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Power Generation from the Sun without the Use of a Convertor

Dr. Manisha Ghodeswar[1], Charvi Morkhade[2]
Professor[1], Research Scholar[2]
Department of Electrical and Electronics Engineering
Yadavindra College of Engineering
Corresponding Author's Email id: *charvimorkhade65@yahoo.com*

Abstract

Renewable energy sources are currently in high demand. We can't rely on fossil fuels because they're limited, especially in this new era where energy consumption has skyrocketed. Solar energy has the potential to be one of the most efficient renewable energy sources. We can generate alternating current straight from photovoltaic cells, which is a new way of looking at a solar panel. To construct an AC wave form, we can employ an array of photovoltaic cell pairs coupled in anti-parallel fashion. Solar panels currently produce DC electricity, which must first be converted to AC before being used in commercial and residential equipment. When the cost of solar panels is combined with the cost of inverters and phase synchronizers, solar panels become prohibitively expensive. Furthermore, the power losses of various components utilized in DC to AC converters make the situation even more unfavorable. We demonstrate a new way for generating AC electricity from solar panels without using an inverter, hence eliminating power losses caused by inverters. Because our method does not require batteries, the overall cost is also lowered. Another advantage of this method is that it produces a highly clean sine wave with higher efficiency than an AC inverter. By adjusting the speed of the motor utilised in this technique, we may generate a sine wave of any frequency. As a result, it's a really simple approach with fantastic results.

Keywords*:- Solar cells , Anti parallel connection ,Inverter, Disc.*

INTRODUCTION

AC generators now generate AC electricity for the power grid. The generators are powered by mechanical energy given by water turbines (hydroelectric) or steam turbines fueled by coal, natural gas, or nuclear fuel. To create voltage, mechanical energy turns the coils of the generator into a magnetic field. Because the conductor coil of the generator flips orientation during rotation in the magnetic field, the resultant voltage [1], we may turn sunlight into energy in a variety of methods, including utilising solar cells or concentrated solar power (CSP), in which we hurl magnified sunlight onto water, which can subsequently be utilised to generate electricity. In this study, we use solar cells to directly create AC. So we no longer need those pricey inverters since we can generate AC electricity straight from solar cells. We may also alter the frequency of the sine wave by simply regulating the system. The nice part about this technology is that it can create a clean sine wave better than an AC derivation or inverter [2].

Existing solar panels require additional instruments to convert direct current (DC) power to alternating current (AC) electricity. Inventive Research duplicated this sinusoidal voltage by mechanically turning off and on alternating banks of solar cells. They worked on this technique for many years. It's known as the AC Solar Generator. It's so straightforward and practical that you'll be surprised it hasn't been done earlier, but it hasn't.

The method employed to do this is simple, but its application is brilliant. Half of the cells are connected in one circuit and the other half in another. A spinning disc powered by a DC electric motor is mounted above the solar cells. The DC motor is powered by four tiny DC solar cells positioned in the base's corners. The disc has apertures carved into it that allow light to flow through to all of the solar cells beneath it. As the disc rotates, each bank of solar cells is sequentially exposed to light and produces power. The voltage cancels and falls to zero when the portal is halfway between the two cells.

Other benefits include:

1. Produces free energy from the sun.
2. Nonpolluting energy decreases emissions: Has no direct environmental impact.
3. It is readily expandable.
4. Grid Tie systems let you to resell excess power to the utility.

5. Can be placed and operated anywhere, including difficult-to-reach regions and distant sites.
6. Aids in weaning us off of foreign oil.
7. PV cells produce no noise and emit no exhaust [1].

This is genuinely game-changing technology. If you envisage photovoltaic solar power centers distributed around the country supplying additional power for the grid, the AC solar generator has the potential to drastically reduce the need of fossil fuels [4].

