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The background of the cover features a person's hands holding a glowing, semi-transparent globe of the Earth. The globe is surrounded by various digital data visualizations, including bar charts, line graphs, and network diagrams. The overall color scheme is dark blue and purple, with a futuristic, high-tech aesthetic. The text 'INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH' is prominently displayed in large, bold, white letters with a black outline across the middle of the image.

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# A Novel Work on Solar based Electric Vehicle Charging Station

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**ABSTRACT:** In this work a charging station prototype is designed for charging the electric vehicle using solar supply. in the absence of the solar supply, it is connected to the AC source which charges the Electric vehicle at the same speed of solar supply.

## I. INTRODUCTION

Electric Vehicles have emerged as a viable alternative to vehicles powered by internal combustion engines (ICEs). To minimize the use of petroleum and its byproducts for transportation, electric cars may be used. A significant environmental worry concerning global warming has resulted in no emissions. Recent technological advancements in solar energy panel, battery technology, and energy management are accelerating the adoption of electric vehicles in the automotive industry. Manufacturing of electric vehicles has increased by 2.5 times in the last four months. Indian policy, led by SIAM, calls for all vehicles to be electric by the country's 100th anniversary of independence. By shifting to electric vehicles as soon as possible, India stands to benefit greatly. Solar power is more suited to powering electric cars. It would save a lot of money on oil imports. There is little doubt that the replacement of internal combustion engines with electric cars will have a positive impact on air quality in cities. In terms of small and public electric cars, we have a good chance of becoming a major player. It's estimated that India has more than 170 million two-wheeler vehicles. Each of these cars, if it consumes a little more than one-fifth of that amount each day, would use 34 billion gallons in a year, or roughly 200 gallons. This will cost roughly 3.4 lakh crores at a price of above 100 per liter. It takes six to eight hours to charge a 4KW solar-powered charging station (solar roof). In addition, the charging time should be slashed to only 10 minutes.

## II. PROPOSED SYSTEM

This project consists of a solar panel, in which 12V dc is generated, is utilized for charging the electric vehicle, via storing in batteries, thereby batteries are the main storage device, its protection plays a vital role, hence the battery of the prototype is protected by using BMS (Battery management System)

Programming and LEDs display the battery's charging state, which is separated from the circuit when it's completely charged to avoid overcharging and premature battery degradation. On the other hand, the solar power is climate oriented & not available in the night times, to have a better customer satisfaction, the charging station has to be connected to the grid / AC supply. Here a changeover switch is used to change the source from Solar dc supply to AC supply. First, 230V AC is transformed into 12-volt DC using a transformer, which is then converted to DC using a rectifier filter circuit. This 12-volt DC is then boosted, if necessary, using a DC-DC Chopper (buck booster converter), and the pure DC is then charged as fast as solar circuits, which is the goal of this AC system.

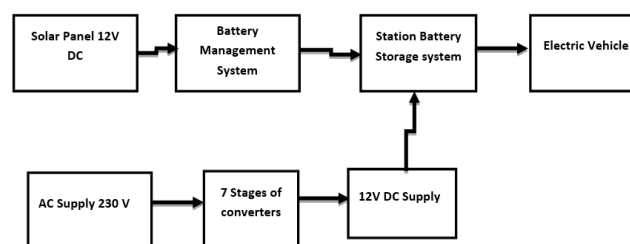


Figure 1: Block diagram of the module

### III. SYSTEM DESCRIPTION

In Solar panel to increase the output voltage, photovoltaic cells are linked in a series arrangement, which is known as an array. Solar energy is converted into electrical energy by releasing photons in a photo voltaic cell. The energy obtained by PV cell is DC & Power is in terms of Watts, but practically any electrical appliances or Electric vehicle requires power range from kilowatts to Megawatts. therefore, a large number of PV cells are connected to form a module. Many such modules interconnected constitutes a solar Panel. This solar panel acts as a complete generating unit. In this project BPL make eco-friendly 12V, 5W solar panel is used.

