehicles, uninterrupted power deliver and microgrids, to offset power relations between power generation and power consumption. A bidirectional DC-DC (BDC) converter with bidirectional influence conversion and transmission features is a key component that connects power storage elements (such as batteries or supercapacitor) to various power supply systems. One side of the BDC is associated to battery. The battery power is typically low, usually in the range of 12-48 V, while other side of BDC is related to a high power bus of up to 400 V or advanced to meet inverter or AC

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 2, February 2021||

DOI:10.15662/IJAREEIE.2021.1002013

power requirements. so, for an energy storage system, a BDC with a high up / down power conversion ratio is beloved to attach a low voltage battery to a high power DC bus.

III. METHODOLOGY

This chapter examines three basic topological transformers. Transform, improve and convert converts. Each of these is used to determine the most appropriate topology to achieve the control of the maximum authority indicator of PV model. In almost all circumstances, the domestic battery storage system (BESS) used to increase self-consumption of roof photovoltaic (PV) units is still economically disadvantageous to the German market, as battery prices in 2015 are assessed under the German market conditions, this is the savings of such systems can usually do not exceed the battery's investment costs within the estimated life of the system. In this work, the economic benefits of a system providing technical data based on Tesla's announcement of the power wall are evaluated. For the German market. The purpose is to make a reliable assessment of Tesla's Power Wall and estimate the conditions under which the storage system will be economically advantageous. The results also apply to other BESS homes with similar prices and technical parameters. Tesla's product is just one example, it is an example of analysis of BESS economics in photovoltaic systems for housing.

IV. OBJECTIVES

The chief principle of this investigate is to intend or realize the maximum authority point tracker for photovoltaic power provide based on fuzzy logic. To complete this work, an MPPT model consisting of a DC-DC converter or a fuzzy logic manager was residential. Then perform a characteristic analysis of the boost converter to select the topology most suitable for all mechanism of entire solar cell classification. The collective reproduction of photovoltaic module or selected buck-boost converter is imitation, or result are used to acquire best intend to create and adjust unclear logic control algorithm used to track maximum authority.

V. FUZZY LOGIC CONTROLLER

In a vague logical system, language changes are used instead of mathematical numbers. The procedure of change digital changes (real numbers or clear changes) into linguists (fuzzy numbers or fuzzy variables) is called structure. In this function, variable in a DC voltage converter is electricity. The output of the output is controlled by a vague logical communicator. Errors e (k) and modifications Δe (k) are given as an introduction to the fuzzy logic software. Comparing real voltage Vo (k) with power power Vrf (k) will find errors. Based on faults e (k) and faults E higher than (k), modification faults are calculated and then adjusted to use the same fuzzy logic driver as the other indicators. Then there are the errors and the inequalities (Adel E. El-kholy or A.Dabroom, 2002), the comparisons (3.1) and (3.2) give?? E (k) = Vrf (k) -Vo (k) (3.1)

PRINCIPLE OF OPERATION OF BOOST CONVERTER

The major operating attitude of boost converter is that inductor in input circuit can resist impulsive changes in the input present. When the switch is open, the inductor provisions energy in form of compelling power or discharge it when switch is closed. The capacitor in output course is supposed to be great sufficient to increase constant time of RC circuit in output stage. Compared to switching cycle, a higher time constant can guarantee a invariable output power Vo (t) = Vo (constant)

CIRCUIT DIAGRAM OF BOOST CONVERTER

The circuit drawing of boost converter is shown in figure below

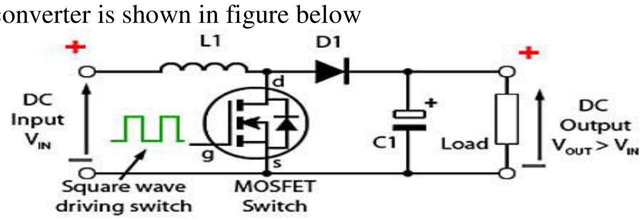


Fig 1 : circuit diagram of boost converter

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 2, February 2021||

DOI:10.15662/IJAREEIE.2021.1002013

Operation:

Step 1

When switch is closed, clock flows through inductor on one side, or inductor stores energy, produce a attractive field. The polarity on left side of inductor is good.

