Optimal Power Management of Renewable Energy Resources In Micro Grids Power Management System

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Abstract- *The fast depletion of fossil fuels and the growing awareness of the need for environmental protection have led us to the energy crisis. Positive development has been achieved since the last decade by the collective effort of scientists. In this regard, renewable energy sources (RES) are being deployed in the power system to meet the energy demand. The microgrid concept (AC, DC) is introduced, in which distributed energy resources (DERs), the energy storage system (ESS) and loads are interconnected. DC microgrids are appreciated due to their high efficiency and reliability performance. Despite its significant growth, the DC microgrid is still relatively novel in terms of grid architecture and control systems. In this context, an energy management system (EMS) is essential for the optimal use of DERs in secure, reliable, and intelligent ways. Therefore, this paper strives to shed light on DC microgrid architecture, control structure, and EMS*

Keywords- Renewable energy sources (RES), Hybrid power systems (HPS), Photovoltaic (PV), Wind turbine (WT), Low-carbon electricity, Energy management.

I. INTRODUCTION

Hybrid PV-wind based generation of electricity and its interface with the power grid are the important research areas. It have proposed a multi-input hybrid PV-wind power generation system which has a boost fused multi-input dc-dc converter and a full-bridge dcac inverter. This system is mainly focused on improving the dc-link voltage regulation. In the six-arm converter to pology proposed by the outputs of a PV array and wind generators are fed to a boost converter to match the dc-bus voltage. The steady-state performance of a grid connected hybrid PV and wind system with battery storage is analyzed in. This paper focuses on system engineering, such as energy production, system reliability, unit sizing, and cost analysis. In a hybrid PV-wind system along with a battery is presented, in which both sources are connected to a common dc-bus through individual power converters. In addition, the dc-bus is connected to the utility grid through an inverter.

The use of multi-input converter (MIC) for hybrid power systems is attracting increasing attention because of reduced component count, enhanced power density, compactness and centralized control. Due to these advantages, many topologies are proposed and they can be classified into three groups, non-isolated, fully-isolated and partially-isolated multi-port topologies.

All the power ports in non-isolated multi-port to pologies share a common ground. To derive the multi-port dc-dc converters, a series or parallel configuration is employed in the input side. Some components can be shared by each input port. However, a time-sharing control scheme couples each input port, and the flexibility of the energy delivery is limited. The series or parallel configuration can be extended at the output to derive multi-port dc-dc converters. However, the power components cannot be shared. All the to pologies in non-isolated multi-port are mostly combinations of basic to pology units, such as the buck, the boost, the buck-boost or the bidirectional buck/boost topology unit. These timesharing based multi-port topologies promise low-cost and easy implementation. However, a common limitation is that power from multiple inputs cannot be transferred simultaneously to the load. Further, matching wide voltage ranges will be difficult in these circuits. This made the researchers to prefer isolated multi-port converters compared to non-isolated multi-port Dc -Dc converters.

The interesting complementary behavior of solar in solation and wind velocity pattern coupled with the above mentioned advantages, has led to the research on their integration resulting in the hybrid PV-wind systems. For achieving the integration of However, these converters are not effectively utilized, due to the intermittent nature of the renewable sources. In addition, there are multiple power conversion stages which reduce the efficiency of the system.

II. LITERATURE SURVEY

1. DESIGN AND CONTROL OF GRID CONNECTED PV/WIND HYBRID SYSTEM USING 3 LEVEL VSC

The demand of renewable energy has been increased significantly because of the shortage of fossil fuel and the global greenhouse effect. Among various types of renewable energy sources, the solar energy and wind energy are the most promising ones for human beings. Due to the rapid growth of the power electronics techniques, the photovoltaic (PV) and wind power generations system have been increased rapidly . Because of the inherent nature of the solar energy and the wind energy, the electric power generations of the PV array and the wind turbine are complementary. Therefore, the hybrid PV/wind power system has higher reliability to deliver continuous power than either individual source .

2 GRID CONNECTED HYBRID (PV-WIND-BATTERY) SYSTEM WITH BIDIRECTIONAL DC-DC CONVERTER

Applications with photovoltaic (PV) energy and wind energy have been increased significantly due to the rapid growth of power electronics techniques. Generally, PV power and wind power are complementary since sunny days are usually calm and strong winds are often occurred at cloudy days or at nighttime. Hence, the hybrid PV/wind power system therefore has higher reliability to deliver continuous power than either individual source. Traditionally, a substantial energy storage battery bank is used to deliver the reliable power and to draw the maximum power from the PV arrays or the wind turbine for either one of them has an intermittent nature.

3 MODELING AND CONTROLLER DESIGN OF A SEMI ISOLATED MULTI INPUT CONVERTER FOR A HYBRID PV/WIND POWER CHARGER SYSTEM, -

In The Past Century, global surface temperatures have increased at a rate near 0.6◦C/century because of global warming caused by effluent gas emissions and increases in CO_2, levels in the atmosphere. The problems with energy supply and use are related not only to global warming but also to such environmental concerns as air pollution, acid precipitation, ozone depletion, forest destruction, and radioactive substance emissions.

