PHOTOVOLTAIC BASED ELECTRIC VEHICLE CHARGER FOR CUSTOMER ADAPTIVE CHARGING STATION

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ABSTRACT:
This paper describes the multifunction EV charger for house hold applications. solar and grid vehicle charger scheme is implemented for charging of electric vehicle system. EV charger scheme is implemented using RFID reader to analysis vehicles for charging and would allow EV charging to be conducted. RFID reader is used for analysis battery charging price analysis.
Keywords:*Photovoltaic, Electrical Vehicle, Vehicle to Grid, Vehicle to Home,Unity Power Factor*,

1.INTRODUCTION

Electric vehicle is necessary for saving the fuel in future generation. So we implement solar photovoltaic based electric vehicle charger for customer adaptive charging station[1]. Solar energy is easily available in earth so electric vehicle charger is most comfortable method for saving the electricity and fuel in future generation[2] . There are different types of electric vehicles are available. One is battery electric vehicle next one is hybrid electric vehicle and another one is range extended electric vehicle[3] . Battery electric vehicle is mostly available in market. It consists of electric motor. Battery electric vehicle is noiseless while operating motor. But one disadvantage is it requires more recharge time[4]. Hybrid electric vehicle is a combination of electric motor and internal combustion engine. It work in two different modes. One is electric mode and another one is gasoline powered vehicle[5]. In hybrid electric vehicle we use low speed mechanical electric motor. This type of vehicle not producing the air pollution[6] . Range extended electric vehicle designed in battery. It consist gasoline generator[7] .

Mostly electric vehicles are used the lead acid battery. This battery is more comfortable for electric vehicles so it is implemented in electric vehicle[8]. Major motive of this project is we consuming the solar energy and it is used in different applications one is we using the solar energy for home appliances and also used in electric vehicle charging method. In this implementation we are using the solar panel , voltage sensor, battery ,voltage regulator ,inverter, ARDUINO UNO, potentiometer, RFID, relay, grid ,LCD display[9]. Solar panel is one part of photovoltaic framework.

They are build out of a progression of photovoltaic cells orchestrated into a board. Solar energy is the most powerful energy in world so with the help of solar panel we save the solar energy. This project operated in two different modes one is vehicle to grid mode and another one is vehicle to home mode[10] .

Inverter is major component of electric vehicle charging station so we used the inverter in this project it convert the DC to AC. Voltage sensor is a straight forward yet valuable module which utilizes a likely divider to diminish any information voltage by a factor of 5. Voltage regulator is device it is used to regulate different types of voltages in this implementation. Relay is a switching device that opens and closes under the control of another electrical circuit. LCD displays are used to display the information about project. RFID is used to pay the amount for charging of electric vehicle[11] .

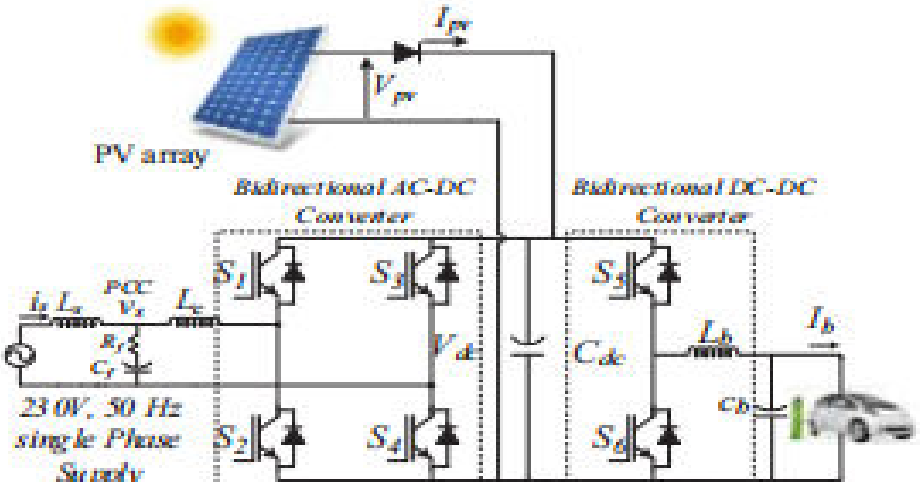

Figure 1 Pictorial representation of photovoltaic based EV charger

2.RESEARCHMETHODLOGY:

