

# **GREEN WIND ENERGY FOR RURAL ELECTRIFICATION**

Submitted in partial fulfillment of the requirement for the award of  
Bachelor of Engineering Degree in  
Electrical and Electronic Engineering

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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING  
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

## **SATHYABAMA**

**INSTITUTE OF SCIENCE AND TECHNOLOGY**

**(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC**

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**MAY 2022**



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**BONAFIDE CERTIFICATE**

This is to certify that this Project Report is the Bonafide **Nabarun Sarkar (38140033)** and **Sayantana Dey (38140049)** who carried out the project entitled "**GREEN WIND ENERGY FOR RURAL ELECTRIFICATION**" under our supervision from November 2021 to May 2022.

Mr. J. BARNABAS PAUL GLADY  
**Internal Guide**

Dr. V. SIVACHIDAMBARANATHAN  
**Head of the Department**

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Submitted for Viva voce Examination held on \_\_\_\_\_

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Signature:

**Internal Examiner**

**External Examiner**

## **DECLARATION**

We **Nabarun Sarkar (38140033)** and **Sayantana Dey (38140049)** hereby declare that the Project Report entitled “**GREEN WIND ENERGY FOR RURAL ELECTRIFICATION**” done by us under the guidance of Mr. J. BARNABAS PAUL GLADY is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electrical and Electronics Engineering.

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2. SAYANTANA DEY

**DATE:**

**PLACE:**

**SIGNATURE OF THE CANDIDATES**

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We would like to express our sincere and deep sense of gratitude to our Project Guide **Mr. J. Barnabas Paul Glady** for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

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## ABSTRACT

During early civilization wind energy was used to pump water from deep wells and sailboats. In pre industrial Europe wind mills were used in many things which includes irrigation or drainage pumping, grain-grinding etc. and with the help of wind mills the processing spices, cocoa, paints and dyes, and tobacco took places. Earlier when U.S. installed a designed of electricity wires, the vitality to farming developing the American Great Plains and west, both water-pumping windmills and small wind electric turbines were used heavily. . The main advantage is it can get installed very quickly, so the demand of electricity supply is easy. The fuel the wind is free and abundant, which reduces the need to buy, ship, and store expensive utility. It is pliability - with the power generated, households which can use appliances, such as light and refrigeration, computers and televisions can be used in school, and many multinational industries can access a good amount of power source. It may most importantly used as the generator does not produce any effective emissions in the process of generation of the electricity.

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# CHAPTER 1

## INTRODUCTION

### 1.1 GENERAL INTRODUCTION

Our project green wind energy for rural electrification is based on renewable energy where we will be converging the wind energy to electrical energy using the help of wind turbine. We have planned to do this project to help the rural areas where electricity fails many times.

As we know that the conversion of wind energy into electricity with the help of wind turbines is known as Wind Energy. The power which we get from the wind is attracted by wind turbine which as a result allowing to moving blades that pressurize torque on a rotor. The technological developed in these recent years, which brings more power saving and more reliable wind turbines, which as a result making wind power more cost-efficiency. In these specific energy costs per annual kWh is inversely proportional with the size of the turbine. The advantages of using SMC with a PI controller to operate DSTATCOM for an induction generator are single point voltage operation at the generator terminals and reactive power adjustment, which prevents the generator from being saturated. Balanced generator currents under any load condition, harmonic current suppression, constant DC link voltage, and a decreased number of sensors are among the other benefits offered.

## 1.2 LITERATURE SURVEY

Satapathy A.S et al. (2014) described currently the energy needed heavily relies on conventional sources. The wind is also sporadic. As a backup, adequate storage technology is used to provide a continuous supply of power. This research has studied the long-term viability of a 4-kW hybrid wind-battery system to satisfy the demands. Both control systems are combined, and their efficiency is verified in MATLAB/SIMULINK using varied load and wind profiles.

