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FLOATING SOLAR PANEL WITH SUN POSITION TRACKER

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Abstract

The Noticeable rise in the electricity demand, fast depletion of fossil fuels, and environmental concerns throughout the world has led to the requirement of commissioning Solar PV plants on a large scale. Solar photovoltaic (PV) installation has the burden of intense land requirements, which will always be a premium commodity. To conserve the valuable land & water, installing a Solar PV system on water bodies like oceans, lakes, lagoons, reservoirs, irrigation ponds, wastewater treatment plants, wineries, fish farms, dams, and canals can be an attractive option. Floating type solar photovoltaic panels have numerous advantages overland installed solar panels, including fewer obstacles to block sunlight, convenience, energy efficiency, and higher power generation efficiency due to the lower temperature underneath the panels. Additionally, the aquatic environment profits from the solar installation because the shading of the plant prevents excessive water evaporation, limits algae growth, and potentially improves water quality.

Index Terms **:** Solar photovoltaic,Floating type,energy efficiency,evaporation,depletion,fossil fuels

I.INTRODUCTION

Throughout the long term the exercises of the sun-based energy have being advantageous humankind. It is obvious that the sun-oriented energy is the most plentiful wellspring of energy on the planet despite the fact that it isn't the finished solution to the present energy emergency Sun powered energy, brilliant light and warmth from the sun have promptly been outfit by people since directly from the hour of old utilizing a scope of developing advances. The expense of sun-oriented boards has been continually diminishing which energizes its utilization in different areas. Subsequently sun-based force is the fate of inexhaustible force age. The issue with sun powered boards is that they go through a great deal of room on housetops or open regions and are hard to mount, keep up and clean routinely. Moreover, the sun-oriented boards are moved according to sun position can create up to 40% more sun-based force. We thus propose another sort of sun-based boards that can be mounted on water bodies like lake pools so they don't consume any land space Additionally, we present a creative sun tracker and board development framework utilizing Arduino UNO microcontroller and LDR to move the sunlight-based boards according to sun position and produce more force.

