ISOLATED CONVERTER FOR HYBRID WIND AND PV

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Abstract –*In this paper the idea of the hybrid system configuration are modeled using renewable energy hybrid system (Solar PV and Wind Energy) is designed. Renewable energy systems are likely to become widespread in the future due to adverse environmental impacts and escalation in energy costs. Solar and wind energy resources are alternative to each other which will have the actual potential to satisfy the load demand for some extend because of their effect of unstable nature. The proposed system contains hybrid energy systems photovoltaic and wind have been found to be more economic alternative to fulfill the energy demands of isolated consumers load demand. The proposed control strategies are simulated using MATLAB/ Simulink software.*

Key Words: PV–wind-based hybrid systems, photovoltaic, wind turbine, Maximum Power Point Tracker

1.INTRODUCTION

An Electric power grid can be physically or economically connected to many remote communities around the world. By means of small isolated diesel generators electricity demand in these areas is conventionally supplied. The operating costs associated with these diesel generators may be high due to fossil fuel costs and maintenance of generators. Renewable energy sources such as solar photovoltaic (PV) and wind turbine generator provide alternative for electricity generation in off-grid areas supplement to engine-driven generators. Hybrid energy systems can significantly reduce the total life cycle cost of standalone power supplies in many off-grid situations. Many hybrid systems have been installed across the world due to reliable and cost competitive systems using a variety of technologies and the expanding renewable energy industry has now developed.

Standalone solar PV–wind hybrid energy systems can provide economical and reliable electricity to such local needs. Possible sources of alternative energy choices are Solar and wind energy are non-depletable, site dependent, non-polluting. Many countries with an average solar insolation level in the range of 3–6 KWh/m2 and average wind speed in the range of 5–10 m/s are pursuing minimize their dependence on fossil-based non-renewable fuels the option of wind and PV system.

The use of hybrid energy systems also reduces greenhouse effect/global warming caused by combustion of fossil fuels and consequent CO_2 emission. The global warming is an international environmental concern which has become a decisive factor in energy planning. Figure 1 shows the block diagram of a typical PV–wind hybrid system. Thus, the task of assessing different design possibilities to plan a hybrid system for a specific location becomes quite difficult. The PV–wind hybrid energy system can be provided to electrify the remotely located communities using battery bank and a diesel generator as a back-up that need an independent source of uneconomical to extend the conventional utility grid electrical power.

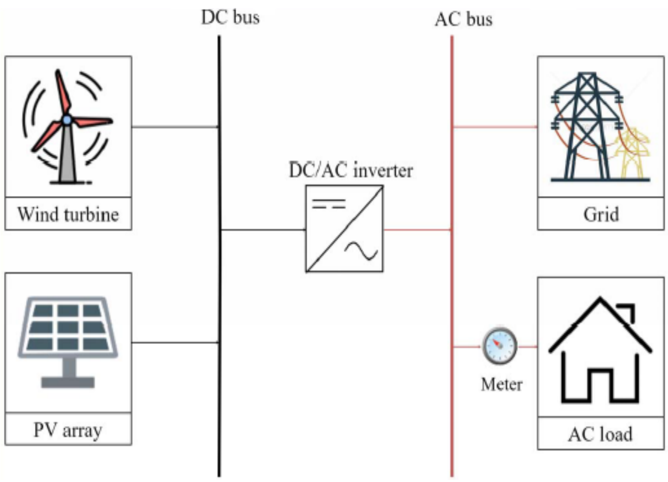

Figure 1: Proposed PV-wind hybrid system - Single line diagram

2. DESCRIPTION OF HYBRID RENEWABLE ENERGY SCHEMES

A hybrid renewable PV–wind energy system is a combination of solar PV, wind turbine, inverter, battery and other addition components. The PV–wind combination has number of model employed to satisfy the load demand ie PV hybrid system, wind hybrid system, and PV–wind hybrid system. Excess power generated is fed to the battery until it is fully charged once the power resources (solar and wind flow energy) are Sufficient. When the renewable energy sources (PV–wind) power is not able to satisfy the load demand, the battery comes into play until the storage is depleted. The operation of hybrid PV–wind system depends on the individual element/component is modeled first, thereafter their combination can be evaluated to meet the require dependability in order to evaluate the maximum output.