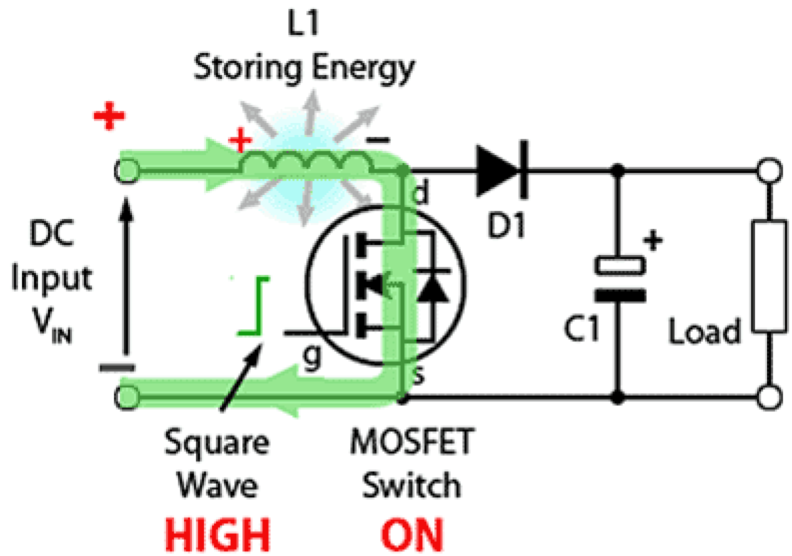


Fig 2:circuit diagram of boost converter

Step 2

When switch is release, present will decline as impedance increases. The previously generated magnetic field will be smashed to keep current flowing into the charge. Therefore, division will be reversed (which means that left side of inductor will become negative). As a result, the two power supplies will be connected in series, source a higher power to arraign capacitor during diode D.

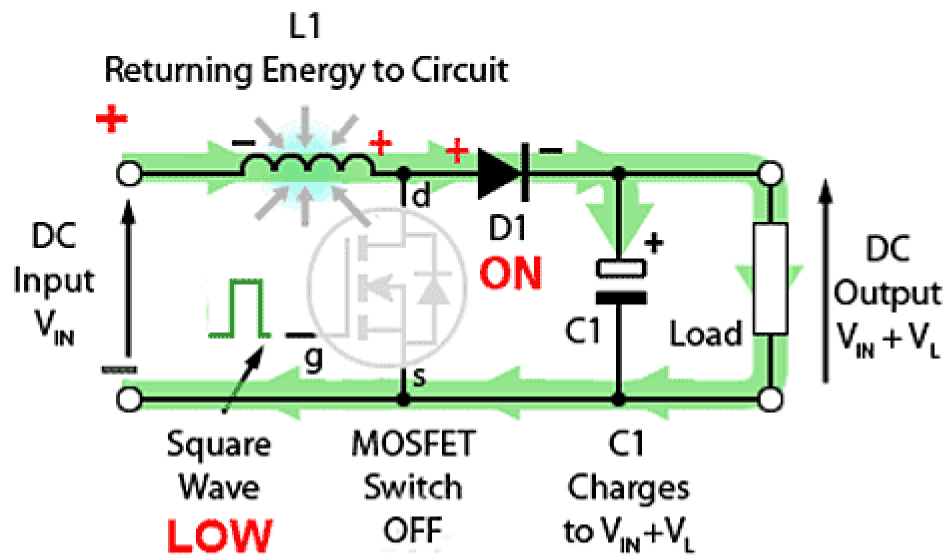


Fig 3: circuit diagram of boost converter

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 2, February 2021||

DOI:10.15662/IJAREEIE.2021.1002013

MODES OF OPERATION OF BOOST CONVERTER

The boost converter can work in two modes

a) Continuous conduction mode, in which recent flowing through inductor is never zero, that is, inductor is somewhat discharged before commencement of switching cycle.

b) Discontinuous conduction mode, in which current flowing throughout the inductor is zero, that is, the inductor is entirely discharged at end of switching cycle.

d) Boost converter circuit examination

Throughout the analysis, it is assumed that the current oscillation through the inductor (maximum to minimum) and the voltage oscillation through the capacitor are very small, so they change linearly. This is to simplify investigation or, compared to actual value, the results we get from this investigation are very correct.