1.4 OBJECTIVES

The main objectives of this system are as follows:

- To explore a multi-objective control scheme for optimal charging of the battery using multiple sources.
- Supplying un-interruptible power to loads.
- Ensuring evacuation of surplus power from renewable sources to the grid, and charging the battery from grid as and when required.

III. EXISTING SYSTEM

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 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.

Existing Block Diagram

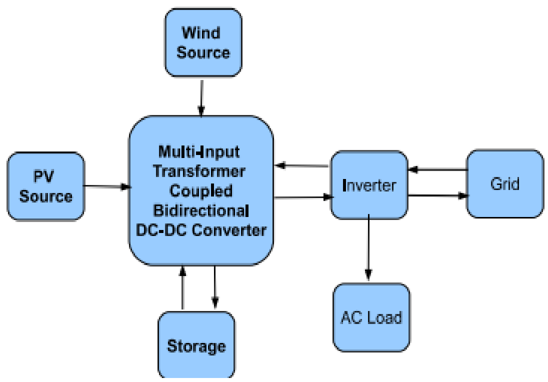

Fig 1.1 Typical power system one-line diagram

IV. PROPOSED SYSTEM

A control strategy for power flow management of a grid-connected hybrid PV-wind-battery based system with an efficient synchronous 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.

A transformer coupled boost half-bridge converter is used to harness power from wind, while bidirectional boost converter is used to harness power from PV along with battery charging/discharging control. A single-phase full-bridge bidirectional DC-HVDC converter is used for feeding ac loads and interaction with grid.

Proposed Block Diagram

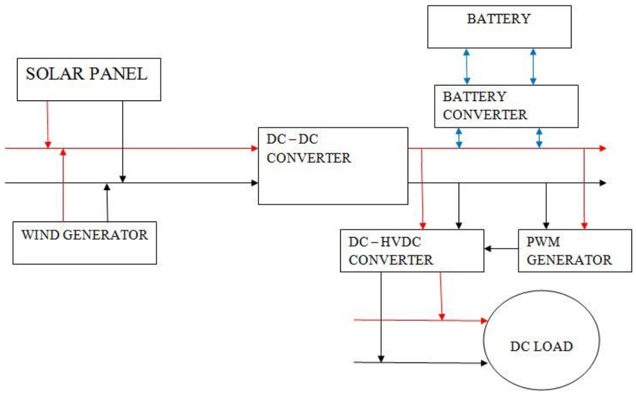

FIG 1.2 Proposed Block Diagram

V. SIMULATION OUTPUT

EXPERIMENTAL RESULT

The simulation circuit of the proposed Microgrid Power management system using renewable Energy. The proposed converter comprises of 8 MOSFET switches as shown in figure.

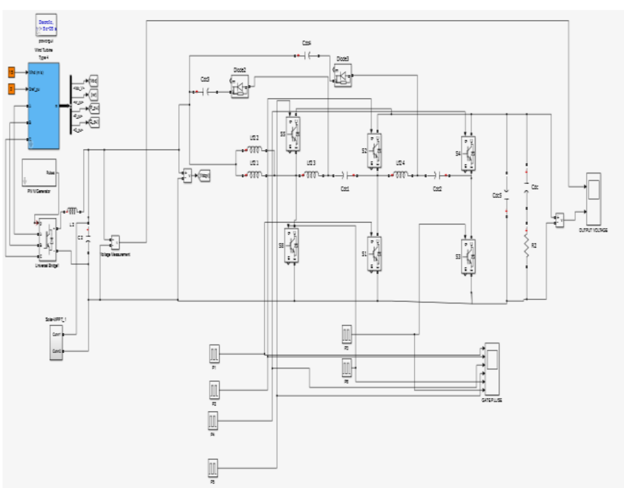

Fig 1.3 Simulink Model

Photovoltaic (PV) energy is one of the most important energy sources since it is clean and inexhaustible. It is important to operate PV energy conversion systems in the maximum power point (MPP) to maximize the output energy of PV arrays. An MPPT control is necessary to extract maximum power from the PV arrays. In recent years, a large number of techniques have been proposed for tracking the maximum power point. This paper presents a comparison of different MPPT methods and proposes one which used a power estimator and also analyses their suitability for systems which experience a wide range of operating conditions.