Figure.1 Floating Solar PV

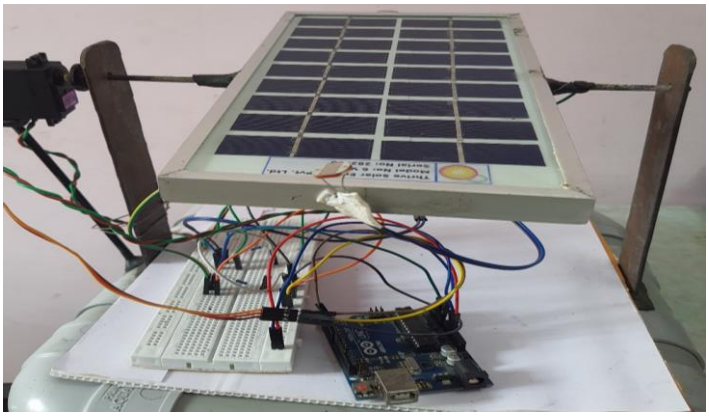

Figure.2 Floating Solar PV

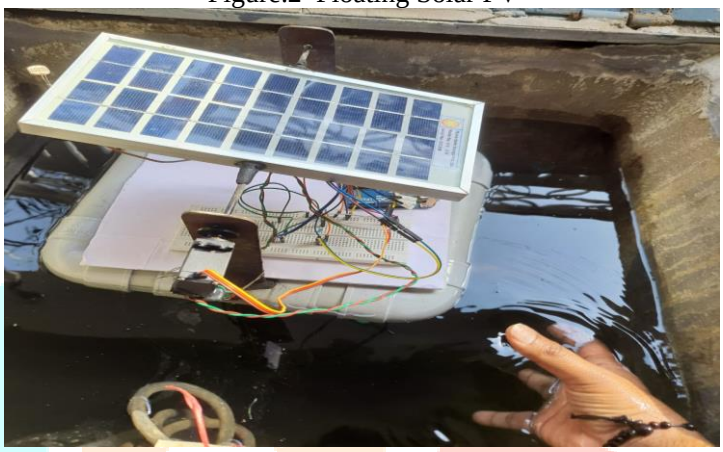

Figure.3 Floating Solar PV

When heat is the source of every creation, Sun produces the biggest ever energy in this solar system to produce and transcend life from one organism to the other. In this response, the project called "Automatic Solar Tracking System" serves the purpose of utilizing the maximum amount of energy taken from the Sun and to convert such energy into some other production. The basic endeavour is crooned to scoop out from this project in making this system an economically convenient subject, accessibility of which is easy and functioning of which is optimum in the end. In the wake of technological advancement when the pace of time is at its best to pass by, this system is a time worthy production, produced to create the best of its kind. In a stretch, it could be signified that this project which is an extension of solar energy, is a renewable source of energy, never-ending phenomena. It's only 10 to 20 per cent of the solar cells that are being used commercially out of which the best potential of the cells gets reflected and therefore scope for better use of the solar cells exist. In the world of pollution, this system is an eco-friendly alternative, hence a valuable asset. When the ocean of pollution is encumbering every corner of life, this system would be able to create ripples of hope in the midst of this bustling civilization. The survivability of this system lies upon its work ability. In the trend of comparison with other mind-boggling systems, it could be a trailblazer.

1.1 Floating Solar PV

The total installed electricity generation capacity of the country has reached over 366 GW3 Out of which renewable energy share (RE) is 23.60% (84.4GW4) and with recent cabinet approval of the addition of large hydro power plants (45 GW) as an RE source, the current share of RE in the total installation will become 35.18%. India has done a remarkable job in terms of deployment of RE-based installation, growing almost 3.55 folds in the last 5-6 years, most of which have occurred in the onshore wind (37.27 GW) and solar PV (32.53 GW) sector. The majority of this growth in solar has been triggered by the launch of Jawaharlal Nehru National Solar Mission (JNNSM) on January 11, 2010. The target set under the mission was to achieve 20 GW of grid-connected solar power by the year 2022, which was later revised in the year 2015. The new targets under the mission are to achieve 175 GW RE capacities of which 100 GW is from solar by 2022. Out of this, 40 GW of the target is for installation of solar rooftop and 60 GW is for large-scale solar plants. To achieve its targets the Government of India has also taken various innovative policy measures such as viability gap funding (VGF), development of solar parks, and solar renewable purchase obligation (RPO), etc.

Figure.4 Floating Solar panel

II.METHODOLOGY

Solar power is the future of renewable power generation. The problem with solar panels is that they use up a lot of space on rooftops or open areas and are difficult to mount, maintain and clean regularly. Additionally, the solar panels is moved as per sun position can generate up to 40% more solar power.We here by propose a new kind of solar panels that can be mounted on water bodies like lake pools so that they don't occupy any land space. Additionally, we introduce an innovative sun tracker and panel movement system using hydraulic mechanism to move the solar panels as per sun position and generate more power.

2.1 Components

1. Solar Panel
2. LDR sensors
3. Standard 12V wire
4. Piping arrangement for Water Floats
5. Arduino UNO
6. Bread board
7. Servo motor
8. Resistors
9. Jumper wires
10. Base Frame with Supporting frames
11. Source Code/Program
12. Circuit diagram
13. Support Rods

The project called "Automatic Solar Tracking System" is produced through installation of the various nitty-gritty such as solar panel which provides 12 volts as output, an Arduino UNO as MCU, a motor driver with IC L293D, two LDR sensor module, a 10 r.p.m. Servo motor, a current sensor and a 9 V battery. Construction of the said project is being built out of the wooden base installed at the ground of it, affixed with the iron rods on both the sides in a cross-shaped manner connected with a hollow cylindrical rod from both the sides and the DC motor is clinging at one edge of the hollow rod. Three-fold sections into which the circuit of the solar tracking system is divided. The input stage has two LDR module that is so arranged to form a voltage divider circuit, the microcontroller is programmed through the software named Arduino ide being decked up in the system and lastly the driving circuit that has the DC motor helps in rotating the solar panel. The motor driver is embraced with three terminals- two for motor input/ output respectively and the third one for power input. The terminal for motor input is connected to 2 of the 14digital input/output pins of Arduino UNO and subsequently, the motor output terminal is connected to the DC motor. The two LDR sensor modules are annexed to the scaffolding with Node Mcu analogue inputs. The light dependent resistors are then affixed along the length, on either side of the solar panel.

