International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 06 | June 2019 www.irjet.net p-ISSN: 2395-0072

A Review on Grid Connected Multi Array PV Battery Based Bi-Directional DC – DC Converter

Yogesh Tiwar[1], Gokul Kumar Dewangan[2]

Dept. of Electrical and Electronics Engineering, Shri Shankaracharya Group of Institutions, Junwani, Bhilai, C.G., India

---

Abstract: In this project, a control strategy for power flow management of a grid-connected to photo voltaic battery based system with an efficient multi-input transformer coupled bidirectional dc-dc converter is presented. The proposed system aims to satisfy the load demand, manage the power flow from different sources, inject surplus power into the grid and charge the battery from grid as and when required. Bidirectional buck-boost converter is used to harness power from PV along with battery charging/discharging control. A single-phase full-bridge bidirectional converter is used for feeding ac loads and interaction with grid. The proposed converter architecture has reduced number of power conversion stages with less component count, and reduced losses compared to existing grid-connected hybrid systems. This improves the efficiency and reliability of the system

Keywords: PV Battery, DC-DC Converter, Grid, Bidirectional Converter

Literature Survey:

G. Suresh (2018) In this paper, a control strategy for power flow management of a lattice associated cross breed PV-wind battery based system with a productive multi-input transformer coupled bidirectional dc-dc converter is introduced. The proposed system expects to fulfil the heap request, deal with the power flow from various sources, infuse surplus power into the lattice and charge the battery from matrix as and when required. A transformer coupled lift half-connect converter is utilized to tackle power from wind, while bidirectional buck-help converter is utilized to bridle power from PV alongside battery charging/releasing control. A solitary stage full-connect bidirectional converter is utilized for nourishing air conditioning burdens and collaboration with lattice. The proposed converter engineering has diminished number of power change stages with less segment check, and decreased misfortunes contrasted with existing lattice associated cross breed systems. This enhances the productivity and unwavering quality of the system. Re-enactment comes about got utilizing MATLAB/Simulink demonstrate the execution of the proposed control strategy for power flow management under different methods of task. The viability of the topology and adequacy of the proposed control strategy are approved through point by point trial examines, to exhibit the ability of the system task in various modes.

Ramendra Kumar et al. (2018) Hybrid power system will be utilised to decrease energy storage wants. There's increasing interest for the use of exchange or property power sources to accomplish good and ease power for Residential Application the PV-wind hybrid system restores the foremost reduced cost esteems to stay up an identical level of DPSP once contrasted with independent solar and wind systems. For all heap requests the levelised energy taken a toll for PV-wind hybrid system is reliably below that of independent solar PV or wind system. The PV-wind hybrid various is techno financially possible for provincial zap. This paper proposes a completely unique incorporated device topology for interfacing between the energy storage system and therefore the dc transport for a personal micro grid application The planned coordinated full-bridge dc–dc device displays the incidental to elements: low range of dynamic gadgets contrasted with the converters usually connected to comparative applications, low data and

yield current swell, high voltage proportion, duplex power stream, and galvanic disengagement. Keywords: Battery charge control, full-bridge bidirectional converter, hybrid system, solar photovoltaic (PV), coupled boost dual half-bridge bidirectional converter, wind energy.

M. Bijomerlin et al. (2017) The efficient use of hybrid energy for three phase domestic applications is presented in this paper. The proposed hybrid system manages the power flow from solar-wind-battery sources and the battery is charged when required from the grid. The proposed converter consists of a half bridge converter to harness the power from solar and battery through bidirectional buck-boost converter and power from wind through the diode rectifier. The highfrequency transformer and voltage multiplier step up the voltage to feed three-phase loads by means of a three-phase inverter. Simulation results for various operating modes are obtained using MATLAB. The improved voltage performance of the various operating modes is validated and results are obtained.

P. Anesh Kumar et al. (2017) Hybrid power system can be utilized to decrease energy storage necessities. There is expanding interest for the utilization of exchange or sustainable power sources to accomplish perfect and ease power for Residential Application the PV-wind hybrid system restores the most reduced unit cost esteems to keep up a similar level of DPSP when contrasted with independent solar and wind systems. For all heap requests the levelised energy taken a toll for PV-wind hybrid system is dependably lower than that of independent solar PV or wind system. The PV-wind hybrid alternative is techno financially feasible for provincial zap. This paper proposes a novel incorporated converter topology for interfacing between the energy storage system and the dc transport for a private microgrid application The proposed coordinated full-bridge dc–dc converter displays the accompanying elements: low number of dynamic gadgets contrasted with the converters generally connected to comparative applications, low information and yield current swell, high voltage proportion, bidirectional power stream, and galvanic disengagement.

Hekmatullah et al. (2017) The main problem in the electrical system is the load demand by using the renewable and non-renewable sources we are satisfying the load demand. The power flow between the load and renewable energy sources is difficult so we gone for multi-input transformer coupled bidirectional dcdc converter. This maintains the power flow between the load, grid and renewable sources. But the harmonics is main problem in the conventional model to overcome that problem we are going for the multilevel transformer in this paper, which can be observed in matlab/simulink software.

