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A Review Paper on Solar Energy System

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Abstract - The plant (an arrangement of solar panels) which converts solar energy to light energy from the sun into electrical energy (charge emission) is called a solar power plant process. In solar plant there are many solar panels are connected and in panels there are many cells units which make panels. In which special metal is used which is in the form of lines and these lines are also connected to very thin lines and all these lines are connected to a metal line frame which is mainly quadrilateral in shape. So there is large area to trap light i.e. now there is a suitable area for light to fall on it as the metal arrangement in large to fall on it electrons start's to emit from thin lines to metal frame and current goes into a diode box which is behind the panel and then comes into supply wires.

Keywords: CSP, DER, FIT

INTRODUCTION

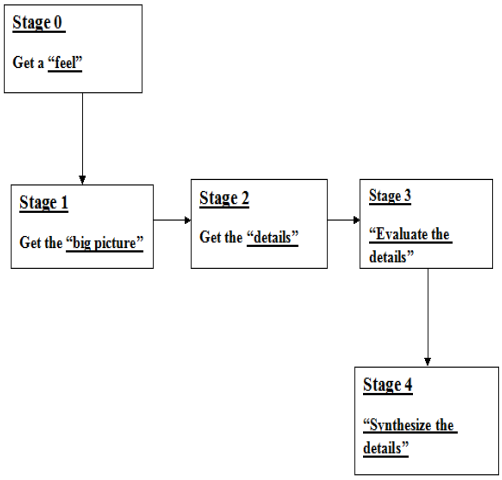
When a suitable light of certain frequency (i.e E=hv energy of light depends on its frequency) is fall on a special metal like silicon, electrons get some energy of suitable frequency which is greater than work function[work function is minimum energy required by an electron to emit from metal surface . So there is no photoelectric emission possible below work function (w≤E) and emit from the conduction band and come out from metal surface. Like that other electron come out and form a big unit of charge flow which is responsible for electric current.

- First, the projects tend to reduce the overall cost of the energy technology as large Scale utilization of a particular technology, in general, tends to reduce the cost of that technology. This has also encouraged the entrepreneurs to invest in solar energy technologies.
- Second, the projects are serving as test platforms for large scale solar energy Utilization technologies.
- Third, these projects are engaging the academic institutions in long-term solar Energy research, development, and pedagogical activities.
- Fourth, these projects have increased the awareness of green technologies.

Fig. 1 Solar Cells

II. REVIEW PROCESS ADOPTED

A literature review is necessary to know about the research area and what problem in that area has been solved and need to be solved in future. This review process approach were divided into five stages in order to make the process simple and adaptable. The stages were:-



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.

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 he Title, Abstract, introduction, conclusion and section and subsection headings.

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.

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.

Stage 3+: "Synthesize the detail"

Stage 3+ deals with evaluation of the details presented and generalization to some extent. This stage deals with synthesis of the data, concept & the results presented by the authors.

III. How to Calculate Size of Solar Panels, Battery and Solar Inverter in India

Power (in watts) = Voltage x Current

How to calculate size of solar system in India?

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:

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**.

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.

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.

1000 (watts) = 24V x 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.

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

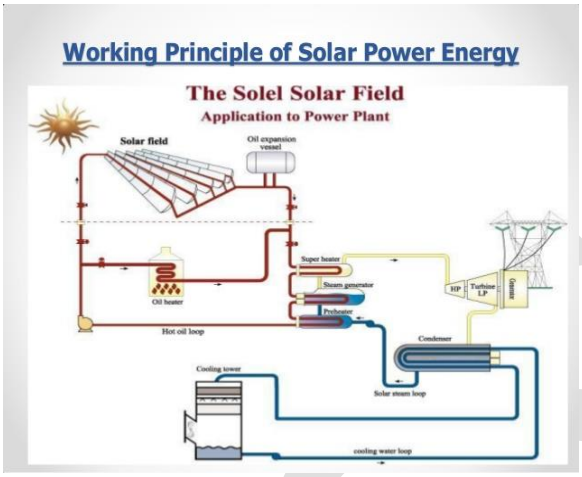


Fig. 2 Solar Power Energy System

Why should we divide by 24? Because our inverter 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.

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.

IV. CONCLUSION

Solar power is an immense source of directly useable energy and ultimately creates other energy resources: biomass, wind, hydropower and wave energy.

Most of the Earth's surface receives sufficient solar energy to permit low-grade heating of water and buildings, although there are large variations with latitude and season. At low latitudes, simple mirror devices can concentrate solar energy sufficiently for cooking and even for driving steam turbines.

The energy of light shifts electrons in some semiconducting materials. This photovoltaic effect is capable of large-scale electricity generation. However, the present low efficiency of solar PV cells demands very large areas to supply electricity demands.

Direct use of solar energy is the only renewable means capable of ultimately supplanting current global energy supply from non-renewable sources, but at the expense of a land area of at least half a million km^2.

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