The goal of the work given here is to lower the cost of solar power generation by removing the inverter, converter, and other components. We are utilizing this technology to generate AC power straight from the photovoltaic cell without the use of an inverter. The spinning disc is positioned above the solar cells and is turned by a direct current motor. The DC motor is powered by the battery. The disc has apertures carved into it that allow light to flow through to all of the solar cells beneath it. As the disc rotates, each bank of solar cells is alternately exposed to light and produces power. The voltage cancels and falls to zero when the portal is halfway between the two cells. The resultant voltage is sinusoidal or alternating current (AC). It may even be set up to generate three phases of alternating current.

The prototype is simply intended to demonstrate the concept in action and is not the most efficient method the technology might be used. With the correct manufacturing technique, solar cells in the shape of a pie wedge might be created. They may produce electricity from the full area under the revolving disc when organized in a circle adjacent to each other, rather than simply a fraction of the area as shown in the prototype. The ideal size might be similar to that of a compact disc. As illustrated in the photos, these tiny modules might be connected to make a whole solar panel.

This is genuinely game-changing technology. The utilization of solar energy to generate electricity has the potential to drastically reduce the consumption of fossil fuels. Existing technology necessitates the conversion of solar energy from direct current (DC) to alternating current (AC) before it is compatible with the Nation's Power Grid. By directly creating alternating current rather than depending on extra equipment, the AC Solar Generator aims to accomplish the same effect at a cheaper cost and with less energy loss. The demonstration gadget is

made up of solar cells organized in a circular pattern and put on a base. A rotating disc with slots above the solar cells adjusts each cell's exposure to light and darkness. The resultant voltage is alternating current (AC), which may be converted to three-phase electricity useable with the national power system. We may transform sunlight into energy in a variety of methods, including utilizing solar cells or concentrated solar power (CSP), which uses magnified sunlight to boil water, which can then be used to generate electricity. We are utilizing these solar cells in our project in such a manner that they can immediately create AC [3].

NEED OF SOLAR AC GENERATOR WITHOUT INVERTER

As the earth's global climate changes, the demand and need for clean and renewable energy becomes increasingly pressing. Coal-fired electrical generation accounts for more than half of all carbon dioxide emissions into the atmosphere each year. Coal and other fossil fuels will ultimately run out as well. Hydroelectric power generation of energy is limited to areas with a sufficient water supply. The disadvantage of using nuclear energy to generate electricity is that it generates radioactive waste [5].

Solar energy, or sunshine, is one kind of clean renewable energy. Solar energy is a continuous source of clean energy that can shine on all sections of the planet's surface. A photovoltaic cell converts solar energy or sunshine into electricity. A solar cell is a photovoltaic cell that collects and transforms sunlight into energy. A solar cell is constructed of a semiconducting material (a semiconductor) such as silicon that absorbs sunlight and creates an electrical current that flows through the solar cell. Because of semiconductor qualities, the positive and negative terminals of a solar cell remain static, and electron transport from a solar cell is unidirectional (i.e. the electricity can only flow in one direction). As a result, the solar cell, like other photovoltaic cells, generates solely direct current (DC) power. The difficulty with direct current power is that it is difficult to transfer any significant distance, limiting its application. As a result, direct current electricity is less useful than alternating current power. Furthermore, the majority of electrical gadgets use alternating current (AC) power [5].

Existing solar panels require additional equipment to be converted from direct current (DC) power to alternating current (AC). The AC solar Generator achieves

the same effect at a cheaper cost and with even less energy waste by creating alternating current straight from sun cells rather than utilising additional circuitry. The prototype device used to demonstrate this technique contains an array of solar cells organised in a circular, a base, and a disc on top with perforations that govern each cell's exposure to sunlight and darkness. This AC is accomplished by adjusting the disc and, eventually, the shaded and exposed portions of the solar cells. As a result, we may refer to it as a Smart Solar AC Generator without an inverter.

CIRCUIT DISCRIPTION

Panel Arrangement

A base supports the numerous components of the solar cell a/c energy generator. The foundation can be made of wood, plastic, or any other acceptable material that is preferably, but not necessary, non-conductive. A disc and a number of photovoltaic or solar cells comprise an alternating current power producing section of the base [4].

