# Uninterrupted Hybrid Renewable Energy Distribution System

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*Abstract: The increase in usage of different modern technology paved a way for higher energy requirement. This made a major role on the power sectors to provide the required energy. But the biggest problem facing by the power sector is the generation of electric power. Here we introduce new concepts of uninterrupted power supply system using solar, wind and other renewable sources. A simplified hybrid electrical energy system (HEES) is designed with less switch for both AC and DC inputs. This will provide a solution for increased demand in an economical way. The model is designed and tested using Matlab.*

*Keyword: Renewable energy sources, hybrid electrical energy system, Energy management*

## I. INTRODUCTION

The demand for electrical energy is getting increased as a result new technology has to be identified. Concepts like micro grid, solar energy, and wind energy are the other major sources for generation of electrical energy. It is also very much available throughout the year. Different methods are also available to utilize these sources effectively. To meet the demand two or more source has to be interconnected. In this paper we introduce a hybrid electrical source which is a combination of wind and solar energy. Many individual sources can be interconnected and can be operated along with the grid or isolated. One of the main problems facing today is the cost of erecting and establishing a new system. The renewable energy is having a main advantage over other system is that they having minimized pollution level and almost zero cost for fuels. Due to this large impact of above mentioned features the renewable energy system will now popularized, another reason is that large price hike for non renewable energy fuels. General block diagram of an interconnected hybrid electrical system is shown in the Fig.1.As we know that the price of petroleum products and thermal products and the nuclear fuels are increased day by day and also they emits a large pollution and a large amount is found to give security for such system. Usually they become a public problem. So that we now most preferring in renewable energy sources they are having a high advantages over the conventional energy production methods. As here we present such a wonderful paper regarding the hybrid renewable energy system. It would be applicable to commercial as well as residential purposes. Generating electric power alone does not able to satisfy the required demand.

A proper method has to be implemented to distribute the generated power for utilizing in an effective way. The present system is having a hybrid electrical system and a modified IEDM technique commercialized in it. The existing system the solar system is having many problem in standalone operation so that the solar pv module is having problem in collecting, storage, and its utilization. Another important problem is the degradation rate of solar pv module, so that solar pv module alone is not solution when it is commercialized.

## II. HYBRID ENERGY SYSTEM

In HES the solar and wind power developed is integrated together into a scheme. By using suitable converters we have to increase the power level and stored it in a battery. By using IEDM technique the energy from the battery is transfer to load as the demand from the load the excess energy is supplied to grid.Here the solar energy is produced individually and the output of solar pv module as we know that it is having dc output, so that it can be collected by using a cuk converter and the output from the solar panel is raised and stored in the battery it can be verified using mat lab.
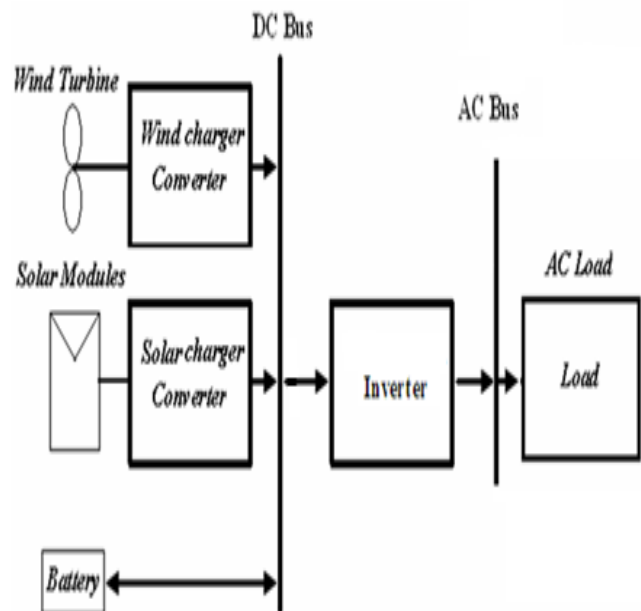


**Fig.1.Hybrid System**

Similarly, another source of energy conversion method is hybrid with solar panel that continues its operation even in standalone.