2.1.EXISTINGSYSTEM:

In existing system unidirectional power flow control of solar grid connected system. In single phase boost convertor based EV charger system is Implemented. Plug in hybrid vehicles including vehicle to home functionality scheme has been implemented in existing system. Existing system consists of solar panel ,battery, bidirectional converter, inverter, grid, charging station.Battery is connected between solar panel and bidirectional converter[12],[13]. Inverter is connected between bidirectional converter and house hold appliances. Solar panel is a device that consume solar energy. This system consists of two operations one is vehicle to grid connected operation and another one is vehicle to home operation . In vehicle to grid operation solar energy is converted into electrical energy with the help of inverter DC current is converted into AC current vehicle is charged in this mode of operation. In vehicle to home operation with the help of bidirectional converter electric vehicle is charged[14].

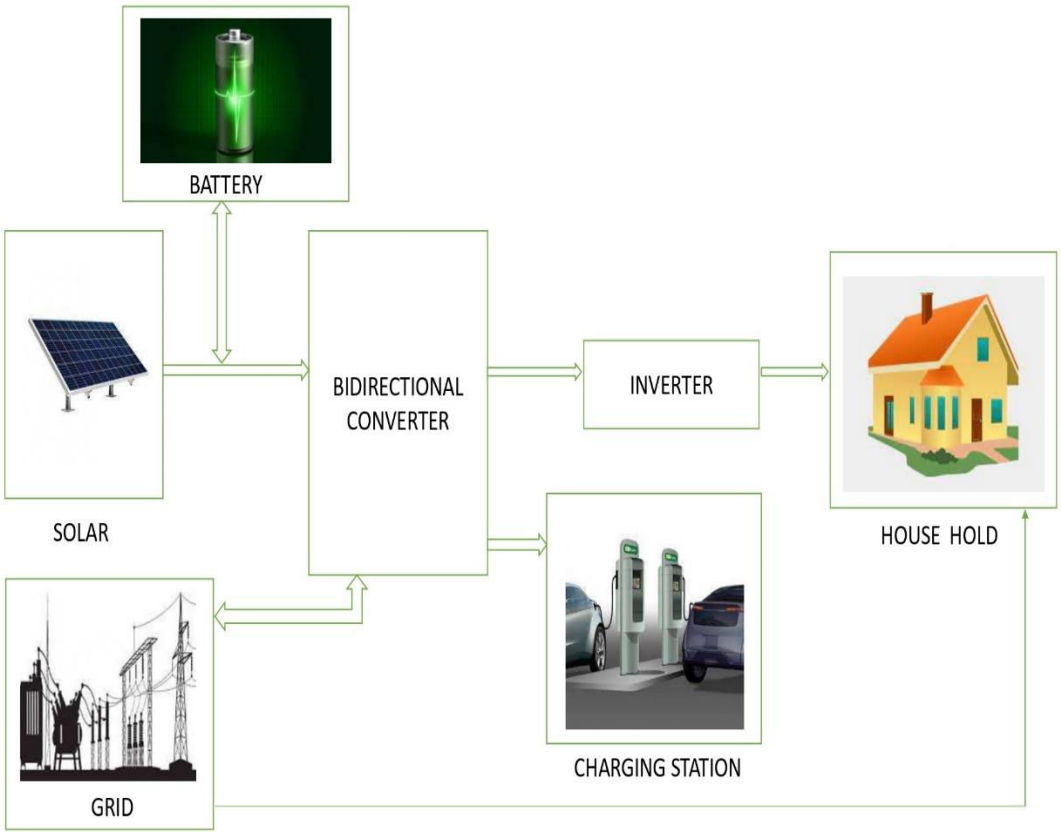

Figure 2 Block diagram of existing system

2.2.PROPOSED SYSTEM:

Smart power meter to recharge electric vehicle. In this system charge controller is used to measure the energy which consumed by the vehicle during charging. Electric vehicle charging from voltage sensor with the help of power from solar panel to voltage regulator, it gives power for battery. Incase power is did not reach from solar panel; grid will act as another charging controller. Vehicle will run with the help of dc motor through potentiometer. RFID is used for this charging station to make easy payment.