S. Pardha Saradhi et al. (2017)in this project, a control strategy for power flow management of a grid-connected hybrid PV-wind-battery based system with an efficient multi-input transformer coupled bidirectional dc-dc converter is presented. The aim of our project is to satisfy the load demand, manage the power flow from different sources, inject surplus power into the grid and charge the battery from grid as and when required. A transformer coupled boost half-bridge converter is used to harness power from wind, while bidirectional buck-boost converter is used to harness power from PV along with battery charging/discharging control. A single-phase full-bridge bidirectional converter is used for feeding ac loads and interaction with grid. The proposed converter architecture has reduced number of power conversion stages with less component count, and reduced losses compared to existing grid-connected hybrid systems. Then we are going to test the single phase multilevel converter to feed ac loads and interaction with grid.

B. Venkata Seshu Babu et al. (2017) A hybrid wind/PV system for supplying an isolated small community with electrical energy is digitally simulated and presented in this paper. a control strategy for power flow management of a grid-connected hybrid photovoltaic (PV)–windbattery-based system with an efficient multi-input bidirectional dc–dc converter is presented. A converter is used to

harness power from wind, while a bidirectional buck–boost converter is used to harness power from PV along with battery charging/discharging control. The proposed converter architecture has reduced number of power conversion stages with less component count and reduced losses compared with existing grid-connected hybrid systems. This improves the efficiency and the reliability of the system. The proposed controllers are coordinated dynamic error driven PI regulators to control the interface converters.

K.Sudarshana et al. (2017) Another control technique for an efficient multi input transformer-coupled bidirectional dc– dc converter for control stream administration in a grid-connected hybrid photovoltaic (PV)– wind-battery-based system is introduced in this paper. A transformer-coupled lift half-bridge converter is utilized to outfit control from wind, while a bidirectional buck– support converter is utilized to bridle control from PV alongside battery charging/releasing control. A single-phase H6 inverter is utilized for sustaining air conditioning burdens and connection with the grid. The proposed system means to fulfill the heap request, deal with the power spill out of various sources, infuse the surplus power into the grid, and charge the battery from the grid as and when required. Additionally, the proposed converter design has decreased number of energy transformation stages with less segment tally and diminished misfortunes contrasted and existing grid-connected hybrid systems. This enhances the effectiveness and the unwavering quality of the system. Reproduction comes about got utilizing MATLAB/Simulink demonstrate the execution of the proposed control technique for control stream administration under different methods of operation.

Shafinaz A. Lopa et al. (2016) Another control technique for an efficient multi input transformer-coupled bidirectional dc– dc converter for control stream administration in a grid-connected hybrid photovoltaic (PV)– wind-battery-based system is introduced in this paper. A transformer-coupled lift half-bridge converter is utilized to outfit control from wind, while a bidirectional buck– support converter is utilized to bridle control from PV alongside battery charging/releasing control. A single-phase H6 inverter is utilized for sustaining air conditioning burdens and connection with the grid. The proposed system means to fulfill the heap request, deal with the power spill out of various sources, infuse the surplus power into the grid, and charge the battery from the grid as and when required. Additionally, the proposed converter design has decreased number of energy transformation stages with less segment tally and diminished misfortunes contrasted and existing grid-connected hybrid systems. This enhances the effectiveness and the unwavering quality of the system. Reproduction comes about got utilizing MATLAB/Simulink demonstrate the execution of the proposed control technique for control stream administration under different methods of operation.

P. Dhanaselvi et al. (2017) proposed hybrid system provides an elegant integration of PV and wind source to extract maximum energy from the two sources. It is realized by a novel multi-input transformer coupled bidirectional dc-dc converter followed by a conventional full bridge inverter. A versatile control strategy which achieves better utilization of PV, wind power, battery capacities without effecting life of battery and power flow management in a grid connected hybrid PV-wind-battery based system feeding ac loads is presented. Detailed simulation studies are carried out to ascertain the viability of the scheme, by placing multilevel inverter we observer the improvement.

Proposed Methodology:

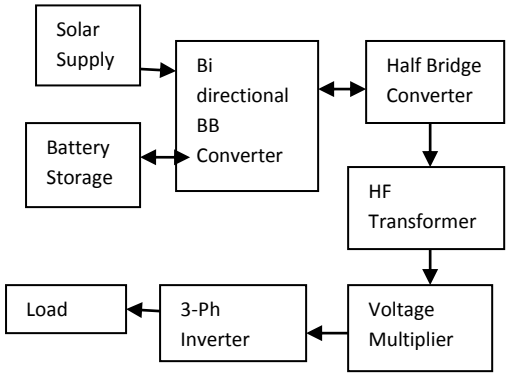

Figure 1: Grid connected system with voltage multiplier for three phase applications.