## III. MULTI INPUT RECTIFIER

In order to convert the generated dc signal a rectifier is used. A multi input rectifier is proposed to over comes error during conversion. Two inputs are given to rectifier one from solar and another from wind energy system.
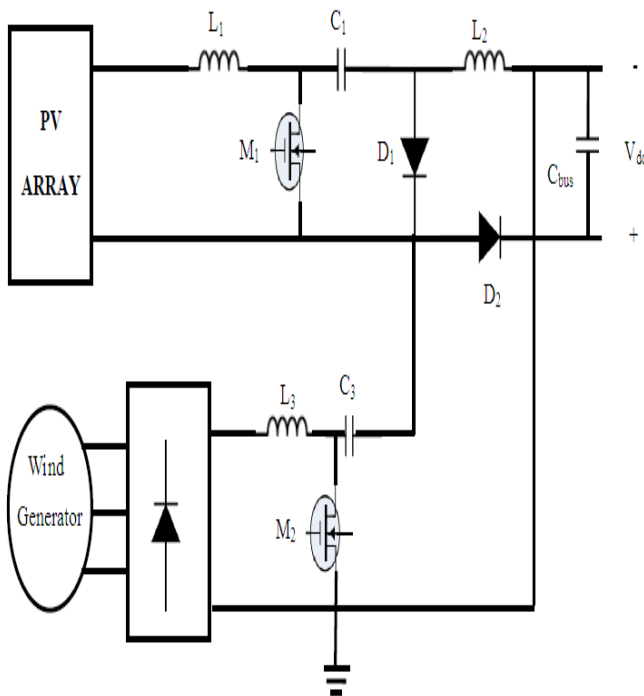


**Fig.2. Multiinput Rectifier circuit**

As there are two inputs to the rectifier, hence the rectifier should operate in different input conditions, either with one input or with the presence of two inputs. It is also possible to add more input to the rectifier. The operation of the rectifier with different input condition is tabulated in table I

**Table I Operation of Rectifier**

| Inputs | Diode 1 (D₁) | Diode 2 (D₂) | Operation of rectifier |
|---|---|---|---|
| Wind Energy | OFF | ON | Sepic Converter |
| Solar energy | ON | OFF | Cuk Converter |
| Both inputs | ON | ON | Sepic and cuk operation |

## IV. SIMULATION AND RESULTS

The simulation is done using Matlab and simulink for analyzing the circuits. The generation of power using wind energy and solar energy is given to the battery for the purpose of storing the energy.
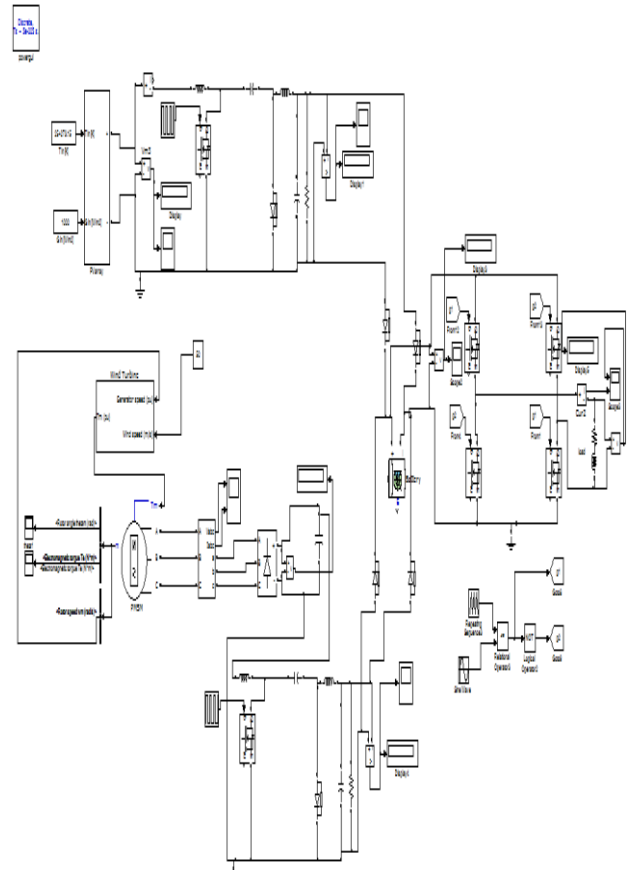


**Fig.3.Simulatin of Hybrid System**

The wind output formed by converting kinetic energy into mechanical or electrical energy which is connected directly to run a machine to collect the three phase output from the pmsg machine the wind output is rectified by an uncontrolled rectifier and it is boosted up to a higher level by using a suitable dc dc converter. Here I am using cuk converter to boost up the level dc input to higher level. Similarly for a solar system the output is dc so that it would be directly converted into another level by using cuk converter. The output voltage from both the converters will charge the battery. The output from the battery is connected to an inverter circuit and its output is directly connected to various loads. The cuk converter has many advantages over other converter. The construction is simple, it provides greater efficiency, polarity reversal is also possible. In practically we have connected to an intelligent energy distribution management system to the present system so we have to control the load and the source side. So that the system performance will increase. Today the cost of electricity increasing day by day so the system designed is practically beneficial to all.