3.1 SOLAR PANEL:

A Solar panel or Solar module is one part of a photovoltaic framework. They are built out of a progression of photovoltaic cells orchestrated into a board. They arrive in an assortment of rectangular shapes and are introduced in blend to produce power. Sun oriented boards, once in a while likewise called gather energy from the Sun as daylight and convert it into power that can be utilized to control homes or organizations. These boards can be utilized to enhance a structure's power or give power at far off areas .

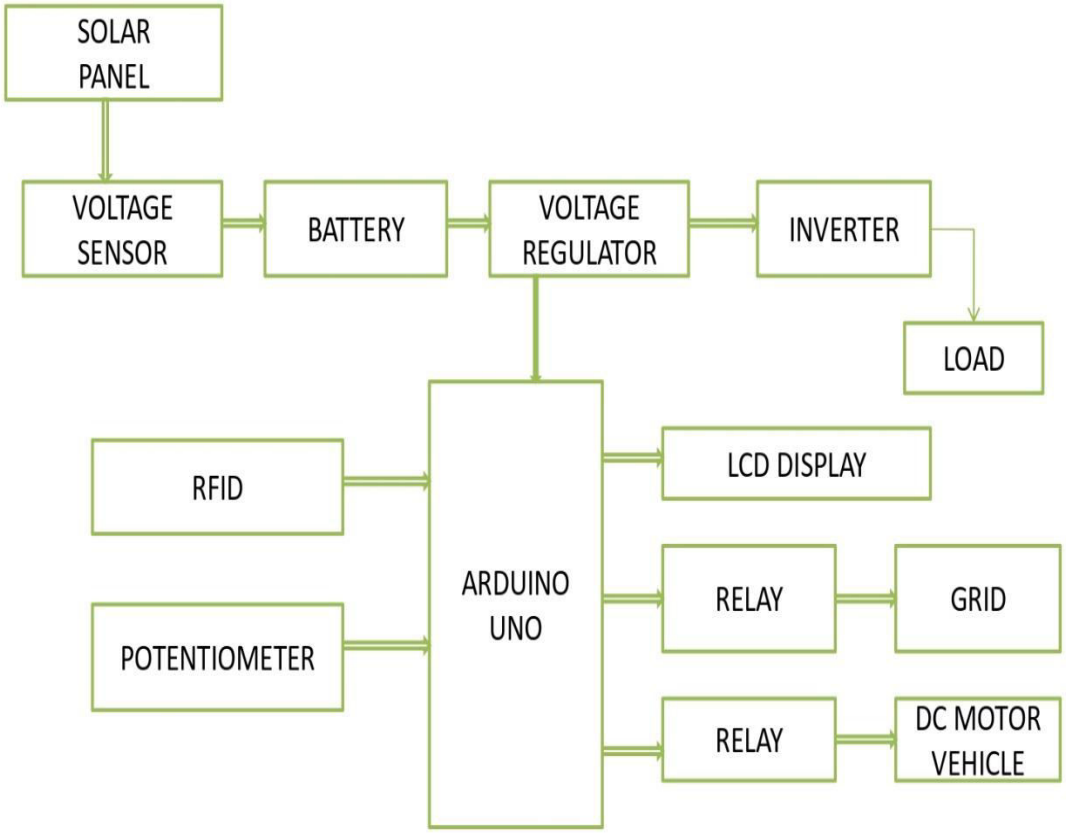

Figure 3 Block diagram of proposed system

3. HARDWARE IMPLEMENTATION

The fundamental segment of any Solar panel is a Solar cell. In particular, various Solar cells are utilized to fabricate a solitary Solar panel. These cells are the piece of the gadget that convert the daylight into power. Most Sunlight based boards are produced using translucent silicon type Sun oriented cells. These cells are made out of layers of silicon, phosphorous, and boron (despite the fact that there are a few unique kinds of photovoltaic cells). These cells, once delivered, are spread out into a framework.

