

# Solar Electric Wheel Chair

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**Abstract:-** The idea of a solar electric wheelchair is presented in this abstract. It is a state-of-the-art mobility solution that combines the convenience of an electric wheelchair with solar energy technology. With its increased independence and improved convenience, the solar electric wheelchair is made to give those with mobility disabilities with sustainable and environmentally friendly mobility. The wheelchair uses solar energy to power its electric motor through the use of lightweight and efficient solar panels, allowing users to travel farther between charges. Furthermore, the abstract emphasises the use of intelligent functionalities and modifiable design components, guaranteeing maximum user comfort and flexibility. The solar electric wheelchair fosters better accessibility and autonomy for those with mobility issues and is a trailblazing move towards environmentally conscientious and user-centric mobility solutions.

**Keywords:-** Solar Panel, DC Motor, Battery, Charge Controller, Control Switch, Frame.

## I. INTRODUCTION

An innovative kind of mobility is the solar electric wheelchair, which charges its battery using sun radiation. It combines the advantages of solar technology for the environment with the functionality of a regular electric. These wheelchairs use BLDC gear motors, solar panels, and batteries to charge their batteries. This extends their battery life and lessens the need for traditional charging techniques. The method lessens the environmental effect of conventional electric wheelchairs while providing users with greater independence and mobility.

Many practical uses for human-machine control interfaces have been identified, some of which may benefit those with physical disabilities. Worldwide, a substantial and expanding corpus of wheelchair research and development is being produced. A wheelchair is a useful tool for involvement in life, activity, and mobility. While many are prepared to speculate, no one is truly sure when the first wheelchair was invented. The odd thing about wheelchairs is that they weren't always created with the best of intentions, particularly when it came to the Romans. As to the most recent worldwide reports on disability, over one billion people, or around 14% of the global populace, are living with a handicap. Individuals with reduced balance and mobility, such as amputees of lower limbs, Carried mobility devices are commonly used by people with neurologic illnesses, osteoarthritis, degenerative muscle, and spinal cord injuries.

Disability is defined as "an umbrella term for impairments, activity limitations, and participation restrictions" in the International Classification of Functioning, Disability and Health, which is the World Health Organization's (WHO) framework for measuring health and disability at both the individual and population levels. Wheelchair manufacturers have been pleased with small product improvements rather than proposing innovative concepts, especially when it comes to powered wheelchairs.

### A. Objectives

- To build an electric wheelchair powered by the sun.
- How to correctly apply the renewable solar electricity.
- To reduce environmental impact while increasing mobility and independence.

### B. Block Diagram

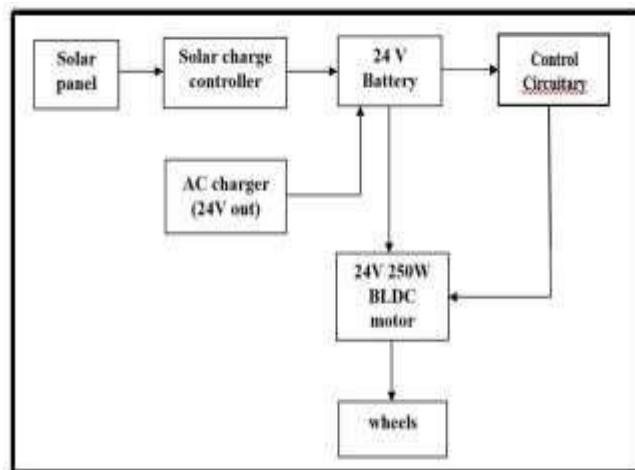


Fig 1: Basic Block Diagram

### A. Solar Panel

One type of electrical device that directly transforms light energy into electricity is a solar cell, also known as a photovoltaic cell. It has a maximum system voltage of 1000 V, a peak voltage of 85.5 V, a peak current of 1.93 A, and a power of 165 W.

### B. Battery Charger

Another name for this device is a charging regulator. To avoid overcharging, it controls the amount of electricity that the solar panel sends to the battery. Because of its affordability and ease of use, the Firestar solar charge controller 20 A was determined to be the best battery charging controller for this design. In order to charge a phone,

a cell phone charger cable can be inserted into a slot on this gadget.

