Third International Conference on "Materials, Computing and Communication Technologies"
International Journal of Scientific Research in Computer Science, Engineering and Information Technology | ISSN : 2456-3307 (www.ijsrcseit.com)

RENEWABLE ENERGY BASED SMART E-BULK FOR ELECTRIC VEHICLE USING IOT

A.Ann Rufus[1],
Associate Professor,
Electrical and Electronics Engineering,
SCAD College of Engineering and Technology, Cheranmahadevi,
annrufus@gmail.com

Enoch Samuel,[2]
Final Year,
Electrical and Electronics Engineering,
SCAD College of Engineering and Technology,Cheranmahadevi,
enochsamuel.ug18.ee@scadengineering..ac.in

R.Mahesh[3].
Final Year,
Electrical and Electronics Engineering,
SCAD College of Engineering and Technology,Cheranmahadevi,
maheshramadurai@gmail.com

T.Anbarasu[4].
Final year,
Electrical and Electronics Engineering,
SCAD College of Engineering and Technology, Cheranmahadevi,
anbarasuthiraviyam@gmail.com

P.Rahul[5],
Final year,
Electrical and Electronics Engineering,
SCAD College of Engineering and Technology, Cheranmahadevi,
rahulpmvk10@gmail.com

Abstract:

Means and modes of transport in urban environments are changing. The emergence of new means of personal transport, such as e-scooters or e-bikes, combined with new concepts such as `e-vehicle' are changing urban transport. A greater social awareness of the harmful effects of polluting gases is leading to the adoption of new e-mobility solutions. In the proposed novel solution, a stand-alone PV system is built for the free recharge of e-scooters using an original system that supports new sustainable means of transport using IOT technology. The design of the PV system considers the size limitations of the equipment, where a single PV module must generate the energy needed to recharge the e-vehicle. A battery is used to store the energy and adjust power generation and consumption profiles. A commercial electronic converter adjusts the various electrical characteristics of generation, storage, and consumption. Wi-Fi used to update the vehicle status in internet. Here, the RFID technology, to provide better service for the electric vehicle charging bulk, for electric vehicle identification as well as to debit the charging amount from users. We implement this project in hardware presentation of solar based wireless charging station for e-bulk using Atmega328 controller, and also monitoring the system through IOT webpage.

Introduction:

The need for clean environment promoted the development of green car technology such as electric vehicles (EV).Thus the demand of plug-in electric vehicles(PEVs) charging for public vehicle charging system is increasing. Recently, the use of distributed charging based on renewable energy sources for electric vehicles is highly demanding green technology alternative. Since continuous reduction in the price of PV modules the use of hybrid photovoltaic solar and batteries applied as energy storage system. There are two ways on the connection of the energy sources to the electric vehicles.

Plug-In Electric Vehicles:

Plug-in electric vehicles (PEVs) are now being rolled out to consumers throughout the United States. General Motors Company is producing the Chevrolet Volt, a plug-in hybrid. Ford Motor

Company is producing the Ford Electric Focus and Nissan Motors is manufacturing the Leaf, both of which are all-electric vehicles. And a number of startup companies are producing specialty PEVs, the most prominent being Tesla Motors, producer of the all-electric Tesla Roadster [Ref:4].

The Smart Grid will have the infrastructure needed to enable the efficient use of this new generation of PEVs. PEVs can drastically reduce our dependence on oil, and they emit no air pollutants when running in all-electric modes. However, they do rely on power plants to charge their batteries, and conventional fossil-fueled power plants emit pollution[Ref:4].

To run a PEV as cleanly as possible, it needs to be charged in the wee hours of the morning, when power demand is at its lowest and when wind power is typically at its peak. Smart Grid technologies will help to meet this goal by interacting with the PEV to charge it at the most optimal time. But sophisticated software will assure that your PEV is still fully charged and ready to go when you need it. And you'll still be able to demand an immediate recharge when you need it [Ref:4].

In the future, PEVs may play an important part in balancing the energy on the grid by serving as distributed sources of stored energy, a concept called "vehicle to grid." By drawing on a multitude of batteries plugged into the Smart Grid throughout its service territory, a utility can potentially inject extra power into the grid during critical peak times, avoiding brownouts and rolling blackouts. PEVs also have the potential to help keep isolated parts of the grid operating during blackouts. They could also help integrate variable power sources into the grid, including wind and solar power. Financial incentives may be available for PEV owners that allow their batteries to be used this way [Ref:1].