2.1. HYBRID PHOTOVOLTAIC SYSTEM

Solar energy is one of renewable energy source that are site-dependent, non-depletable, environmental friendly is available in abundance energy sources. Dependence on fossil fuel reduces, solar energy act as a potential source of alternative/renewable energy and utilization of solar radiation for power generation. Figure 2 shows that Solar PV power generation unit consists of PV generator, diesel generator, and inverter and battery system. The role of battery storage is very important for improved performance and better control. The necessary condition during hot climate in order to get maximum outputs power the design of the hybrid PV systems is very effective. For remote and isolated areas where the cost of the transmission line is very high, this type of system is cost effective and reliable where the power supplies though the grid is not suitable.

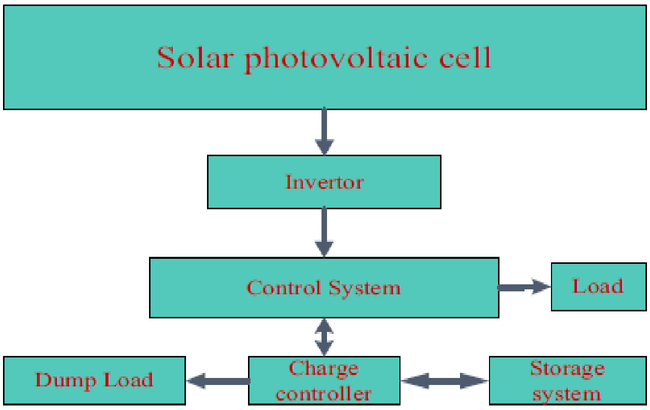

Figure 2. PV hybrid system Architecture.

2.2. HYBRID WIND ENERGY SYSTEM

Figure 3 shows the architecture of wind hybrid energy system. Better wind energy potential must be chosen for the hybrid wind system design for a reliable and economical operation. Optimal sizing of a hybrid wind system and forecasting of a hybrid system based on Artificial intelligence Techniques. Hybrid configuration genetic algorithm techniques are used to calculating the size of wind turbines and optimal location of distributed energy system. Analysis should be feasibility, economic viability and capacity to meet the demands. When the hybrid system generated power is in surplus, this power is used for loading the batteries for backup security and this charge battery power is used when the load requirement is not supplied by design hybrid system.

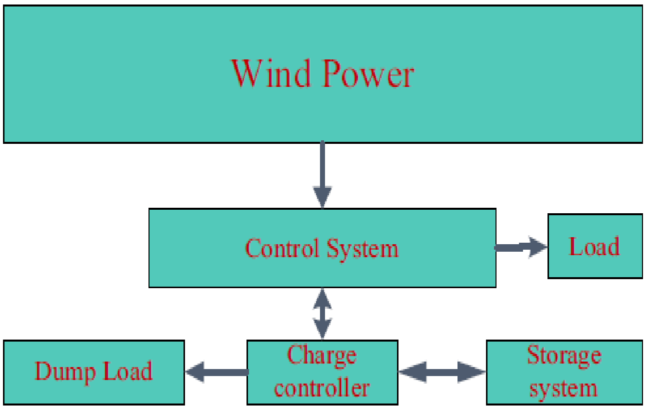

Figure 3. Wind hybrid system Architecture.

2.3. HYBRID PHOTOVOLTAIC/WIND ENERGY SYSTEM

Figure 4 shows the architecture of PV-wind hybrid energy system. Individual hybrid PV and hybrid wind system does not produce usable energy throughout the year as both PV and wind system depending on climatic condition. For better performance battery backup unit of the standalone PV combination or wind combination for proper operation and better reliability which increase the hybrid system cost and lower cost of the system regarding the combination of hybrid PV–wind system. The new strategy offers a suitable sizing of any standalone hybrid PV/wind/hydrogen method, supplying a desalination unit which feeds the area's inhabitants with fresh water.

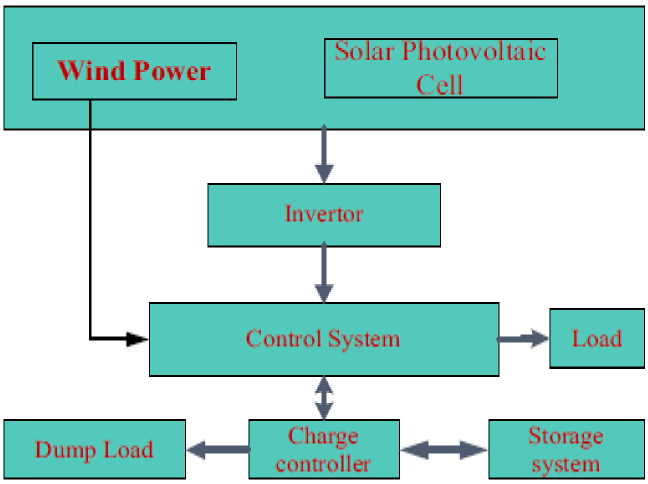

Figure 4. PV– wind hybrid system Architecture.