Kirtley J.L et al. (2013) describes that dynamic grid support must be integrated for distributed power systems connected to medium voltage grids. This paper provides a comprehensive control system for utility-scale photovoltaic (PV) power plants to improve fault ride-through (FRT) capability. The paper suggests a new feature that takes advantage of grid-tied inverters' overload capabilities to improve FRT performance. In response to severe unbalanced voltage conditions caused by asymmetrical grid faults, a thorough simulation validated the suggested control methods' capacities to mitigate voltage dips, improve voltage response, and improve the overall stability of interconnected dispersed generation. Chen W.L et al. generators are determined using a systematic technique based on eigen structure assignment in this paper (IG).

Sekhar V.C. et al. (2016) showed how to use a DSTATCOM (Distribution Static Compensator) with a sliding mode controller (SMC) and a proportional. In steady-state settings, the use of a PI controller for terminal voltage control allows for error-free voltage profile tracking. The advantages of using SMC with a PI controller to operate DSTATCOM for an induction generator are single point voltage operation at the generator terminals and reactive power adjustment, which prevents the generator from being saturated. Balanced generator currents under any load condition, harmonic current suppression, constant DC link voltage, and a decreased number of sensors are among the other benefits offered.

Although fault indicator technology has provided reliable methods of detecting permanent errors, the current state of error detection is very worrying and time consuming as the technical team and monitoring teams still have to physically monitor and inspect equipment for long hours to find faulty parts. of their transmission lines and then have to clear the error, which requires a lot of human effort in identifying the error location and removing the error. Wire-based monitoring of transmission lines provides

a solution to many of these concerns such as real-time structural awareness, rapid error detection, accurate error detection and detection of electrical errors in mechanical errors, reduced costs due to conditional rather than occasional correction. care, etc. These applications define solid requirements such as faster delivery of large amounts of highly reliable data. The success of these applications depends on building an efficient and reliable network structure with fast response time. The most important disruption that will alternate the energy landscape may additionally come from the solar rooftop enterprise. As in line with their forecast, sun rooftop strength, supported through internet-metering coverage and mixed with storage, could be cheaper than grid energy after 2022, for a huge segment of customers. During EB failure at night in college, the whole powerhouse becomes dark because of no backup power. Because of that a lot of times when powerhouse employees try to switch on the generator to give backup power to the whole college may fall into a cable trench or got hit by obstacles due to darkness in the powerhouse since no backup power is there.

Since the college powerhouse is being isolated from the college area due to safety measures, if someone got serious injuries it will be difficult to carry that person to the nearest medical help. So, considering all the issues, we gave a solution to the powerhouse in charge after analyzing the problem. We will be installing lighting fixtures to illuminate the whole powerhouse and this all will work on solar energy as a backup.

### 1.3 SCOPE OF THE PROJECT

With the help of this project, we are trying to bring out the importance of wind. Here the wind energy will get converted to electrical energy with the help of wind turbine or wind mills, the wind will rotate the wind turbine and the turbine will produce energy which is known as rotating energy and from that rotation those energy will be stored into the battery and whenever there is shortage of electricity, we can use the energy which is saved onto the battery and the battery will be rechargeable battery. The amount of wind will get by the turbine will produce that amount of energy.

Our project is just the module where we used small amount to show how we can expand in rural areas where there is no amount of electricity or we can use street light using this method.

So as a result, we can see that wind energy have a huge scope where we can be

reliable to the nature for this. Our project is based on an applied approach to solve the real-time problem and enhance technology in the area of green energy. We are doing this project to gain more theoretical and practical knowledge on green energy. In our project, we came across a lot of challenges when we started mapping the layout of the powerhouse. First and foremost, the problem statement of the project, to better understand the project.

#### 1.4 ADVANTAGE AND APPLICATION FOR PROPOSED TECHNIQUE

##### **1.4.1 Wind energy cost less from other sources.**

If we plant trees and from trees it will be forest and forest there will be huge number of winds and thus if we get wind the wind turbine will get used and produce wind energies.

