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Modelling and Analysis of Three Phase Grid Photo Voltic System for Electric Vehicle

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Abstract: *Representation and demonstrating of sun-based cells is critical for the photovoltaic framework configuration keeping in mind the end goal to get best productivity from the sun and decrease the shore of sun-based cell framework. The fundamental subject of this article concentrates on a software created in MATLAB/Simulink of photovoltaic unite. This software depends on numerical equation and is depicted through a comparable. The electric circuit is integrated into the photocurrent source, a diode, and a set of series and parallel resistors. The re-enactment utilized as a part of this article to get the attributes (I-V), and afterward we will concentrate the impact of each parameter on the curve. The created demonstrate permits the expectation of photo-voltaic unite conduct beneath various physical and characteristic parameters. The unite can likewise be utilized to separate the physical parameters for a given sun-based PV cell as an element of temperature and sunlight-based irradiance.*

Keywords: MATLAB-Simulink, PV, Solar Cell Model, Solar Array Mode

I. INTRODUCTION

The improvement of new vitality sources is ceaselessly upgraded due to the basic circumstance of the synthetic chemical powers. Therefore, the inexhaustible vitality sources turned into a more critical patron to the aggregate vitality devoured on the planet. Truth be told, the interest for sunlight-based vitality has expanded by 20% to 25% in the course of recent years. With a specific end goal to get advantage from the utilization of PV systems, explore exercises are being led trying to increase promote change in their cost, productivity and unwavering quality, therefore numerical displaying of sun powered cells is fundamental for any operation yield improvement. An exact learning of sun-based cell variables from exploratory information is of fundamental significance for the outline of sun-powered cells and for the evaluations of their execution. The electrical proportional circuit is a helpful and regular route in most reproduction studies. The five variables of enthusiasm for the proportionate circuit are the photocurrent (IPV), series resistance (RS), diode immersion current (I0), shunt resistance (RSH) and the idealism consider (A). The present relation voltage of a sun powered cell is depicted by a scientific condition both certain what's more, nonlinear. In this work, MATLAB script document program has been utilized to register the five variables of the a unite diode model of lit up sun powered cells. The outcomes acquired by re-enactment demonstrate the consistency between the information and got the parameters given by the maker, to be specific: short circuit current (ISC), open circuit voltage (VOC) and most extreme power (Pmax). For example, these variables can be utilized for quality control amid creation or to give bits of knowledge into the operation of the gadgets.

II. PROBLEM STATEMENT

Conservation of energy is very normal nowadays but management of energy is very essential factor to work on the basis of switching to energy generation devices for continuous supply of DC storage also demand of electricity is increasing day by day but available electrical power plants are not able to supply electricity as per the demands needs. The power will be get generated with the help of PV solar panel, output obtain is in DC (direct current) with the help of solar charge controller the DC (direct current) output is given to the “DC” to “DC” converter. It is an electronic circuit or electrotechnical device that convert a source of DC (direct current) from one voltage level to alternative. It is a type of electric power converter. Power level range from very low (small batteries) to very high (high-voltage power transmission).

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The maximum power point tracking (MPPT) system or sometimes just power point tracking, is a technique used with variable power sources to maximise energy extraction as conditions vary with this technique, most commonly used with photovoltaic (PV) solar system. This DC (direct current) power is used for different DC loads, with the help of inverter the DC (direct current) will get converted into AC (alternating current). It is well known that DC (direct current) is a relatively stable and positive voltage source, while AC (alternating current) oscillates around a nominal 0 v level, usually in a square or sinusoidal waveform. The output AC (alternating current) power is given to the AC loads and grid.

III. BLOCK DIAGRAM AND COMPONENT DETAILS

3.1 Block Diagram

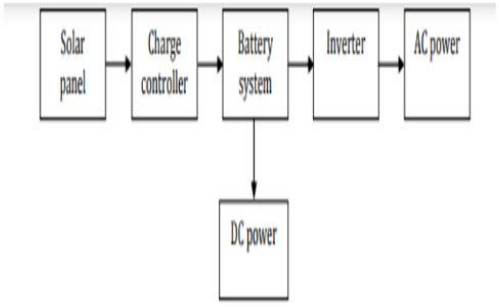

Fig 1: Block diagram of typical solar PV system.

A. Solar Panel

Solar panels produce electricity from sunlight. The first solar panel-powered satellite was launched in 1958 by Hoffman Electronics. A solar panel consists of number of photovoltaic (PV) solar cells connected in series and parallel. These cells are made up of at least two layers of semiconductor material (usually pure silicon infused with boron and phosphorous). One layer has a positive charge; the other has a negative charge. When sunlight strikes the solar panel, photons from the light are absorbed by the semiconductor atoms, which then release electrons. The electrons, flowing from the negative layer (n-type) of semiconductor, flow to the positive layer p-type, producing an electrical current. Since the electric current flows in one direction (like a battery), the electricity generated is DC.