## V. OUTPUT WAVE FORMS

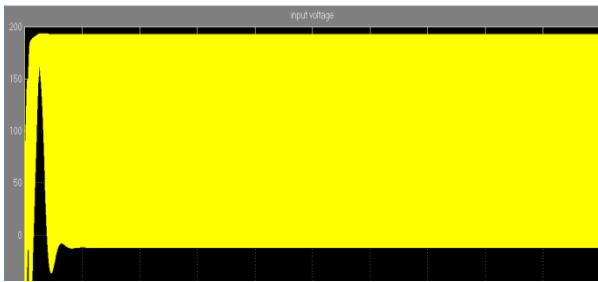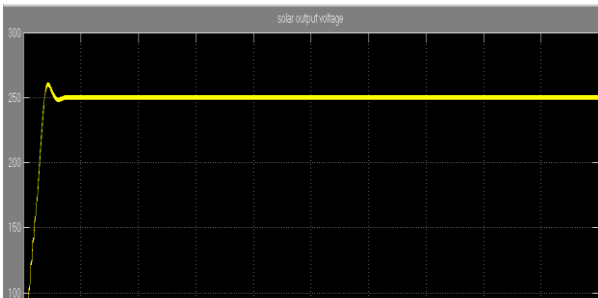Various outputs that were obtained during simulation are presented here.
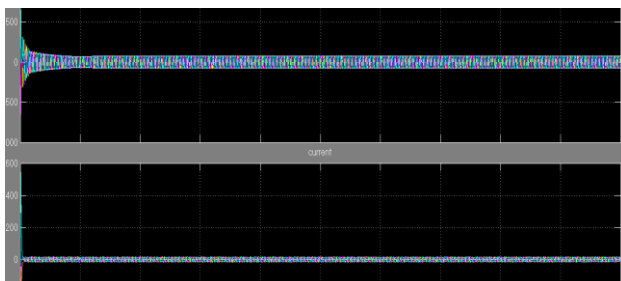
**Fig.4.Solar Input**



**Fig.5. Converter Output**
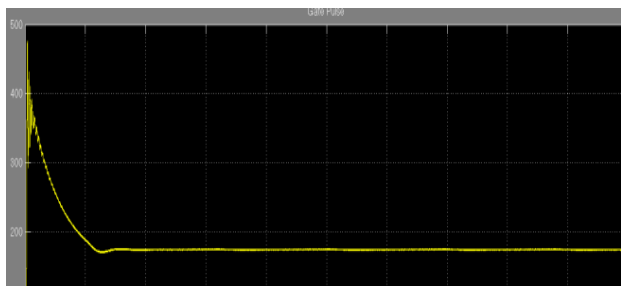


**Fig.6.Wind Output Voltage**
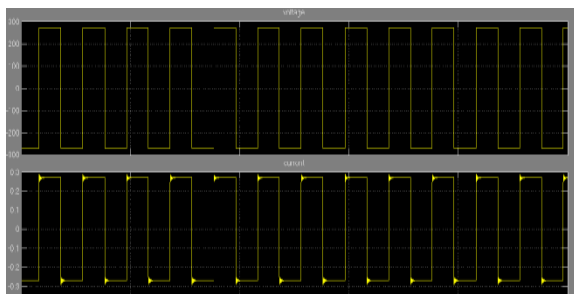


**Fig.7. Wind Cuk Convetrer Output**



**Fig.8. Hybrid System Output Voltage**

## VI. CONCLUSION

As concluding the energy consumption problem can be easily cleared and we have made the system in economical manner .so we have to get profit for the excess of power generation. In un interrupted power supply is having wide application in the society. The system developed by me is having less or zero pollution, so it is more eco friendly. The designed system has wide range of application and opportunity in various industrial sectors and residential usage. Additionally the uninterrupted power supply is very much useful in hospitals and theaters were un interrupted power supply is necessary and essential.

