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Modelling and Simulation of Non Linear Disturbance Observer With Fuzzy Computing for Stability Control In DC Bus Network System

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ABSTRACT

In a hybrid ac to dc micro grid system one important task is to control the DC bus voltage. To improve the dc-bus voltage control dynamics, the nonlinear disturbance observer based dc-bus voltage control is used, which does not need the remote measurement and enables the important plug-and-play feature. Based on this observer, a novel dc-bus voltage control scheme is developed to suppress the transient fluctuations of dc-bus voltage and improve the power quality in such a micro grid system. But it gives low stability and there is no feedback control loop. The Efficiency of DC source utilization is less in DC grid. The converter pulse width modulation signal is simple. In this paper the new fuzzy logic algorithm is proposed to generate pulse width modulation signal and controlling technique are closed loop control. Fly back converter is used to improve the efficiency of DC grid and stabilize the dc bus voltage by connecting synchronizing rectifier. The nonlinear disturbance observer is used track the power disturbance of dc grid. The maximum power point hill claiming algorithm is used. Its tracks even the small fluctuations accurately.

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INTRODUCTION

Mostly photovoltaic (PV) cells have a worldwide great attention in research fields (Loh, P.C., 2013; Loh, P.C., 2013; Radwan, A.A.A. and Y.A.R.I. Mohamed, 2012). The use of new efficient Photovoltaic solar cells (PVSCs) has emerged as an alternative measure of renewable green power, energy conservation and demand-side management. Photovoltaic solar cells have initial high costs; PVSCs have not yet been a fully attractive alternative for electricity users who are able to buy cheaper electrical energy from the utility grid (Chen, D. and L. Xu, 2012).

Solar Photovoltaic (PV) and Battery is used for storage purpose. Solar is energetic sources are clean and world available (Ravi, S. and P.A. Balakrishnan, 2010). The comparative advantages of these energetic sources in relation to other renewable energies are demonstrated by the intense expansion of both wind and photovoltaic (PV) production plants (Guerrero, J.M., 2011; Zhou, H., 2011; Ravi, S., 2013).

In the photovoltaic (PV) system maximum power point tracking (MPPT), hill claiming technique is used. The fuzzy Logic control (FLC) is implemented. This is to check the dc bus balance or not in the dc grid. Even the small changes in the photovoltaic source (PV) racked accurately by the maximum power point tracking (MPPT), hill claiming technique. The proposed to implement the fly back converter (FBC) to apply high power applications. This project concentrates on to improve the efficiency of dc bus voltage based non linear disturbance observer to meet load demand requirement with less conversion stage and the various waveforms which compares with the boost in PV, battery, load balancing (Bier off, M.H. and F.W. Fuchs, 2009; Hwang, S.H. and J.M. Kim, 2010; Ravi, S. and P.A. Balakrishnan, 2011). In this concept the proposed converter output apply.

Scope and Objectives:

The scope of the project is to have sustainable growth and social progress, it is necessary to meet the energy need by utilizing the renewable energy resources like solar. In sustainable energy

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system, energy conservation and the use of renewable source are the key paradigm. The need to integrate the renewable energy like solar energy into power system is to make it possible to stabilize dc bus voltage and improve the efficiency of Dc grid based non linear disturbance observer by implementing fuzzy logic control using MPPT hill claiming algorithm.

The main objective of this project is to clearly study and understand about the flyback converters techniques. To develop the high performance, high efficiency of dc grid by using flay back converter and stabilize the dc bus to operate with both low and high power applications. To implement MPPT (Maximum Power Point Tracking) hill claiming algorithm with fuzzy logic control to increase the efficiency of dc grid and to stabilize dc bus voltage.

Existing System:

DC-bus voltage control is an important task in the operation of a dc or a hybrid ac/dc micro grid system. The Fig.1 shows the block diagram of the existing system. To improve the dc-bus voltage control dynamics, traditional approaches attempt to measure and feed forward the load or source power in the dc-bus control scheme. However, in a micro grid system with distributed dc sources and loads, the traditional feed forward-based methods need remote measurement with communications. In PV panel to produce the energy from the sun and it is convert to electrical energy by using dc-dc converter and then given to dc grid. It was not stabilize the dc bus voltage because it is open loop, whatever input come in PV panel and that output given to dc grid .The expect output is not come in dc grid and again track the maximum power and given to dc grid for stabilize the dc grid. So that it is difficult to maintain the dc grid. For that purpose closed loop control is implemented and maintains the dc bus voltage, to improve the efficiency of dc grid.