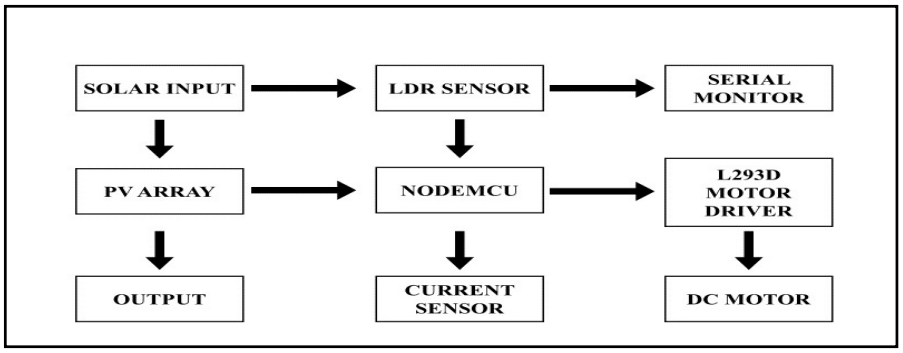

Figure 5.Block Diagram of Automatic Solar Tracking System

The mechanism is accountable to furnish with accurate movements, in the sake of following the footsteps of the sun throughout the day. The prototype of the device is made durable enough to withstand unfavourable weather condition. This mechanism of the solar tracking systems classifies themselves into two segments single axis tracker, dual axis tracker.Single axis tracking can be considered as one of the handy systems or prime solution in terms of small-scale photovoltaic power plants. Single axis tracking can be done using three different arrangements, which are based on the different axes of tracking-Single axis tracker tracks in a single cardinal direction. The tracker has a single row tracking configuration. The above maintained methods are the different arrangements in which single axis tracker can be implemented. The working mechanism of all the maintained methods is at par with each other. The angle of the sun with the surface of the collector is computed and examined, the collectors are thus charged to track down the movement of the sun to meet the expectations of captivating a greater percentage of solar radiance.

2.2 Solar Tracker

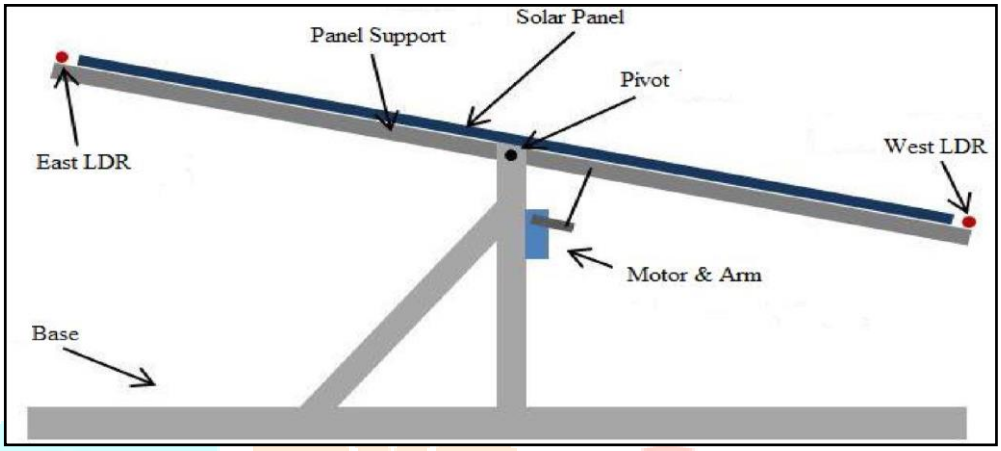

Figure.6 Single Axis Tracker

This creates a substantial diminution in the expenses and the preservation of the collectors. The knowledge of the movement of the sun throughout a season and different hours of the year is essential to enable maximum captivation of solar energy. The Sun chart for Hyderabad is shown below Through the use of the chart, it is possible to ascertain the position of the sun at different times and seasons so that the panel can be fixed for maximum output.