Fig: A- Solar panel

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Solar PV Technologies

With the growing demand of solar power new technologies are being introduced and existing technologies are developing.

There are four types of solar PV cells:

1. Single crystalline or mono crystalline
2. Multi- or poly-crystalline
3. Thin film
4. Amorphous silicon

Single-Crystalline or Mono Crystalline

It is widely available and the most efficient cells materials among all. They produce the most power per square foot of module. Each cell is cut from a single crystal. The wafers then further cut into the shape of rectangular cells to maximize the number of cells in the solar panel.

They are made from similar silicon material except that instead of being grown into a single crystal, they are melted and poured into a mould. This forms a square block that can be cut into square wafers with less waste of space or material than round single-crystal wafers.

Fig: a- Single-crystalline or mono crystalline

B. Multi- or Poly-Crystalline

Polycrystalline or Multi- crystalline solar panels are solar panels that consist of several crystals of silicon in a single PV cell. Several fragments of silicon are melted together to form the wafers of polycrystalline solar panels. In the case of polycrystalline solar cells, the vat of molten silicon used to produce the cells is allowed to cool on the panel itself. These solar panels have a surface that looks like a mosaic. They have a square shape and a shining blue hue as they are made up of several polycrystalline silicon. As there are multiple silicon crystals in each cell, polycrystalline panels allow little movement of electrons inside the cells. These solar panels absorb energy from the sun and convert it into electricity.

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Fig: b-Multi-or poly-crystalline

C. Thin Film Panels

It is the newest technology introduced to solar cell technology. Copper indium dieseling, cadmium telluride, and gallium arsenide are all thin film materials. They are directly deposited on glass, stainless steel, or other compatible substrate materials. Some of them perform slightly better than crystalline modules under low light conditions. A thin film is very thin-a few micrometres or less.

Fig c: Thin film panels

D. Amorphous Silicon

Amorphous silicon is newest in the thin film technology. In this technology amorphous silicon vapor is deposited on a couple of micro meter thick amorphous films on stainless steel rolls. [13] Compared to the crystalline silicon, this technology uses only 1% of the material.

Fig: d- Amorphous Silicon

3.2 Charge Controller

When battery is included in a system, the necessity of charge controller comes forward. A charge controller controls the uncertain voltage build up. In a bright sunny day, the solar cells produce more voltage that can lead to battery damage. A charge controller helps to maintain the balance in charging the battery.

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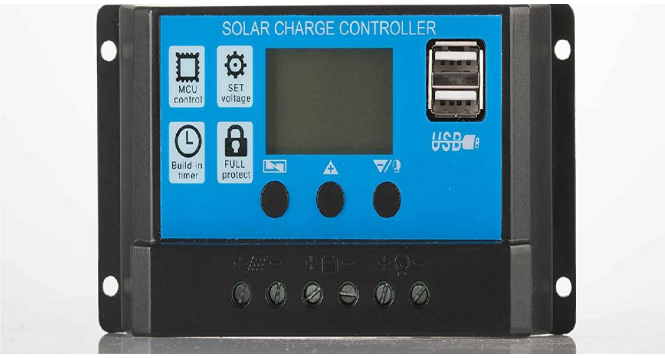

Fig: B-Charge controller

3.3 Battery System

To store charges batteries are used. There are many types of batteries available in the market. But all of them are not suitable for solar PV technologies. Mostly used batteries are nickel/cadmium batteries. There are some other types of high energy density batteries such as- sodium/sulphur, zinc/bromine flow batteries. But for the medium-term batteries nickel/metal hydride battery has the best cycling performance. For the long-term option iron/chromium redox and zinc/manganese batteries are best. Absorbed Glass Mat (AGM) batteries are also one of the best available potions for solar PV use.Battery system Inverter AC power DC power Solar panel Charge controller.

Fig: C-Battery System

3.4 Inverter

Solar panel generates dc electricity but most of the household and industrial appliances need ac current. Inverter converts the dc current of panel or battery to the ac current. We can divide the inverter into two categories. They are- Stand alone and Line-tied or utility-interactive.

Fig: D Inverter

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IV. WORKING

A solar Vehicle solely depends on the photovoltaic cells to absorb the sunlight and convert it into usable energy to power the engine. Photovoltaic cells bypass the originalprincipal of solar thermal energy by converting solar energy directly to usable electricityinstead of thermal conversion.

