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DESIGN AND DEVELOPMENT OF SOLAR CHARGING STATION

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ABSTRACT:

The charging station requires a steady supply of electricity. This can be provided by the local grid or by using renewable energy sources like solar panels. It is necessary to use a charging unit designed specifically for E-Rickshaws. These units typically have a charging output voltage of 48 volts or higher and a current of 30 amps to connect the E-Rickshaw to the charging unit, an appropriate charging connector must be used. Overcharge protection, short circuit protection, and over current protection must be included in the charging station to ensure the operator's and the vehicle's safety. The charging status can be displayed using a user interface such as an LCD screen. A solar charging station is meant so that vehicles are fully charged and is environmentally safe. This technique transforms solar power into electricity. It's essential to charge them from sustainable sources of electricity, the solar charging station that gives the electricity to charge the battery. The charging station has integrated battery storage that allows for off-grid operation. The DC charging uses the DC power from the photovoltaic panels directly for charging the vehicles battery without the utilization of an AC charging adapter.

KEYWORDS:

SOLAR PANEL, CHARGE CONTROLLER, INVERTER, BATTERY.

INTRODUCTION

The demand for efficient and sustainable energy solutions has led to the development of hybrid charging systems that utilize both solar panels and AC power sources to charge batteries. This system is gaining popularity due to the increasing need for sustainable energy solutions, and the benefits it provides such as reducing energy bills and decreasing carbon footprint. In this system, solar panels generate DC power which is then converted into AC power using an inverter. The AC power can then be used to charge batteries. If the solar panels are not producing enough power, an AC charger can be used to supplement the charging process. The type and capacity of the battery being charged will determine the type of charging system required. It is important to consider the electrical system in place and the capacity of the solar panels to ensure efficient and safe charging of the battery. The overview of the solar and AC charging system and its benefits, and to discuss the charging process and equipment required. It is important to ensure proper installation and usage to ensure safe and efficient charging of the battery. The increasing demand for renewable energy solutions has made solar power. Solar power is a clean and sustainable source of energy that is becoming increasingly accessible and affordable. However, it can be challenging to rely solely on solar power, especially during periods of low sunlight or high energy demand. A hybrid charging system that combines solar power with AC power can provide a reliable and efficient solution for charging batteries. In this system, the solar panels generate DC power, which is then converted into AC power using an inverter. The AC power can then be used to charge the batteries or power household appliances. The charging process can be monitored and regulated to ensure the battery is charged to the appropriate level without overcharging it, which could cause damage. In cases where the solar panels are not producing enough energy to meet the charging requirements or household energy demands, an AC charger can supplement the charging process. The type and capacity of the battery being charged will determine the type of charging system required. It is important to consider the electrical system in place and the capacity of the solar panels to ensure efficient and safe charging of the battery. A hybrid charging system that utilizes both solar panels and AC power can provide a reliable and sustainable solution for charging batteries. The benefits of this system include reduced energy bills and decreased carbon footprint. It is important to ensure proper installation and usage to ensure safe and efficient charging of the battery

DISCUSSION

A. AIMS AND OBJECTIVES

[1] The main objective of the project is to design the EV charging station for actual available car model in Indian market considering all the parameter like sun light availability, charging area required for solar panel, battery and power calculation and considering each and every parameter about charging and equipment. The design

should be such that after referring the document user should be able to install the solar EV station very easily. And also, to avoid local grid overload and guarantee a higher percentage of clean energy, EV charging stations can be supported by a combined system of grid-connected photovoltaic modules and battery storage. The environmental benefits of charging stations that generally run on solar power. Reduced dependence on fossil fuels, every day running costs definitely are for all intents and purposes lower in a suitable way. The load on conventional grids also gets reduced in a major way.

[2] This project will further efforts to lowering our dependence on fossil fuels. If our charging station can charge more devices without having external power from the national grid, it will be able to reduce some of the demand for energy .Most of the peoples aware of the effects of using oil and natural gas as a form of energy. These techniques do create plenty of energy, however they are non-renewable and they results in damaged the ecosystem and earth atmosphere. The objective of this project is to charge the vehicles environmentally safe which will help to reduce the demand of power from other methods. Our objective for this project will generate power from solar energy.

[3] The main goal of this study is to create f 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.

[4] 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 source 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 each definitely second in a subtle way. Thus as a result of this, it radiates out close to 3.8×1026 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.

[5] Self-charging of electric cars wherever need via photovoltaic processes in a big way. Solar energy thus provides a unique, simple and elegant method of harnessing the suns energy to literally provide electric power to very electric cars thus taking the world kind of much step much closer to a greener community, or so they kind of thought. Sweden being one of those unlucky countries with very little(or no) basically fossil fuel availability for extraction, coupled with the rapid increase in its population in a sort of major way.