Enabling a Charging Infrastructure for PEVs:

One of the key factors for acceptance of PEVs in the marketplace will be the availability of charging stations. Currently, a number of entities are building charging stations in cities throughout the United States, some of which are supported with DOE funding. For now, many municipalities and private companies are offering free recharges to PEV owners as an incentive for these clean vehicles. However, as PEVs gain market penetration, this "free refueling" is likely to come to an end, and charging station owners will be seeking a convenient way to charge PEV owners for their "fill-ups" [Ref:2].

Smart Grid technologies offer a potential solution to this problem, at least within the area served by the energy provider of the PEV owner. With the Smart Grid, PEVs can identify themselves to the charging station when they are plugged in, and the electricity used can be automatically billed to the owner's account. The technology will not only simplify transactions for the charging station owners, but also allow PEV owners to charge up without the need for cash or a credit card [Ref:6].

Different kinds of PEVS:

There are two basic PEV configurations:

Series PEVs, also called Extended Range Electric Vehicles. Only the electric motor turns the wheels; the gasoline engine only generates electricity. Series PHEVs can run solely on electricity until the battery needs recharging. The gasoline engine will then generate the electricity needed to power the electric motor. For shorter trips, these vehicles might use no gasoline at all [Ref:3&4].

Parallel or Blended PEVs. Both the engine and electric motor are mechanically connected to the wheels, and both propel the vehicle under most driving conditions. Electric-only operation usually occurs only at low speeds.

PEVs also have varied battery capacities, allowing some to travel farther on electricity than others. PEV fuel economy, like that of electric vehicles and regular hybrids, can be sensitive to driving style, driving conditions, and accessory use [Ref:3].

Benefits and Challenges:

Less Petroleum Use. PEVs are expected to use about 40 to 60 percent less petroleum than conventional vehicles. Because electricity is produced primarily from domestic resources, PEVs reduce petroleum dependence.

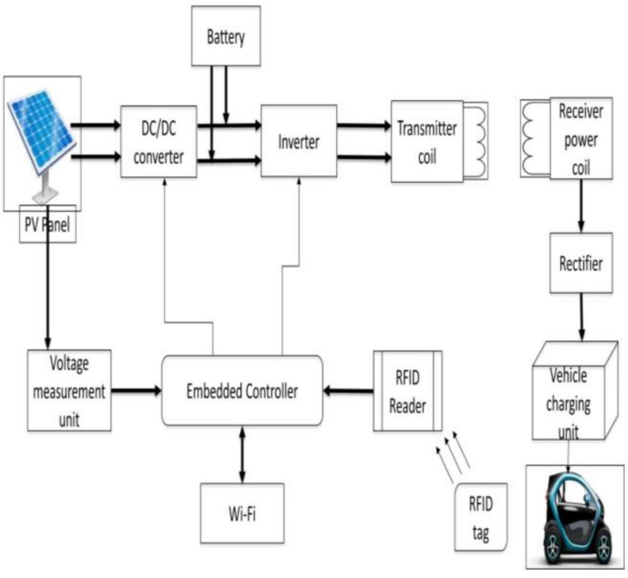
Less Greenhouse Gas (GHG) Emissions. PEVs are expected to emit less GHG emissions than conventional vehicles, but the amount generated partly depends on the fuel used at the power plants that generate the electricity used to recharge the car's battery. A PEV will lead to less GHGs if its electricity comes from nuclear and hydroelectric plants rather than coal-fired power plants. Electricity powered by renewable energy sources such as solar or wind is optimal [Ref:1].

Higher Vehicle Costs, Lower Fuel Costs. PEVs will likely cost $1,000 to $7,000 (USD) more than comparable non-plug-in hybrids. Fueling a PHEV will cost less because the cost of electricity is much lower than the cost of gasoline per mile, but fuel savings will not entirely offset the increased vehicle cost. Many governments provide incentives to consumers for qualifying PEVs [Ref:1].

Charging Takes Time. Charging the battery typically takes several hours, but a "quick charge" to 80% capacity may take as little as 30 minutes. However, PEVs can be driven without being plugged in. They can be fueled solely with gasoline but will not achieve maximum range or fuel economy without charging [Ref:2].

Measuring Fuel Economy. This will be a challenge because PEVs run on both electricity and liquid fuel, and it is unclear what percentage of time each will be used during the average driver's daily travel.