FUZZY CONTROLLER STRUCTURE

The construction of the fuzzy logic manager is based on fuzzy sets, where variables are members of one or more sets with a specific quantity of partisanship. The advantage of using fuzzy logic is that it tolerate us to simulate human inference processes in computers, measure inaccurate in sequence, and make decisions based on fuzzy information, such as connecting resistive loads to photovoltaic modules through booster DC / DC converters [58] The block diagram of the MPPT-based fuzzy logic manage is shown in Figure 4-2 [57].

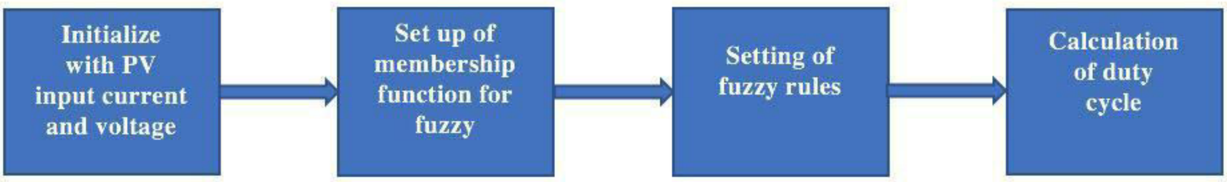


Figure 4: Block diagram of the fuzzy logic algorithm.

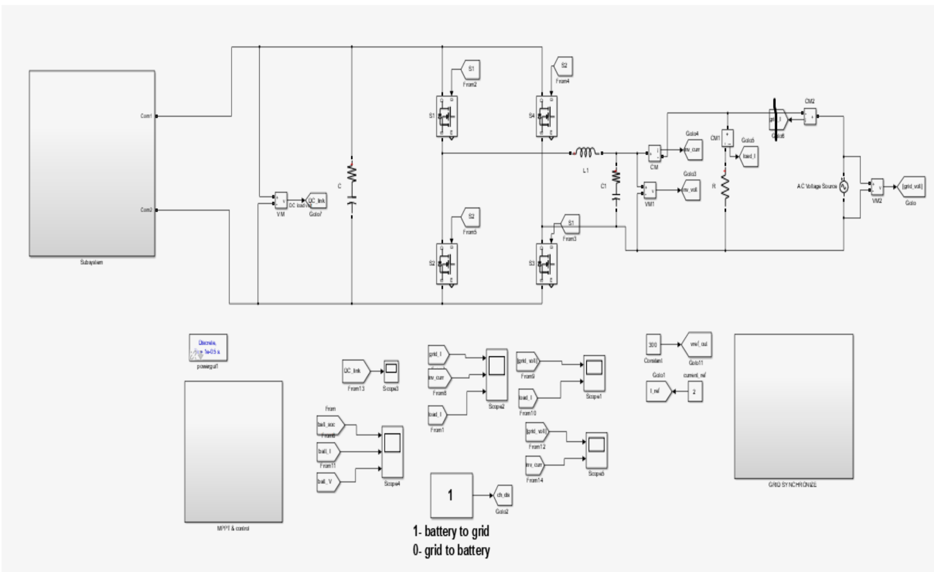


Fig 5: proposed simulink model

The main Sp and Ss switches in anticipated converter function at higher dimensions than fg frequency mains. Therefore, it can be assumed that the vg voltage gate does not change during the Ts exchange period, and it is assumed that power of increasing gate is exactly equal to the vg voltage. The following modifiers are the following: The on state of the main main switch Sp and off state of second main switch Ss, or off state of main switch Sp and the on state of second main switch. Switch Ss. Two methods. Assume that the Sp's first circuit breaker cycle sp determines the role of the circuit breaker D. By embryonic a fuzzy logic algorithm, fuzzy logic is applied to the system. The design and maintenance of the inductor component is done to certify that the converter operates in a permanent transport mode.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 2, February 2021||

