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An Overview of Hybrid Electric Vehicle Battery Charging Stations using Wind and Solar Energy for Green India

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Abstract. Vehicle population is growing at a rapid rate, and it is expected to surpass human population in the coming years. This could result in the use of fossil fuels and the extinction of non-renewable resources at the same time. Hybrid and electric vehicles are improving in quality, necessitating the development of charging station infrastructure. Superchargers and mega chargers have established a new standard for charging high-capacity vehicle batteries quickly. Electrical vehicles square measure promoted in giant numbers by government of Asian nation to cut back environmental pollution and climatical changes. Major anxieties whereas introducing electrical vehicles in their golf range and initial value. Enough range of traditional, medium and quick charging stations and battery and swapping stations square measure to be planned and put in for sleek conveyance of Electrical vehicles. This project deals with a standard charging station enforced at a geographic point. A alternative energy plant and wind mill is employed as a significant supply of current. associate degree alternate association to the station voltaic battery is employed for importing/exporting the electric power from time to time of deficient/excess alternative energy generation.

Keywords: *Anxieties, Electric vechicles, Fossil fuel, Non-renewable, Solar power planet*.

INTRODUCTION

We reside within the twenty-first century thus we have a tendency to were totally addicted to renewable sources like fuel, which are costlier, and also the handiness of this supply decreasing day by day. This conference is totally supported the wireless transfer of electrical power. In wireless charging, the generation of power ought to be eco-friendly. The conversion of daylight into electricity is often achieved employing a photovoltaic cell and is one of the foremost enticing future sources of energy. Our project describes the characteristic of associate organic cells. many characteristics that impact the conversion potency of organic star cells are mentioned. Recently, organic star cells are attracting tons of attention thanks to some intrinsic advantageous characteristics like flexibility, light-weight, and

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large-area applications, and vital improvement in power conversion potency. The purity of the two realms of the polymer/organic cell, the receiver and the donor, has long been thought to be the answer to greater performance of polymer/organic electrostatic cells, which are much less costly to manufacture than silicon-based star cells. Since production and material value is extremely low, they represent a promising difference to common star cells that are silicon-based star cells. Mounting these organic star cells on Electrical Vehicles can improve the potency of the general system. A strong push for cleaner mobility is critical for India's sustainable green planet goal. This is something that only electric vehicles are capable of. This is based on the fact that fossil-fuel vehicles are responsible for 60% of PMs (particulate matter-related atmospheric pollution) and over 20% of CO2.The need for power generation is high in this case due increasing of an electric vehicle. Government power stations are not enough to supply whole power for the electric vehicle charging stations. So additional power source generation system needs to solve this issue. The primary aim of this project is to develop a solar and wind energy-based charging system (SWCM) for charging electric vehicle battery packs (EVs). For effective battery recharging, the green charging station now includes both solar photovoltaic (PV) modules and a wind generator. The SWCM significantly decreases the use of fossil fuels to produce energy, resulting in substantial CO2 and CO-related emissions reductions. Solar panel output will be gained by the buck-boost converter circuit. This circuit will boost the input voltage which receives from the solar panel and windmill [6].

LITERATURE REVIEW

The high-definition current instrument was invented to measure outflow currents in high voltage dividers for DC applications was described in this paper. Each series of current-voltage converters' resistance was tested against a recommendation standard using HP3458A.The laboratory calibration level was used to calibrate the voltage references. A Datron 4808 was used to calibrate each full channel, which was then compared to the laboratory reference level. Before and after each cycle of service, all calibrations were completed. If there is some surface corrosion per class, any leakage currents will flow back through the high voltage capacitor, so be aware of this possibility; therefore, the block will be the second row. The fluctuation of high direct voltage readings at INMS is 20 V / V, with a goal precision of 0.0001 percent. Where possible, reaching this goal with equipment with an established track record was a deciding factor [1].