The proposed converter consists of a transformer coupled boost half-bridge bidirectional converter and voltage multiplier fused with bidirectional buck-boost converter and a three-phase full bridge inverter. The proposed converter has reduced the number of power conversion stages with less component count and high efficiency compared to the existing grid-connected schemes. The boost half-bridge converter and voltage multiplier have two dc-links on both sides of the high-frequency transformer. Controlling the voltage of one of the dc-links ensures controlling the voltage of the other. Moreover, additional converters can be integrated with any one of the two dc-links. A bidirectional buckboost dc-dc converter is integrated with the primary side dc-link and three-phase full bridge bidirectional converter is connected to the dc-link of the secondary side. The input of the half-bridge converter is connected to the PV array in series with the battery source, thereby incorporating an inherent boosting stage. The boosting capability is further enhanced by a high-frequency step-up transformer. The transformer ensures galvanic isolation to the load from the sources and the battery. The bidirectional buck-boost converter is used to harness power from PV along with battery charging/discharging control. The uniqueness of this converter is that Multi-point power tracking, battery chargecontrol and voltage boosting are accomplished through a single converter.

Thus, the proposed configuration and control scheme provide an elegant integration of PV source. It has the following advantages:

- Voltage boosting capability is accomplished by a high-frequency step-up transformer and is further enhanced by voltage multiplier.
- The number of turns is reduced in the high-frequency step-up transformer and hence core losses are reduced.
- Different modes of a grid-connected scheme ensure proper operating mode selection and smooth transition between different possible operating modes.

Conclusion:A multi array photo voltaic battery basedbi directional dc to dc converter for household application is proposed. The proposed system provides an elegant way of combining multiple arrays to a grid using PV source to extract maximum energy from sources. It is realized by a novel multi-input transformer coupled bidirectional dc-dc converter followed by a conventional full-bridge inverter. A versatile control strategy which achieves better utilization of PV power, battery capacities without effecting life of battery and power flow management in a grid-connected PVbattery based system feeding ac loads is presented. Detailed simulation studies are carried out to ascertain the viability of the scheme. The experimental results obtained are in close agreement with simulations and are supportive in demonstrating the capability of the system to operate either in grid feeding or stand-alone mode. The proposed configuration is capable of supplying un-interruptible power to ac loads, and ensures evacuation of surplus photovoltaic power into the grid.

References:

1. S. P. Thiruvadi, S.Bhuvaneshwari, “Hybrid PV-Wind-Battery Based System for Household Applicationsusing DC-DC Converter”, International Journal of MC Square Scientific Research Vol.9, No.1 April 2017.
2. M.Bijomerlin, P.Tamilarasi, “Integration of Hybrid Energy Grid Connected Bidirectional Converter for Three Phase Domestic Applications”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 6, Special Issue 2, March 2017.
3. P. Anesh Kumar, B. Ramesh, “Hybrid Source Based Transformer Coupled Bidirectional Dc-Dc Converter for Domestic Applications”, International Journal of Science Engineering and Advance, Volume 5, Issue No. 4.
4. Hekmatullah, C. L. Sravanthi, “Grid-Connected PV-Wind-Battery Based Multi-Input Transformer Coupled Bidirectional DC-DC Converter with Multilevel Inverter Fed AC

Load", International Journal of Innovative Technologies Volume.05, Issue No.05, May-2017.

5. S. PardhaSaradhi, P. Dhanaselvi, "Grid-Connected PV-Wind-Battery Based Multi-Input Transformer Coupled Bidirectional DC-DC Converter with Multilevel Inverter Fed AC Load", International Journal of Innovative Technologies Volume.05, Issue No.08, August-2017.
6. G. Suresh, "An Efficient Multi-Input Transformer Coupled Bidirectional DC-DC Converter for Grid-Connected PV-Wind-Battery System", International Journal of Advanced Technology and Innovative Research Volume. 10, IssueNo.07, July-2018.
7. S. PARDHA SARADHI1, P. DHANASELVI2, "Grid-Connected PV-Wind-Battery Based Multi-Input Transformer Coupled Bidirectional DC-DC Converter with Multilevel Inverter Fed AC Load", International Journal of Innovative TechnologiesISSN 2321-8665 Vol.05,Issue.08, August-2017.
8. B.VenkataSeshuBabu,B.Ashok Kumar, Dr.A.Purna Chandra Rao, "A Novel Hybrid PV/Wind/Battery based Generation System for Grid Integration", International Journal and Magazine of Engineering, Technology, Management and Research, Volume no. 4, Issue no. 1.
9. Shafinaz A. Lopa, S. Hossain, M. K. Hasan, T. K. Chakraborty, "Design and Simulation of DC-DC Converters", International Research Journal of Engineering and Technology (IRJET) Volume: 03 Issue: 01 | Jan-2016.
10. K.SUDARSHANA1, N.DEVENDRANATH REDDY2, B.NARENDRA3, P.A.PRABHAKARA4, "Hybrid Power Supply Using Improved H6 Based MITCB DC – DC Converter for Household Applications", International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 11 | Nov -2017.