3. SIMULATIONS AND RESULTS

Figure 5 shows the proposed simulation circuit hybrid PV-wind power generation. The software MATLAB was used in the simulations to obtain the results with MPPT controller.

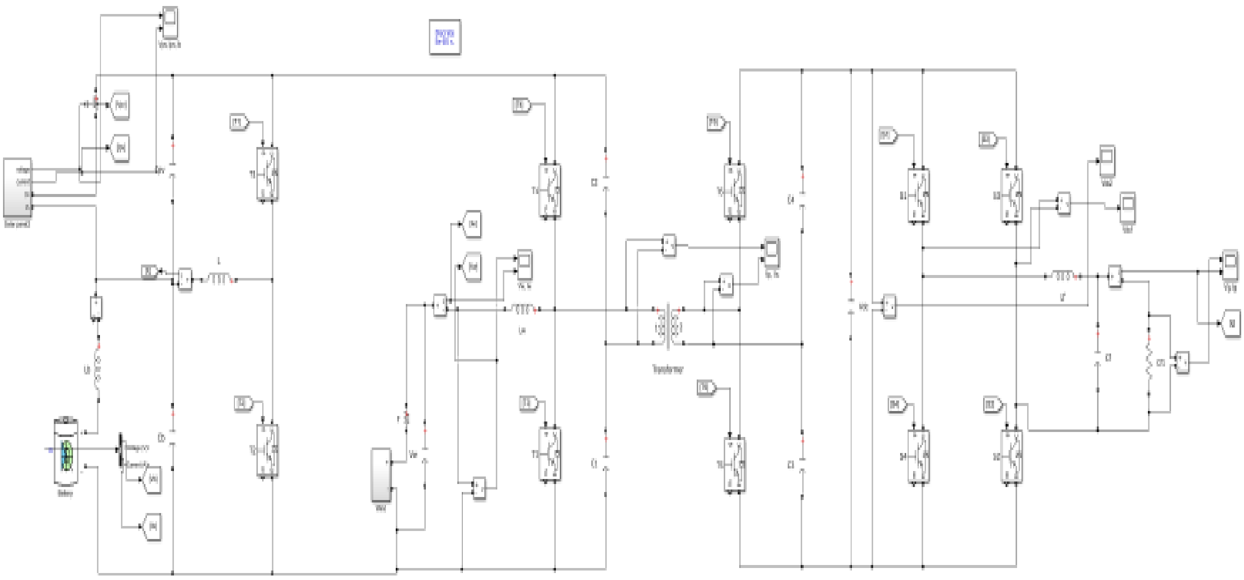

Figure 5 Proposed Simulation Circuit- Hybrid photovoltaic/wind energy system

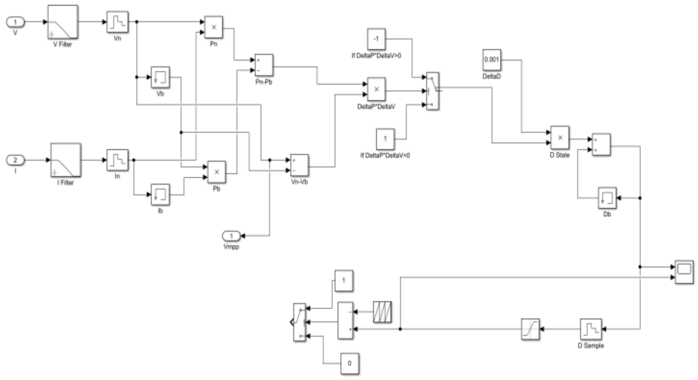

Figure 6 MPPT Controller

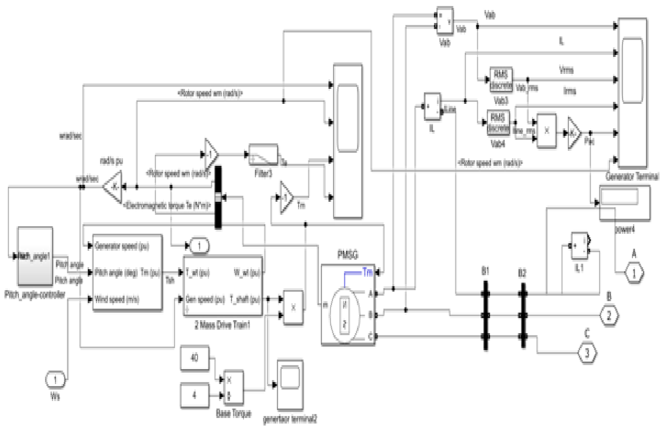

Figure 8 Wind generation

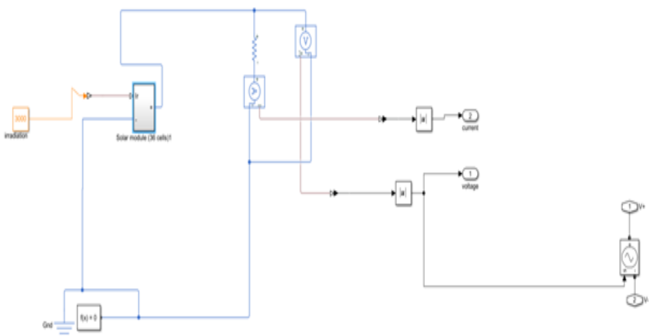

Figure 7 Solar Panel