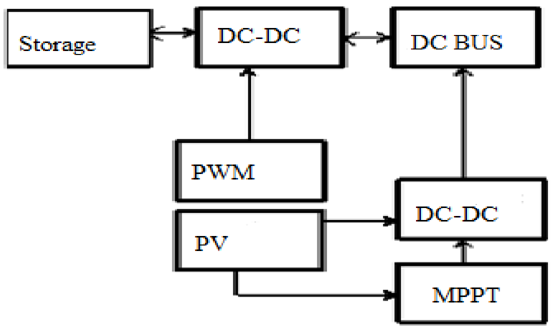

Fig. 1: Block diagram of the existing system.

Proposed System:

The voltage stress on the switch in a fly back is far higher. This makes the switch more expensive, especially for MOSFETs, where chip size rapidly rises with voltage rating, all other things being equal. Switches that are less sensitive to voltage tend to be rather slow, so again less suitable for fly back converters because they would require a bigger core. Fly back converters have a number of advantages potential simplicity because of the single switch, no output inductors required because the leakage inductance works for you, wide input voltage range, but those advantages mostly dominate at lower power levels. The Fly back converter is used to reduce the duty cycle. Fly back transformer is selected to store and transfer energy with minimal loss. Because the heart of a fly back power supply is its transformer, the transformer specifications should be determined early in the design. The fly back converter is used to reduce the duty cycle and to get more efficiency, stabilize of dc grid The small changes in the photo voltaic source also tracked accurately by the maximum power point tracking (MPPT) of hill claiming technique. The system linearity is improved. The results output is to shows in MATLAB simulation. The Fig.2 shows the block diagram of the proposed system.

Matlab Simulation:

The proposed system simulated using MATLAB/Simulink. The Fig.3 shows the simulation model of dc grid system. In order to compensate the PV panel output variations. The battery is in the range of 12V; it is energy storage system and operates with bidirectional energy flow. The PV panel and battery output is connected to dc bus to stabilize dc bus voltage in the dc grid.

The Fig.4 shows the MATLAB simulation of PV panel. In the PV panel energy produce by sun and the maximum output track from PV panel .The PWM signal is given by fuzzy logic controller and flyback converter in order to operate the boost stage to maintain the dc bus voltage in dc grid. The output is shown through the scope.

The Fig.5 shows the simulation of sub system. The Fig.6 shows the MATLAB simulation of battery. Here the battery output is given to fly back converter; this fly back converter is act as bidirectional

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converter to operate buck or boost stage to maintain the 380v in dc grid. The output is shown through the scope.

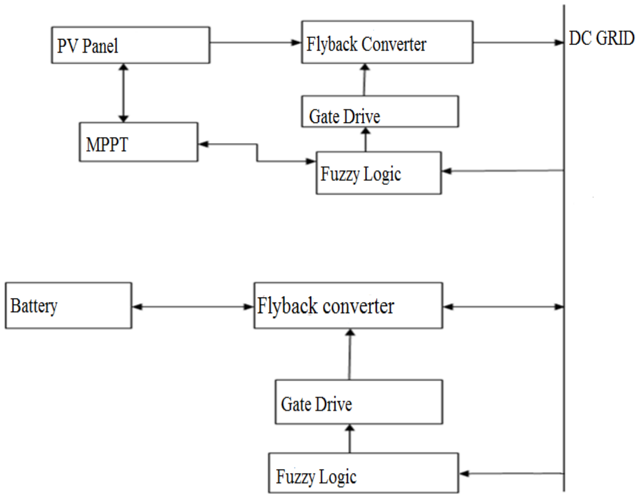

Fig. 2: Block diagram of the proposed system.