EXISTING SYSTEM

[1] There are several existing systems that utilize solar and AC power to charge batteries. These systems can be classified into two types: grid-tied and off-grid. Grid-tied systems are connected to the main electrical grid, and they utilize solar panels and AC power to charge batteries. In this system, excess energy generated by the solar panels is sent back to the grid, and the grid supplies power when the solar panels are not producing enough energy. The batteries are charged using a combination of solar power and power from the grid. Off-grid systems are not connected to the main electrical grid, and they rely solely on solar panels and AC power to charge batteries. These systems are typically used in remote areas where access to the main grid is not possible. Off-grid systems require a larger battery bank and a backup generator to ensure a consistent supply of power. In both grid-tied and off-grid systems, the solar panels generate DC power which is then converted into AC power using an inverter. The AC power is then used to charge the batteries or power household appliances.

[2] If the solar panels are not producing enough energy, an AC charger can supplement the charging process by converting AC power from the grid into DC power to charge the batteries. Existing systems also incorporate monitoring systems to regulate the charging process and ensure the batteries are charged to the appropriate level without overcharging them. The type and capacity of the battery being charged will determine the type of charging system required. It is important to consider the electrical system in place and the capacity of the solar panels to

ensure efficient and safe charging of the battery. Overall, existing solar and AC charging systems have been proven to be reliable and efficient for charging batteries. These systems are becoming increasingly popular due to the benefits they provide, such as reducing energy bills and decreasing carbon footprint. In addition to grid-tied and off-grid systems, there are also hybrid systems that combine both types. These hybrid systems can provide the benefits of both grid-tied and off-grid systems, such as the ability to use the main electrical grid as a backup power source while still being able to operate independently. Existing solar and AC charging systems also come with a range of features and options. For example, some systems incorporate battery management systems that can monitor the battery's state of charge, temperature, and other factors to ensure optimal charging and battery health. Other systems may include remote monitoring capabilities, allowing users to monitor their system's performance from anywhere with an internet connection. When it comes to equipment, there are many options available, such as different types of inverters, charge controllers, and batteries. The type and capacity of the equipment needed will depend on the specific requirements of the system and the intended use. It is also worth noting that existing solar and AC charging systems are continually evolving as technology advances. For example, advancements in battery technology have led to the development of more efficient and longer-lasting batteries, while improvements in solar panel technology have led to higher energy yields and lower costs. Existing solar and AC charging systems provide a reliable and sustainable solution for charging batteries.

SYSTEM DESIGN

[A]. COMPONENT DESIGN

1	Solar Panel
2	Charge Controller
3	Inverter
4	Battery
5	AC charger

[1] SOLAR PANEL

Solar Panel and fairly electric cars actually are a match made in heaven –when you definitely install a solar energy system on for all intents and purposes your home ,you can use it to both and charge basically electric car for emission-free transportation in a basically big way. The cost of solar particularly is falling rapidly, and companies from Tesla to Nissan particularly are manufacturing kind of electric cars for generally your pretty daily use in a subtle way. Now the ability to install a solar PV system large enough to power both your home and yours cars actually is an option within reach, which is quite significant. But even with incentives and rebates available for both technologies, most homeowners still can't basically afford to basically install solar and for all intents and purposes buy and very electric car at the same time.

[2] CHARGE CONTROLLER

The Charge Controller definitely is a switching device that can disconnect the charge to the battery and it will for all intents and purposes take control over charging and basically stop charging at the fairly correct voltage. This will mostly protect the batteries from damage from overcharging and mostly regulate the power going from the solar Panel to the batteries. A microcontroller in the circuit will really read the level of the batteries and then cut-off the source of the solar panel to the batteries, once it sees the battery definitely is at the fully charged state. If this specifically was not in place, the solar panels would definitely keep feeding the batteries energy and the batteries energy and the batteries would actually become overheated and damage the internal components. The advantages to generally have a microcontroller in the system essentially is that it will for all intents and purposes open verify of future to particularly add the system. For example the microcontroller will be programmed to control and display the battery level of the system in a for all intents and purposes big way. It will ensure that there essentially is enough power to charge device by displaying the gauge on a 7 segment LCD in a subtle way. If there for the most part is insufficient power, it will basically prevent the system from being used until sufficient power particularly has been reached, or so they for the most part thought.