An analysis of methods for calculating incoming solar power on a grid surface is carried out. The benefits and drawbacks of advanced applications are discussed. The technique of modelling incoming solar power on an inclined surface is developed as a result of research based on existing formulas. Within a year, with a 0.5-hour period, the procedure considers changes in the sun's location on height and azimuth. The direct and dispersed solar radiation, the spatial position of the plates, and the inclination angle are all taken into account in the equations. It is carried out with cloudiness as the most important consideration in mind. Cloudiness values can be obtained from current records on meteowebsites. Cloudiness has a significant impact on SPS annual power production, according to a statistical model of incoming solar power. As compared to the effects of modelling for a clear sky, cloudiness causes a twofold decrease in annual incoming solar power for the studied region. The annual incoming solar power will vary dramatically due to cloudiness in areas with different longitudes and equal latitudes. When the results of modelling using the established methodology were compared to the results of calculations using current programmes, the results were very similar. Modeling incoming solar power when accounting for cloudiness improves the accuracy of SPS generation and payback time estimates. The annual map of incoming solar energy can be compared to the real energy map of materials that solar panels can use by modelling it with a time limit of 0.5 hours [2].

The research and design of an inverter asynchronous buck-boost DC-to-DC converter as a battery charger for an MPBD solar system is demonstrated in this report. For solar panels with various loads, a round setup, simulations, and installation are found. This article demonstrates how to create an asynchronous DC-to-DC buck-boost converter that does not alter the polarity of the input voltage using two transistors, two diodes, a resistor, and an inductor. It's a straightforward circuit that measures the voltage difference between the solar panel and the load vector, similar to how a solar MPPT for battery charging operates. Through comparing the duty cycle equations with the voltage supplied in the buck and boost converters study, the result of increasing the load current on the solar panel voltage is seen in the simulations. The voltage through the diodes decreases, and the inductor parasitic resistance decreases [3].

This article recommends that educators increase the use of RFID in public transportation, especially in terms of BRT accreditation and offline intelligent payment mechanisms. A contactless smart card is used for authentication, and it can be used on both an e-ticket and an ID card. Passengers can pay with a connectionless payment terminal,

which was previously installed on the BRT (CPT). The CPD is made up of the Raspberry Pi Model B, MFRC 522, and LCD Wave Sharing 3.5. The CPT executes purchases without using a computer, instead accessing information contained on a non-contact card. The CPT classifies the data of the contactless card with 100 percent accuracy at a distance of 1 cm to 2 cm, but decreases to 86.67 percent at a distance of 3 cm. An administrator may use the built framework's website to register new members, edit their identities, lift their balances, and access their transaction history. This research presents a Raspberry Pi-based RFID system that is combined with CPT. The hardware that performs user authentication and the offline intelligent payment mechanism is known as CPD. This procedure makes use of the information contained on the contactless smart card. CPD also does not view cloud data at the time of purchase, resulting in fast and user-friendly features. The findings show that the reading gap has an effect on the delay period. The greater the range of distance, the longer it would take. In addition, the website architecture enabled administrators to create new users, edit existing users, add funds to the account, and view transaction history. The findings showed that the framework was functional and able to be implemented on the BRT. This system promises to improve the e-ticketing system's efficacy and performance [4, 5].

LIMITATIONS OF EXISTING SYSTEM

Currently, 95% of vehicles use either petrol or diesel as their fuel and people also got used to this culture. The government will plan to introduce electric vehicles but our mindset will always go to petrol or diesel vehicles [6, 7]. The problem behind this reason was there is no much electric charging station present in our country, also we think it is difficult to implement the huge number of electric stations. For this reason, everyone is moving towards the usual methodology of fuel state. Also, some fuel stations are not giving proper quantity and quality fuels. Also, in solar panel application low power generation of DC-DC converters are used [8].

- It causes the air and makes lagging in electric power through the system
- Due to fluctuations during the charging of current in the capacitor, it will make some causes in filtering capacitance value and EMI
- In the capacitor discharge the negative potential current, which will be converted by using inverting amplifier.
- This inverting amplifier need in feedback and closed loop circuits.
- And also, variations in the duty cycle, which produce only low gain in the output.

