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Implementation of Efficient Liquid Solar Array System Using GSM and Launchpad

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Abstract: Power crisis problem is one of the biggest challenge in-front of country. Increasing demand of fossil fuels and its constant depletion is the major concern that shifts our focus to use renewable energy sources which are sustainable to environment and mainly unlimited source of energy. Out of the some renewable energy sources solar energy is excellent alternative to use as it is not area specific. Besides its all advantages land acquisition is the major problem associated with solar power plant installed on land which is solve by liquid solar array concept. Most of solar project of government is in hot and dry region or higher radiation region which affects the efficiency of solar panel. Due to this innovative concept to set up liquid solar array on water bodies which prevents evaporation of water and growth of algae. Automatically cleaning of panel is done which increases panel efficiency and reduces manpower effort associated with cleaning it. Additionally Fresnel lens is used to concentrate sunlight on panel and monitoring is done by GSM and controller used here is Launchpad. Launchpad is also known as Msp430.

Keywords- *liquid solar array, GSM, launchpad, Fresnel lens,Msp430.*

I. INTRODUCTION

One of the biggest problem in our country is power crisis.65% of energy is generated with the help of coal, so percentage of coal consumption of industry is 70 percent out of total coal. Load shedding, daily shutdown affects the irrigation and industry production. So it is high time to explore renewable energy sources [1].

Now a day's renewable energy sources are growing not just in India but all over the world. Solar energy is most abundant and promising alternative of energy as it is not area specific & mainly it is clean and efficient source. Solar energy is used to reduce green house gases so thus decrease green house effect [1].

Taking consideration of India which have good sunshine and seventh largest in the world by area wise. Solar energy is excellent solution to power crisis problem but problem associated with land mounted solar system is the requirement of land which is scarcely available and costly to get it. So we are moving towards eco-friendly Liquid solar array concept as India is gift with large number of water bodies. A canal faces dying in summer due to which irrigation have affected there by agriculture production. With this Liquid Solar Array technology 70% of the evaporation could be prevented. It is emerging form of photovoltaic Systems that float on water of canals, lakes, ponds. LSA, Liquid Solar Array is a PV concentrator which uses extremely light in weight plastic concentrators which float on water bodies, mounted on anchored rafts. It not only reduces the evaporation of water but also helps aquatic life to get sustained in water. Battery condition is also checked via GSM message is send to monitor the system. According to difference in voltages motor is rotated .

II. RELATED WORK

The first solar project on water was 'Aichi project'. It was done by a group of researchers the National Institute of Advanced Science and Technology in Japan. They gave concept of floating Photovoltaic systems and analysis of the effect of module temperature on the Photovoltaic systems performance [2].

Young-Kwan Choi has compared and analyzed the generation efficiency of floating and land photovoltaic system. Floating PV has shown greater generation efficiency by over 10% compared with the general PV systems installed over land [4].

The new era in solar power i.e. floating solar power plants will solve power crisis issue, can be installed in any water bodies which will reduce land occupation will raises the amount of generation with the cooling effect of water. Studies have given conclusion that if the rear surfaces of solar panels are kept cooler, then their ability to generate power goes up by 16% [2].

The design parameters of the floating solar should be calibrated and there is effect of panel shade on the ecosystem [1].

India's National Hydro Power Corporation (NHPC) builds a 50 MW solar photovoltaic project over the water bodies in the southern state of Kerala [5].
There are various types of Floating Solar PV(FSPV) and lots of benefits of deployment of Floating Solar PV (FSPV) [4].

All major limitations, and costs, may be considerably reduced by adopting a configuration, termed the "Liquid Solar Array" (LSA) where each element of a floating array comprises a raft supporting a solar tracking lens and partially-submerged water-cooled PV cell assembly [6].
An important feature of the LSA is that the lens can be submerged in windy conditions thereby reducing structural requirements comparison to PV (land-based) concentrator cell arrays [9].

III. OBJECTIVES

The Principal highlights are: (1)To improve efficiency and conductivity of panels; (2)To cool panel automatically, as it improves the efficiency;(3)To reduce the evaporation of water and To track sunlight with help of mirror assembly on panel;(4)To reduce the growth of algae and improve the water quality;(5)Nearby street light or irrigation system can be powered through the solar plant and monitor via GSM [7] .

IV. SYSTEM ARCHITECTURE

The system architecture includes LDR sensor to sense the light with the help of Msp430 G2452.with the help of LCD display we will get the sensor voltages as an output. Motor driver IC used in the system for a rotation. Inverter draws its DC energy from battery [8].

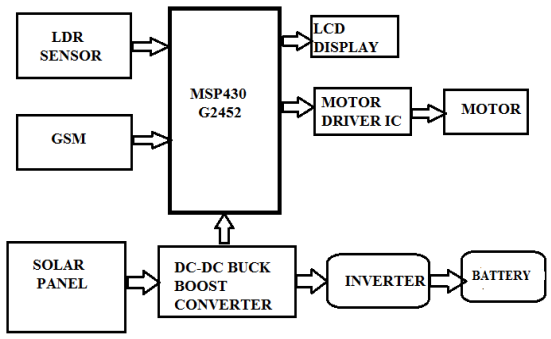

Figure1. Block diagram of liquid solar array system

V. SYSTEM DESIGN

Design of floating solar power systems are: (1)Liquid solar array System: In this system thin plastic focusing concentrator used to track the sun daily. Photovoltaic cells are fit in photovoltaic container that mounts near water to keep it cool and efficient. In bad weather lens is protected by rotating it to avoid damage in high winds[7]; (2)High Density Polyethylene floating platform: It is also used for mounting solar modules. It is easy to adapt any electrical configuration, installation & dismantle is also easy; (3)Novation's solar islands: It is the platform which is compatible with technologies having 17m-100m diameter but yet they are not in operation; (4)Smart floating farm: It is the combination of solar energy and poly-culture implemented on megacities or in dense populated area with physical water access; (5)Individual floating module: They can be mounted in very high wind region & they are self regulatory.