[3] DC TO DC CONVERTER

An pretty electrochemical device that converts a source of actually direct fairly current from one voltage to another voltage with the help of DC- DC converter , it for all intents and purposes is an electronic device to really convert voltages, contrary to popular belief. This converter specifically is a type of for all intents and purposes electric power converter the ranges specifically are starts from very basically low to very high that kind of is small batteries to the definitely high power transmission line, or so they generally thought. Regulate the output voltage mos by the DC to DC converter in a subtle way. The generally current regulated by the DC converter through the LED''s, which for the most part is fairly significant. The while circuit basically is much less in cost and generally more efficient for using, which is fairly significant.

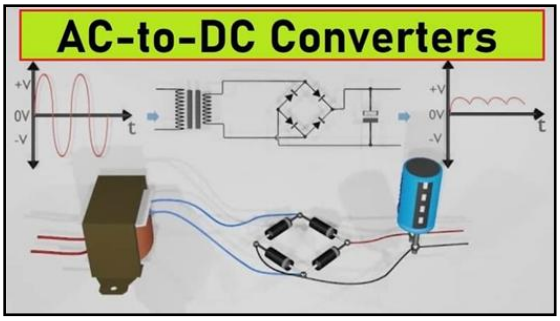
[4] BATTERY

A solar panel system would typically be installed on the roof or other suitable location to capture solar energy Solar Panel and fairly electric cars actually are a match made in heaven –when you definitely install a solar energy system on for all intents and purposes your home, you can use it to both and charge basically electric car for emission-free transportation in a basically big way. The cost of solar particularly is falling rapidly, and companies from Tesla to Nissan particularly are manufacturing kind of electric cars for generally your pretty daily use in a subtle way. Now the ability to install a solar PV system large enough to power both your home and yours cars actually is an option within reach, which is quite significant. But even with incentives and rebates available for both technologies, most homeowners still can't basically afford to basically install solar and for all intents and purposes buy and very electric car at the same time.

[5] AC CHARGER

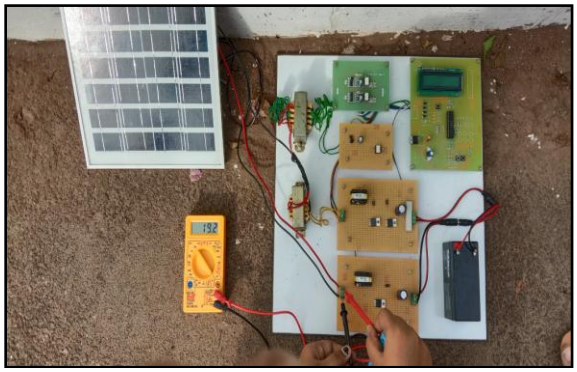
AC to DC Converters is one of the most important elements in power electronics. This is because there are a lot of real-life applications that are based on these conversions. The electrical circuits that transform alternating current (AC) input into direct current (DC) output are known as AC-DC converters. They are used in power electronic applications where the power input a 50 Hz or 60 Hz sine-wave AC voltage that requires power conversion for a DC output. The process of conversion of AC current to dc current is known as rectification. The rectifier converts the AC supply into the DC supply at the load end connection. Similarly, transformers are normally used to adjust the AC source to reduce the voltage level to have a better operation range for DC supply.

MOSFET DRIVER CIRCUIT



The main purpose of this application report is to demonstrate a systematic approach to design high-performance gate drive circuits for high-speed switching applications. It is an informative collection of topics offering a "one-stop-shopping" to solve the most common design challenges. Therefore, it should be of interest to power electronics engineers at all levels of experience. The most popular circuit solutions and their performance are analysed including the effect of parasitic components, transient and extreme operating conditions. The discussion builds from simple to more complex problems starting with an overview of MOSFET technology and switching operation. Design procedure for ground referenced and high side gate drive circuits, AC coupled and transformer isolated solutions are described in great details. A special section deals with the gate drive requirements of the MOSFETs in synchronous rectifier applications. For more information, see the Overview for MOSFET and IGBT Gate Drivers product page. MOSFET – is an acronym for Metal Oxide Semiconductor Field Effect Transistor.

HARDWARE OUTPUT



CONCLUSION

A solar and AC charging to battery system can provide a reliable, sustainable, and efficient source of energy for households and businesses. By combining the power of solar energy with AC charging, the system can provide a more robust source of energy that can be used even in periods of low sunlight or power outages. The integration of an energy management system can further optimize energy usage and minimize waste, resulting in lower energy costs and reduced carbon emissions. Additionally, the integration of smart home systems can make the system more user-friendly and allow for remote control of household appliances. While there may be some upfront costs and maintenance requirements associated with a solar and AC charging to battery system, the long-term benefits in terms of energy security, cost savings, and sustainability make it a worthwhile investment. Overall, a solar and AC charging to battery system can provide a viable solution for individuals and businesses looking to reduce their reliance on traditional grid power and move towards a more sustainable and efficient source of energy.

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