III.RESULTS AND DISCUSSION

Figure.7 Prototype of floating solar panel with sun position tracker

The results for the project were gotten from LDRs for the solar tracking system and the panel that has a fixed position. The results were recorded for four days, recorded and tabulated. The outputs of the LDRs were dependent on the light intensity falling on their surfaces. Arduino has a serial that communicates on digital pins 0 and 1 as well as with the computer through

a USB. If these functions are thus used, pins 0 and 1 can be used for digital input or output. Arduino environment's built in serial monitor can be used to communicate with the To collect the results,code was written that made it possible to collect data from the LDRs after every one hour.

Table.1 Photovoltaic array outputs for bright sunny day

Time (Hrs)	PV Array Output (V)
0600	08.25
0700	08.95
0800	09.52
0900	09.89
1000	10.33
1100	10.76
1200	11.00
1300	10.82
1400	10.56
1500	10.32
1600	10.08
1700	09.26
1800	08.34

The values from the two LDRs are to be read and recorded at the given intervals. The LDRs measure the intensity of light and therefore they are a valid indication of the power that gets to the surface of the solar panel. The light intensity is directly proportional to the power output of the solar panel.

Table 2. LDR Outputs for cloudy day

Time (Hrs)	LDR1(V)	LDR2 (V)
0630	0.277	0.276
0730	0.504	0.509
0830	1.757	1.933
0930	1.631	1.783
1030	1.900	1.798
1130	2.910	2.969
1230	1.990	1.990
1330	1.985	1.990
1430	0.976	0.985
1530	0.941	0.892
1730	0.128	0.981

Table 3.LDR outputs for bright sunny day

Time (Hrs)	LDR1 (V)	LDR2 (V)
0630	1.477	1.487
0730	2.804	2.839
0830	3.203	3.990
0930	3.990	3.990
1030	4.130	4.149
1130	4.500	4.590
1230	4.990	4.990
1330	4.888	4.990
1430	4.976	4.985
1530	4.941	4.892
1630	4.873	4.790
1730	3.964	3.940
1830	2.708	2.815

If you are getting 5 hours of direct sunlight per day in a sunny state like California you can calculate your solar panel output this way: 5 hours x 290 watts (an example wattage of a premium solar panel) = 1,450 watts-hours**,** or roughly 1.5 kilowatt-hours (kWh). Thus, the output for each solar panel in your array would produce around 500-550 kWh of energy per year.In the example above, the solar panel is producing 1.5 kWh per day, which ends up being about 45 kWh per month. That's enough energy to power some small appliances without too much issue, but if you want to cover the energy used by your property's climate control systems or large cooking appliances, you'll need more solar panels. Check out our article on to better understand how much solar energy your unique property needs.

Solar Panel Output Per Day

It is usually measured in kilowatt-hours (kWh). To estimate the potential electricity that your solar panels would generate per day, you can use the following formula:

Size of one solar panel (in square meters) x 1,000
That figure x Efficiency of one solar panel (percentage as a decimal)
That figure x Number of sun hours in your area each day
That figure was divide by 1,000

Color	CCT Range		Base Order Codes Min. Luminous Flux (lm) @ 1050 mA			Calculated Minimum Luminous Flux (lm) @ 85 °C**			Order Code
	Min.	Max.	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	1500 mA	2000 mA	3000 mA	
Cool White	5000 K	8300 K	V5	460	523	620	776	1034	XPLAWT-00-0000-0000V5051
			V4	440	500	593	742	989	XPLAWT-00-0000-0000V4051
			V3	420	478	566	708	944	XPLAWT-00-0000-0000V3051
Neutral White	3700 K	5000 K	V4	440	500	593	741	989	XPLAWT-00-0000-000LV40E5
			V3	420	478	566	708	944	XPLAWT-00-0000-000LV30E5
			V2	400	455	539	675	899	XPLAWT-00-0000-000LV20E5
			U6	380	432	512	641	854	XPLAWT-00-0000-000LU60E5
Warm White	2700 K	3500 K	U6	380	432	512	641	854	XPLAWT-00-0000-000LU60E7
			U5	360	409	485	607	809	XPLAWT-00-0000-000LU50E7
			U4	340	387	458	573	764	XPLAWT-00-0000-000LU40E7

