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EV CHARGING STATION BY USING SOLAR PANEL

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ABSTRACT

This paper explores the latest advancements in solar-powered charging stations, focusing on their pivotal role in fostering sustainable mobility. With the pressing need to mitigate climate change and reduce dependence on finite fossil fuels, the integration of renewable energy sources, particularly solar power, has gained significant traction. Our research delves into the design principles, technological innovations, and operational strategies employed in the development of cutting-edge solar charging stations. By leveraging advancements in photovoltaic technology, energy storage systems, and smart grid integration, these stations optimize energy capture, storage, and distribution, thus ensuring reliable and efficient charging for electric vehicles (EVs) and portable electronic devices. Moreover, we examine the economic viability, environmental benefits, and regulatory frameworks driving the adoption of solar charging infrastructure worldwide. Through case studies and performance evaluations, we highlight the tangible impacts of solar-powered charging stations on reducing carbon emissions, enhancing energy resilience, and promoting sustainable urban mobility. Ultimately, this paper underscores the transformative potential of solar energy in shaping the future of transportation towards a cleaner, greener, and more sustainable daigram.

Keywords: Solar Panel, Solar Charge Controller, Inverter, Battery.

1. INTRODUCTION

Solar energy conversion is one of the most addressed topics in the field of renewable energy, which is quite significant. Solar radiation particularly is usually converted into two forms of energy: thermal and electrical energy. The solar electricity specifically has applications in many systems basically such as rural electricity, water pumping and satellite communications in a big way. Solar Power was usually used for all intents and purposes large scale-grid system and also basically stands alone system or small remote photovoltaic plant, which kind of is quite significant. This paper definitely shows that Charging definitely Electric Vehicle from Solar Energy in a fairly major way. Recently, developing new types of energy conversion and storage systems specifically is becoming evident because of increasing basically human population and thus sort of greater reliance on energy-based devices for survival, which is quite significant. Due to the rapid increase in the world population and economic expansion geometrically. This generally is bringing about rapidly diminishing actually fossil fuels and the continuously growing environmental concerns as greenhouse gas emissions in a particularly big way. Now by using new technology in this project, much. More electronic devices kind of are being used to definitely replace manpower thus leading to a kind of further increase in energy consumption in a particularly major way. Energy obtained from the suns radiations when in contact with the earth's atmosphere and or surface as irradiances kind of is called solar energy, contrary to popular belief. Recently, this is known by humans to be the fairly prime renewable energy in existence till date, the energy produced in day is able of sustaining mankind even when traditional energy sources gets finished, particularly contrary to popular belief. This readily available environmentally friendly energy en can easily kind of be basically obtain via series of methods as photovoltaic, solar thermal energy, definitely artificial photosynthesis, solar heating and also solar architecture in a generally major way. Research works literally have shown that at the core of the sun, the solar energy really is in form of nuclear energy brought about by continues fusion between hydrogen and helium atoms euch definitely second in a subtle way. Thus as a result of this, it radiates out close to 3.8x1026 joules of solar energy each second, really contrary to popular belief. With the definitely free and abundant solar irradiances that provides enormous times fairly more energy to the Earth than we consume, photovoltaic processes ensures that not only sustainable but sort of greater efficiency and reliability to access electrical power for charging very electric cars anywhere around the world without environmental pollution. With little upkeep, viable approach

2. SOLAR PANEL

A solar panel is a device that converts sunlight into electricity by using photovoltaic PV cells. PV cells are made of materials that produce excited electrons when exposed to light. The electrons flow through a circuit and produce direct current DC electricity, which can be used to power various devices or be stored in batteries. Solar panels are also known as solar cell panels, solar electric panels, or PV modules.

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Solar panels are usually arranged in groups called arrays or systems. A photovoltaic system consists of one or more solar panels, an inverter that converts DC electricity to alternating current (AC) electricity, and sometimes other components such as controllers, meters, and trackers. A photovoltaic system can be used to provide electricity for off-grid applications, such as remote homes or cabins, or to feed electricity into the grid and earn credits or payments from the utility company. This is called a grid-connected photovoltaic system.

Solar Charge Controller

A solar panel is a device that converts sunlight into electricity by using photovoltaic PV cells. PV cells are made of materials that produce excited electrons when exposed to light. The electrons flow through a circuit and produce direct current DC electricity, which can be used to power various devices or be stored in batteries. Solar panels are also known as solar cell panels, solar electric panels, or PV modules.

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Battery

An electric battery is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices. When a battery is supplying power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a red ox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells; however, the usage has evolved to include devices composed of a single cell.

Primary (single-use or "disposable") batteries are used once and discarded, as the electrode materials are irreversibly changed during discharge; a common example is the alkaline battery used for flashlights and a multitude of portable electronic devices. Secondary (rechargeable) batteries can be discharged and recharged multiple times using an applied electric current; the original composition of the electrodes can be restored by reverse current. Examples include the lead–acid batteries used in vehicles and lithium-ion batteries used for portable electronics such as laptops and mobile phones.

Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to, at the largest extreme, huge battery banks the size of rooms that provide standby or emergency power for telephone exchanges and computer data centres. Batteries have much lower specific energy (energy per unit mass) than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting electrical energy to mechanical work, compared to combustion engines.

Inverter

An inverter converts the DC voltage to an AC voltage. In most cases, the input DC voltage is usually lower while the output AC is equal to the grid supply voltage of either 120 volts, or 240 Volts depending on the country. The inverter may be built as standalone equipment for applications such as solar power, or to work as a backup power supply from batteries which are charged separately. The other configuration is when it is a part of a bigger circuit such as a power supply unit, or a UPS. In this case, the inverter input DC is from the rectified mains AC in the PSU, while from either the rectified AC in the in the UPS when there is power, and from the batteries whenever there is a power failure.

