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# Electric Vehicle Charging Station Techniques with Data Monitoring System-An review

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**ABSTRACT:** Due to the limited availability of fossil fuels, the world is deprived of energy resources to meet the ever growing dynamic energy demand the various alternatives are to be discovered and implemented as a remedy, as alternative petroleum vehicles EV's are extensively used as a dependable utility. The batteries of EV's are required to be "fueled up" for its continuous operation, thus ensuring secured and steady performance. In this context, energizing the impact of EV charging stations on the power grid as well as possibility to economical system through roof top solar system is essential. The electric vehicle charging has traditionally been grid based but the use of solar-powered charges has materialized a fascinating opening. These charging stations are pollution free and provide clean electricity for electric power vehicles. The present work mainly concentrates on the design of charging station for an intelligent hybrid electric vehicle suitable for commercial as well as domestic utility..

**KEYWORDS:** pulse charging, solar grid, EV Charging station, IoT.

## I.INTRODUCTION

As a step towards sustainable life, there has been an enormous growth in the use of electric vehicles as an alternative to gas/petroleum-based vehicles in our daily lives. Generally, the EV charging has been dependent on grid-based supply, as the world evolved with various technological advancement in the field of renews power generation, especially solar energy which further led to the use of solar-powered chargers for charging of EVs. The chargers based on solar energy are pollution free, electricity to the EVs and in addition helps in promoting green environmental effect. Hence the introduction of these solar-grid-based charging stations most likely enables people to rethink an alternative means of transportation thus switching to zero- emission vehicles [1].

Solar energy is undoubtedly a sustainable energy which is in plenty and clean energy source being eco-friendly and free of cost. Solar energy is an extremely efficient and free from environmental pollution. The current alarming situation of extensive global warming warns us on using limited fossil-based fuels and increases our dependency and complete adoption of the renewable energy-based transportation system. But the mass level deployment of these sustainable resources has been a challenging task. To overcome above predicament, charging electric vehicles using distributed solar energy would be an excellent solution, resulting in net-zero emissions. Solar power would allow us to move to a green initiative [2]

Each passing year, the use of electric vehicles are becoming more and more affordable which leads the investors to start investing for developmentof charging station due to its increasing demand.Currently,electric-power grids are dependent on fossil fuels than that of the renewable energylike solar, wind energies etc. Though EVs are electrically driven, they also will contribute to harmful emissions as electrical energy production for charging stations should be taken into consideration, which are going to be additional generation from fossil fuels. Thus, in order to reduce the impact of the harmful emissions, renewable energy, particularly solar energy-based electric vehicle charging stations can be built. This paper provides the design of a charging station that uses conventional grid supply for commonly available vehicles, to design and develop a solar fed charging station, to collect power details of electric vehicles, to implement the charging station that has the capability to utilize solar energy when it is available and switch to grid supply otherwise.

Solar energy conversion is one of the most addressed topics in the field of renewable energy, which is quite significant. Solar radiation 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.

Challenges faced:Even though pulse charging has been actively studied, it has not yet reached commercialization for active use in day-to-day activities. As time elapses the EVs has to adapt themselves for fast charging and various advanced charging techniques.

## II. BLOCK DIAGRAM

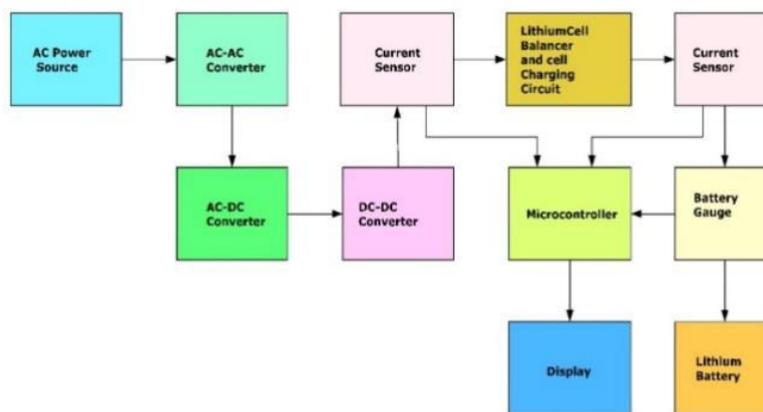


Figure-1:Block diagram of charging station structure

**AC-DC Converter:** AC -DC Converter is full wave bridge rectifier.

**AC-AC Converter:** AC -AC Converter is nothing but steps down voltage from a high voltage range to the required voltage level using transformers.