The solar cells are placed in a usually circular array on an upper surface of the base, as best shown in Figure 1. It should be noted that arrays other than circular can be employed in accordance with the current rules. It should also be noted that, while the solar cells are depicted as rectangles, their size and form might vary, such as truncated conical, triangular, polygonal, or square [4].

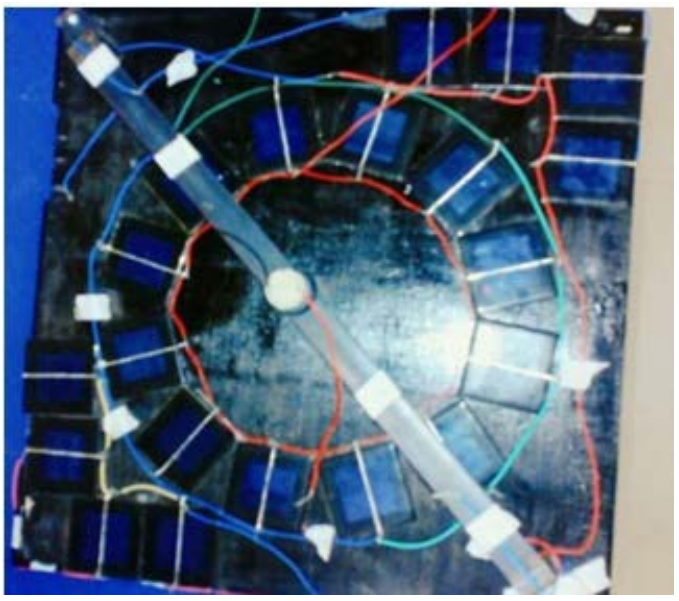

Figure 1 Panel Arrangement

Disc Arrangement

As shown in Figure 2, the disc has a typically flat body formed of a sunlight-blocking material that is about the circumference of the solar cell array in order to extend over the solar cell array while in operation. The disc should also be composed of a lightweight material that resists or is not vulnerable to warping. It should be noted that the disc can be partially or completely reflective if desired.

The disc features a number of cuts, apertures, or windows. The cutouts are normally the same size and shape as the solar cells, and are specifically made and formed to allow entire exposure of a solar cell to sunlight when the cutout is positioned over the solar cell. Cutouts are placed and spaced on the disc to define a number of covers, coverings, or blocks. When the covering is over the solar cell, it is sized and formed to totally cover or block it [4].

