

Review of Smart EV Charging Station Using Green Power

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Abstract: *Now days use of Electrical vehicles are increasing continuously because of good and eco-friendly nature as compared to fuel vehicles. But we see that EV charging stations are not readily available every where like fuel station. The aim of this project is to implement more EV charging stations using green power, like other fuel station for non-stop travel without any type of disturbance. In this project especially solar panels and windmill generated energy will be used because these two renewable sources are continuously and unlimited sources of energy. For backup we also using the grid connection. Smart authentication like relays, RFID module protection device are used in EV charging station, also gives the four types of charges for fast charging like DC fast charging, AC charging, Wireless charging, Grid power AC charging. When we implementing this fully advanced EV charging stations on Highways, Cities, schools, colleges the charging stations are easily available every where and also increased purchasing rate of EV and it helps to make environment pollution free*

Keywords: EV, chargers, Devices, Implementation

I. INTRODUCTION

In recent years, the increasing global focus on sustainability and combating climate change has led to a major shift towards a green transition in many sectors, including transportation. One of the most important areas of change is electric vehicles, particularly electric vehicles (EVs), which hold great promise in reducing domestic emissions and dependence on fossil fuels. However, the proliferation of electric vehicles also brings challenges in terms of infrastructure and the environment, including the creation of efficient charging stations.

Power plants are often griddependent, which may not be sustainable as they rely on intermittent power and emit carbon monoxide gas. To solve this problem, it is possible to integrate renewable energy sources such as solar energy into electric vehicle charging. Electric car charging stations can operate off-grid using solar energy or supplement the power grid with clean and stable electricity, helping to reduce the carbon footprint of emissions and improve environmental sustainability.

This reviewpaper investigates the design, application and quality of smart energy products powered by solar panels. The integration of these technologies enables the use of renewable energy while improving the efficiency, reliability and user experience of electric vehicle charging. Additionally, the article also covers the installation process of solar panels, energy storage systems, and interconnection plans to optimize the charging station.

The main objectives of this study are:

Evaluation of the feasibility and effectiveness of integrating solar energy into fire To pay for the electricity of an electric car.

Examine the impact of smart technology on improving operations and user experience in power plants.

Discover the environmental benefits and economic potential of solar electric vehicles compared to traditional electric vehicles.

Identifies challenges and solutions in the distribution and operation of sustainable electric vehicles.

Through this research, useful information will be generated to inform policy makers, urban planners and business stakeholders in supporting sustainable transportation solutions. Using solar energy and technology, solar power plants can play an important role in facilitating the transition to clean, green and better transportation in the future.

Smart EV Charging Station:

Writing a review paper on a topic such as "Smart Electric Vehicle Charging Stations Using Green Energy (Solar Panels)" requires a method.

Advances in Smart EV Charging Technology:

The world is discussing the latest advances in smart EV charging technology, including passive charging management, vehicle to grid sharing integration, and smart grid integration.

These advances optimize charging times, resources demanded, and integration with renewable energy sources such as solar power.

Integration of solar energy into power plants:

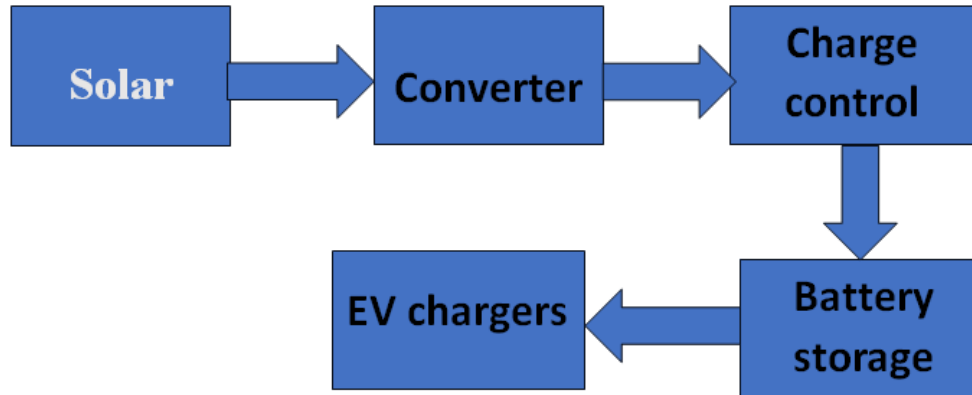
Indepth analysis of the possibilities and benefits provided for the integration of solar energy, into power plants. This chapter examines various configurations, including gridconnected andoffgrid configurations, and evaluates their economic feasibility, environmental impact, and scalability.

Challenges and Solutions:

This article describes the challenges associated with integrating solar energy into electric vehicle charging stations, such as solar delays, limited space, and cost considerations. It explores possible solutions, including energy storage, previous technologies and new design methods, to overcome these problems and maximize the use of solar energy.

Choose a focus: Define the scope of your research paper. Do you have concerns about performance, environmental benefits, financial sustainability or other aspects of charging station design? Narrow your topic down to a simple research paper.

II. METHODOLOGY



Solar panel

A solar panel is a device that converts sunlight into electricity using photovoltaic cells, typically made of silicon. When sunlight hits the cells, it creates an electric field across the layers, generating the direct current (DC) electricity. This electricity can then be used to power electrical loads or

Absorbing sunlight: Solar panels consist of many solar panels combined into a single grid. These cells contain semiconductors, usually made of silicon, that absorb photons from sunlight.

Generate current: When sunlight hits the solar cell, it excites the electrons in the semiconductor material, causing them to flow and creating an electric current. This flow of electrons creates direct current (DC) electricity.