Figure 4 pictorial representation of Solar panel

3.2 INVERTER:

Inverter is the most important device in proposed system. Inverter is a device that converts the dc current voltageinto Ac current voltage without changing the frequency and voltage. Inverter is mainly used in solar power systems. This device never generate the any kind of power. There are two types of inverter is available one is single phase inverter and another one is three phase inverter. Single phase inverter is classified into two types. One is half bridge inverter and another one is full bridge inverter. In this project we used the MOSFED type inverter.

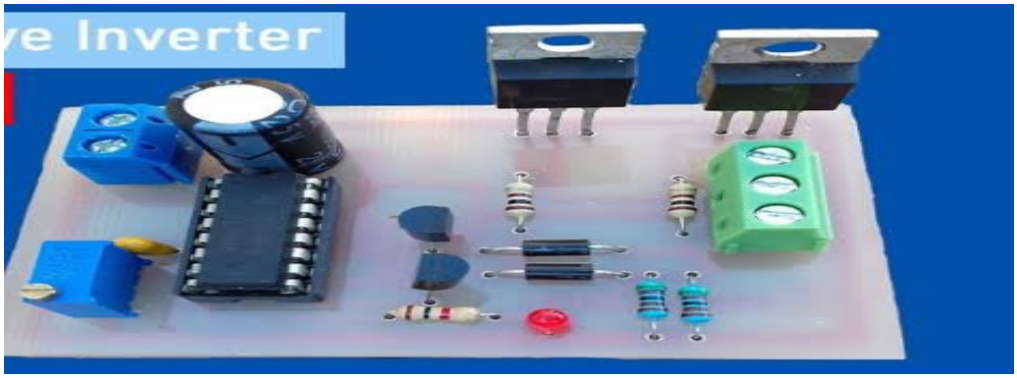

Figure 5 pictorial representation of inverter

3.3. RADIO FREQUENCY IDENTIFICATION (RFID)

RFID means radio frequency identification. REID is used to interrogate RFID tags. It contains an RF module, which act as a both a transmitter and receiver of radio frequency signals. RFID is the wireless use of electromagnetic fields to transfer the data for the purpose of automatically determine the tags attached to objects in the system. RFID labels can store a scope of data from one chronic number to a few pages of information. Readers can be portable with the goal that they can be conveyed by hand , or they can be mounted on a post or overhead reader frameworks can likewise be in corparated into the engineering of a bureau ,rooms, or buildings.

Figure 6 pictorial representation of RFID

3.4. BATTERY:

Battery is a device that converts the chemical energy into electrical energy with the help of the chemical reaction. Battery is also used for store the electrical energy in easier manner. There are different types of batteries are available in market. In electric vehicle system Lead acid battery is mostly used. In this implementation we are using 12V battery. Battery is operated in two different modes one is charging period and another one is discharging period.

Figure 7 pictorial representation of Battery

3.5. ARDUINO CONTROLLER:

The ARDUINO UNO is a open source microcontroller board. It consists of digital and analog based input and outputs. In this implementation we using the ARDUINO ATmega328p microcontroller. The ARDUINO consists of six analog pins and fourteen digital pins. IDE (Integrated development environment) is used in ARDUINO controller it is used for the implement the necessary program powered by USB cable. The operating voltage controller is 5 volts. The clock speed of the controller is 16 MHZ. The length of the controller is 68.6 mm. The width of the controller is 53.4 mm . The weight of the controller is 25 gram.