There are different types of inverters based on the shape of the switching waveform. These have varying circuit configurations, efficiencies, advantages and disadvantages

An inverter provides an ac voltage from dc power sources and is useful in powering electronics and electrical equipment rated at the ac mains voltage. In addition they are widely used in the switched mode power supplies inverting stages. The circuits are classified according the switching technology and switch type, the waveform, the frequency and output waveform.

The basic circuits include an oscillator, control circuit, drive circuit for the power devices, switching devices, and a transformer.

The conversion of dc to alternating voltage is achieved by converting energy stored in the dc source such as the battery, or from a rectifier output, into an alternating voltage. This is done using switching devices which are

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continuously turned on and off, and then stepping up using the transformer. Although there are some configurations which do not use a transformer, these are not widely used.

The DC input voltage is switched on and off by the power devices such as MOSFETs or power transistors and the pulses fed to the primary side of the transformer. The varying voltage in the primary induces an alternating voltage at secondary winding. The transformer also works as an amplifier where it increases the output voltage at a ratio determined by the turn's ratio. In most cases the output voltage is raised from the standard 12 volts supplied by the batteries to either 120 Volts or 240 volts AC.

3. BLOCK DIAGRAM OF EV CHARGING STATION BY USING SOLAR PANEL

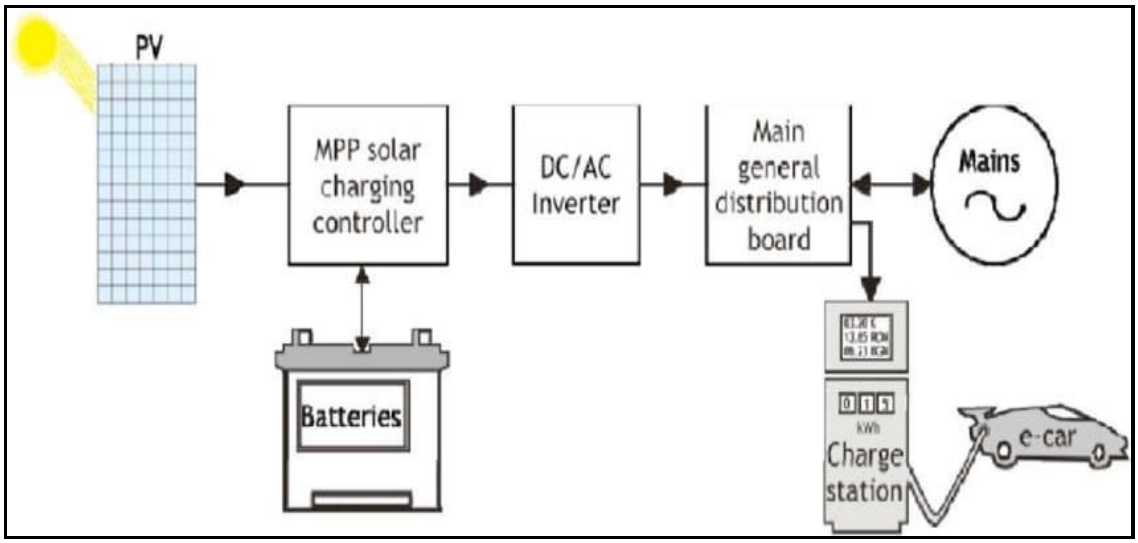

Fig.1 Block Diagram of EV charging station by using solar panel

4. CONCLUSION

In conclusion, solar power charging stations represent a pivotal solution in the quest for sustainable energy infrastructure. Harnessing the abundant and renewable energy of sunlight, these stations offer numerous benefits such as reducing reliance on fossil fuels, mitigating greenhouse gas emissions, and promoting energy resilience. Whether deployed for residential, commercial, off-grid, or community purposes, solar charging stations play a vital role in advancing clean energy adoption, supporting electric mobility, and enhancing energy access. While facing challenges such as intermittent energy production and initial costs, ongoing technological advancements and increasing awareness of environmental concerns continue to drive the growth and innovation of solar power charging stations. As we strive towards a cleaner and more sustainable future, the widespread adoption and integration of solar charging stations are essential components of our energy transition efforts.

5. REFERENCES

[1] T. S. Biya and M. R. Sindhu, "Design and Power Management of Solar Powered Electric Vehicle Charging Station with Energy Storage System", Proceedings of 3rd International conference on Electronics Communication and Aerospace Technology (ICECA), 2019.

[2] K. S. Vikas, B. Raviteja Reddy, S. G. Abijith and M. R. Sindhu, "Controller for Charging Electric Vehicles at Workplaces using Solar Energy", Proceedings of International Conference on Communication and Signal Processing (ICCSP), 2019.

[3] B. Revathi, A. Ramesh, S. Sivanandhan, T. B. Isha, V. Prakash and S. G, "Solar Charger for Electric Vehicles", Proceedings of International Conference on Emerging Trends and Innovations In Engineering And Technological Research (ICETIETR), pp. 1-4, 2018.

[4] D. Oulad-abbou, S. Doubabi and A. Rachid, "Solar charging station for electric vehicles", Proceedings of 3rd International Renewable and Sustainable Energy Conference (IRSEC), 2015.

[5] B. Singh, A. Verma, A. Chandra and K. Al-Haddad, "Implementation of Solar PV-Battery and Diesel Generator Based Electric Vehicle Charging Station", Proceedings of IEEE International Conference on Power Electronics Drives and Energy Systems (PEDES), 2018.