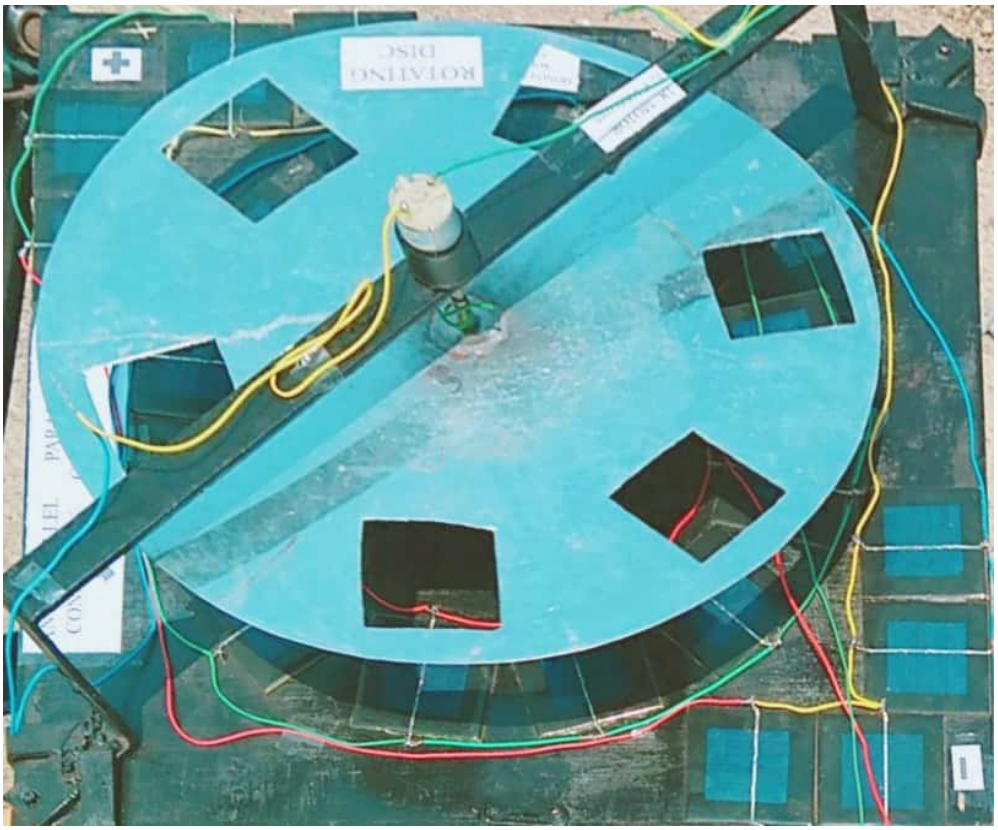

Figure 2 Disc Arrangement

Solar Panel Arrangement

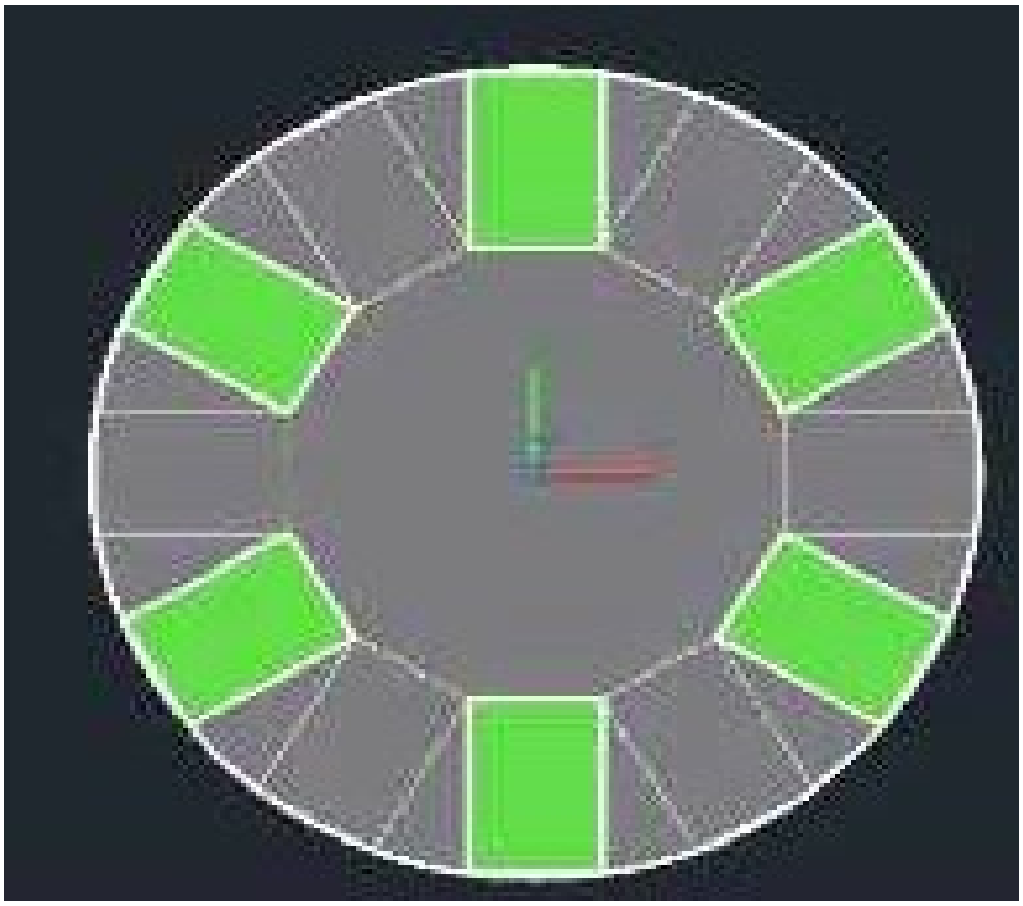

Figure.3 Arrangement of Solar Panel

The relationships are classified as either positive or negative. The cells are organised so that alternating cells form a positive group and alternate cells form a negative group. See Figure 3

For example, if cells 1, 3, 5, and 6 forms a positive group, then cells 2, 4, and 6 form a negative group. Figure 3 shows that red represents good groupings and black represents negative groups. Cells are joined in sequence horizontally.