Figure 8 pictorial representation of ARDUINO controller

3.6. LCD DISPLAY:

A Liquid crystal display is electronic visual display. An LCD is small low cost display. It is easy to interface the microcontroller.LCD are used in different application such as television, Android mobile ,Computer monitors , and communication systems. LCD consists of 16 pins .pin 1 is a grounding and pin 2 is a supply voltage pin ,pin 3 is a variable resistor, pin 4 is a register select, pin 5

is a read or write pin, pin 6 is a enable pin, pin 7 to 14 is a eight bit data bins, pin 15 is a backlight input pin, pin 16 is a backlight ground pin.

Figure 9 pictorial representation of LCD

3.7. VOLTAGE SENSOR:

A Straight forward yet valuable module which utilizes a likely divider to diminish any information voltage by a factor of 5. This permits you to utilize the simple contribution of a microcontroller to screen voltages a lot higher than it equipped for detecting. For instance with a 0-5V simple info range you can gauge a voltage up to 25V. The module likewise incorporates helpful screw terminals for simple and secure association of a wire.

Figure 10pictorial representation of Voltage sensor

3.8. VOLTAGE REGULATOR:

A voltage controller is a circuit that makes and keeps a fixed yield voltage, independent of changes to the info voltage or burden conditions. Voltage controllers (VRs) keep the voltages from a force supply inside a reach that is viable with the other electrical segments. While voltage controllers are most normally utilized for DC/DC power change, some can perform AC/AC or AC/DC power transformation too. This article will zero in on DC/DC voltage controllers.There are two principle kinds of voltage controllers. Straight and exchanging. The two kinds manage a framework's voltage, yet straight controllers work with low proficiency and exchanging controllers work with high effectiveness. In high-effectiveness exchanging controllers, a large portion of the information power is moved to the yield without scattering

.

Figure 11 pictorial representaion of voltage regulator

3.9. POTENTIOMETER:

Potentiometeris a device it will act as a variable resistor. It consists of two pins one is end type another one is wiper, it act as a rheostat. It will act as measuring instrument. It is used for the control of electrical devices such as volume control on joystick. In this implementation potentiometer is act as a variable resitor in electric vehicle charging method.

Figure 12 pictorial representation of Potentiometer.

4.SIMULATION RESULT

The simulation circuits and the simulation results are enclosed.PSO have been implemented in MATLAB and the performance has been compared .The simulation results with PSO method are show in figure 13.