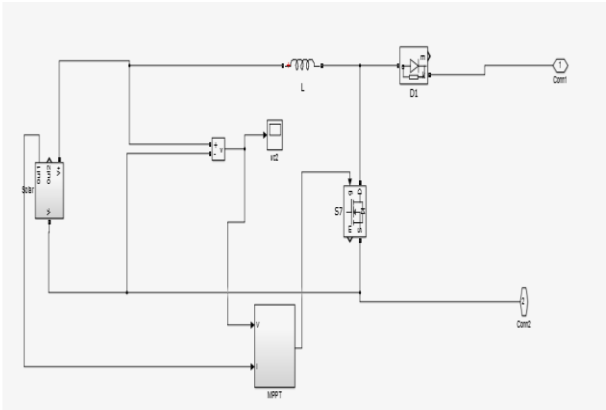

Fig 1.4 Solar With MPPT Technique

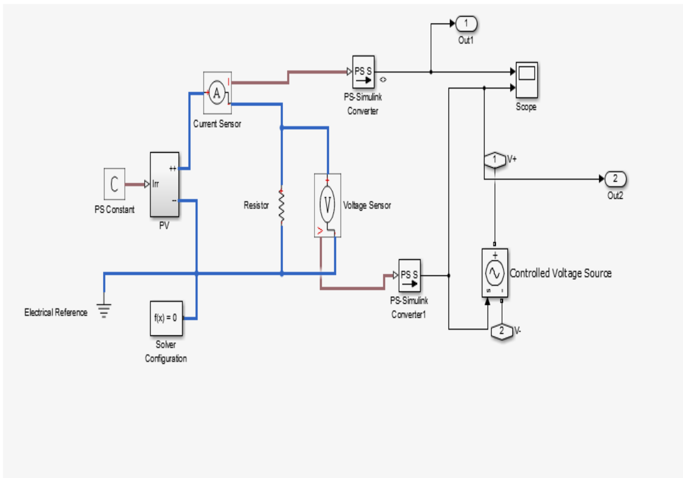

Fig 1.5 PV structure

OUTPUT CURRENT

Major aim of this project is to achieve the lesser harmonic and improve the current

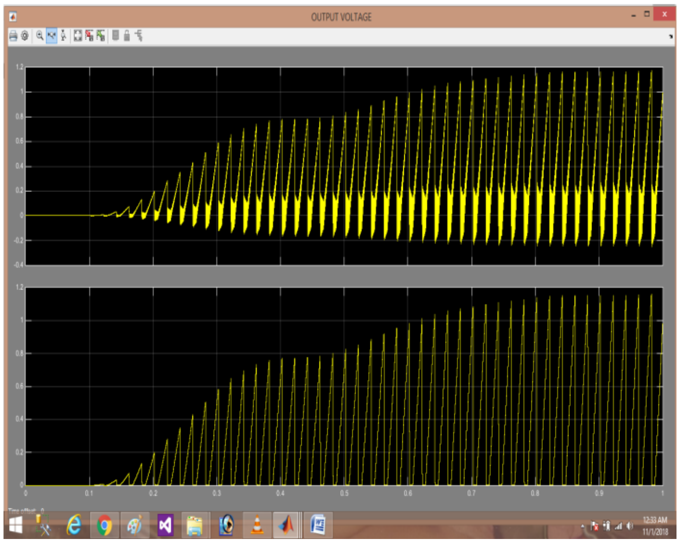

Fig 1.6 Outputs Current

GATE PLUSE

A gate drive is a power amplifier that accepts a low power input from a controller IC and produces high current drive input for the gate of a high power transistor such as power MOSFET.

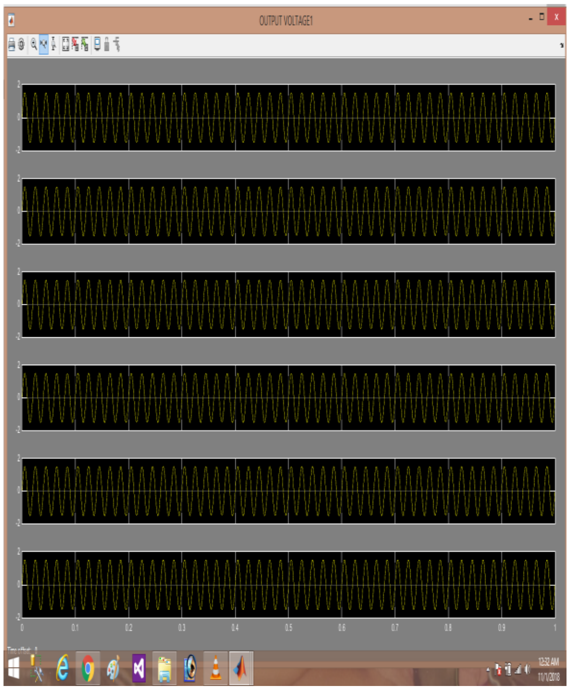

Fig 1.7 Gate Pluses

VI. CONCLUSION

This paper successfully developed a high step-up isolated converter with two input power sources using voltage-clamped and soft-switching techniques. In the stand-alone state, the properties of current sharing and soft switching guarantee that both conduction and switching losses can be reduced for high efficient conversion. In the united power supply state, the maximum efficiency of the proposed converter could be higher than 95%, because the conduction loss can be effectively reduced by topological design of series connection of two input circuits. In the charge and discharge state, the conversion efficiency slightly decreases because higher current loading on switches is caused by opposite inductor currents.

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