##### **1.4.2. Wind energy creates jobs.**

As wind energy is a huge project in every part of the world the engineer's scientist and workers are getting jobs with huge salaries.

##### **1.4.3 Wind energy have economic benefits to communities.**

##### **1.4.4 Wind energy is an inexhaustible renewable energy source.**

Offshore wind has tremendous energy potential.

#### **1.4.5 Wind turbines do not consume water.**

Producing electricity from the wind does not require water as wind does not require water to flow.

#### **1.4.6 Wind energy is clean.**

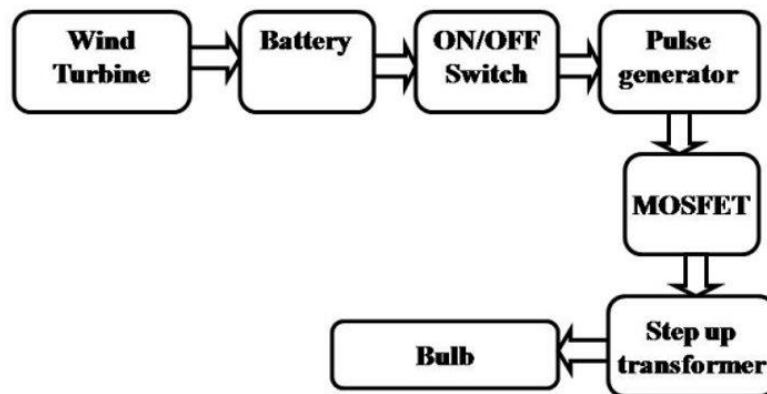
Electricity which are generated by wind are not able to pollute the water we drink, so as a result wind energy will come up with less smog and other less pollutions.

## CHAPTER 2

### PRODUCT DESCRIPTION

#### 2.1 BLOCK DIAGRAM

##### **Green Wind Energy for rural electrification**



**Fig 2.1 Green wind energy for rural electrification block diagram**

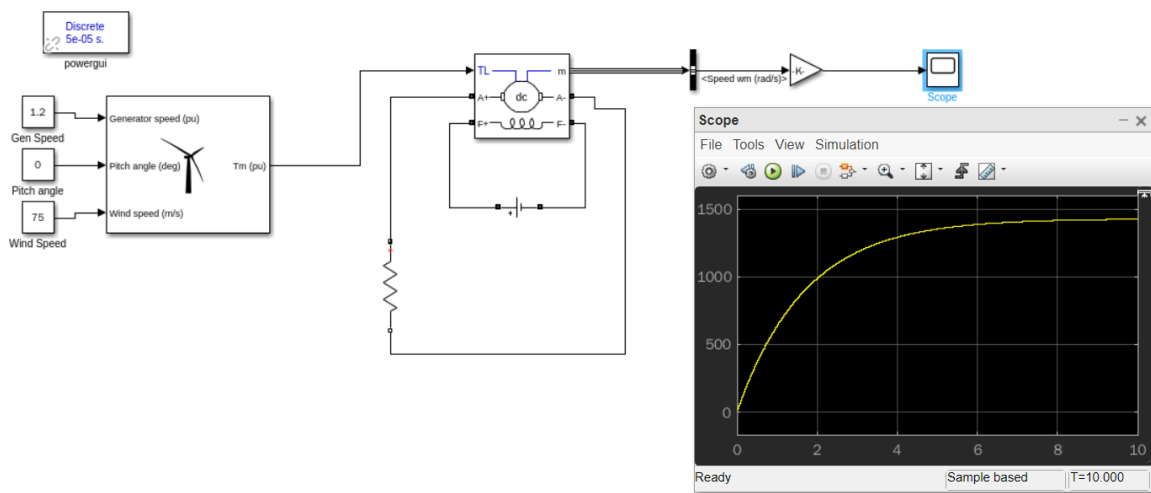
## 2.2 CONCEPT EXPLANATION

The above fig 2.1 general shows the block diagram for our project green wind energy for rural electrification.