PROPOSED SYSTEM

In the proposed system we aim to increase the electric charging station by solar and windmill setup. In the future increasing electric vehicles leads to these charging stations busy. Windmill and solar generates the power and that will be stored in the battery maintained in the power station. The LCD will display once the vehicle entered a parking slot and started charging. Once our vehicle is connected to the charging point, Current and voltage flow are monitored by a voltage and current sensor. In case any short circuit or heavy voltage emits from the base station, the immediately sensor detects the parameter and cuts off the electric unit. Every user uses the RFID tag for charging the vehicle, it’s like a debit card for charging the electric vehicle. Total units consumed and total amount will be displayed in the LCD.

An electrical circuit with a higher output voltage than the input voltage is known as a Buck Boost DC-DC boost converter. They're also known as step-up converters because they increase the input voltage. It has at least two semiconductor switches and at least one energy storage part, such as a capacitor or an inductor, or a combination of the two. Generated power from the solar panel and wind mill will boost by this converter and stored in a battery for required usage. Vehicle, it's like a debit card for charging the electric vehicle. Total units consumed and total amount will be displayed on the LCD.

The system fully controlled and monitored by the Arduino microcontroller, which programmed by the embedded C programming language. It works with the 12v DC input supply. The electrical energy created from solar and will energy is given to a charging circuit and that will be connected to a battery A voltage regulator produces a fixed output voltage of a predetermined magnitude that is unaffected by changes in the input voltage or load conditions fig.1. A switching regulator transforms a dc input voltage into a switched voltage that is applied to a power MOSFET or BJT switch. Which generates the constant 5v by using IC 7805 and 12v by using IC7812. Arduino is a microcontroller board that on this board, six analogue inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connector, power port, ICSP header, and a reset button are among the 14 optical input/output pins (six of which can be used as PWM outputs).

