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# Advantages of using Floating PV Solar Power Stations

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**Abstract:** ***The limited fossil fuel resources and higher energy demand concentrates on solar energy, which is free of cost and unlimited source of energy, eco-friendly and sustainable to the environment. But during the execution of the solar projects on land, problems are faced by the government and partners of the scheme such as land availability, land development & land acquisition, substation capacities, evacuation also timely clearances for the project on land and evacuation – these are hurdles for completion of the project. Most of the locations projected by the government considering solar radiation data in the country are hot and dry regions. Though at these locations the radiation appeared to be higher, the energy yield of these points is less due to heating of the solar panels and higher temperature of the surface of solar cells. To overcome these problems an innovative idea has come in front for installation of solar power plants on the water that is canal tops, water bodies, lakes, dam backwater and reservoirs, which generally belongs to the government. This paper reveals review regarding the advantage of using floating solar PV power plants.***

**Keywords:** Photovoltaic system, floating PV system

## 1. Introduction

Government of India has set up aggressive renewable energy (RE) capacity addition target of 175 GW by 2022. The Primary focus of Government is on the promotion and scaling up electricity genertation from the renewable energy.Photovolatic solar plant will be the one of the option for achiving this target through solar energy.But installation of solar plant required huge land and in india land is required for multiple purpose.As land is the one of the concern for installing the solar power plant, therefore alternate way to search such plant has been explored.Solar plant on water is on the solution for land.

### Concept of Floating PV System

A developed PV floating power generation results from the combination of PV plant technology and floating technology. This fusion is a new concept for technology development. As a new generation technology, it can replace the existing PV plants that are installed on top of woodland, farmland and buildings. The PV floating plant consists of a floating system, mooring system, PV system and underwater cables.

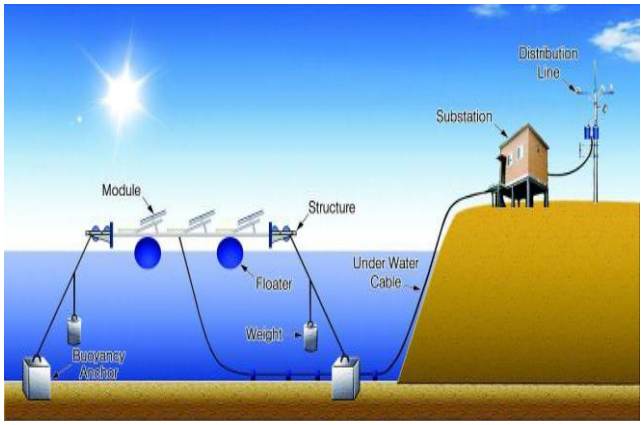



**Figure 1:** PV Floating Plants Outline

### PV Floating Plants Outline

a) Floating System: A floating body (Structure + Floater) that allows the installation of the PV module
b) Mooring System: Can adjust to water level fluctuations while maintaining its position in a southward direction
c) PV System: PV generation equipment, similar to electrical junction boxes, that are installed on top of the floating system
d) Underwater Cable: Transfers the generated power from land to the PV system

Floating PV celss will solve the problem of land and simultaneously, ensure the targets of renewal energy generation. Besides to this, the floating PV cells is also having other advantages over land based solar power station.

These are summarized as follows:

### a) The Reduction of Water Evaporation

The building of a PV plant will reduce water evaporation not only from the surface of the part that will be covered by the PV panels. There are two main effects reducing the level of water evaporation from the reservoir. The covering of a part of the area reduces the total contact area between the water basin and air thence there is almost no evaporation from the surface below the panels. The second effect is related to the heat balance that is changed after the building of the power plant. One part of the solar energy is converted into electricity, while the other part is reflected from the PV

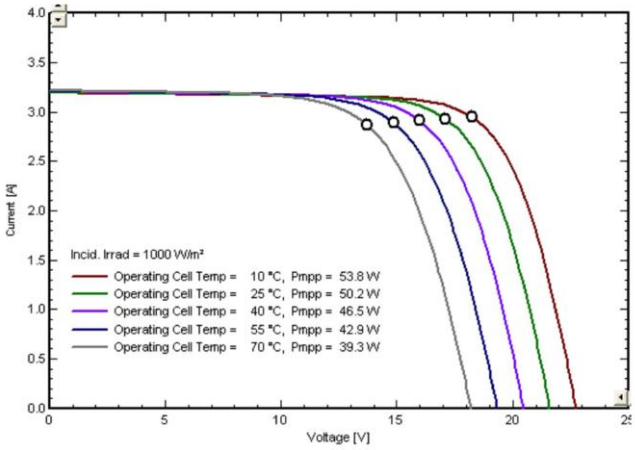
panels and the platform. As a consequence of this, water in the lake will be colder, and thence it will evaporate less. Because of installing floating solar PV cells aprox. 70 % evaporation losses of water will reduced.