The first row's cells are linked in parallel with the second row's cells. This creates a good group. The negative group is formed by connecting cells from the third and fourth rows in parallel. The number of cells may be expanded to meet the needs. Now, the two produced groups, positive and negative, are joined in series opposition, bringing the voltage to zero and producing the needed sinusoidal alternating output [4]. Figure 4 depicts an anti parallel connection.

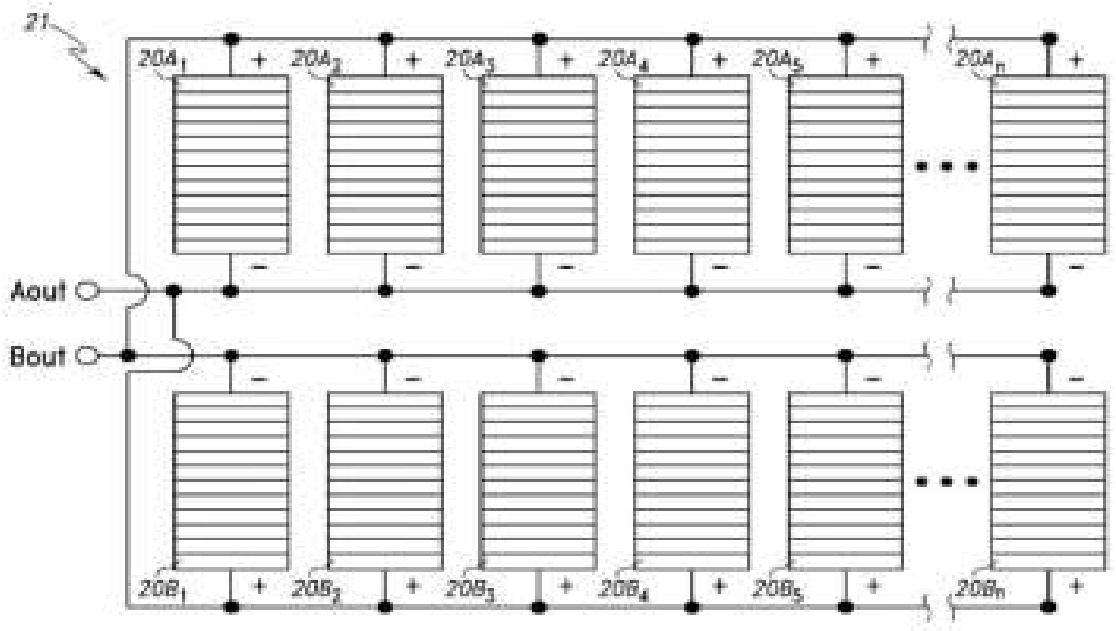

Figure 4 Antiparallel connection

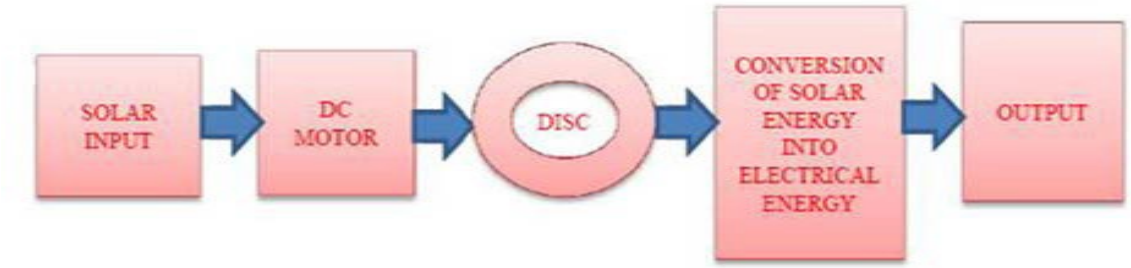

Figure 5 Block Diagram of project

WORKING

We may transform sunlight into energy in a variety of methods, including utilising solar cells or concentrated solar power (CSP), which uses magnified sunlight to boil water, which can then be used to generate electricity. We are employing these solar cells in our project in such a manner that they can immediately create AC [5].