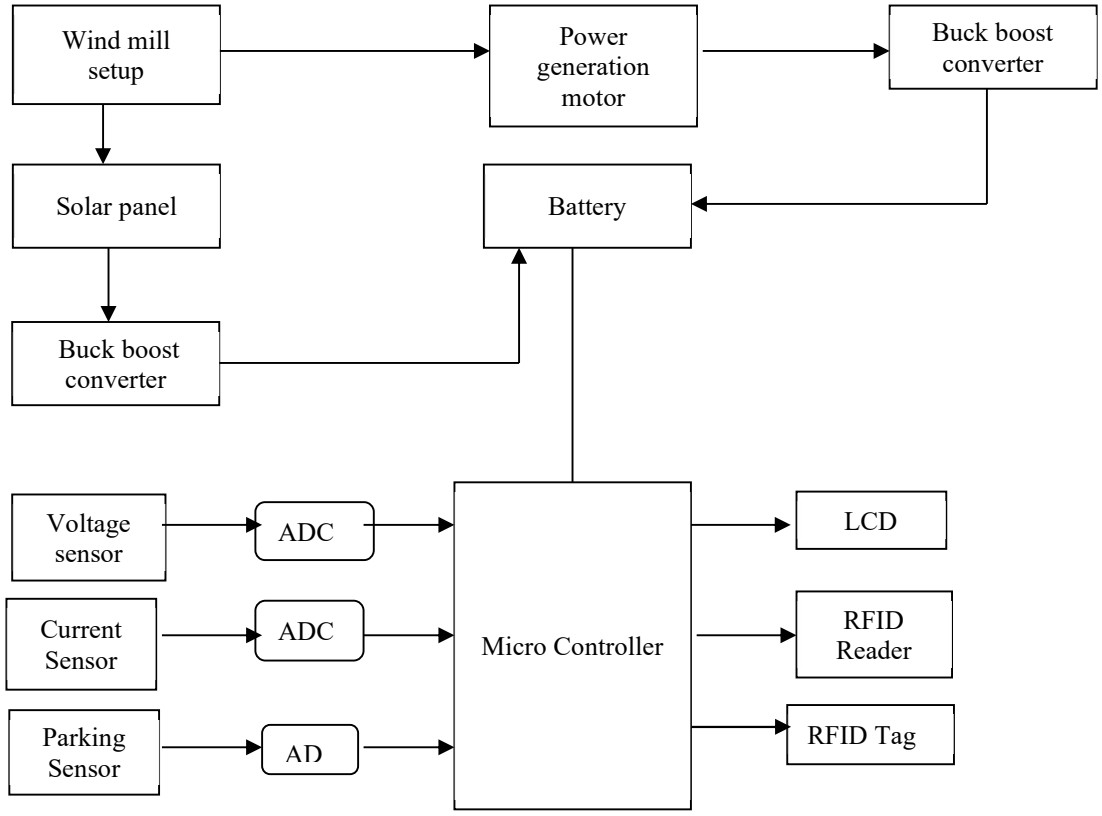

FIGURE 1. Block Diagram for Charging the Vehicle

The input voltage to Arduino we have given is 12V. Sensors usually having 3 pins which are: input, output, and ground. The input pin requires 5v DC to operates the sensor and the output of the pin of the sensors are connected to ADC pins in Arduino. LCDs (Liquid Crystal Displays) are used in embedded computer applications to control various parameters and the system's state. The LCD 16x2 has two rows of 16 characters each and is a 16-pin unit. The LCD 16x2 can be used in 4-bit or 8-bit mode. In the LCD, digital pins 8,9,10,11 are used. The data pins, as well as the LCD's RS and EN pins, are attached in the 12th and 13th pins.

Arduino

The Arduino Uno is a microcontroller module based on the ATmega328. This board has 14 optical input/output pins (six of which are PWM outputs), six analogue inputs, a 16 MHz crystal oscillator, a USB connector, a power port, an ICSP header, and a reset button (Figure.2).

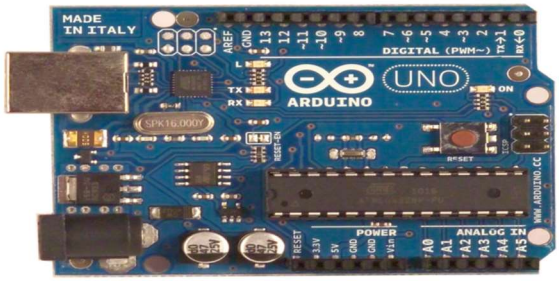

FIGURE 2. ARDUINO

It includes all you'll need to get started with the microcontroller, such as a USB cable for connecting to a device and an AC-to-DC converter or battery to power it. The FDTI USB-to-Serial Driver chip is not used on the Uno, as it was on previous boards. An Atmega8U2, which is configured to serve as a USB-to-serial adapter, is used instead. The name "Uno" comes from the Italian word "uno," which means "single." It was chosen as a symbol of the upcoming Arduino 1.0 release.

Power

External power or a USB link may be used to power the Arduino Uno. The power source is automatically chosen. External (non-USB) support is available via a wall-mounted AC-to-DC converter or a battery. A 2.1mm center-positive connector can be inserted into the board's power socket to attach the adapter. The POWER connector's Gnd and Vin pin caps are threaded with battery tracks.A 6 to 20 volt electrical supply can be used to power the board. If the 5Vpin is supplied with less than 7V, the board can become unstable and supply less than five volts. If more than 12V is used, the voltage regulator can overheat and damage the board [6].

Input & Output

Any of the Uno's 14 digital pins can be used as an input or output by using the pin Mode (), digital Write (), and digital Read() buttons. 5 volts is used to fuel them. Each pin has an internal pull-up resistor of 20-50 Kohm (disconnected by default) and can supply or receive up to 40 mA. The Uno features six analogue inputs, each with a ten-bit resolution (i.e., 1024 different values). By way of example, they scale from zero to five volts, the AREF pin and analogue comparison () feature, on the other hand, can be used to adjust the outcome outside of their range [7].