**b) Higher effciency**

A study found out that a FPPP has a higher energy density than a land-based one, while a Utility-scale solar does not involve a significant cost increase.

The impact of the temperature rise of PV cells is one of the main reasons for the reduction of the efficiency of the production in onshore power plants.

Solar cells vary under temperature changes. The change in temperature will affect the power output from the cells. The voltage is highly dependent on the temperature and an increase in temperature will decrease the voltage.




.**Figure 2:** Output I-V characteristics of the PV module with different temperatures

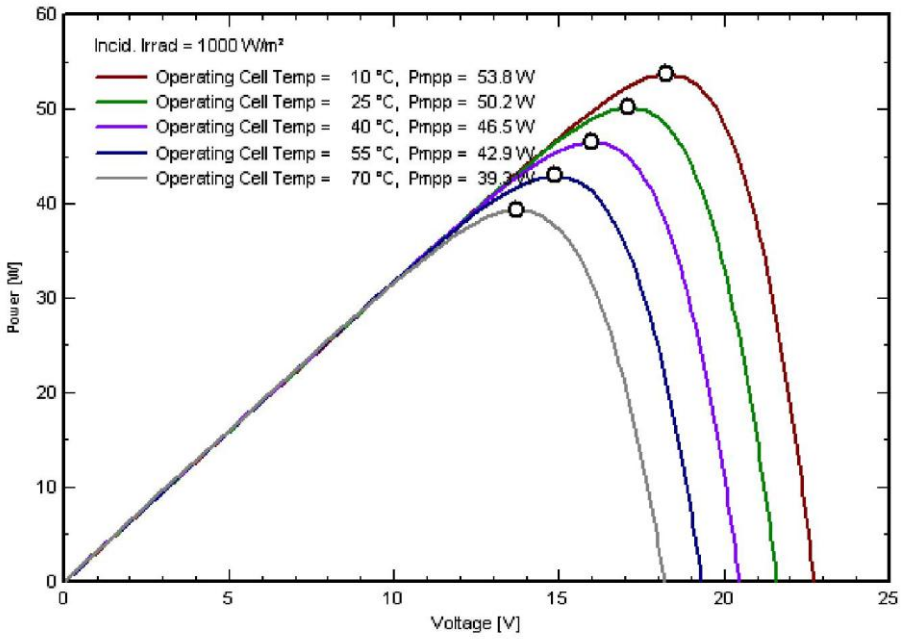



**Figure 3:** Output P-V characteristics of the PV module with different temperatures

Figure 2 shows the effect of temperature on I-V characteristic of PV module at constant radiation. With decreasing temperature, PV current decrease slightly but PV voltage increase clearly. As figure 3 indicates, output power of photovoltaic module increases with decreasing temperature.

1) Low maintenance cost: The dust collection issues would be minimum leading to enhanced generation and reduced cleaning frequency.Besides, there is no cost of acquiring water for module cleaning.
2) Besides above, the modules and the floats anchoring them reduce photo-synthesis process that promotes algae and other organic growth. This is particularly of interest to water utility companies as it reduces the water treatment and labor costs. Also as large power consumers, utilizing the water surface to generate electricity help them save on their energy cost.
3) The modules in floating systems operate under much cooler environment and this would reduce thermal losses and also the long term heat induced degradation
4) Additionally, such a power plant would significantly contribute to the reduction of CO2 emissions.The CO2 factor (unit: kg/kWh) indicates how much CO2 is produced for every one kilowatt hour of electricity generated in the country. Depending on the technology used and the efficiency, the CO2 factor can vary between the different energy supply companies in the region. You can find out the level of the CO2 factor of the electricity supplied to you by contacting your energy supply company.

Sample calculation of CO2 avoidance: A region has, for example, a CO2 factor of 0.6 kg/kWh. In this region there is a 3 kWp PV system which generates, for example, 2400 kWh electricity per year. The electricity generated in this way spares the earth a CO2 emission of 2400 kWh x 0.6 kg/kWh = 1440 kg CO2.

## 2. Conclusion

The review presented in this paper shows the advantage of using floating solar PV projects that have been established to date. These systems were either constructed for research purposes or for commercial use. All grid connected systems are kept afloat using pontoons or floats with panels rigidly connected to these floats. By installing floating PV plants for solar power generation, not only we can save the land but also get the better efficiency and economics.The same land can be utilized for other purpose.

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