DOI:10.15662/IJAREEIE.2021.1002013

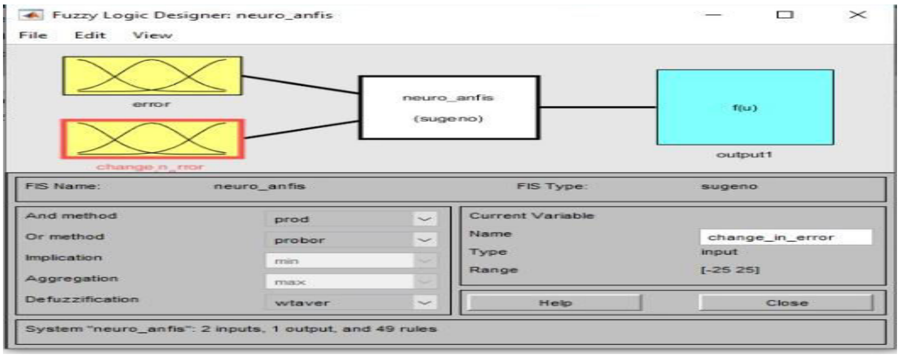


Figure 6: The Membership Function plots of change error.

The surface of the fuzzy controller ruler, which is a graphical version of ruler base.

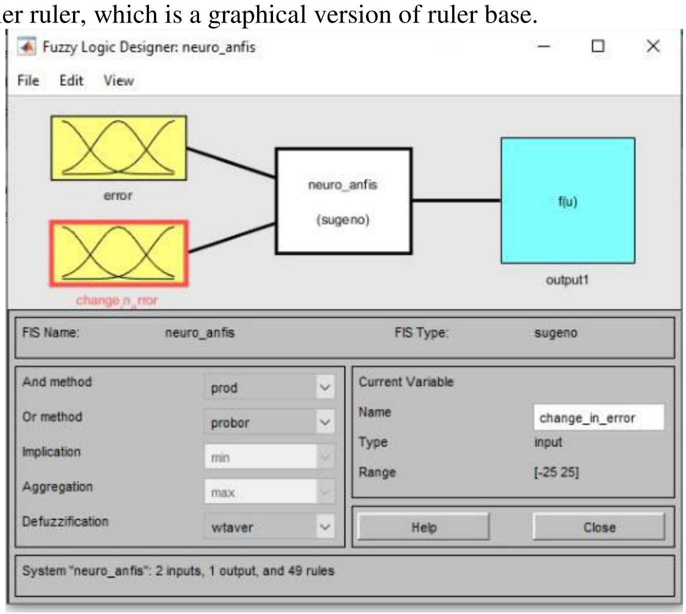


Figure 7: The Membership Function plots of change error.

This chapter proposes a fuzzy controller to track greatest Maximum point of photovoltaic power source, and simulates it in Simulink / MATLAB. The controller is based on essential modules of the fuzzy system, namely (fuzzification, reasoning or de-fuzzification). These blocks read ambiguous inputs or program device procedure, or convert programs into output actions respectively. In this controller, trapezoidal shape of the input and output membership functions is proposed, and Mamdani fuzzy conclusion process and centroid method are also selected as the deburring process. The entire system includes photovoltaic, booster converter, diffuse controller and modelling and simulation of load under different irradiance changes.