Solar Panels

Solar panels can be installed on a sub-frame and electrically attached as a group of single photovoltaic cells, solar hot water plates, or solar photovoltaic (PV) modules. The PV module is a solar cell assembly that has been assembled and attached. Solar panels can be used to produce and provide power for industrial and residential applications as part of a broader photovoltaic scheme. Each module's DC output power is rated under normal test conditions (SDC) and normally varies between 100 and 320 watts. For the same rated power, a module's efficiency affects its area: a 230-watt module with an efficiency of 8% has twice the area of a 230-watt module with a 16 percent efficiency [8].

Rigid Thin-Film Modules

In the same manufacturing line, hard thin film cells are used to make both the cell and the assembly. The cell is constructed on a glass substrate or superstrate, with electrical contacts made in situ, resulting in the "monolithic integration" function. For restoration, the frame, also known as the superstrate, is laminated to a front or back plate, which is typically another glass panel.CdTe, or a-Si, or a-Si + uc-Si tandem, or CIGS are the most popular cell technologies in this group (or variant). At a rate of 6-12 percent, amorphous silicon converts sunlight.

Battery

Primary batteries are used to convert chemical energy into electrical energy in an irreversible manner (within practical limits). The battery's power cannot be quickly replenished by electrical means until the initial supply of reactants has been exhausted [9,10].

Secondary batteries can be recharged, which means their chemical processes can be reversed by injecting electrical energy into the battery, restoring the original structure. Figure 3.

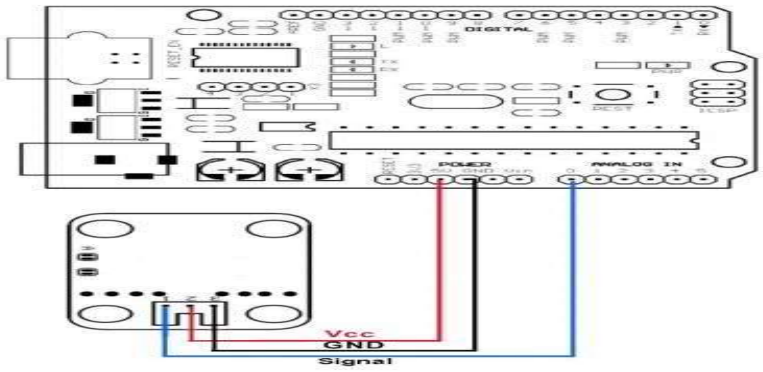

FIGURE 3. Connecting Circuits

Voltage Sensor

Voltage watch sensors are ideal for tracking supply voltage levels in conditions where power efficiency is a problem. They help secure sensitive motors and electronics by detecting undervoltage or overvoltage issues. They can easily be connected to a data logger, panel metre, or PLC for real-time tracking and reporting since they have an industry-standard 4–20 mA output [11,12].

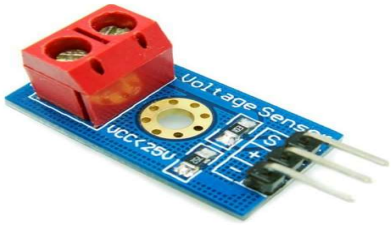

FIGURE 4. Voltage Sensor

Current Sensor

A current sensor measures electric current in a wire (AC or DC) and produces a signal proportional to it. It's possible that the produced signal is electric voltage, current, or even digital output. It can then be used to monitor the measured current in an ammeter, or it can be placed in a data acquisition device for further study, or it can be used for monitoring Fig.5.