Wind mill is connected to the dc dynamo and this dc dynamo can be used as a generator. So, the 12v,3.0Ah rechargeable battery is joined with the power generator through the wire, from the battery we are powering to this inverter through the switch so the ground is directly connected and the positive from the battery to the inverter

the IC generates clock pulses which trigger this transistor-based switches here we can use any mosfet or any power transistor and then further transferred to step up transformer (12-0-12 to 230v). the step-up transformer will generate 230v power which will lead to power the load which we gave as led bulb. While the fan is rotating it will charge the battery and battery will store the power and it will continue further. When we switch on the switch the load will generate.

## 2.3 CIRCUIT DIAGRAM



**Fig 2.2 Green wind energy for rural electrification hardware circuit diagram.**

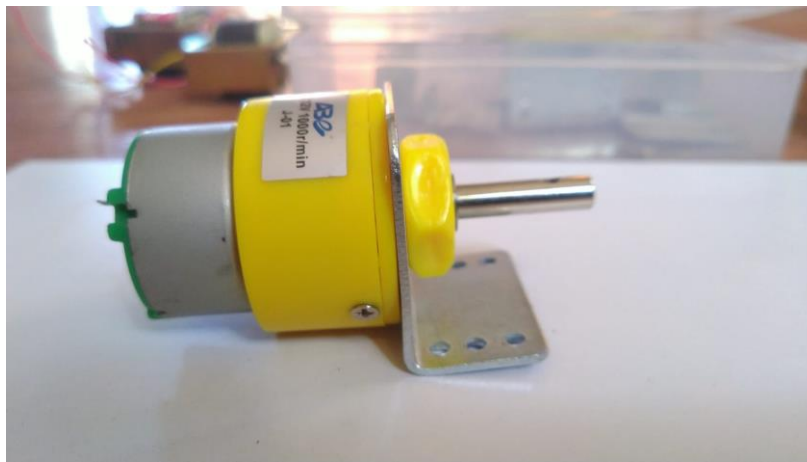
Wind mill is connected to the dc dynamo and this dc dynamo can be used as a generator. So, the 12v,3.0Ah rechargeable battery is joined with the power generator through the wire, from the battery we are powering to this inverter through the switch so the ground is directly connected and the positive from the battery to the inverter

the IC generates clock pulses which trigger this transistor-based switches here we can use any mosfet or any power transistor and then further transferred to step up transformer (12-0-12 to 230v). the step-up transformer will generate 230v power which will lead to power the load which we gave as led bulb. While the fan is rotating it will

charge the battery and battery will store the power and it will continue further. When we switch on the switch the load will generate.

## 2.4 HARDWARE DESCRIPTION

### 1. 12v DC Generator



**Fig. 2.3 12v DC Generator**

We are using here 12volt DC motor (dynamo) which carries voltage up to 12volt. We are using a yellow dc dynamo. It's worked as Fleming's right hand side rule. A 12v DC motor cost less and is enough powerful to be used by any appliances.

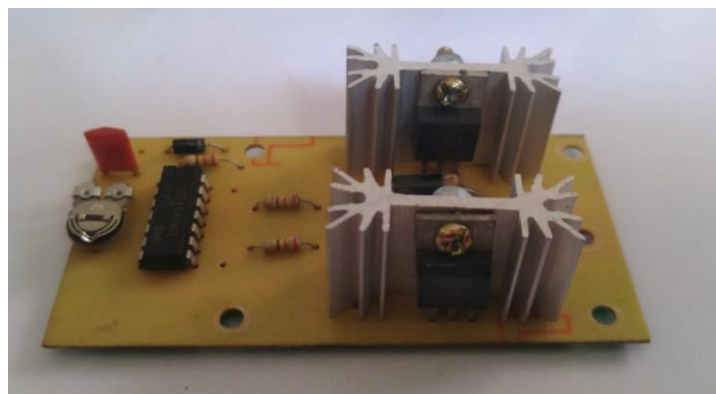
### 2. 12v rechargeable battery



**Fig. 2.4 12v rechargeable battery**

This battery is used to store the energies and can be used to give the power to light.