**C. Battery**

The rechargeable battery provides the energy required to operate the DC motor. Rechargeable batteries come in a variety of shapes and sizes. The solar energy is stored in the battery and is managed by the charging controller. To power the motor, this energy is then transformed into electric energy. Because it was affordable and readily available, the Exide battery 12 V 100 AH was employed in this design.

**D. DC Motor**

The mechanical energy is transformed from electrical energy. Current is fed into one or more coils to create a magnetic field, which is how the conversion is accomplished. The wheelchair is propelled by a DC motor. Couplers are used to attach it to the back wheels. The motor incorporates a gearbox, which generates 31.2 Nm of torque.

**E. Frame**

The wheelchair skeleton serves as the frame. It supports the weight of the rider as well as any other attached parts. It was constructed from 20 x 20 mm square mild steel tubes. To make the tube strong enough to support the weight and reduce vibration during movement, it was cut into various lengths based on the design parameters and fused using CO2 welding. The frame can support a maximum weight of 155 kg. 620 mm broad, 620 mm long, and 1 300 mm high make up the frame.

Solar panel output is commonly expressed in watts. For instance, a 65 x 39- inch, 12 volts, 60-watt solar panel has a rated voltage of 30 V and an 8 ampere rating. Since 30 volts times 8 amps is equal to 240 watts,  $V \times A = W$ . We use the term "peak sun hours" as a way to smooth out the variances into a daily average because the amount of sunshine that hits the solar panel changes throughout the day. Early in the day

Also, sunlight at this time of day generates less energy than sunshine at midday. It goes without saying that cloudy days would generate less electricity than sunny ones.

- **Panel Frame:** This is the frame that has a solar panel installed in it. It is fastened to the wheelchair's top. It needs to be sufficiently stiff to support the weight of the solar panel and the vibrations it generates. In order for the panel to be correctly attached in it, the dimensions should also be little greater than. Additionally, it shields the user from intense sunshine and rain.
- **Toggle Switch** The wheelchair can be started or stopped by using the toggle switch, which also controls the motor.
- **Lever:** The wheelchair's front castor wheels, which are tiny wheels, are used to adjust the wheelchair's direction.
- The frame handle is used to attach the wheelchair's panel frame to its chassis.
- **Chassis:** The internal framework that protects the battery and other components while supporting the artificial object during development is known as the chassis.

**II. METHODOLOGY**

**III. WORKING**

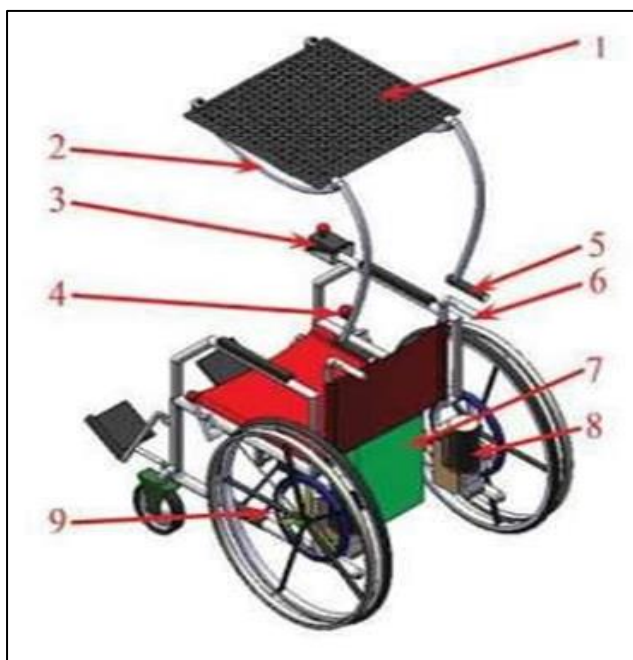


Fig 2: Construction Diagram of Wheelchair

Wheels, a battery, a DC motor, and a solar panel make up the solar wheelchair. The battery is continuously charged when the solar panel is in use as a charging mechanism. The central component of the apparatus is the D.C. motor, which supplies the power to turn the wheels. An electrical switch that completes the circuit with the battery and DC motor powers the system. The foundation of a solar wheelchair is a compact yet potent engine that has sufficient torque to support a person's weight. Typically, a chain is used to position the motor apart from the wheels; however, in a solar wheelchair, the engine is in direct contact with the wheels. Additionally, a mechanical support is included to help balance the chair. It produces the energy required to run the solar wheelchair using the photovoltaic panel.