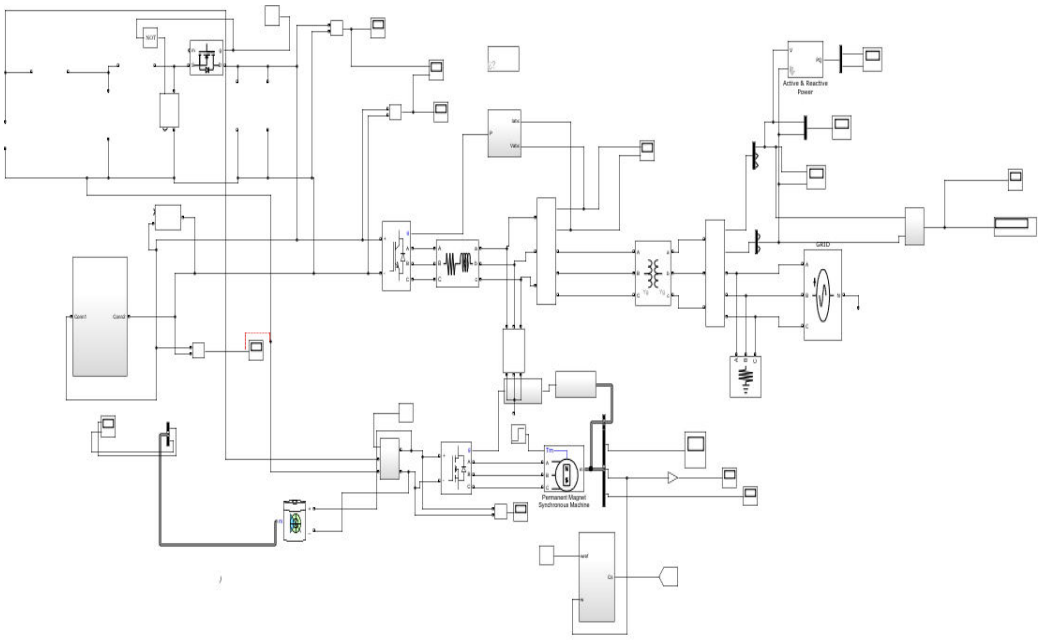

Figure 13 Simulation model with PSO method

The EV charging station the executives procedure reenactment is performed with MATLAB in which the cycle CC/CV with three charging modes is carried out. An indispensable relative regulator controls the current and voltage of EVs during the EV charging measure. The reenacted situation follows the depicted EV charging station dependent on DC Micro grid and under power restriction. At the point when an EV shows up, the driver picks the charging mode. Under the force constraint, if the charging station accessible force is more noteworthy than the maximal force requested by the charging mode picked by the driver, the EV charges straightforwardly. If not, the framework offers alternatives for drivers. Five EV chargers are set in the recreation model, as indicated by the need request, in particular from the charger 1 to charger 5, the request start to finish in Figure 12.