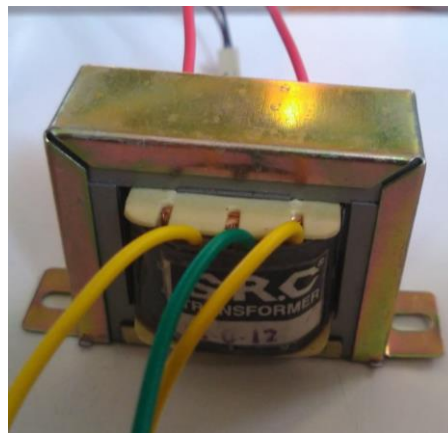
### **3. Pulse generator**



**Fig. 2.5 Pulse Generator**

A pulse generator is IC555, which is generated clock pulse transistor-based switch. Pulse generator is joined with the battery. Pulse generator is commonly used in a system for as a timer.

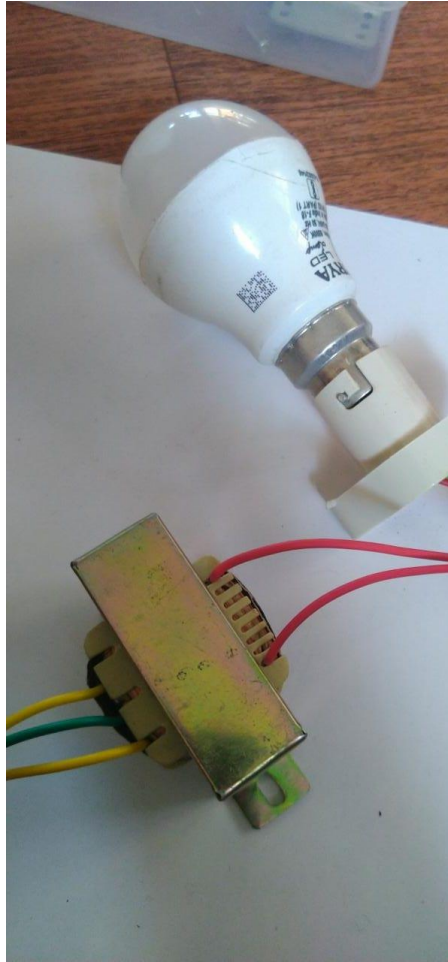
#### **4. 12v to 230v step up transformer**



**Fig. 2.6 12v to 230v step up transformer**

This is a step-up transformer which convert low voltage to high voltage power, we convert the power 12volt to 230volt.in this transformer 12v side is connected with inverter side and 230v is connected with the load.

## **5. Lamp load**



**Fig 2.7 Lamp load**

We are using a lamp as a load. The output of the led lamp is 230v.

## **6. Wind turbine**



**Fig. 2.8 Wind turbine**

With the help of wind turbine, the wind gets converted to electrical energy and when it rotates it helps to produce electrical energy.