**Battery management system (BMS)** is a mix of hardware and software that assures proper battery charging function. As the battery is low, it recharges it and drains it when required. Forecasting load and PV generation profiles as well as other BMS management enhancements have been made. Arduino nano board and LEDs are used to show battery status, such as whether it is half-charged, fully charged, or completely depleted, in this project. A C language programme is used to write the application. When the battery is in a dangerous state, a relay circuit is employed to isolate it.

**Battery:** A battery is Energy storing device which stores energy in the form of chemical energy. The energy stored in battery is always DC. the main source of energy for propulsion in Electric Vehicle is Battery power. the energy stored in the battery is supplied to the DC Motor in Electric vehicle.

**Change over switch (COS):** It's a tool for switching between different power sources. There are a variety of switch kinds. Manual and automatic transmissions are the most often seen. In the absence of solar power, a manual switch is thrown to AC standby power in this project. On the other hand, it will be hooked up to a solar panel array at all times. In light of the fact that renewable energy sources do not provide electricity at a consistent rate, this device is essential. When solar power is not available, the changeover switch is linked to another source, such as the grid or an AC supply, by changing the position handle of the switch and pressing the reset button. Using the COS with a reset pushbutton is shown below; the switch has three working positions: off when the load is separated, position 1 for solar as the source, and position 2 for the COS when using AC power as the source.

**Step down transformer:** Inductive coupling occurs between the winding circuits of the transformer, which is a static electrical device. Primary and secondary winding currents are affected by the transformer core's changing magnetic flux, which in turn affects the secondary winding's variable magnetic flux. There is a fluctuating EMF or voltage in the secondary winding due to this variable magnetic flux. The transformer's cores are built of silicon steel, which has a high permeability. Magnetic flux is constrained to a channel that is intimately coupled with the windings because steel has a permeability several times greater than that of open space. The secondary side's output is 12 volts AC, whereas the main side's input is 230 volts AC.

**Bridge Rectifier** The bridge rectifier converts the 12V AC to 12V DC. There are many harmonics present in the DC output, and the capacitor included into the bridge rectifier board serves as a filter for the bridge rectifier to decrease these harmonics.

**DC-DC Chopper:** This device boosts DC voltage by converting it from one form to another. Switching regulators are utilized to enhance the voltage of the DC-DC Buck Boost Converter Module (LM5118) in the project. In addition to set output voltages of 3.3, 5, and 12 volts, these devices also include an adjustable output option. Smaller filter components may be used since the LM5118 series has a switching frequency of 150kHz, compared to lower frequency switching regulators.

**Inverter:** Inverter is a power electronics circuit which is used to convert DC to AC, in AC type charging multilevel stages of inverter & rectifiers are used in order to reduce the time of charging. in my project seven stages are used in order to match the DC charging duration.

**Relay:** Relay is used to prevent the battery from being overcharged when the voltage is below the threshold. The relay's job is to isolate the battery when its voltage rises over a certain level. A relay is an electrically operated switch that isolates a portion of the circuit when it detects a dangerous state.

**LED:** Here the Light emitting Diode are used in every stage of the circuit, in order to ensure the proper sequence operation of the circuit.

