

## A Review on Floatovoltaics

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**ABSTRACT:** Solar energy is classified as clean and renewable alternative to fossil fuels. It is freely and enormously available throughout the world. Usually we use photovoltaic module in order to solar energy into electricity. These solar panels are most commonly mounted over the rooftops or directly erected over land in order to collect maximum sunlight. But the problem arises when we use solar energy for commercial power generation, large number of PV modules must be used which in turn covers a large area of land. As the need and value of land is increasing it becomes difficult to encourage and promote the solar power generation. As a solution for these problems floatovoltaics or floating solar photovoltaic system is introduced. It is the method of installing PV modules over the water bodies' in order to reduce the land use and also for the improved power generation. In this paper a detailed review of floating solar PV system or Floatovoltaics is discussed.

**KEYWORDS:** Floatovoltaic System, Aquasystem, Submerged FV, Thin film FV

### I. INTRODUCTION

Solar energy is one of the most abundant sources of energy on the earth. It is renewable and it is also a clean source of energy. It is said that our earth intercepts 173 thousand terawatts of solar power, which is more than adequate amount of power for the total population on the earth. By utilizing this we can power the world by a clean and non-polluting way. In order for converting the solar energy to electricity we use solar panels, which are made of the semiconductors (usually silicon wafers). Usually they are mounted on rooftops or directly placed over land. But the problem arises as for commercial power generation a large scale solar power plant is required. As the value and demand for land is increasing, and land is also used for other livelihood activities which is being a major constrain for solar power generation.

In order to solve this problem a new method of Floating solar photovoltaic system or Floatovoltaics is introduced. As its name, it is the process of placing the solar PV modules over the water bodies with the help of a special arrangement

in order to float on the water surface. This not only reduces the land use, but also improves the power generation, saves the water from getting polluted and reduces the evaporation rate in water bodies. . In this paper, it is discussing about the floatovoltaics and its role in power generation by maintaining the aquatic ecosystem.

### II. COMPONENTS OF FLOATOVOLTAICS

The major components of floatovoltaics are:

**Solar Panels:** A solar panel is a package of connected assembly of photo voltaic solar cells available in different voltages and watts. It converts light energy into electrical energy. The solar cells are made up of semiconductors (usually silicon). As the light strikes the panel the electrons in the outer shell of the semiconductor excites and moves, leaving behind the positively charged holes. The movement of the negatively charged electrons results in the charge flow.



Solar Panels

**Floats:** Floats are used for mounting the solar panel and prevent it from sinking. These are airtight hollow structures designed to provide buoyancy in water. Usually they are made up of fibre-reinforced plastic or high-density poly ethylene or any other material that provide buoyancy. The whole floating bed is secured with the help of anchoring and mooring system.



Floats



Thin Film Floatovoltaics

### III. CLASSIFICATION OF FLOATOVOLTAICS

The floatovoltaics is classified into **surface mounted**, **thin film** and **submerged** types.

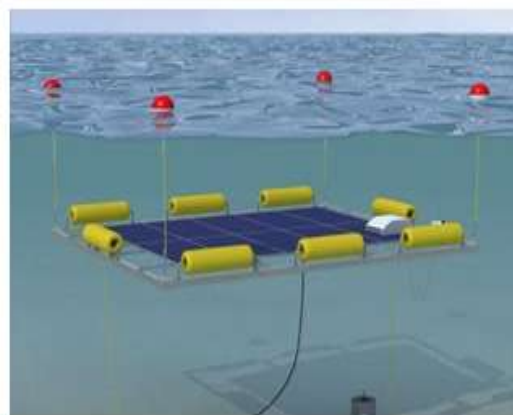
**Surface Mounted Floatovoltaics:** These are the most widely and commonly installed floating solar PV system. Here the solar panels are mounted over the floats (pontoons) which provide buoyancy to the system. A mooring system is also provided for providing stability. There are two types of surface mounted FPV systems, fixed type and tracking type FPV system. In fixed type the solar panel is fixed in certain angle in order to capture the sunlight. Whereas in tracking type FPV system a tracking system is installed in order to track the azimuth and altitude of the sun. The tracking type FPV system is more efficient than fixed type i.e. 60-70% more energy yield than the fixed type FPV system.



Surface Mounted Floatovoltaics

**Thin Film Floatovoltaics:** The thin film FPV is a system in which solar panels are mounted over thin floats. The major advantage of this type is that the FPV system is that it can easily deform to wave motion and also required fewer infrastructures.

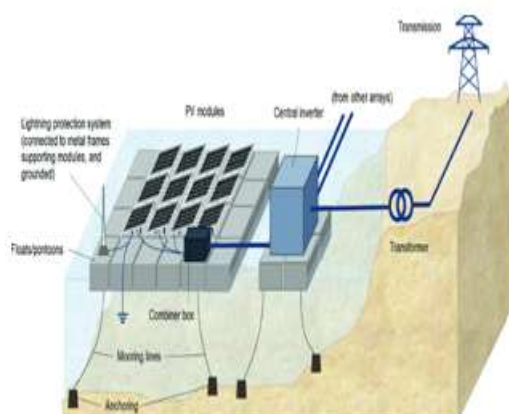
**Submerged Floatovoltaics:** In submerged FPV system the solar panels are submerged in shallow water till the depth. As a result there won't be thermal drift and also reduction in light reflection. The system also provides 10-20% increase in efficiency than the normal type of FPV system.



Submerged Floatovoltaics

### IV. WORKING OF FLOATOVOLTAICS

The solar panels use the photons produced by sunlight to generate direct current electricity. When photons hit the panel they are absorbed by panel's semiconducting silicon material. During this process the electrons separate from the holes of an atoms and move around the solar cell. This movement of the electrons is what generates Direct Current (DC) electricity. The DC electricity then flows to the systems inverter through the underwater cables, where it is converted to alternating current (AC). The inverter and the other systems are placed over the land and from there it is distributed.



Design of floatovoltaics

## V. ADVANTAGES OF FPV SYSTEM

The main advantage of Floatovoltaics is that it reduces the land usage and its efficiency is higher than the land mounted solar PV systems.

Since it is placed in the water, which provide cooling effect to the panels and prevent it from overheating.

The floatovoltaics system reduces the water evaporation rate in the reservoirs. It also reduces the algae growth on water bodies which in turn reduces water pollution and also helps in maintaining aquasystem.

## VI. CHALLENGES TO FLOATOVOLTAICS

As the system is placed in water, the maintenance is little difficult than the conventional type. The initial cost of the system is also higher than the land mounted solar PV systems. The systems also need to be cleaned periodically as dirt accumulation takes place on the floats due to flow of water.

## VII. CONCLUSION

Floatovoltaics is one of the newest and most efficient ways of power generation process. Like other cleaner power generation methods, it is highly efficient and also reduces the land use than the conventional solar power plant. As currently only the surface floating photovoltaic system is widely used, many more advancement and researches have been conducted for improvement and overcoming the current constrains of the FPV system.

In India there is a wide scope for the floatovoltaics as here nearly 909.05 GW capacity floating solar systems can be installed. There are some FPV systems that have already been installed in India. It has been installed in Kolkata, Chandigarh, Nagpur, Kerala etc. The system installed in Kerala i.e. in Banasura sagar reservoir is the first FPV system with a concrete platform. The nation has a wide scope in implementing much more floatovoltaics systems as they are one of the most efficient renewable energy power generation system and also as a good substitute for the coal power plants.

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