So we no longer need those pricey inverters since we can create AC current straight from solar cells. By manipulating the mechanism, we can also control the frequency of the sine wave. The nice part about this method is that it can generate a sine wave that is superior to what we receive from an AC converter or inverter.

They may produce electricity from the full area under the revolving disc when organized in a circle adjacent to each

other, rather than simply a fraction of the area as shown in the prototype. The ideal size might be similar to that of a compact disc. These little components might be linked together to make a complete solar panel. This is genuinely game-changing technology. The utilization of solar energy to generate electricity has the potential to drastically reduce the consumption of fossil fuels. Existing technology necessitates the conversion of solar energy from direct current (DC) to alternating current (AC) before it is compatible with the Nation's Power Grid. By directly creating alternating current rather than depending on extra equipment, the AC Solar Generator aims to accomplish the same effect at a cheaper cost and with less energy loss. The demonstration gadget is made up of solar cells organized in a circular pattern and put on a base. A rotating disc with slots above the solar cells adjusts each cell's exposure to light and darkness. The resultant voltage is alternating current (AC) [5].

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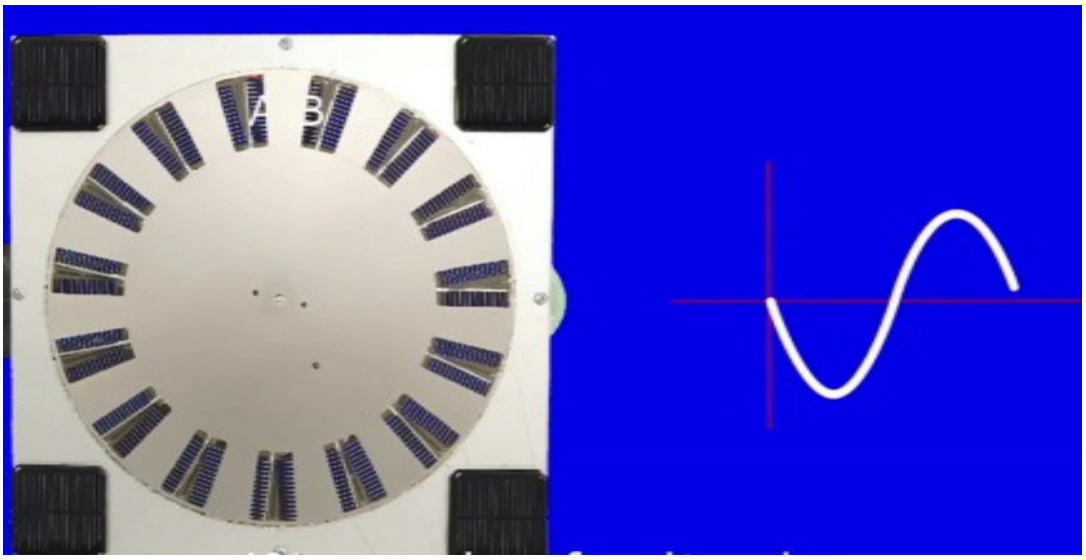

Figure 6 AC generated from solar AC solar generator

Existing technology necessitates the conversion of solar energy from direct current (DC) to alternating current (AC) before it is compatible with the Nation's Power Grid. By directly creating alternating current rather than depending on extra equipment, the AC Solar Generator aims to accomplish the same effect at a cheaper cost and with less energy loss.