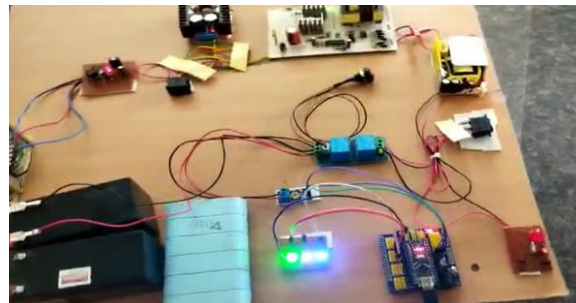


Figure 2: Working of the prototype Charging Station

### III. RESULTS & DISCUSSION

Proposed solar-based modules are hybrid charging stations, which utilize renewable energy more efficiently and fill in for it when it isn't available through the utility grid. By changing all its internal combustion engines to electric vehicles at the earliest opportunity, India would benefit greatly. Electric cars are better suited to solar power, which is more readily available. It would save a lot of money on oil imports. In cities, pollution is a big problem, and the replacement of internal combustion engines with electric vehicles is certain to improve air quality. In terms of small and public electric cars, we have a good chance of becoming a major player. It's estimated that India has more than 170 million two-wheeler vehicles. Each of these cars, if it consumes a little more than one-fifth of that amount each day, would use 34 billion gallons in a year, or roughly 200 gallons. By 2047, all new vehicle sales in India will be 100% pure electric vehicles (battery electric and fuel cell vehicles), a goal that the Society of Indian Automotive Manufacturers (SIAM) and its automobile manufacturers are aiming to accomplish. System advisory model software gives the design with estimation for any solar projects, these boost the user-friendly relationship for solar customers. Data predicted for the solar array commercial in SAM is as below.

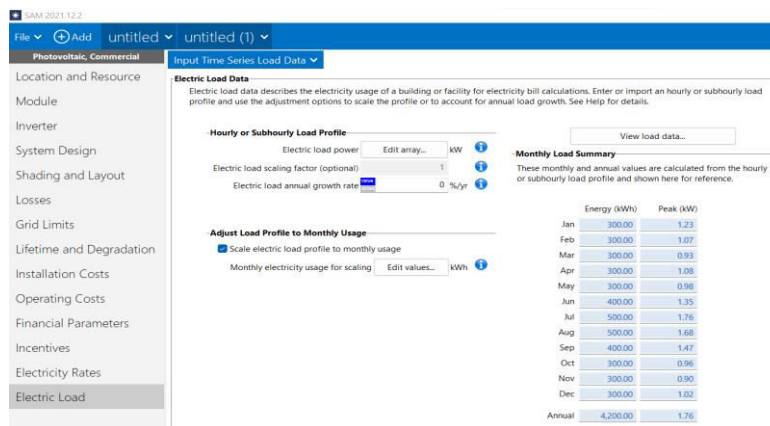


Figure 3. Modelling of solar array with annual peak demand

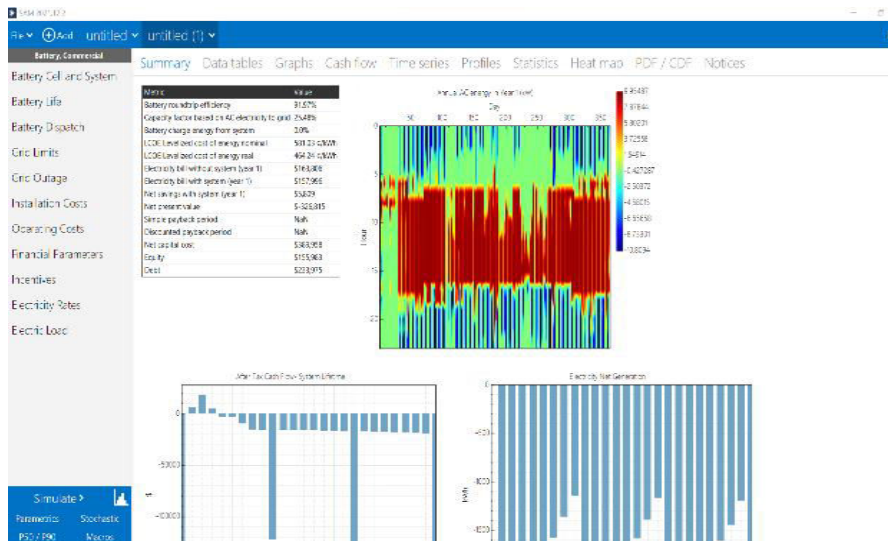


Figure 4. Modelling of solar array with annual cost for 1KW

These data provide the complete scenario of the solar based project before installation and also suggest the proper design, location and finance to start up. Hence make popular solar based projects.