Conversion into usable electricity: DC power produced by the solar panel is sent to the inverter. The inverter converts direct current into alternating current (AC) power, the type of electricity used in homes and businesses.

Integration with generators: AC produced by solar panels can be used immediately by the power plant or stored in batteries for later use.

Grid-connected (if necessary): Grid-

connected, energy from solar panels can be returned to the grid and the owner of the Solar panels receives credit or payment for the power they provide.

Converter:

Convert DC power to AC power: An inverter receives the DC power produced by a solar panel. It then uses electronics and devices to convert DC power into AC power.

Sync with the grid (if necessary): In a gridconnected solar energy system, the inverter ensures that the AC power produced by the solar panels is synchronized with the grid. This integration is important for safety and efficiency because it allows the energy produced by solar panels to be combined with the grid's existing electrical equipment.

Voltage Regulation and Control: Inverters also regulate the frequency and frequency of the voltage alternating current to ensure it meets the requirements of the grid and is suitable for use in materials and equipment.

Monitoring and optimization: Many solar panels today have monitoring capabilities that allow users to monitor the performance of their solar systems in real time. . Some inverters also have an optimization function that maximizes efficiency by adjusting the activity of the solar panel based on factors such as sunlight intensity and temperature.

Safety Features: Solar power inverters include many safety features to protect the power supply and prevent damage to the solar panel and other components. These features may include surge protection, overcurrent protection, and ground detection.

Charge control:

Control of the charging process: The charge controller controls the voltage and current of the solar panel and the battery . When there is sunlight, the charge controller controls the flow of electricity from the sun to the battery to ensure that the battery is charged at the best possible rate. It prevents overcharging by interrupting the charging process when the battery reaches its capacity.

Avoid overcharging and undercharging: overcharging will cause overheating and electrolyte loss, which will damage the battery; Undercharging causes sulfation and shortens the battery. Charge controllers prevent both of these situations by keeping batteries at a safe voltage, extending their lifespan and ensuring good performance.

Load Management: Load management can also manage the distribution of electricity to the load connected to the system. When solar energy is available, they first charge the batteries, ensuring that the products are supplied with energy when they are needed. Some charging controls provide a function that prevents the battery from overcharging, thus preventing damage to the battery.

Charging temperature: To optimize the battery, some control systems include temperature sensors to adjust the charge according to changing temperature. These features help maintain battery health and performance in a variety of environments.

Monitoring and protection: Chargers often include monitoring features to display important parameters such as battery voltage, charging current and status symbol. It also protects the entire solar system by including protection mechanisms such as overcurrent, short circuit and reverse polarity.

Battery storage:

Payment: When there is sunlight during the day, solar panels convert sunlight into electricity (direct current). While some of the electricity is used directly to generate electricity in the system, the rest is used directly to charge the batteries.

Battery packs: Charging power is stored in a battery pack, usually several batteries connected in series or parallel and capable of providing the required voltage. These batteries can be made of many types, such as lead-acid, lithium-ion, or other chemicals, each with different characteristics in terms of energy density, longevity, and performance.

Discharge: When the solar panel cannot produce enough electricity in situations such as night or bad weather condition, the energy stored in the battery is discharged to the power supply connected to the system. The battery provides direct current, which can be converted to variable current using an inverter before being used by a power source or device.

Battery Management System (BMS): Most battery systems have a battery management system (BMS) to monitor and control the charging and discharging process. BMS helps improve battery performance, prevent overdischarge, overdischarge and overheating, and extend battery life.

Charge and Discharge Cycles: Since the solar energy system has changing and energy needs, charge and discharge cycles are repeated and diversified. Battery storage systems make the most of solar energy by acting as a buffer and provide backup power during low solar power or power outages.

Care and Maintenance: It is important to pay attention to the state of charge (SoC) and battery health (SoH) to ensure that it works well and can be used for a long time. Maintenance operations such as cleaning terminals, balancing, replacing old batteries should be performed to maintain the performance and reliability of the storage battery.

EV charges:

Connection: The EV charger is connected to a power source, usually the grid or a renewable energy source such as a solar panel.

Plugin: Electric car drivers use an electric motor to plug their car into the charger and then a suitable connector to the car's port.

Communication: Many electric vehicles today have communication capabilities to interact with the vehicle and exchange information such as charging status, battery level and price of charging preferences.

Charging Protocol: The charger communicates with the vehicle to determine the appropriate charging protocol, including charging rate (such as AC or DC charging), voltage, and current.

Charging process: The charger powers the vehicle's battery and converts AC power from the grid (or DC power from a DC fast charger) into the DC power required to charge the vehicle battery.

Safety Features: Electric vehicle chargers have safety features such as ground protection, overcurrent protection and temperature control to ensure safety and reliability.

Charging complete: When the vehicle battery reaches the state that needs to be charged or the charging time is completed, the charger will stop sending electricity and the EV driver will stop sending electricity. The car can be cut.

Charging and Billing (if applicable): In some cases, EV chargers may be equipped with a charging system that allows users to pay for the electricity they use. Payments can be made through a variety of methods, including RFID cards, mobile apps or credit/debit cards.

III. CONCLUSION

A smart electric vehicle charging station integrating solar energy provides a sustainable solution for electric vehicle charging. By using solar energy, these power plants reduce dependence on the grid, encourage the use of renewable energy and contribute to a cleaner environment. Smart features enable better charge management, better energy efficiency and grid interoperability. This new approach supports the transition to electric mobility while meeting the sustainable energy target.