4.1 Working Principle of a Solar car

Solar cars have solar panels custom-designed to be mounted on the surfaces receiving maximum sun rays, which is generally the rooftop. The photovoltaic cells on the solar panels comprise of Silicon and a combination alloy of Gallium and Indium and Nitrogen gas.

These elements have a natural retentive property that allows them to absorb the light energy from the solar rays. The retained energy then releases in form of free-moving electrons into specially designed storage sections.

In fact, we refer to this storage facility as batteries. They comprise of special elements like Lithium-ion, and Nickel – Cadmium, etc. These batteries have the ability to convert free electrons into usable energy to power the vehicle engine.

The speciality of these batteries is that we can use them repeatedly to power a vehicle. We can do it by recharging them using solar energy. With an ability to generate 80 to 150 volts of energy, solar-powered cars can cover 60 to 90 km on a single full charge.

The best aspect of these Solar Cars is their ability to constantly keep recharging their battery even when parked idle under sunlight. Therefore, this reduces the cost of operation of a car to almost negligible.

V. ANALYTICAL AND SIMULATION DIAGRAM

5.1 Analytical

A photovoltaic cell can be demonstrated as a present electrical current source PN associated in shunt with a diode. Current source delivers a steady present. This current is corresponding to the power of the light hit the upon cell. Photovoltaic frameworks influenced specifically with climate conditions and sun-oriented radiation. The execution of a sun-oriented cell is expected to comprehend the relationship amongst current and voltage of the cell. The ideal proportional circuit of a PV cell (Duffy and Beckman, 1980) is appeared in Figure 1. It incorporates a current source, a diode, a series arrangement resistance (Rs) and a shunt resistance (Rsh), these two resistances added because there is no ideal solar cell in practice.

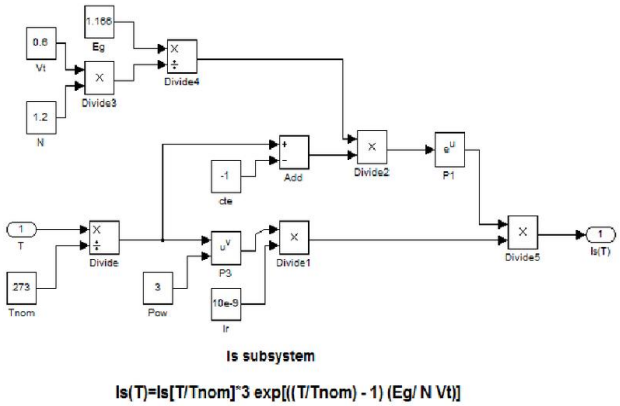

Fig 2: MATLAB / SIMULINK temperature effect subsystem on diode reverse saturation current

5.2 Simulation Diagram

The electrical energy will be get generated with the help of renewable energy source which is our solar energy.

The solar panel are mounted on the roof of car, the energy generated by the solar panel is used by the car and remaining will provided to grid.

If because of some reason energy is not generated at that time the backup will be given by the diesel generated set.

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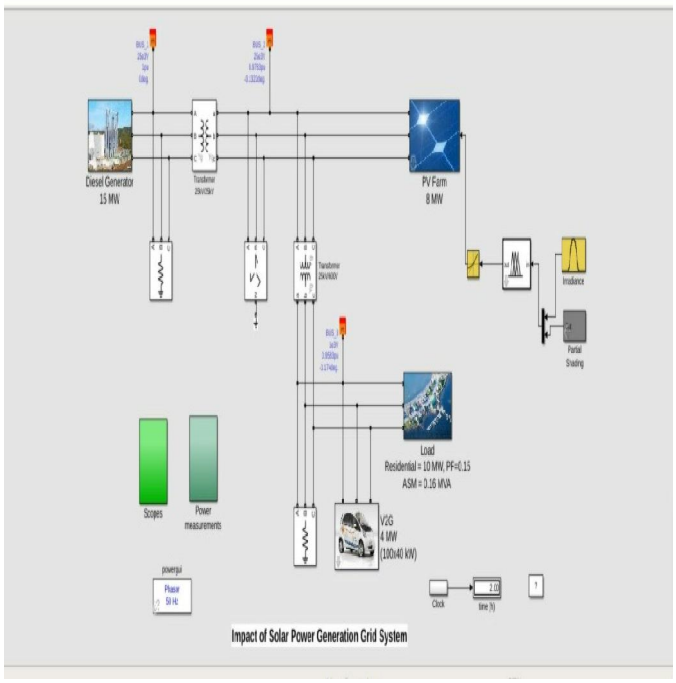

Fig 3: Simulation diagram

VI. ADVANTAGES

1. Renewable Energy Source

Among all the benefits of solar panels, the most important thing is that solar energy is a truly renewable energy source. It can be harnessed in all areas of the world and is available every day. We cannot run out of solar energy, unlike some of the other sources of energy.