SOLAR POWER

Standard Solar, Inc. recently completed one of the first grid-interactive battery pack solar microgrid systems in the country. The first challenge is to make this project a reality after months of dedication, innovative engineering design and coordination with key partners, public services and government departments. The first half of this article will set the stage explaining how to set up the microgrid, its features, and its uniqueness. Then, I will discuss the time required to design and install a solar microgrid system, the lessons learned from this groundbreaking project, and what technical considerations should be considered when implementing this new technology.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 2, February 2021||

DOI:10.15662/IJAREEIE.2021.1002013

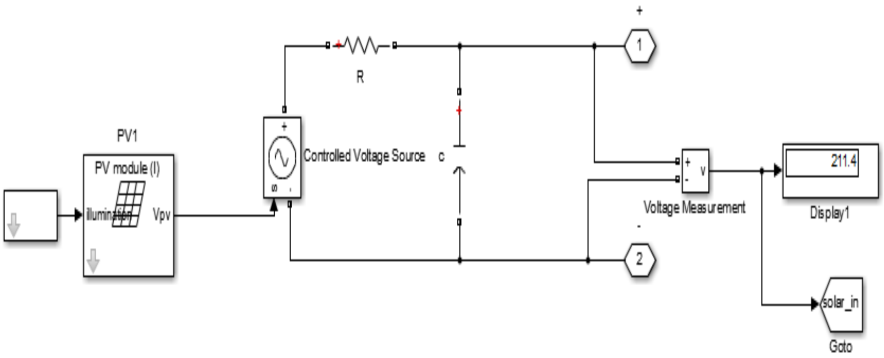


Fig 8:solar panel

VI. CONCLUSION

This paper proposes a fuzzy controller to track greatest Maximum point of photovoltaic power source, and simulates it in Simulink / MATLAB. The controller is based on essential modules of the fuzzy system, namely (fuzzification, reasoning or de-fuzzification). These blocks read ambiguous inputs or program device procedure, or convert programs into output actions respectively. In this controller, trapezoidal shape of the input and output membership functions is proposed, and Mamdani fuzzy conclusion process and centroid method are also selected as the deburring process. The entire system includes photovoltaic, booster converter, diffuse controller and modelling and simulation of load under different irradiance changes.