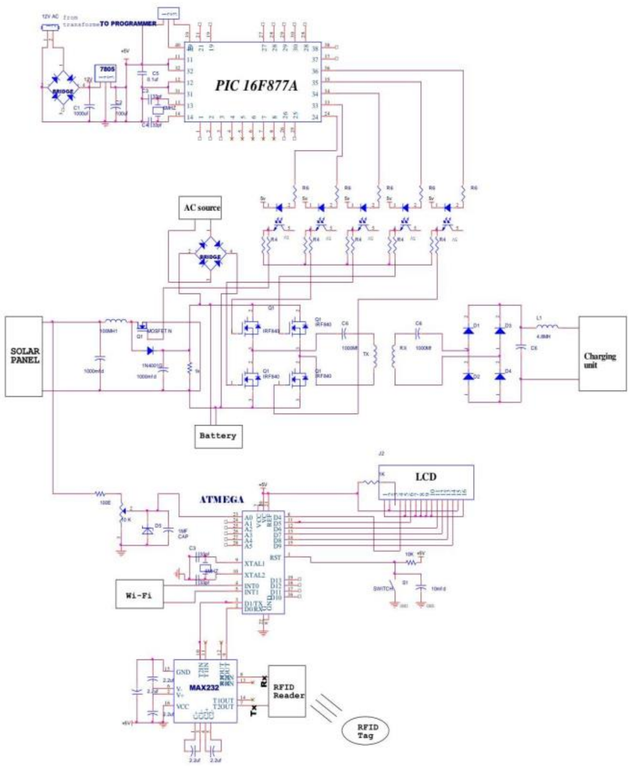
Block diagram:



Description:

In this project to charge the vehicle by using renewable energy. Solar panel used as renewable energy source. Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect. This output is given to DC-DC converter. Converter is used to boost the voltage from solar panel and is stored in battery. The converter voltage is given to inverter. Inverter is used to invert the converter DC voltage to AC voltage. This AC voltage is given to transmitter coil. In this system we use inductive charger for charging the vehicle through wireless power. Wireless power transfer between transmitter and receiver power coil. Receiver output is given to rectifier. Rectifier is used to convert AC to DC and is given to vehicle charger unit. In rainy season the solar panel is not sufficient to charge the electric vehicle, so we use alternate power source from AC grid source. This AC source is convert to DC by using rectifier. This voltage is injected to inverter unit. In this project we use ATMEGA328 Microcontroller. ATMEGA 328 microcontroller, which acts as a processor. Nearly it consists of 28 pins. From these 28 pins, the inputs can be controlled by transmitting and receiving the inputs to the external device. It also consists of pulse width modulation (PWM). These PWM are used to transmit the entire signal in a pulse modulation Controller to measure the voltage from solar panel by using voltage measurement unit. Controller to give the PWM signal to converter and inverter switches by using gate driver unit. The RFID tag is used to detect the presence of nearby vehicle without any physical contact. Controller to update the vehicle status in webpage thorough IOT technology. Wi-Fi module is used as communication between controller and IOT [Ref:3].

Circuit diagram:



Description:

Power supply gives supply to all components. It is used to convert AC voltage into DC voltage. Transformer used to convert 230V into 12V AC.12V AC is given to diode. Diode range is 1N4007, which is used to convert AC voltage into DC voltage. AC capacitor used to charge AC components and discharge on ground. LM 7805 regulator is used to maintain voltage as constant, and then the signal will be given to next capacitor, which is used to filter the unwanted AC component. Load will be LED and resister. LED voltage is 1.75V. The Solar panel produce the voltage, the MOSFET gate will be opened according to the signals from the micro controller. The converter voltage is given to inverter. Inverter is used to invert the converter DC voltage to AC voltage. This AC voltage is given to transmitter coil. In this system we use inductive charger for charging the vehicle through wireless power. Wireless power transfer between transmitter and receiver power coil. Receiver output is given to rectifier. Rectifier is used to convert AC to DC and is given to vehicle charger unit. To give PWM signal to converter and inverter switches by using PIC 16F877a controller through op to driver (IC 4n35). The RFID tag sends the encoded data signal in the form of Radio frequency wave form, the RFID reader will receives these signal data. The output of the RFID reader connected to MAX232 Pin No. 7&8. The output of the MAX232 is connected to the Micro controller ATMEGA 328. The ATMEGA 328 controller will produce the output according to the in-build program. Controller to update the vehicle information in internet through IOT server via Wi-Fi module. Wi-Fi we used ESP8266 and it is connected to controller port 4 & 5. It is used as communication between controller and IOT page [Ref:5].

