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Estimation Model on Electricity Generation from Solar Energy

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Abstract: ***The Solar Energy is produced by the Sunlight is a renewable source of energy which is eco- friendly. Every hour enough sunlight energy reaches the earth to meet the world's energy demand for a whole year. In today's generation we needed Electricity every hour. This Solar Energy is generated by as per applications like industrial, commercial, and residential. In this article, we have reviewed about the Solar Energy from Sunlight and illustration given to estimate the parameters for solar energy set up.***

Keywords: Renewable energy, Solar panel, Photovoltaic cell.

I. INTRODUCTION

Nowadays, due to the decreasing amount of renewable energy resources, the last ten years become more important for per watt cost of solar energy device. It is definitely set to become economical in the coming years and growing as better technology in terms of both cost and applications. Sunlight is unlimited source of energy which is available at no cost. The major benefit of solar energy over other conventional power generators is that the sunlight can be directly converted into solar energy with the use of smallest photovoltaic (PV) solar cells. Moreover, solar energy requires considerably lower manpower expenses over conventional energy production technology.

II. SOLAR ENERGY

Amount of energy in the form of heat and radiations called solar energy which is shown in the following figure. It is radiant light and heat from sun that is natural source of energy using a range of ever changing and developing of technology such as solar thermal energy, solar architecture, solar heating, molten salt power plant and artificial photosynthesis. The large magnitude of solar power available makes highly appealing source of electricity.

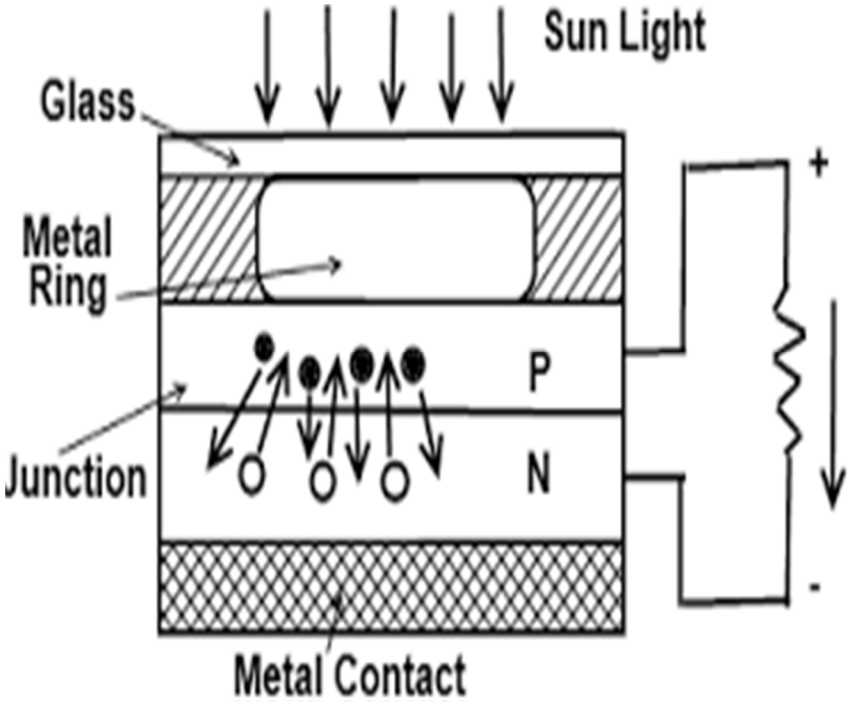


Fig 1: Internal functioning representation

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III. OPERATIONAL FEATURES OF SOLAR ENERGY

PV cells Convert Sunlight to Direct Current (DC) electricity. Charge Controller work as control the power from solar panel which reverses back to solar panel get cause of panel damage. Battery System act as storage of electric power is used when sunlight not available (i.e. night).From this system connected to inverter for convert Direct Current (DC) into Alternating Current (AC).

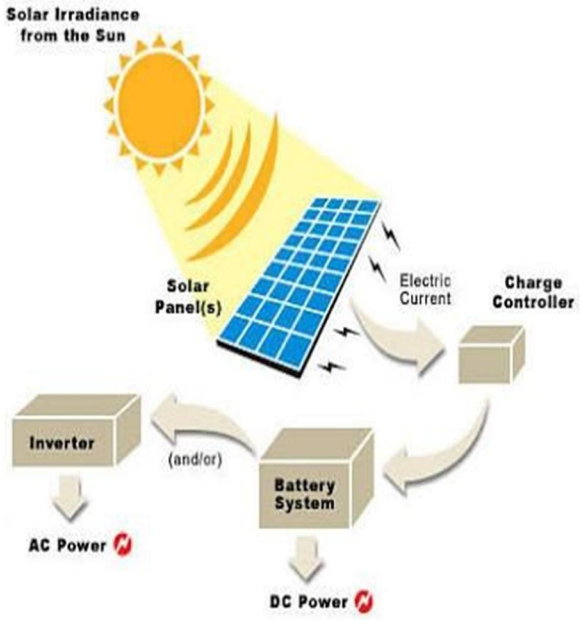


Fig 2: Working Model representation

IV. STAGES IN REVIEW PROCESS OF SOLAR ENERGY SYSTEM

A review is necessary to know about the problem in that area has been solved and need to be solved in future. This review process approach was divided into five stages in order to make the process simple and adaptable.