The demonstration gadget is made up of solar cells organized in a circular pattern and put on a base. A rotating disc with slots above the solar cells adjusts each cell's exposure to light and darkness. The resultant voltage is alternating current (AC) [5].

To better grasp the notion of AC waveform production, the system is separated into four modes of operation. PV cell A in Figure 6 generates positive voltage, whereas PV cell B generates negative voltage. It may be determined using millimetres and the connections of all pairs made accordingly

In the first mode, all of cell A is exposed to light, whereas all of cell B is darkened. As a result, cell A creates the most positive voltage while cell B generates the least negative voltage. As a result, the output voltage is the maximum positive voltage [5].

In the second mode, the left side half of cell A is exposed to light, while the right side half of cell B is exposed to light. As a result, cell A creates 50% positive voltage while cell B generates 50% negative voltage. As a result, the output voltage is zero.

In the third mode, all of cell A is darkened and all of cell B is exposed to light. As a result, cell B generates the most negative voltage while cell A generates the least positive voltage. As a result, the output voltage is the maximum negative voltage In the four mode, the right side half of cell A is exposed to light, while the left side half of cell B is exposed to light. As a result, cell A creates 50% positive voltage while cell B generates 50% negative voltage. As a result, the output voltage is zero.

Cells A and B became exposed and shaded as the segmented disc rotated. As a result, the output voltages steadily rise and fall. This approach yields an AC waveform. The frequency of the output voltage is determined by the number of PV cell pairs and the number of disc segments [5].

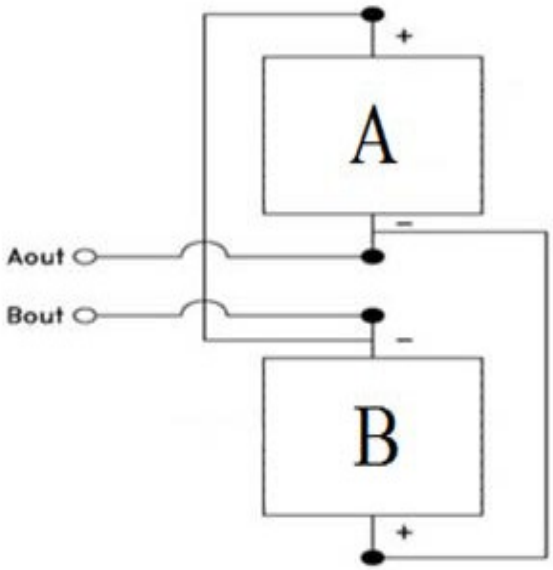

Figure 7 Anti-parallel connection of two solar cell

Figure 7 shows two PV cells with identical ratings. A number of pairs are joined in an array to directly create AC electricity from solar energy. The solar cell array is arranged in a circular pattern. The disc is rotated by a tiny DC motor located in the centre of the circular array. The revolving disc contained a portion that exposed and shaded the PV cell from light.

If we use an even number of pairs, we cannot arrange PV cells A and B in front of each other; instead, they must be close to each other. If we use an odd number of pairs, we may position PV cells A and B in front of each other. It is important to trim the disc in order to properly align the PV cells A and B.

To better grasp the notion of AC waveform production, the system is separated into four modes of operation. PV cell A in Figure 7 generates positive voltage, whereas PV cell B generates negative voltage. It may be determined with a multimeter, and all pairs should be connected in accordance with it.

In the first mode, all of cell A is exposed to light, whereas all of cell B is darkened. As a result, cell A has the highest positive voltage while cell B has the lowest negative voltage. As a result, the output voltage is the highest positive value.

In the second mode, the left side half of cell A is exposed to light, while the right side half of cell B is exposed to light. As a result, cell A creates 50% positive voltage

while cell B generates 50% negative voltage. As a result, the output voltage is zero.

In the third mode, all of cell A is darkened and all of cell B is exposed to light. As a result, cell B generates the most negative voltage while cell A generates the least positive voltage. As a result, the output voltage is the maximum negative voltage.