**IV. CONCLUSION**

The Solar Electric Wheelchair project is a major advancement towards sustainable and accessible mobility. We have given users a renewed sense of eco-friendliness and independence by utilising solar energy. As we proceed, we want to improve the technology and make it more accessible, highlighting our dedication to inclusivity and a more environmentally friendly future.

- **Solar Panel:** A solar panel is an assembly of photovoltaic cells or a photovoltaic module. Solar energy is captured by the solar cells, which then transform it into electrical energy. The wattage of a solar panel is calculated by multiplying its rated voltage by its rated ampere rating.

➤ *Material Used*

- **DC Geared Motor:** - Often called a DC Geared Motor, DC Gearedn Motor, or Speed Reduction Motor, a DC gear motor is a combination of a DC motor and gearbox. It ran on direct current power. Increasing the motor's output torque and limiting the motor shaft's speed are the usual goals of adding a gearbox. DC gear motors are widely utilised in small and medium-sized automotive applications, ranging from robotics to vehicles, because of their numerous functions. To construct a DC motor, a magnetic field must be created. The magnetic field is produced by permanent or electromagnet magnets.
- **12V DC Battery:** - An irregular battery utilised in particular electronic applications is the 12-volt battery. The 12-volt battery is one of the battery kinds that varies greatly in appearance based on its intended purpose. It is among the most varied batteries available in several aspects. It can be heavy or light, big or small. Sometimes they can resemble standard AA batteries quite a bit.
- **Charge controller:** -By controlling the voltage and current from the solar panel to the battery, a solar charge controller prevents the battery from overcharging. It is configured as a 15-A/200-W device and uses maximum power point tracking, or MPPT, to speed up the battery's daily sun charging by up to 30%. To ensure that the battery receives the maximum amount of current, MPPT measures the solar panel's output, compares it to the battery voltage, and modifies it to the optimal value. The solar charge controller has a baseline constant power consumption of 35 mA and is protected against overcurrent by a 25-A circuit breaker. An inserted female cigarette lighter socket provides access to the 12-V DC electricity a sidewall of the hard case, and the solar charge controller's internal circuitry guards against overcurrent.
- **24V Solar Panel:** -An hour and a half's worth of sunshine striking the surface of the globe is sufficient to meet all of the world's energy needs for a complete year. Solar technologies use mirrors to focus solar radiation or photovoltaic (PV) panels to convert sunlight into electrical energy. This energy can be stored thermally or in batteries, or it can be used to create electricity.
- **Connecting Wires:** -Conductors called electrical wires carry electricity from a source, typically a nearby transformer, to an outlet in your house or place of business. In appliances and other electrical gadgets, they conduct electricity as well. To accommodate the diverse electrical loads and operating environments, electrical wires are available in a range of diameters, compositions, and casings.
- **AC Switch:** - Before beginning any maintenance or repairs on your system, your technician may easily verify that the air conditioning has been completely turned off thanks to the safety feature known as the AC disconnect switch. Your HVAC specialist may frequently install an AC disconnect switch if one isn't already there for you to guarantee the utmost safety for you, your family, and your repair and maintenance personnel both now and in the future.