The description of stages given below:-

A. Stage 0: Get a "feel"

This stage provides the details to be checked while starting literature survey with a broader domain and classifying them according to requirements.

B. Stage 1: Get the "big picture"

The groups of research papers are prepared according to common issues & application sub areas. It is necessary to find out the answers to certain questions by reading methodology proposed in those papers.

C. Stage 2: Get the "details"

Stage 2 deal switch going in depth of each research paper and understand the details of methodology used to justify the problem, justification to significance &novelty of the solution approach, precise question addressed, major contribution, scope & limitations of the work presented.

D. Stage 3: "Evaluate the details"

This stage evaluates the details in relation to significance of the problem, Novelty of the problem, significance of the solution, novelty in approach, validity of claims etc.

E. Stage 4: "Synthesize the detail"

Stage 4 deals with evaluation of the details presented and generalization to some extent. This stage deals with synthesis of the data, concept & the results presented.

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V. ILLUSTRATION OF SOLAR ENERGY SYSTEM

In this section the way of calculating Size of Solar Panels, Battery and Solar Inverter in India will be covered.

A. The Way Of Calculating Size Of Solar System

Most of the solar installations in India are off-grid because our country, India, faces frequent power cuts. Off grid solar installation has 3 key components: solar panels, battery and solar PCU (solar PCU is a solar inverter with built-in solar charge controller). To calculate size of solar system, it is important to follow these steps:

1) Step 1: Calculate your total load that you want to run

You should know how much power (in watts) your electrical appliances consume. For example, a tube light consumes 40watts, fan consumes 80 watts etc. You should add the electrical load (in watts) that you wish to use. Let's assume that you added everything and the figure that you get is 1000 watts.

2) Step 2: Size your solar inverter based on electrical load

After know the total electrical load, the next thing that you have to do is find a solar inverter that can power the load. In this case where your total electrical load is 1000 watts, you should choose an inverter of 1600 watts. It is advisable to oversize the inverter because unfortunately DC to AC conversion that solar inverters do causes loss of energy. It is also good to know that a 1600 watts inverter comes in 24v (v = voltage). Remember this because we are going to use this fact ahead in our calculations.

3) Step 3: Calculate the total current of your load Power (in watts) = Voltage x Current

In our example, the power (watts) is 1000 and we already know the voltage to be 24v. Let's insert these figures into our formula.
Power (in watts) = Voltage x Current
1000 (watts) = 24V x current
So, Current= 1000/24 = 41.66 amps
Let's round it off to 41 amps. Now our solar system needs to generate at least 41 amps of current to power the connected electrical load.

4) Step 4: Decide how many hours of battery backup you need – buy battery based on that

The next step in calculating size of solar system in India is to think how many hours of backup you need. Remember, solar PCU/inverter will directly power your electrical load through solar. However, when solar is not available, the solar energy stored in batteries can be used to power load. Let's say you need backup of 5 hours. Now there is a very simple formula to calculate size of battery based on your total load and backup time required.
Total load (in watts) x hours of backup needed / 24
Why should we divide by 24? Because our inverter rating is 24V. Let's put the figures from our example in this formula: 1000 (watts) x 5 hours / 24 = 208
Let's round it off to 300AH because it is OK to have extra backup. We can install 2 batteries of 150Ah.

5) Step 5: Calculate size of solar panels based on battery size and current of electrical load

Yes, sizing of solar panels comes at the last because panels are either going to feed the battery or run electrical load. They need to produce enough voltage and current to charge the battery properly and to run electrical load. So how do we decide the size of solar panels?
Charging Current of Battery = 1/10th of its Total AH.
In this case, we have 300ah so if we divide it by 10 we get 30amps. Our solar panels need to make 30 amps of current to feed our battery bank. We already calculated that our electrical load will need 41amps to run. We need to add this to the amps that our battery bank is going to take: 30+41 = 71amps.
Our solar panels should make 71amps.
Fact: On an average, 250 watts solar panels have a voltage of 30v. Power = Volts x Amps
Amps: We calculated in the last step that we need 71amps (30amps to feed the battery bank and 41amps to run the electrical load directly through solar).
Power = 30x71amps = 2130 watts. Let's round it off to 2500 watts because you can't have 2130 watts panels.
This is our answer: We need to install panels of 2500 watts to feed our battery bank and run electrical load.
So, we can go for 10 panels of 250 watts each.