## REFERENCES

1. Emanuel Serban, Senior Member, IEEE, and Helmine Serban, Member, IEEE, "A Control Strategy for a Distributed Power Generation Microgrid Application With Voltage and Current-Controlled Source Converter" IEEE Transactions on Power Electronics, Vol. 25, No. 12, p2981 - p2992, December 2010
2. Ahmed K. Abdelsalam, Member, IEEE, Ahmed M. Massoud, Member, IEEE, Shehab Ahmed, Member, IEEE, and Prasad N. Enjeti, Fellow, IEEE, "High-Performance Adaptive Perturb and Observe MPPT Technique for Photovoltaic-Based Microgrids" IEEE Transactions on Power Electronics, Vol. 26, No. 4, p1010 - p1021, April 2011
3. Xiong Liu, Student Member, IEEE, Peng Wang, Member, IEEE, and Poh Chiang Loh, Member, IEEE, "A Hybrid AC/DC Microgrid and Its Coordination Control" IEEE Transactions on Smart Grid, Vol. 2, No. 2,p278 - p286, June 2011
4. Hristiyan Kanchev, Di Lu, Frederic Colas, Member, IEEE, Vladimir Lazarov, and Bruno Francois, Senior Member, IEEE, "Energy Management and Operational Planning of a Microgrid With a PV-Based Active Generator for Smart Grid Applications" IEEE Transactions on Industrial Electronics, vol. 58, no. 10, p4583 - p4592, October 2011
5. Bader N. Alajmi, Khaled H. Ahmed, Member, IEEE, Stephen J. Finney, and Barry W. Williams, "A Maximum Power Point Tracking Technique for Partially Shaded Photovoltaic Systems in Microgrids" IEEE Transactions on Industrial Electronics, Vol. 60, No. 4, p1596 – 1606, April 2013
6. Mohammad B. Shadmand, Student Member, IEEE, Robert S. Balog, Senior Member, IEEE, and Haitham Abu-Rub, Senior Member, IEEE, "Model predictive Control of PV Sources in a Smart DC Distribution System: MPPT and Droop Control" IEEE Transactions on Energy Conversion Volume: 29, Issue: 4, p913 – 921, Dec. 2014
7. Dan Wu, Fen Tang, Tomislav Dragicevic, Member, IEEE, Juan C. Vasquez, Member, IEEE, and Josep M. Guerrero, Senior Member, IEEE, "Autonomous Active Power Control for Islanded AC Microgrids With Photovoltaic Generation and Energy Storage System" IEEE Transactions on Energy Conversion Volume: 29 , Issue: 4, p 882 – 892, Dec. 2014
8. S. Mishra, Senior Member, IEEE, and D.Ramasubramanian, Student Member, IEEE, "Improving the Small Signal Stability of a PV-DE-Dynamic Load-Based Microgrid Using an Auxiliary Signal in the PV Control Loop" IEEE Transactions on Power systems Volume: 30, Issue: 1, p166 – 176, Jan. 2015
9. Sijo Augustine , N. Lakshminarasamma, Mahesh Kumar Mishra The Institution of Engineering and Technology "Control of photovoltaic-based low-voltage dc microgrid system for power sharing with modified droop algorithm"Volume: 9 , Issue: 6 , p1132 – 1143, 2016
10. Snehamoy Dhar, and P. K. Dash "An Adaptive Threshold Based New Active Islanding Protection Scheme for Multiple PV based Microgrid Application" IET Generation, Transmission & Distribution Volume: 11 , Issue: 1, p118 - 132 1 5 2017
11. Adel Merabet, Member, IEEE, Khandker Tawfique Ahmed, Member, IEEE, Hussein Ibrahim, Rachid Beguenane, Member, IEEE and Amer Ghias, Member, IEEE, "Energy Management and Control System for Laboratory Scale Microgrid based Wind-PV-Battery" IEEE Transactions on Sustainable Energy Volume: 8 , Issue: 1, p145 – 154, Jan. 2017
12. Yuru Zhang, and Yun Wei Li, Senior Member, IEEE, "Energy Management Strategy for Supercapacitor in Droop-controlled DC Microgrid Using Virtual Impedance" IEEE Transactions on Power Electronics Volume: 32 , Issue: 4, p2704 – 2716, April 2017