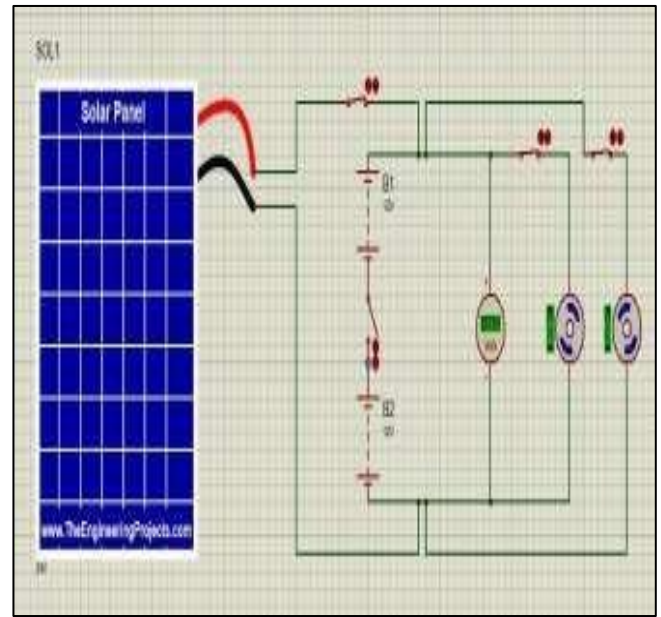
➤ *Hardware Implementation*

Fig 3: Circuit Diagram

The 20 Watt/12-volt solar panel powers the "Solar Powered Wheelchair," producing approximately 500 mill amperes of electricity. This power is then used to charge a 12 volt, 2.5- amp lead-acid battery. Since solar energy is known to fluctuate in supply, it must first be stored in order to ensure a steady supply for the DC motors. A charge controller is positioned ahead of the battery to prevent the battery from being overcharged. When sunlight is insufficient to create electricity, there is also a facility to charge the battery using a rectified AC supply via a charge controller in adverse weather conditions.

Electrical energy is held by capacitors, which then repurpose the energy when needed in the circuit. In the same circuit, the capacitor is discharged after being charged by the battery. Components like as relays, resistors, diodes, and transistors are located in the other section. Four DC relays are arranged, two for one DC motor and two for the second DC motor. The 7A, 12V~250V relay operates with the aim of the NO and NC contactor. Each relay has a current loss of about 2 milliamperes. When a PCB experiences an abnormal circumstance that results in a huge amount of current rushing through the circuit, the resistors limit the passage of current to other components. The purpose of the diode in

The purpose of this circuit is to open in one direction while blocking the flow of electricity in the other. The DC motors with the gear assembly attached are powered by the directional control circuit, which ensures smooth motion. The DC motor's specifications include 12VDC, 10 kg/n of torque is produced, and 60 revolutions per minute.

➤ *Actual Project Model*

Fig 4: Actual Model

➤ *Future Scope*

- **Improved Technology for Batteries** Using cutting-edge materials and technologies during the design and manufacturing process of batteries can improve their longevity, performance, and efficiency. This is known as advanced battery technology.
- **Identification and Navigation of Obstacles** To ensure their safety, those who are blind or visually challenged must avoid restrictions. One solution would be to create an artificial vision gadget that can identify boundaries and alert the visually impaired character to avoid them. To find constraints for comparable processing, an object detection device should be employed in the impact scenario.
- **Including Intelligent Features** Sensing, actuation, statistics transmission, energy control, and cognitive activities are all incorporated into smart systems. Nanoelectronics, micro-electromechanics, magnetism, photonics, chemistry, and radiation are some of the concepts that enable their functions.

➤ *Lower Prices and Greater Accessibility:*

- ✓ **Cost savings:** Sun electric powered wheelchair production and maintenance costs can be reduced by enforcing cost-effective manufacturing practices, using durable and lightweight materials, and optimising manufacturing processes. Furthermore, utilising economies of scale through expedited production might result in cost credit score, bringing these wheelchairs even more affordable and accessible to a wider market.
- ✓ **Greater Accessibility:** To guarantee greater accessibility, programmes include government grants, applications for financial aid, and collaborations with medical firms can help make solar energy more widely available. Wheelchairs are more widely available to people with mobility limitations, regardless of their financial situation. Furthermore, distribution and outreach initiatives to reach underserved communities and individuals in need can be facilitated by cultivating

partnerships with nonprofit organisations and network corporations.

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