## CHAPTER 3

### SIMULATION CIRCUIT AND RESULT

#### 3.1 SIMULATION CIRCUIT

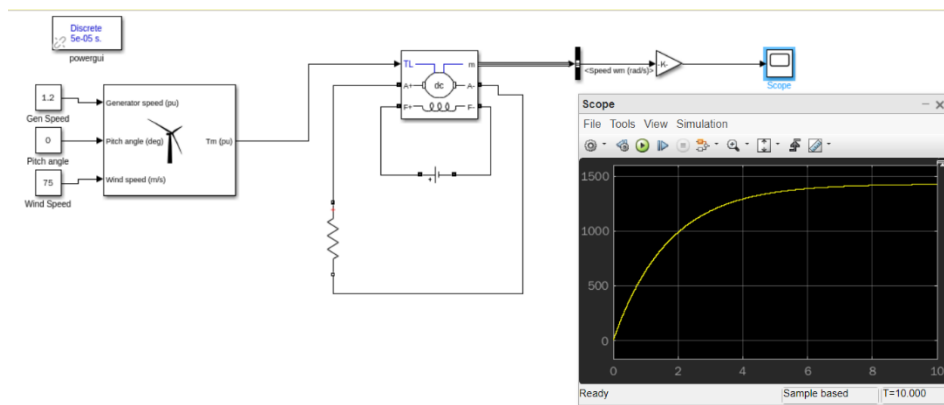
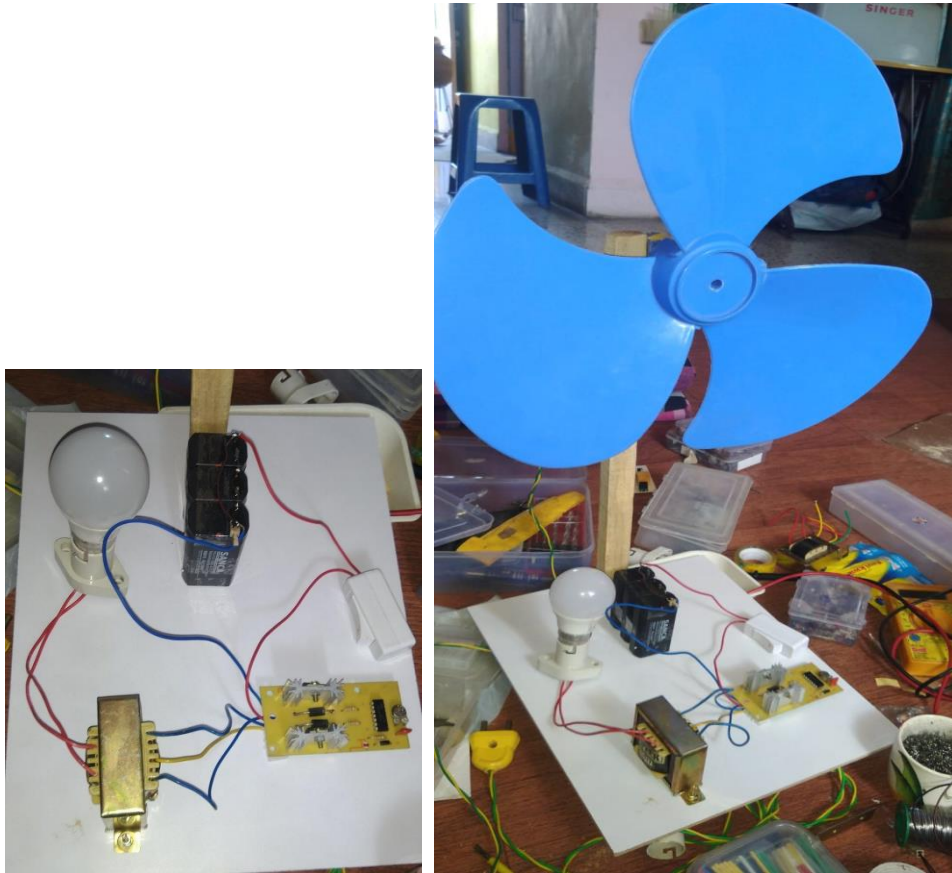


Fig. 2.9 Simulation Circuit

1. **Power Gui Block** is used as a compiler to the circuit.
2. **Wind turbine** torque is connected to dynamo input.
3. **Dc Machine** (m) is connected to bus selector and Field is connected to Dc voltage Source and Series RLC branch to Ammeter
4. **Bus Selector** is further connected to gain block

5. **DC voltage source** is connected to field of the machine.
6. **Series RLC** is connected to the ammeter in the dc machine.
7. **Scope** is used as the output waveform.
8. **Gain** is a process for measuring the performance of a two-port circuit. Gain allows an amplifier to build up the power or amplitude of a signal.
9. **Constant Block** is the input to wind turbine.