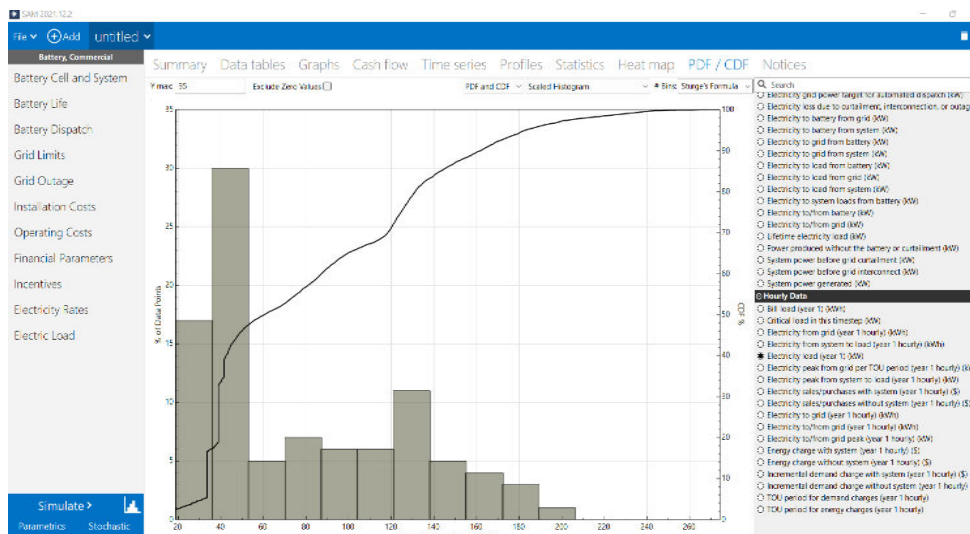


Figure 5. Modelling of solar array with battery charging hourly data

These data provide the complete scenario of the solar based project before installation and also suggest the proper design, location and finance to start up. Hence make popular solar based projects. There are now just 250 solar-powered charging stations in India out of the 15000 total, which is less than 2% of the total. This has to change. Electric Vehicles, on the other hand, may play a crucial role because of their capacity to operate as a regulated load and as a fast-response store for the grid. The key to a safe and easy transition to e-mobility is the development of a charging infrastructure for electric car batteries. On-road charging of Electric Vehicles, renewable energy charging, vehicle-to-grid (V2G) technologies, and contactless charging would be of greater advantage to EVs.

#### IV. CONCLUSION & FUTURE SCOPE

In this study, a hybrid charging station is presented that operates with and without solar energy, maintaining the same charging time and precision. As a consequence, customers are satisfied, and satisfied customers are more likely to move from gasoline engines to electric ones. The charging station's key benefits are its ability to operate at all hours

and in all weather conditions. Solar power utilization for domestic purpose requires multilevel conversion stations, whereas the generated power can be directly used in charging stations. To conclude solar based charging station are ecofriendly, accurate & fast charging. Till now the solar panels are connected to grid only for domestic purpose, this has to be extended in commercial purpose of Electric vehicle.

- Solar based charging is faster & economically.
- Solar energy can be directly used for storing in battery.
- Charging by using AC supply is achieved at the same duration.
- It works at same speed in all seasons and geographical condition.
- Charging can be achieved using AC supply during night times.

#### ADVANTAGES

- Eco friendly: No emissions, no fuel is burnt, it's a go green project.
- Since renewable energy is used, it can work as standalone generation module, & if essential can be connected to grid also.
- As a stand-alone generating module, the load variations will not affect other customers, and the extra energy may be stored in a battery and used whenever needed.
- Since the output of the solar is DC supply, no synchronization is required.
- Requires very less maintenance for solar panel & battery.
- f. A simple battery charger is all you need to recharge rechargeable batteries.
- Since DC supply charges faster, time saving can be achieved.
- Minimize the amount of primary oil used in transportation.
- Encourage the use of electric and alternative fuel cars by the general public.
- Enhance public transportation for the movement of people and products.
- Increased manufacturing capacity for electric vehicles helps to boost the global scale and competitiveness.
- Allow for more jobs in this area to be created.

#### DISADVANTAGES

- Solar based projects have a very high initial cost.
- It requires large space for installation.
- The generation of solar power cannot be controlled, and is not a factor of load.
- In charging stations, load **forecasting** is difficult.
- Synchronizing with the grid is difficult, as it involves more technical parameters.
- Solar supply is not available in Night & rainy seasons.

#### V. ACKNOWLEDGEMENT

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