REFERENCES

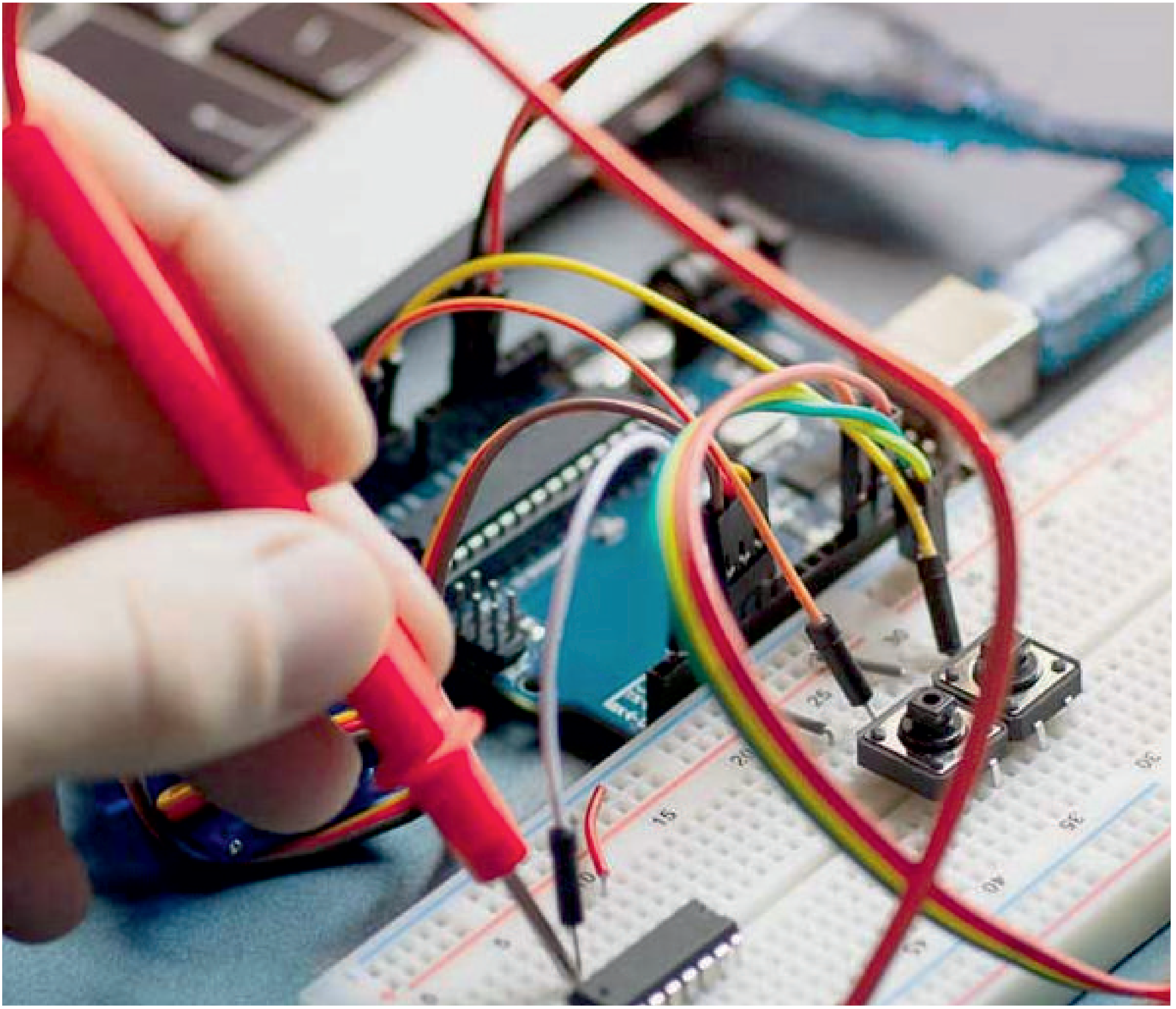
1. Xu Jia Guoming Chuai ; Haonan Niu ; Qianfan Zhang Grid Connected Power Generation Control Method for Z-Source Integrated Bidirectional Charging System 2018 International Power Electronics Conference (IPEC-Niigata 2018 -ECCE Asia) Year: 2018
2. PandlaChinna Dastagir iGoud ; Chandra Sekhar Nalamati ; Rajesh Gupta Grid Connected Renewable Energy Based EV Charger with Bidirectional AC/DC Converter 2018 5th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON) Year: 2019
3. Fatama-Tuz-Zahura ; Md. Ziaur Rahman Khan Advanced Control Scheme for Bidirectional Grid-Connected Inverter 2018 10th International Conference on Electrical and Computer Engineering (ICECE) Year: 2019
4. Jiao Jiao ; Runquan Meng ; Zheng Guan ; ChunguangRen ; Lei Wang ; Baifu Zhang Grid-connected Control Strategy for Bidirectional AC-DC Interlinking Converter in AC-DC Hybrid Microgrid 2019 IEEE 10th International Symposium on Power Electronics for Distributed Generation Systems (PEDG) Year: 2019
5. Yulu Cui ; Yifeng Wang ; Xiaoyong Ma A Delay Compensation Control Method Based on Interleaved Dual BUCK Full Bridge Grid-connected Bidirectional Converter 2019 22nd International Conference on Electrical Machines and Systems (ICEMS) Year: 2019
6. H. G. Langer and H. -Ch. Skudelny (1989), “DC to DC converters with bi-directional power flow and controllable voltage ratio,” in Proc. IEE EPE Conf., pp. 1245–1250.
7. Capel (1986), “A bidirectional high power cell using large signal feedback control with maximum current control for space applications,” in Proc. IEEE Power Electron. Spec. Conf., pp. 684–695.
8. K. Venkatesan (1989), “Current mode controlled bidirectional fly back converter,” in Proc. IEEE Power Electron. Spec. Conf, pp. 835–842
9. Ray (1992), “Bidirectional dc–dc power conversion using quasiresonant topology,” in Proc. IEEE Power Electron. Spec. Conf., pp. 617–624.
10. Inoue, S. &Akagi, H. (2007). A Bidirectional DC-DC converter for an Energy storage system With Galvanic Isolation. IEEE Transactions on Power Electronics, Vol. 22, No. 6, (2007), pp. 2299-2306, ISSN 0885-8993.
11. Yu, W., Qian, H. and Lai, J.S. (2010), "Design of High-Efficiency Bidirectional DC–DC Converter and High-Precision Efficiency Measurement", IEEE Transactions on Power Electronics, Vol. 25, No. 3,, pp. 650-658.
12. Tao, T., Duarte, J.L. & Hendrix, M.A.M. (2008). Three-Port Triple-Half-Bridge Bidirectional Converter With Zero-Voltage Switching. IEEE Transactions on Power Electronics, Vol. 23, No. 2, pp. 782-792