**Voltage regulators and Current Regulators:** are been used to make the DC power supply constant.

**Current Sensors:** The flow of the current need to be monitored every time to charge efficiently to maintain the health of the batteries by avoiding overcharge and deep discharge.

**Battery Cell Balancer and Charging Circuit:** when batteries need to be charged at a time inside the electric vehicle. Charge is transferred actively from cell with higher voltage to cell with lower voltage using MOSFET.

**Battery Gauge:** Battery Gauge: provides information about battery usually the state of charge of battery.

**Display:** The charging status, battery storage status and other important details are displayed on 16\*2 LCD display.

**Microcontroller:** A 8-bit microcontroller is used in this system to monitor the activities of the charging system by interacting with the sensors inside the system.

## III. ELECTRIC VEHICLE CHARGING TECHNIQUES

Fast charging is critical for the adoption of electric vehicles (EV’s), but higher current charging typically comes at the expense of battery life.

Multistage constant current (MCC), pulse charging, boost charging, and variable current profiles (VCP), are some of the fast-charging methods used so as to reduce the charging time.

Fast charging methods are compared to CC-CV and CP-CV with the same average Current rate.

Constant current and voltage control (CC-CV) is compared with Fast charging techniques. Constant current control the voltage applied to the battery to maintain constant current flow and switching off, when the battery terminal voltage reads the maximum lower voltage of battery. It maintains constant voltage with controlling the charged current regardless of the capacity of battery increase and charge current of the battery decreases exponentially. It reduces over charging probability which leads to reduction in risk of battery life. In addition to reducing overcharging probability it reduces high starting current.

Pulse charging interrupts with time period. It either shortens the rest periods or discharges pulses. Pulse charging technique uses high current pulses. Which leads to increase in risk of battery life? According to research it



doesn't show any significant difference in capacity fade when compared with constant current and voltage control (CC-CV)[1,2,4]. Another limitation of pulse charging is that it requires new hardware equipments which are currently unavailable.

Boost charging:

- Battery integrated charging was demonstrated at Free Wire testing facilities.
- In hours boost charging was deployed.
- To show performance in high utilization scenarios, boost charging was powered by low voltage infrastructure.
- At the starting of demo, boost charger battery will be nearly full.
- Electric Vehicles are not charged from grid, they are charged directly from the Boost battery.
- Simultaneously two Electric vehicles can be charged at 60kW each.
- Using a low voltage grid connection, Boost Charger is recharged.
- High utilization is enabled when simultaneous charging is done.
- Including Tesla with adapter, Boost charging is compatible with all BEVs.
- When Boost battery is drained, Electric Vehicles receive lower power from the grid.

#### IV. DATA MONITORING:

Electrical parameters in the electrical distribution boxes are monitored with internet access through Wi-fi communication. For working independently, the system requires two reading channels, it also allows the data to be recorded from different energy supplies. For the effective data monitoring, data acquisition and processing unit that includes IoT features along with compact sensors are required. The data are read and this information can be stored locally. A registered cloud database is necessary for the information sent to the IoT platform. Now the user can access this information at ease from a web server using a mobile application from anywhere.

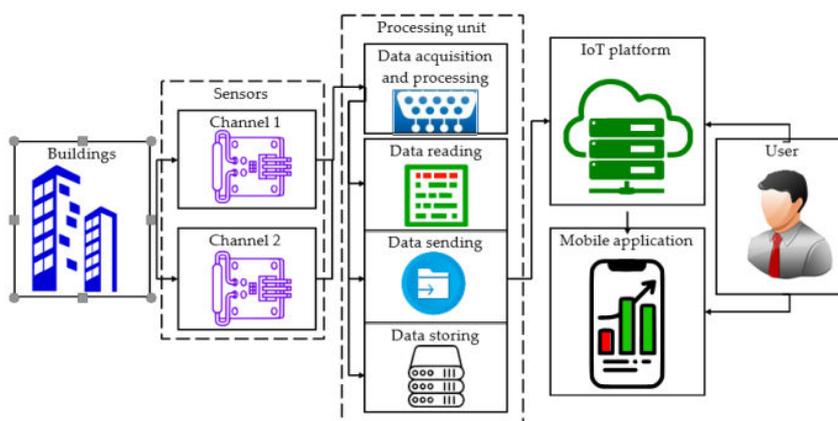


Figure-2 Block diagram of data monitoring system.