Figure.8 Order Code Values with Luminous Flux Values

Solar Panel Output Per Square Meter
The most common domestic solar panel system is 3 kW. And it has 16 panels, each of which is about 1.6 square meters (m^2) in size. They are rated to generate approximately 265 watts (W) of power (in ideal conditions).To calculate the output per square meter, you can use the following formula:

Number of panels x Capacity of the solar panel system
Capacity ÷ Total size of a system (number of panels x size of one panel)

IV.CONCLUSION

Energy is the primary foundation upon which the entire society is founded in today's world of unbridled output. As it is said that energy cannot be generated or destroyed, this might be interpreted to mean that it can be stored in some way. This effort has attempted to untangle the road of such objectivity in order to make such a purpose substantiated. It is very normal that continual usage of energies leads to shortage in terms of earthly resources. Sun spiked above the tallest source in the stand For age, starting from the beginning of the cosmos, through which life was conceived, is the fundamental and mother source of all energy. The proposal has been unravelled by considering the basic principles of storing such energy. Other than from the Sun, energies have been created by the burning of various materials, resulting in the production of a vast quantity of pollutants, leading the environment and the atmosphere to deteriorate day by day. Every day is a fresh task of hatching something new and distinct, which causes an energy to be the fundamental source of all the hard work that exists. In this light, it would be more appropriate to expose that commercialization has spread its wings to such a degree in desire of money and power that we are now in a pool of severe ignorance of the world's resources. Scarcity, as a result of which the entire globe suffers.

V.FUTURE SCOPE

In a decade, solar energy has gone a long way. In 2010, the worldwide market was limited and heavily reliant on government subsidies in countries like as Germany and Italy. This year, more than 115 gigatonnes (GW) of solar will be deployed worldwide, which is more than all other generating methods combined. It is also becoming increasingly affordable, particularly in sunny locations where it has already become the least expensive source of new power generation. In the next years, technological advancements will ensure that solar becomes even more affordable. Solar might become the most important source of energy for power production in a vast area of the planet by 2030. This will have a favourable effect as well With relation to the environment and climate change

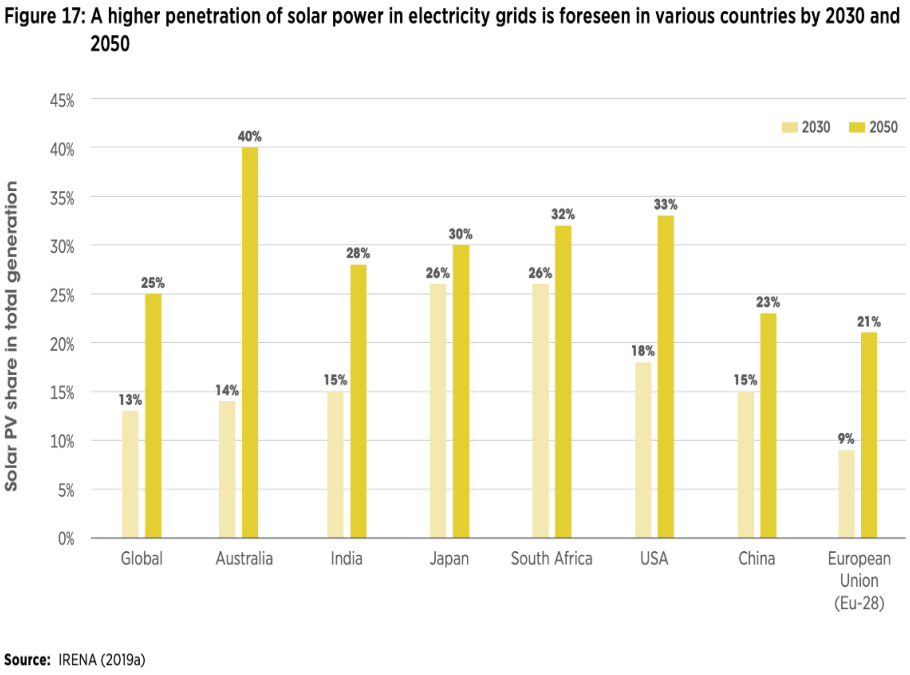

Figure 8 . solar power grids is foreseen in various countries by 2030

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