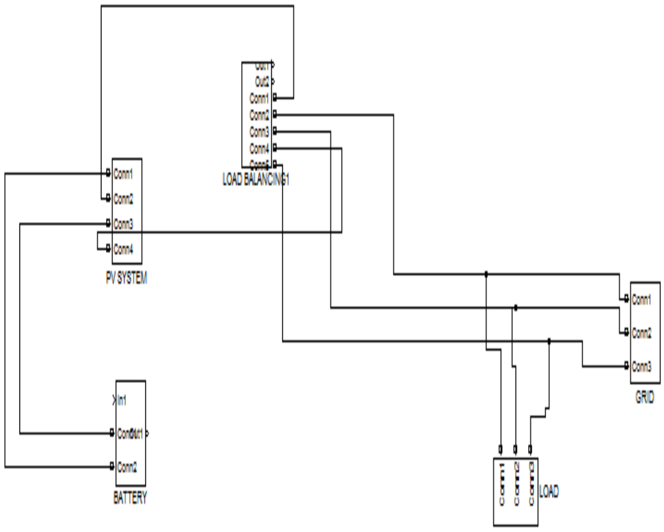

Fig. 3: Simulation diagram of DC grid systems.

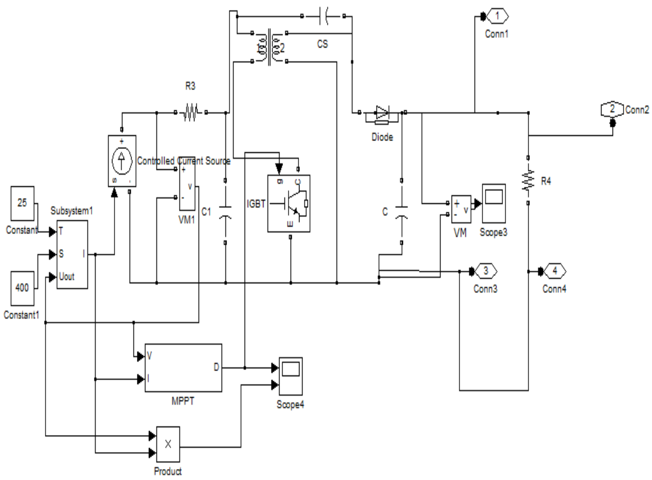

Fig. 4: Simulation diagram of solar panel.

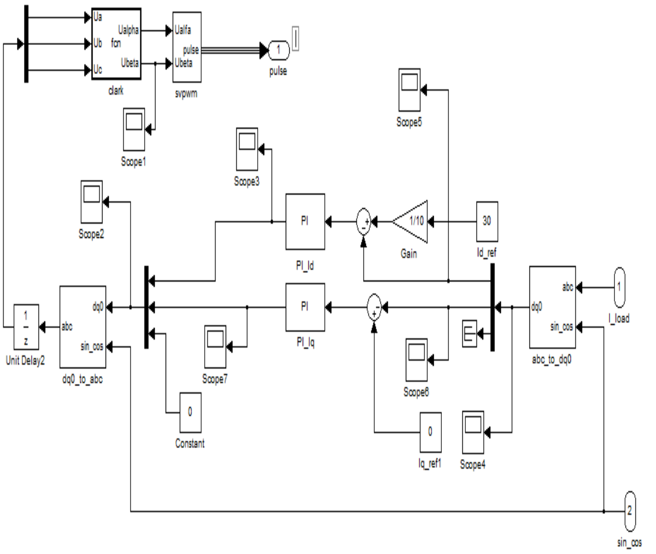

Fig. 5: Simulation of sub system.

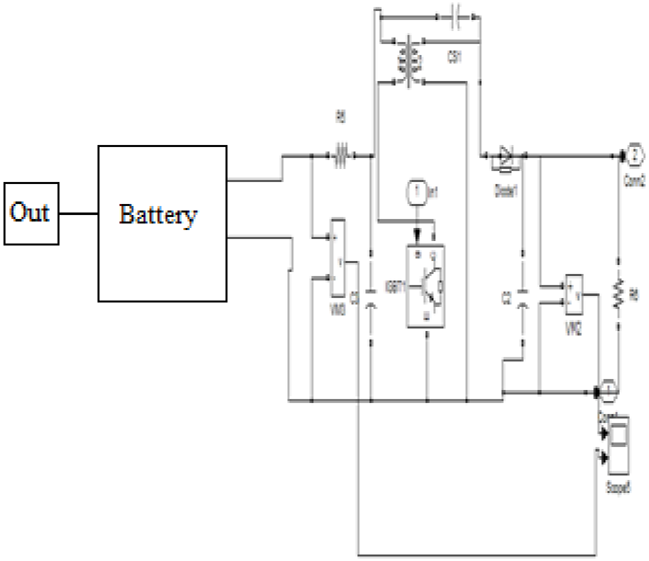

Fig. 6: MATLAB Simulation of battery.