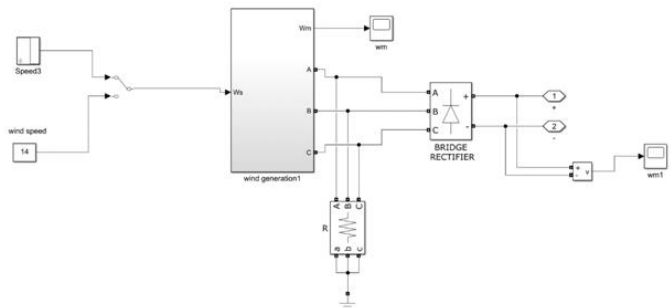

Figure 9 Wind Block connected to Bridge Rectifier

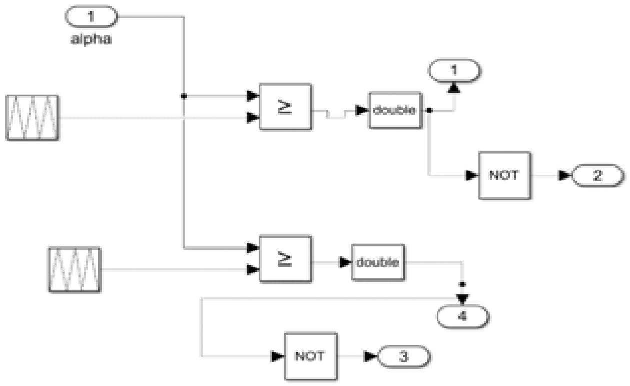

Figure 10 PWM Generation

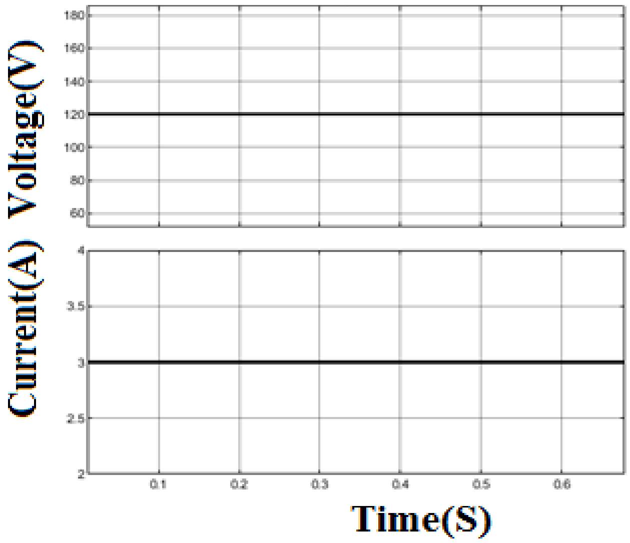

Figure 11 Solar Voltage and Current

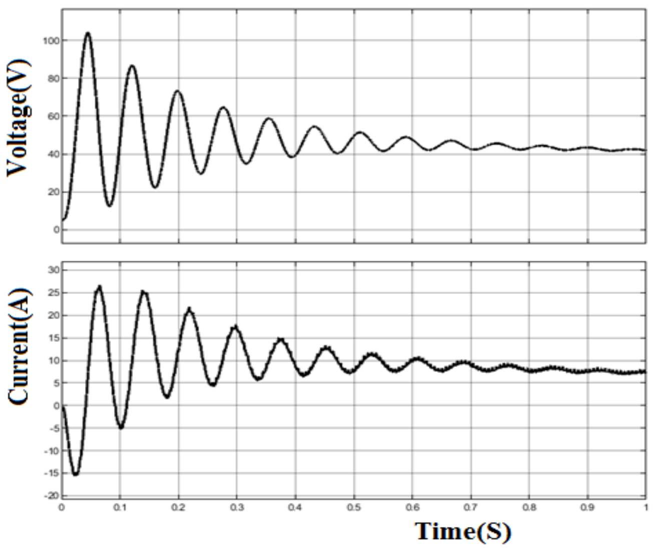

Figure 12 Wind Voltage and Current

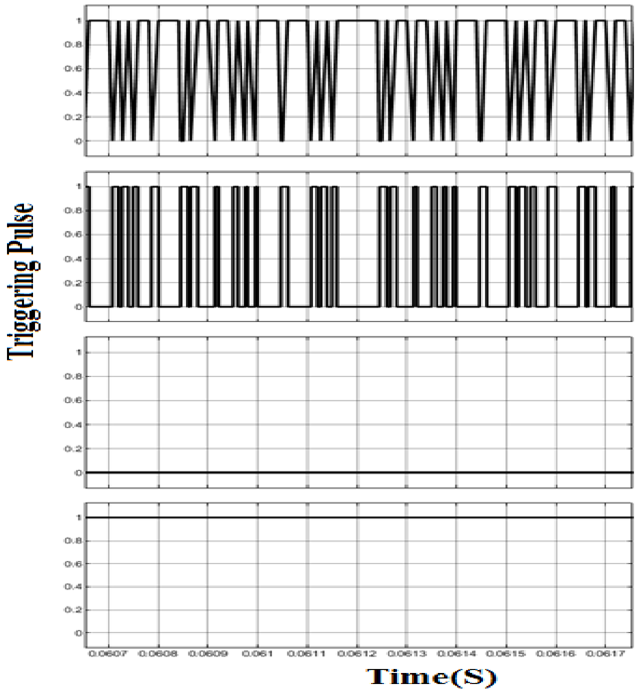

Figure 13 Triggering Pulse at inverter 1

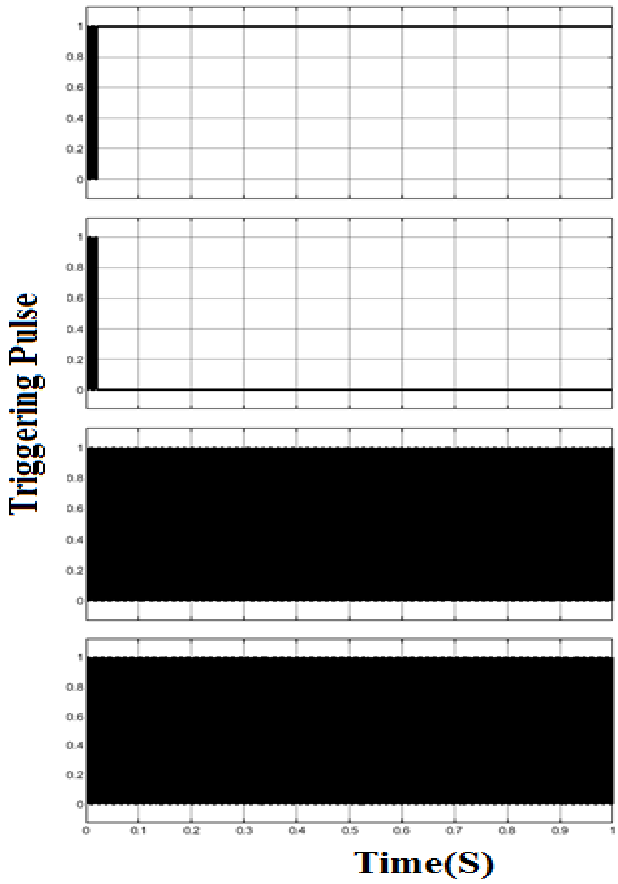

Figure 14 Triggering Pulse at inverter 2