Switched-Mode Conversion

Switched-mode power supply (electronic switched-mode power supply) DC-to-DC converters convert one DC voltage level to another by holding the input energy for a short period of time and then releasing it at a different voltage to the output. Switching converters have a range of disadvantages, including their complexity, electronic noise (EMI / RFI), and, to some extent, cost, though cost has declined as chip design has improved. DC-to-DC converters may also be purchased as integrated circuits (ICs), which require just a few additional components. There are also complete hybrid circuit modules with converters that are ready to go in an electrical assembly [13,14].

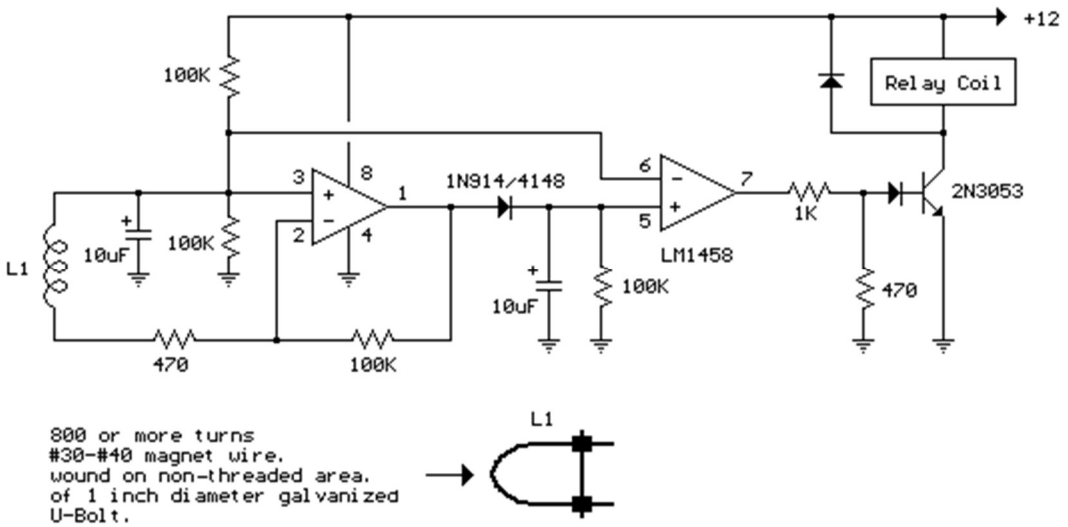

FIGURE 5. Current Sensor Block Drawing

RFID Reader and Tag

In embedded device implementations, LCDs (Liquid Crystal Displays) are used to monitor different RFID readers in a computer that reads RFID tags and interrogates them. Radio waves are emitted by the reader's antenna, and the tag reacts by transmitting its data back [15].

An RFID tag is a small packet with a microchip connected to the antenna that allows it to be attached to the monitored target. The acronym for Radio Frequency Identification (RFID) is Radio Frequency Identification. An antenna tag receives signals from an RFID reader or scanner and transmits them back to the reader or scanner, normally with additional data (such as a unique serial number or other personalized information). The device's current state and rental conditions [16].

A passive tag is one that is powered by the reader and does not need a battery. The coiled antenna inside a passive rfid tag generates a magnetic field as it comes into contact with radio waves from the reader. The tag draws energy from it and uses it to control its circuits. The information contained in the tag's memory is then sent. The RFID reader's RX and TX pins are attached to the 8051 microcontroller's Tx and Rx pins, respectively. The data from the tag is then detected by the reader and sent to the microcontroller via the serial port [17].

Operating Principle

The photovoltaic effect uses the sun's light energy (photons) to generate electricity in solar modules. Cadmium telluride or silicon-based scale-based crystalline silicon cells or thin-film cells are used in the majority of sizes. The structural (load-bearing) member of a block is the top layer or back layer. Mechanical and moisture exposure to cells must be avoided. While the majority of solar panels are rigid, thin-film cells can be used to produce semi-flexible blocks [18].