In the four mode, the right side half of cell A is exposed to light, while the left side half of cell B is exposed to light. As a result, cell A creates 50% positive voltage while cell B generates 50% negative voltage. As a result, the output voltage is zero.

Cells A and B became exposed and shaded as the segmented disc rotated. As a result, the output voltage progressively rises and falls. This approach yields an AC waveform. The frequency of the output voltage is determined by the number of PV cell pairs and the number of disc segments [7].

RESULT AND DISCUSSION

Proper ac waveform

Mechanically exposing and covering the photovoltaic cell pairs one at a time, alternating between exposing and covering the two anti-parallel solar cells. It produces a sinusoidal alternating current waveform. The sine wave that results is periodic. The frequency of the sine wave is determined by the pace of exposing and shading.

Output

A single ac solar generator produces the following output. The peak voltage and frequency of the resultant Sinusoidal wave shape are indicated in the table below.

TABLE: I Analysis of ac solar power generated

Peak-to-peak voltage	7 V
Peak voltage	3.5V
RMS voltage	2.47V
Frequency	40Hz

Solar energy is becoming increasingly important as energy demand rises, and we want clean, free energy. Because fossil fuels are scarce and most of them are harmful to the environment, solar is the greatest answer to our energy crisis. There are several methods for utilizing solar energy, but the best and most simply adopted at any location is to create power using solar cells. However, because solar cells generate DC electricity, we must first convert it to AC using an inverter. Inverters increase the cost of the

arrangement while decreasing its efficiency. To address this issue, a mechanical arrangement is utilized that directly generates AC from the solar cell array, which is less costly and has about the same efficiency as an inverter.

However, it has its own constraints, such as the need for tiny solar cells and the usage of an appropriate sheet as the base and spinning disc. Its efficiency is fairly poor, however it will improve when a tracking system is utilized. We will also make an effort to decrease weight and frictional losses.

It is a novel approach, and with some tweaks, we can improve it so that it may be used in the home. For example, if we utilize little solar cells with more power, it will become extremely effective. Also, solar tracking will boost its output since it will collect sunlight entirely rather than at an angle that will generate its own shadow. We may compare the efficiency of our system to that of existing systems.

ADVANTAGES AND DISADVANTAGES

Advantages

1. **There is no need for an inverter**.
   Inverters are necessary in traditional solar power generation to convert the generated DC power from solar panels to AC power, however this project does not require them because AC power may be created.

2. **Reduction in inverter costs**
   Because an inverter is not required, the expensive cost of an inverter is lowered, and the number of solar cells may be increased to enhance generating capacity.

3. **Efficiency is more important**
   The switching losses caused by the inverter in a conventional plant are decreased in this situation, increasing the project's efficiency.

4. **Enhanced dependability and adaptability**
   The reduced usage of inverters allows for the use of additional solar cells to boost the project's power generating capacity, enhancing the project's flexibility and dependability.

Disadvantages

1. **Essential maintenance**
   During peak hours of power generation, the DC motor used to rotate the disc must be maintained in order to function without interruption.

2. **Excessive size and excessive price**
   This sort of generation with a limited capacity has a high cost, but as the capacity of power production increases, the cost of the project decreases and since the scale of this project is huge, it may be decreased via study.

CONCLUSION

Solar energy is becoming increasingly important as energy demand rises. The issue with solar cells is that they generate DC power, which must first be converted to AC using an inverter. Inverters increase the cost of the arrangement while decreasing its efficiency. To address this issue, a mechanical arrangement is utilised that directly generates AC from the solar cell array, which is less costly and has about the same efficiency as an inverter. However, it has its own constraints, such as the need for tiny solar cells and the usage of an appropriate sheet as the base and spinning disc. Its efficiency is fairly poor; however it will improve when a tracking system is utilized. We also attempted to decrease weight and frictional losses. It is a novel approach, and with some tweaks, we can improve it so that it may be used in the home. For example, if we utilize little solar cells with more power, it will become extremely effective. Also, solar tracking will boost its output since it will collect sunlight entirely rather than at an angle that will generate its own shadow. We may compare the efficiency of our system to that of existing systems.

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