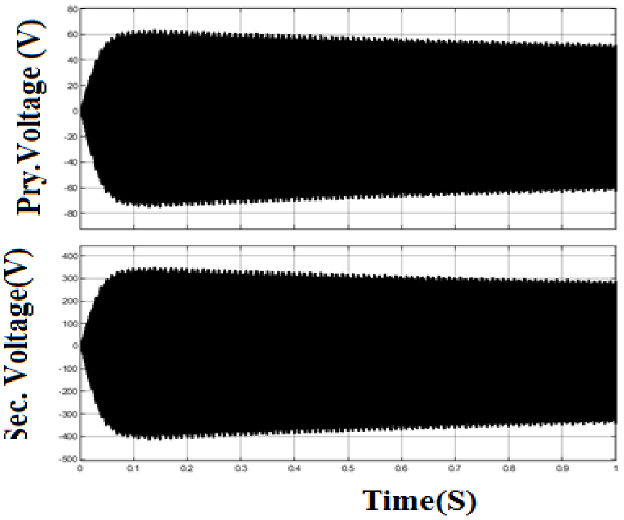

Figure 15 Transformer primary and Secondary voltage

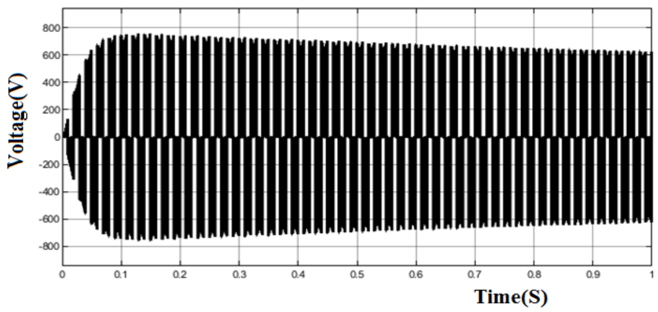

Figure 16 Voltage across Switchs

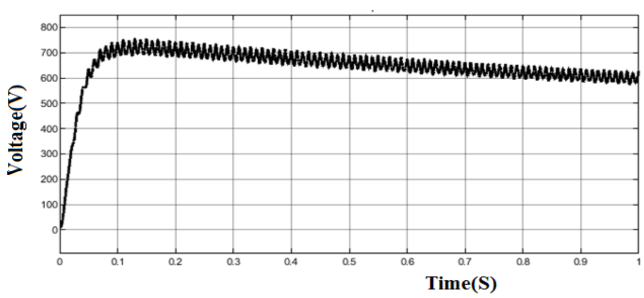

Figure 17 Voltage across Bridge Rectifier

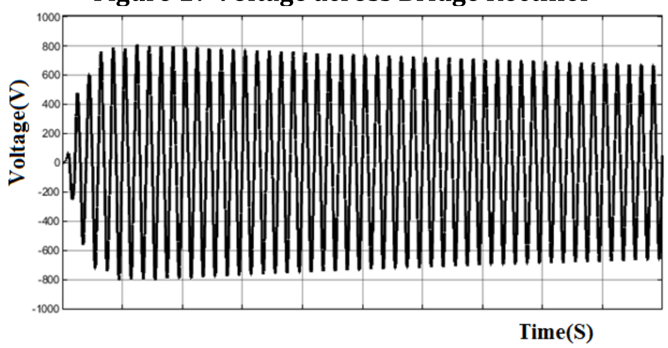

Figure 18 Output Voltage

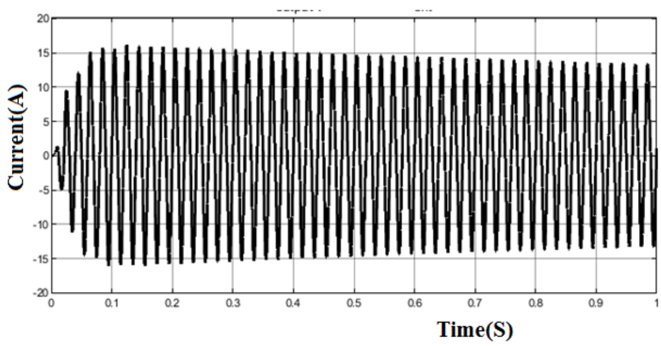

Figure 19 Output Current

4. CONCLUSION

In this paper the ideas of the hybrid system configuration are modeled using renewable energy hybrid system (Solar PV and Wind Energy) is designed and simulated using MATLAB/simulink. The proposed work tackles technical feasibility of the hybrid system indicates that the hybrid system meets the household energy demand in a stand-alone PV or wind systems. This paper also features some of the near future improvements which attracts connected with this sort of techniques and their endorsement by the consumer.

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BIOGRAPHIES

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