Existing System:

There is little literature on the use of electric scooters (e-scooter) in urban environments as a new element in micro mobility, but there are studies that show the e-scooter's ability to replace the conventional private vehicles in short urban trajectories. Several reasons explain the increase in the number of e-scooters in cities. E-scooters represent a cheap and independent mobility system with easy parking, and can often share lanes initially intended only for bicycles. The use of e-scooters in urban routes increasingly enables the use of other means of public transport (metro, bus, train, etc.), strengthening inter modality, as well as reducing the use of private vehicles [Ref:7].

Sharing has spread too many types of vehicles and free-floating scooter sharing could help improve the situations previously identified, and move us towards a more sustainable urban mobility. Most of the advantages identified for e-bikes also are valid for e-scooters. Some common disadvantages of free-floating floats, like the battery recharging and the relocation trips, are analyzed.

Proposed System:

To propose a control design and power management for a PV wireless charging station for HEV (hybrid Electric vehicle) by use of renewable source. The charging station charges HEVs using power from PV panel. The RFID technology, to provide better service for the electric vehicle charging bulk, for electric vehicle identification as well as to debit the charging amount from users.In rainy season the solar panel is not sufficient to charge the electric vehicle, so we use alternate power source from AC grid source [Ref:4].

Hardware View:

Advantage:

- ✓ Renewable energy won't run out
- ✓ Maintenance requirements are lower
- ✓ Renewables save money
- ✓ Renewables lower reliance on foreign energy sources

Application:

- ❖ Solar, wind and rain data analysis.
- ❖ Application engineering for solar, wind and biomass energy sources.
- ❖ Solar photovoltaic test laboratory

Conclusion:

This project presents aIOT based wireless electric vehicle charging unit. The recharging dock is conceived as a stand-alone PV system, and contains a PV module, a lead-acid battery, and a commercial power converter that includes a PWM charge regulator and an inverter. The most important constraints considered during the sizing process are outlined and linked to the selection of the components used in the recharging dock. The proposed system facilitates the deployment of electric mobility solutions in urban environments, with all the advantages of this type of mobility. In this project to implement as hardware model of solar based e-bulk, and experimentally verified the results through IOT. This system to update the vehicle information through internet via Wi-Fi module success fully.

Reference:

1. F. Musavi, M. Edington, W. Eberle, and W. G. Dunford, "Evaluation and efficiency comparison of front end ac-dc plug-in hybrid charger topologies," IEEE Transactions on Smart grid, vol. 3, no. 1, pp. 413– 421, 2012.
2. M. Yilmaz and P. T. Krein, "Review of battery charger topologies, charging power levels, and infrastructure for plug-in electric and hybrid vehicles," IEEE Transactions on Power Electronics, vol. 28, no. 5, pp. 2151–2169, May 2013.
3. G. Gamboa, C. Hamilton, R. Kerley, S. Elmes, A. Arias, J. Shen, and I. Batarseh, "Control strategy of a multi-port, grid connected, direct-dc pv charging station for plug-in electric vehicles," in Energy Conversion Congress and Exposition (ECCE), 2010 IEEE. IEEE, 2010, pp. 1173–1177.
4. P. Goli and W. Shireen, "Pv integrated smart charging of phevs based on dc link voltage sensing," IEEE Transactions on Smart Grid, vol. 5, no. 3, pp. 1421–1428, 2014.
5. S. Mishra, R. Adda, and A. Joshi, "Inverse watkins–johnson topology based inverter," IEEE Transactions on Power Electronics, vol. 27, no. 3, pp. 1066–1070, 2012.
6. Ann Rufus,A.,Kalaivani,L.AGOA-RNN controller for a stand-alone photovoltaic/wind energy hybrid-fed pumping system.soft comput23,122512276(2019).https://doi.org/10.1007/s00500-019-04224-8
7. Annie poornima princess, G.,Radhamani, A.S.A Hybrid Meta-Heuristic for optimal Load Balancing in cloud Computing.J Grid computing19,21(2021). http://doi.org/10.1007/s10723-021-09560-4
8. Alphonse, ARA , Raj, APPG, Arumugam, M. Simultaneously allocating electric vehicle charging stations (EVCS) and photovoltaic (PV) energy resources in smart grid considering uncertainties: A hybrid technique. Int J Energy Res. 2022;1-22.doi:10.1002/er.8187__.