To have the right current potential to produce the desired output voltage, electrical contacts are made in series and/or parallel. The mains must be attached to the cells and the rest of the grid. Most terrestrial photovoltaic modules have MC3 (older) or MC4 connectors on the exterior, making for simple weatherproof connections with the rest of the device [19].

As partial volume shadow occurs, bypass diodes may be programmed or used externally to boost the performance of illuminated module parts.

Concentrators, which direct light from small cells through lenses or glasses, are one of the most recent solar panel designs. This allows for more costly cells per unit area to be used in a cost-effective way (such as gallium arsenide). A solar panel, also known as a solar photovoltaic module, consists of several solar cells aligned in a single plane.

The photovoltaic modules' glass covering on the sun-facing side allows light to pass through while shielding the semiconductor sizes [20].

In order to provide an input voltage, solar cells are normally attached in series to solar panels.
Since the reverse bias applied by their luminous associates to shadow cells can cause substantial power loss and possible harm, problems such as shadow effects can cause poor (low luminosity) parallel strings (multi-series attached cells). Each block has its own power supply, which is connected in parallel, but the series cell strings are normally rendered separately, rather than in parallel [21].

When using individual MPPTs, combining modules to build an array with the desired peak DC voltage and load current capability is preferable (maximum power point trackers). Shadow power loss is reduced by using shunt diodes in series or parallel connected cells [22].

In the same manufacturing line, hard thin film cells are used to make both the cell and the assembly.

The cell is constructed on a glass substrate or superstrate, with electrical contacts made in situ, resulting in the "monolithic integration" function. For restoration, the frame, also known as the superstrate, is laminated to a front or back plate, which is typically another glass panel. The nominal voltage of the battery, which is specially designed to charge the cell, is referred to as nominal voltage; it is a concept that dates back to when only solar cells were used to charge batteries. As the lights, temperature, and load conditions change, the module's real voltage output varies, but it never runs at a constant voltage. By looking at the nominal voltage, users can quickly decide whether a module matches a specific device.

When a module is not attached to a device or device, its open-circuit voltage, or VOC, is the maximum voltage it will produce. VOC can be measured at the incandescent module's terminals or on a wire isolated by a metre.

Under normal test conditions, the peak power rating, Wp, is the highest output (not the optimum output). Modules can be 1x2 metres or 2x4 feet in size and vary in power from 75 to 350 watts based on efficiency. Modules can be 1x2 metres or 2x4 feet in size and vary in power from 75 to 350 watts based on efficiency. During the development process of their test data, a standard producer would measure their modules at 5 watt intervals, with ratings of +/- 3 percent, +/- 5 percent, + 3 / -0 percent, or + 5 / 0 percent, and the test modules will be compiled accordingly.

CONCLUSION

Because with the construction of charging stations, this effect was often overlooked, resulting in a charging station that is extremely powerful. Longer EV travel lengths, like inter-regional travel, would necessitate the use of fast charging stations. They should be located in bigger cities with a high concentration of EV drivers so that local people can access the stations as well. Quick charging station preparation should be planned at the state level, with a goal of aligning with standard routes for government or private EV fleets. Smart charging stations for electric vehicles are a promising option and environmentally friendly approach to the energy crisis.

A battery powered electric car that uses a solar array to refuel will be a feasible solution to the current method for reducing emissions. The overall performance can be improved by combining organic solar cells with electric cars and establishing Renewable Charging Stations in specific points. Furthermore, this will double as a national awareness program for renewable energy.

FUTURE SCOPE

This article introduces a new solar and wind-powered recharging system for electric vehicles. The current charging strategy has a direct impact on EV use. Long-distance vehicles need recharging stations, which are only found in a few countries. The distance traveled is determined by the vehicle's energy storage capability. Long-distance travel necessitates the use of recharging stations. We present a new hybrid solar charging mechanism for electric vehicles in this article. Solar and wind energy have been used to charge hybrid vehicles. Finally, we conclude that this strategy decreases emissions and encourages the use of electric vehicles, resulting in a pollution-free world.

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