Solar energy will be accessible as long as we have the sun, therefore sunlight will be available to us for at least 5 billion years when according to scientists the sun is going to die.

2. Reduces Electricity Bills

Since you will be meeting some of your energy needs with the electricity your solar system has generated, your energy bills will drop. How much you save on your bill will be dependent on the size of the solar system and your electricity or heat usage.

For example, if you are a business using commercial solar panels this switch can have huge benefits because the large system size can cover large chunks of your energy bills.

Moreover, not only will you be saving on the electricity bill, but there is also a possibility to receive payments for the surplus energy that you export back to the grid through the Smart Export Guarantee (SEG). If you generate moreelectricity than you use (considering that your solar panel system is connected to the grid).

VII. APPLICATION

Solar energy can be used for diverse purposes. You can generate electricity (photovoltaics) or heat (solar thermal). Solar energy can be used to produce electricity in areas without access to the energy grid, to distil water in regions with limited clean water supplies and to power satellites in space.

Solar energy can also be integrated into the materials used for buildings. Not long ago Sharp introduced transparent solar energy windows.

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VIII. RESULT

Modelling and analysis of three phase grid photo Voltic system for electric vehicle is presented to get the output power.

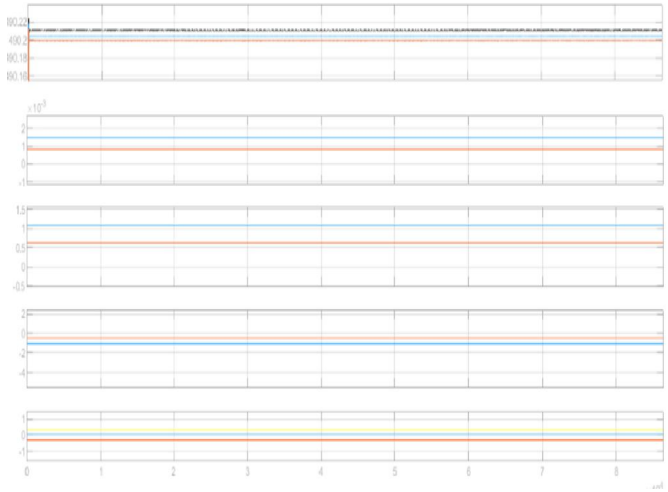

Fig 4: Regulation

In the logical formalism, a regulatory network is modelled as a regulatory graph. In this graph, nodes represent genes or regulatory products.

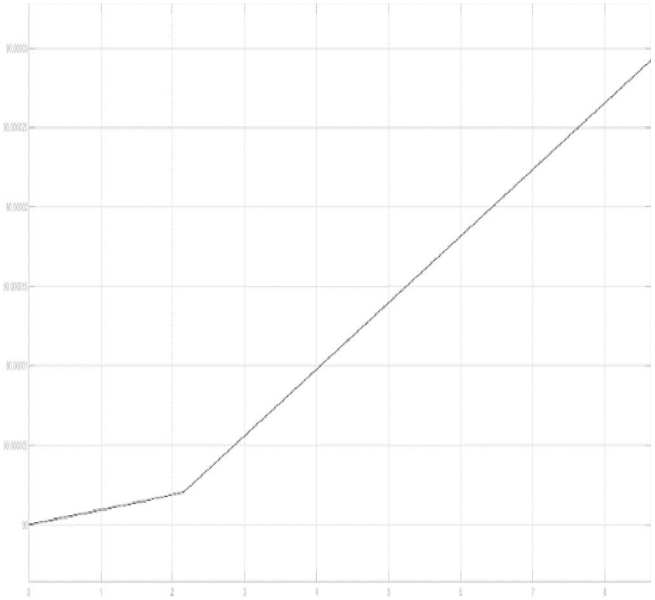

Fig 5: Scope

Scope graphs provide a new approach to defining the name binding rules of programming languages. A scope graph represents the name binding facts of a program using the basic concepts of declarations and reference associated with scopes that are connected by edges.

IX. CONCLUSION

A MATLAB/SIMULINK model for the solar PV cell, modules and array was developed and presented in this paper. This model is based on the fundamental circuit equations of a solar PV cell taking into account the effects of physical and environmental parameters such as the solar radiation and cell temperature. The module model was simulated and validated experimentally using the highly efficient PVL-124 solar laminate panel. As a result of the study, one can benefit from this model as a photovoltaic generator in the framework of the SunPower-System MATLAB/SIMULINK

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toolbox in the field of solar PV power conversion systems. In addition, such a model would provide a tool to predict the behaviour of any solar PV cell, module and array under climate and physical parameters changes.

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