RESULTS AND DISCUSSION

The Fig.7, Fig.8 shows the simulation results for load balance and MPPT control signals. Fig.9 shows the results for sub system. The Fig.10 shows Simulation result of DC bus stabilization output voltage. The performance of the system is measured with the time of 2 minutes. The simulation output between the voltage multiplier output voltage in volts and the time in minutes. At the time of 0.04seconds, the output voltage reaches 300V. At 0.1seconds the voltages reaches 380V and attains the constant value.

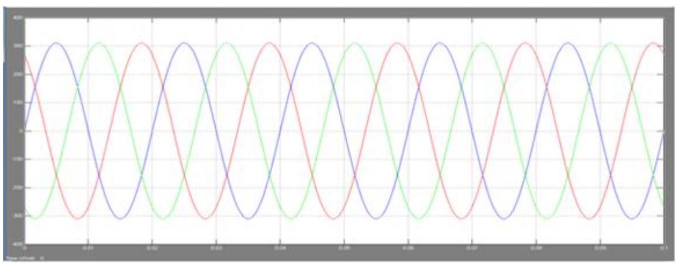

Fig. 7: Simulation result of load balance.

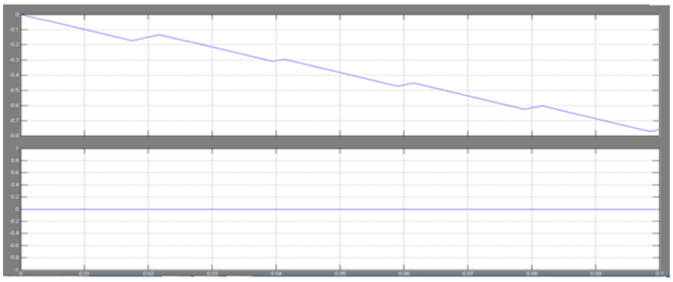

Fig. 8: Simulation result of MPPT control signals.

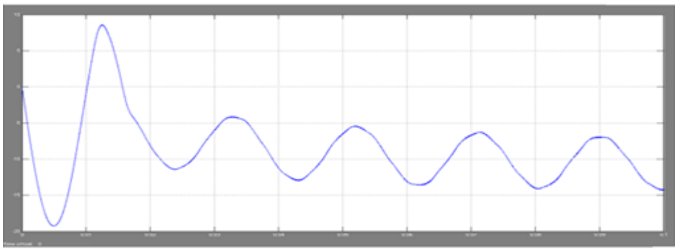

Fig. 9: Simulation result of sub system.

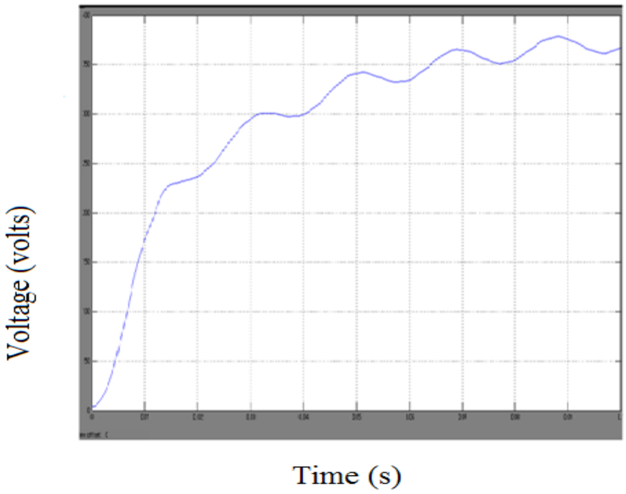

Fig. 10: Simulation result of DC bus stabilization.

The performance of the system is measured with the time of 1 minute. The simulation output between the dc bus output voltage in volts and the time in minutes. At the time of 0.01seconds, the output voltage reaches 180V and then falls into the constant value. It reaches 380V constant at 0.1seconds and achieves desired output voltage.

Conclusion:

The need for improve efficiency in grid connected photovoltaic generation with Battery systems. A Photovoltaic power generation system with Fuzzy logic control, MPPT converter to improve the efficiency and stabilize the DC Grid with the use of storage elements based non linear disturbance observer. The fly back converter, solar and battery were designed to stabilize the dc bus voltage control. The output is get from dc grid (voltage-380v) directly from PV solar energy, and was conceived to be a commercially viable solution having low cost, high efficiency. The output waveform of the system is verified from simulated results using MATLAB.

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