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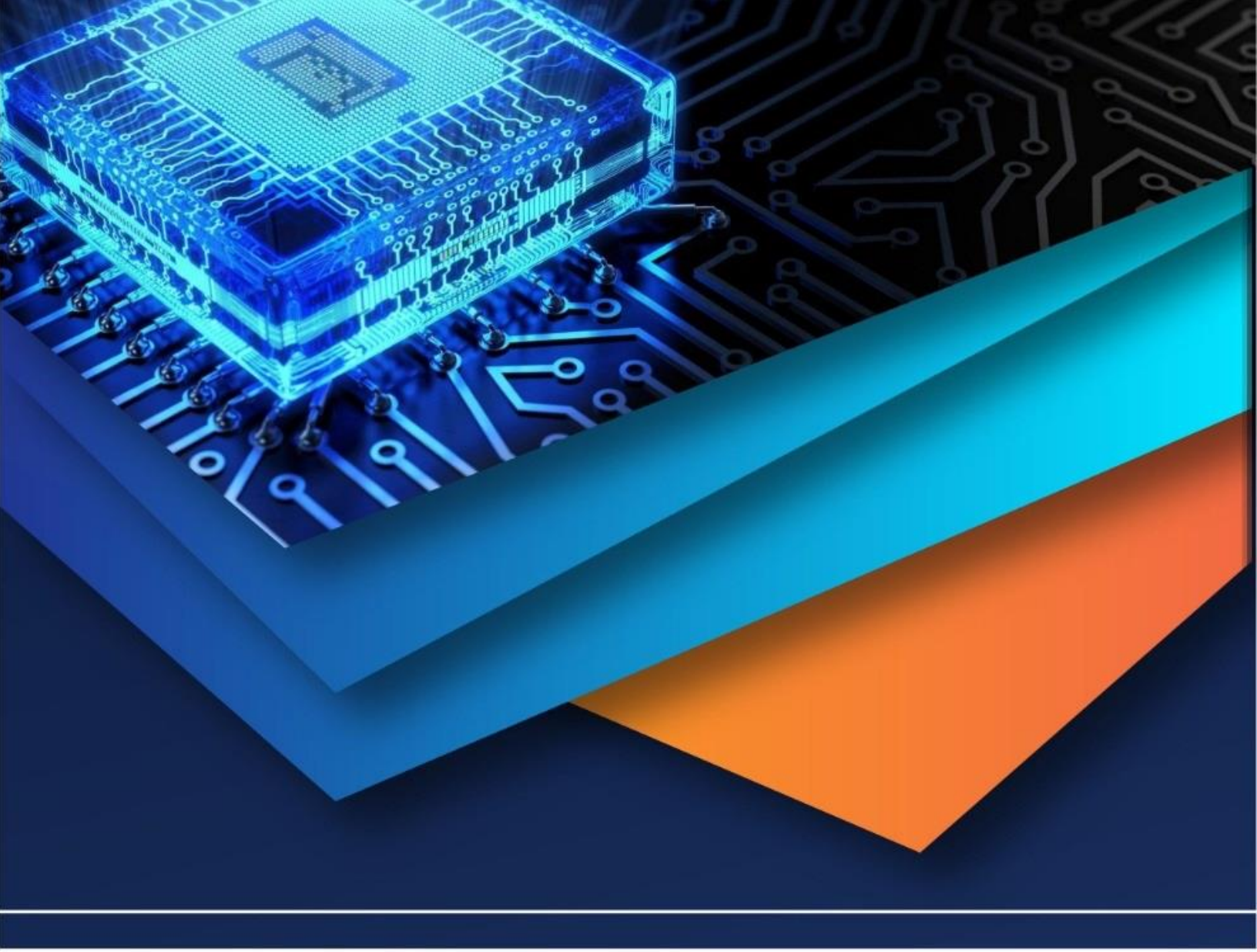
VI. CONCLUSION

Most of the people are aware about non-renewable energy resources. Solar energy has become increase more popular due to their economic benefits. It has more benefits compared to other forms of energy like fossils fuels and petroleum deposits. It is an alternative which is promise and consistent to meet the high energy demand. Research on solar cell and solar energy has a future worldwide. Mentioned illustration in this paper helps to understand the way of estimating the parameters for solar energy set up.

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