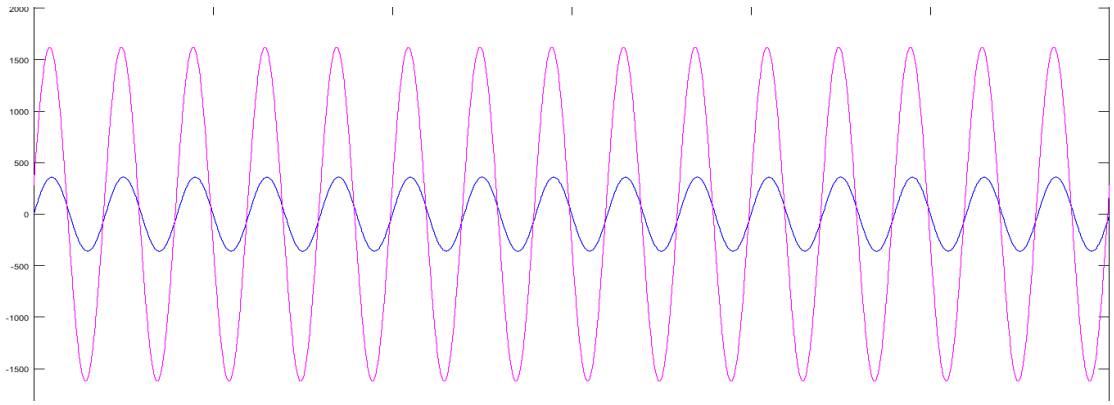

Figure 14 Voltage and Current response

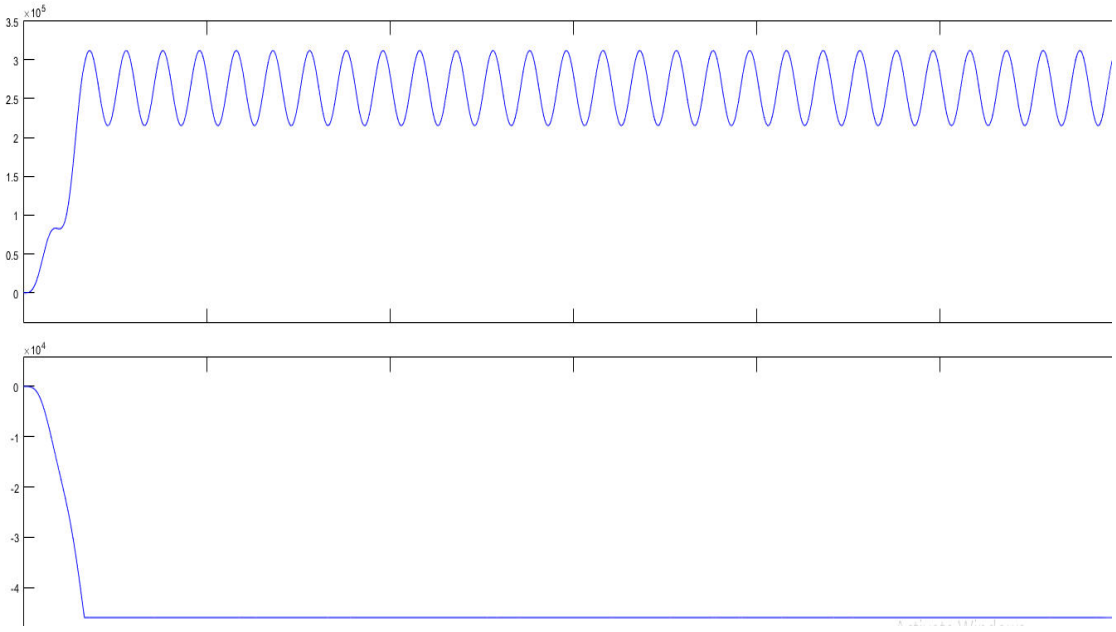

Figure 15 Real and Reactive power response

From figure 14 &15 shows the simulation output waveform of solar power ,voltage & current ,Power factor, real and reactive power. The values which we given to the suitable waveform as in the simulation output.

5.HARDWARE RESULT

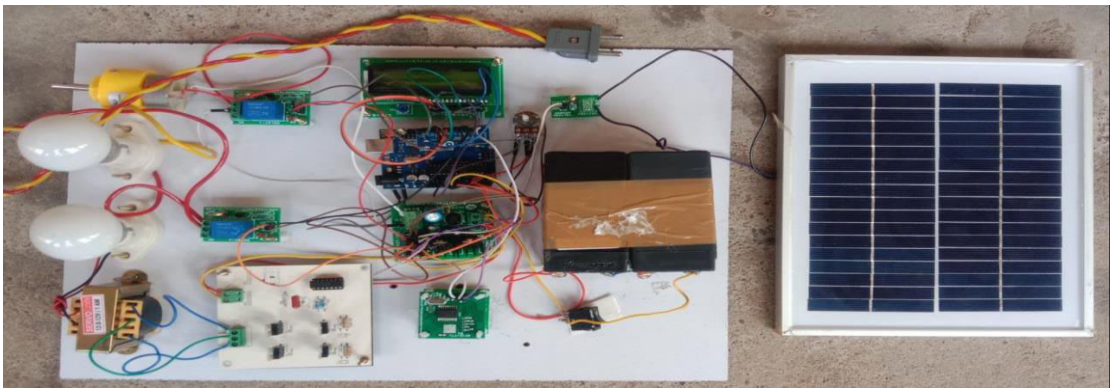

Figure 16 Hardware Setup

Thus to examine the effectiveness of the proposed charger simulated in MATLAB, a prototype charger was modeled in figure 15 shows the prototype model of the proposed topology. It consists of 12 v solar panel, 12 v battery, voltage sensor voltage regulator, ARDUINO controller, LCD display, Inverter, relay and RFID. This project work under the two different conditions .one is grid connected mode another one is solar connected mode. In this system charge controller is used to measure the energy which consumed by the vehicle during charging. Electric vehicle charging from voltage sensor with the help of power from solar panel to voltage regulator, it gives power for battery. Incase power is did not reach from solar panel, grid will act as another charging controller. Vehicle will run with help of dc motor through potentiometer. RFID is used for this charging station to make easy payment.

6.CONCLUSION:

We concluded that , these are things that we are proposed in our project paper. Here we are implement the photovoltaic based electric vehicle charger for customer adaptive charging station by using the RFID method. This proposed system is very useful in present world, because solar energy is the easily available in every place so this project work easily with the help of our project we are avoid the air pollution and save the electrical energy in easier manner.

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