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 2, February 2021||

DOI:10.15662/IJAREEIE.2021.1002013

13. Yu, W., Qian, H. & Lai, J.S. (2010). Design of High-Efficiency Bidirectional DC–DC Converter and High-Precision Efficiency Measurement. IEEE Transactions on Power Electronics, Vol. 25, No. 3, (March 2010), pp. 650-658, ISSN 0885-8993.
14. Sheng-Yuan Ou, Ho-Pu Hsiao and Chen Hung Tien (2010), "Analysis and Design of a Prototype Single-Stage Half-Bridge Power Converter,"2010 5th IEEE Conference on Industrial Electronics and Applications, pp.1168-1173.
15. S.-J. Chiang, K. Chang, and C. Yen, "Residential photovoltaic energy storage system," IEEE Trans. I nd. Electron., vol. 45, no. 3, pp. 385–394, Jun. 1998.
16. J. G. de Matos, F. S. e Silva, and L. A. d. S. Ribeiro, "Power control in ac isolated microgrids with renewable energy sources and energy storage systems," IEEE Trans. I nd. Electron., vol. 62, no. 6, pp. 3490–3498, Jun. 2015.
17. N. R. Tummuru, M. K. Mishra, and S. Srinivas, "Dynamic energy management of renewable grid integrated hybrid energy storage system," IEEE Tra n s . I n d . E l e c t ron ., vol. 62, no. 12, pp. 7728–7737, Dec. 2015.
18. M.-T. Tsai, C.-E. Lin, W.-I. Tsai, and C.-L. Huang, "Design and implementation of a demand-side multifunction battery energy storage system," IEEE Trans. I nd. Electron., vol. 42, no. 6, pp. 642–652, Dec. 1995.
19. H. Wu , K . S u n , L . C h e n , L. Zh u , a n d Y. Xi n g , " H i g h st e p - u p / s t e p - d own soft-switching bidirectional DC–DC converter with coupled-inductor and voltage matching control f or energy storage systems," I E EETra n s . I n d .Electron., vol. 63, no. 5, pp. 2892–2903, May 2016
20. S. Eren, M. Pahlevani, A. Bakhshai, and P. Jain, "A digital current control technique for grid-connected AC/DC converters used for energy storage systems," IEEE Trans. Power Electron., vol. 32, no. 5, pp. 3970–3988, May 2017.
21. W. W. Chen, R. Zane, and L. Corradini, "Isolated bidirectional grid tied three-phase AC-DC power conversion using series resonant con verter modules and a three-phase unfolder," IEEE Trans. Power Electron., vol. 32, no. 12, pp. 9001–9012, Dec. 2017.
22. Krismer, F., Biela J. &Kolar, J.W. (2005). A comparative evaluation of isolated bi-directional DC/DC converters with wide input and output voltage range, Proceedings of the Fourtieth IAS Annual Meeting, Vol.1, pp. 599-606.
23. Yu, W., Qian, H. and Lai, J.S. (2010), "Design of High-Efficiency Bidirectional DC–DC Converter and High-Precision Efficiency Measurement", IEEE Transactions on Power Electronics, Vol. 25, No. 3,, pp. 650-658.
24. Tao, T., Duarte, J.L. & Hendrix, M.A.M. (2008). Three-Port Triple-Half-Bridge Bidirectional Converter With Zero-Voltage Switching. IEEE Transactions on Power Electronics, Vol. 23, No. 2, pp. 782-792



INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 7.122

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर
NISCAIR

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

9940 572 462 6381 907 438 ijareeie@gmail.com

www.ijareeie.com

Scan to save the contact details