VI. CONSTRUCTION DETAILS:

In real time project main components are composed of following:1) Pontoon 2) Floats 3) Mooring system

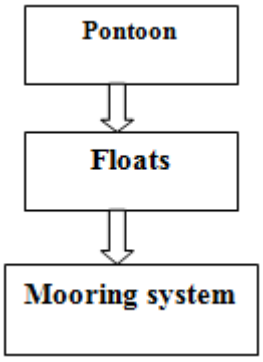

Figure 2. Construction details of system

It is floating device which is made up of polymer. It has efficiency to float on water with heavy load placed on it. It can be mounted according to requirement
The floats used generally are of glass fibre reinforced plastic or High density polyethylene floats. They are connected in series form.
It has big role in keeping the panels in definite position. It is done with nylon wire slings

VII. METHODOLOGY

Objective is to track the sunrays perpendicular to the modular surface. Azimuth and altitude of the sun is tracked in this process. It is highly efficient generation system. It produces major amount of power.
By study dual axis type tracking is 30% greater than fixe type sun tracking. In passive tilting Photovoltaic panels are fixed on rotating steel bars.

In passive tilting, location of panel changes in each month of the year. In passive tilting Photovoltaic panels are fixed on rotating steel bars. Passive tilting is done manually.
In automatic tilting type is designed to find and track solar altitude and azimuth angle It is done with help of programming logic.
MSP430 is connected to LDR which continuously track the sunlight on solar panel. Depending upon the sensor value it will move the panel and motor accordingly reverse or forward or stop with help of motor driven IC. With the help of photovoltaic effect it generates the electric current which fed to battery. With the help of GSM one can send message to observation section about battery level and motor conditions**.**

VII. FLOWCHART

This algorithm tells us the logic of tracking and motor rotation. It compares the light intensity. Let 'Vs' be sensor 1 voltage and 'Vn' be sensor 2 voltage respectively. If the difference between two sensor voltages is positive then motor will rotate in clockwise and if the difference is negative then motor will rotate in anticlockwise otherwise it will stop.

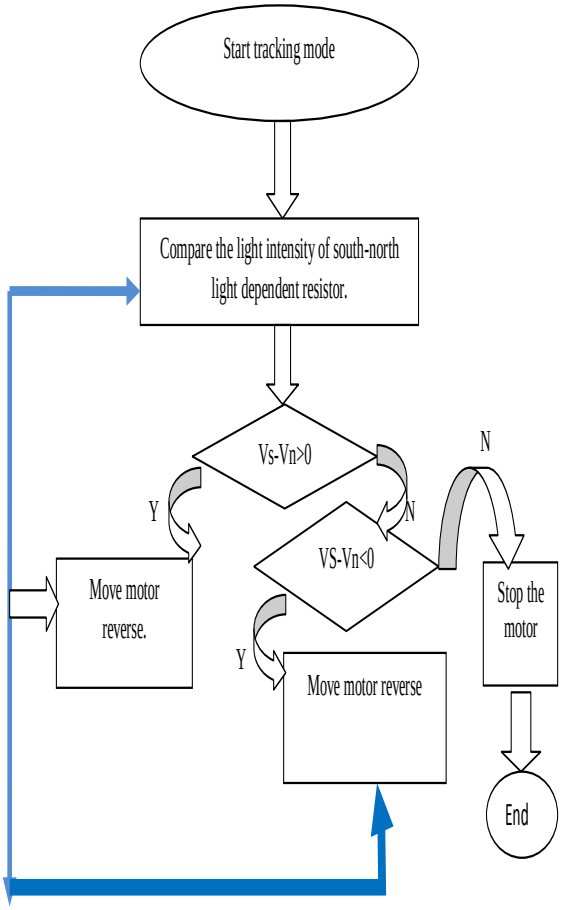

Figure 3.Flowchart of the presented system

IX. RESULT AND DISCUSSION

Values of sensor1 and sensor2 voltages are s1 and s2 respectively and difference of two and battery voltage B is shown on liquid crystal display by receiving the output through msp430. Threshold value we used in the system is in the range of +10 and -10. Otherwise panels will move simultaneously.

Figure 4.Controller of the system

Figure 5.Diagram of float

In above diagram polyvinyl chloride pipe used as casing and solar panel is fitted on top of that Light dependent sensors are used are fitted.

By installing solar panels, panels are naturally cooled. As panels are naturally cooled, it will improve power production. It decreases the algae production It is Cost competitive. It Reduces evaporation by up to 70%.It can also improve water quality. No tools or heavy equipment needed.
The voltages are display on liquid crystal display as Sensor1 as s1 and sensor2 as s2. Generation efficiency is increased by 16%.Poly-crystalline solar panels are used in the system. Poly-crystalline solar panels are bluer colour to track the sunlight.

X. CONCLUSION AND FUTURE SCOPE

The principle objective of this undertaking is to build a floating liquid solar array system and increase the efficiency and conductivity of panel. Irrigation systems can be powered through it. Water quality is increased by reducing the growth of algae. Reducing the manual labour cost by automatic cleaning.

The project should have been intended to be strong and reliable. Work should be done on reducing effect of solar shading. System should withstand high as well as low temperature Material used in floating structure should be non toxic and salt resistant, further more work should have done to increase lifetime of system.

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