### 3.2 HARDWARE RESULT



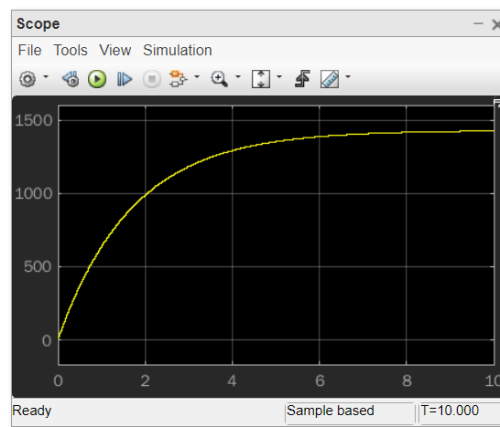
**Fig 3.0 Hardware for the green wind energy for rural electrification**

Wind mill is connected to the dc dynamo and this dc dynamo can be used as a generator. So, the 12v rechargeable battery is further attached to the power generator through the wire, from the battery we are powering to this inverter through the switch so the ground is directly connected and the positive from the battery to the inverter the IC generates clock pulses which trigger this transistor-based switches here we can use any mosfet or any power transistor and then further transferred to step up transformer (12-0-12 to 230v). the step-up transformer will generate 230v power which will lead to power the load which we gave as led bulb. While the fan is rotating it will charge the battery and battery will store the power and it will continue further. When we switch on the switch the load will generate.

Services provide extra functionality for use in drawings, such as interacting with equipment or managing information. Select a collection from the Shape

Integrate Library submenu to use it in a design. It'll also place zero or more include statements there at top of something like the file and collect the library with your image. Libraries boost the number of available storages up on the board because they will be transported with your sketch. If a doodle does not require such library however at time, just erase it include statements from the top of your code.

In the history section, there is a list of institutions. With Uno programming, a few packages are included. Some may be not.



**Fig 3.1 Graph for the output of the stimulation**

## **CHAPTER 4**

### **CONCLUSION AND FUTURE SCOPE**

#### **4.1 CONCLUSION**

Wind mill is connected to the dc dynamo and this dc dynamo can be used as an generator. So, the 12v,3.0Ah rechargeable battery is joined with the power generator through the wire, from the battery we are powering to this inverter through the switch

through the wire, from the battery we are powering to this inverter through the switch so the ground is directly connected and the positive from the battery to the inverter

the IC generates clock pulses which trigger this transistor-based switches here we can use any mosfet or any power transistor and then further transferred to step up transformer

(12-0-12 to 230v). the step-up transformer will generate 230v power which will lead to power the load which we gave as led bulb. While the fan is rotating it will charge the battery and battery will store the power and it will continue further. When we switch on the switch the load will generate.

#### **5.2 FUTURE SCOPE**

With the help of this project, we are trying to bring out the importance of wind. Here the wind energy will get converted to electrical energy the wind will rotate the wind turbine and the turbine will produce energy which is known as rotating energy, we can use the energy which is saved onto the battery and the battery will be rechargeable battery, the step-up transformer will generate 230v power which will lead to power the load which

we gave as led bulb. While the fan is rotating it will charge the battery and battery will store the power and it will continue further. When we switch on the switch the load will generate. Our project is just the module where we used small amount to show how we can expand in rural areas where there is no amount of electricity or we can use street light using this method or in some Ares below poverty line where the cost of electricity they can't afford this process can be used.

So as a result, we can see that wind energy have a huge scope where we can be reliable to the nature for this.

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