Using the Trust-Worthy algorithm it defines a threshold value to the SUs to overcome the PUE attacks. It enables CR-Networks nodes to efficiently utilize the available spectrum channels. Nodes, which can easily find various licensed channel opportunities without interfering the primary system increases. This reveals that it has a potential to be able to convert the various network conditions into a performance improvement.

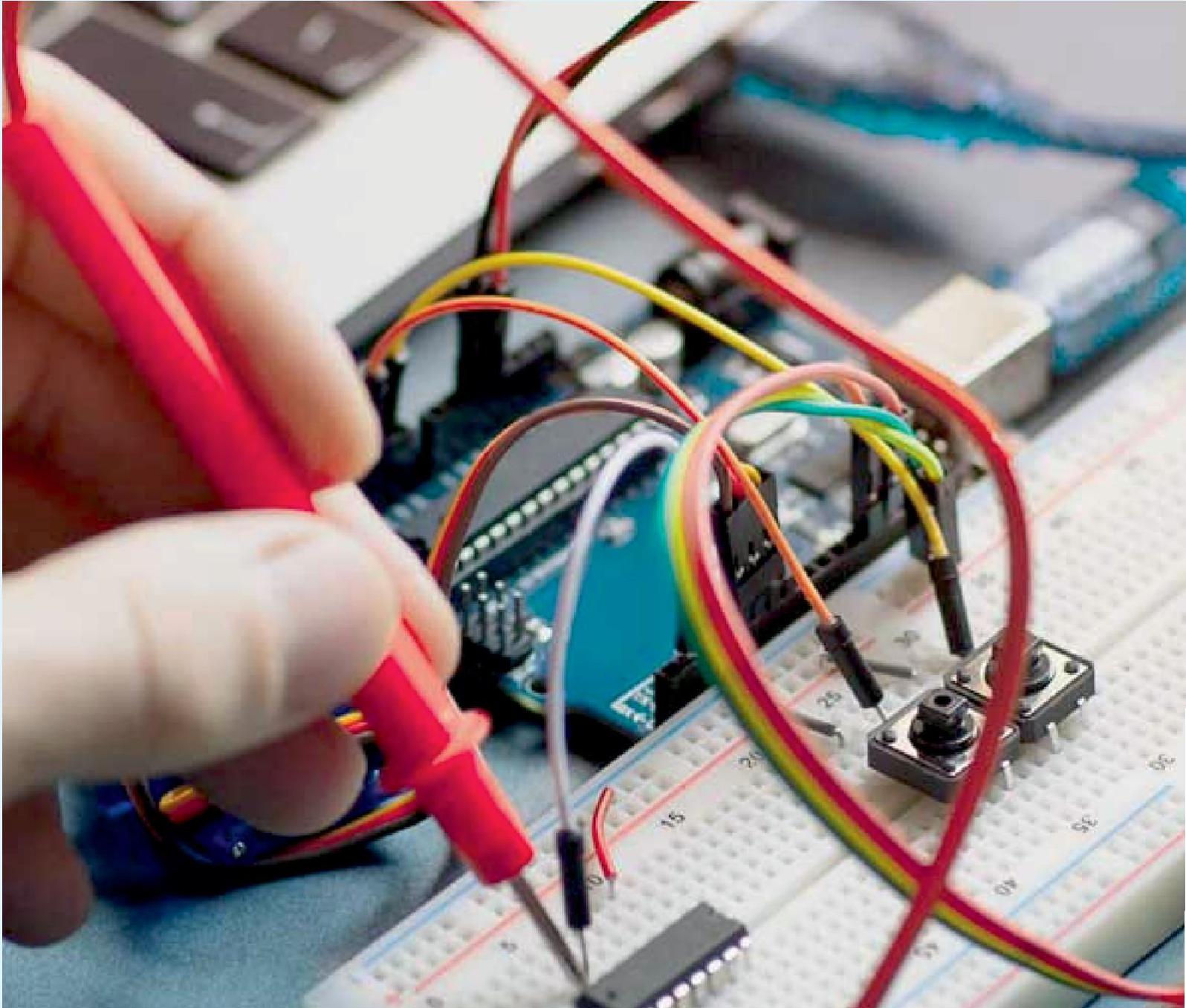
#### V.CONCLUSION

Though fast charging and its implementation has become quite important to keep up with the ever-moving dynamic world, it causes adverse effect in battery's shelf-life. Hence preference for fast charging until its necessary is not recommended. Whenever possible option for slow charging even though the time consumption of the process is definitely greater than that of the other fast-charging techniques, this will greatly impact on the enhancement of battery life and duration.



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