

# Floating Solar Panels - A New Step towards Sustainability

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## ABSTRACT

In recent years, associate increasing variety of states have shown interest in constructing floating solar energy plants as they seek for a renewable supply of energy. India is one amongst them. Endowed daylight all year round, India is a perfect location to construct a solar power plant. However, the recent climate conjointly causes country to lose great deal of valuable water resources from reservoirs thanks to high evaporation rates. As floating solar array systems are engineered over water bodies rather than land, they are proposed to have the extra advantage of reducing evaporation rates. thus, the utilization of floating solar systems is extremely relevant to India's context and price exploring. Energy demand during this era has accumulated that led India to travel for renewable energy sources; solar power with this respect will fulfill the energy demand. This paper focuses on an overview of solar floating panels which can be a good solution to India as the land acquisition for solar farms is limited. The paper also aims at the solar floating panels design model of Kerala which is a new start to the India's renewable energy in water.

**KEYWORDS:** Renewable energy, solar photo voltaic, solar power plants, floating Solar System, floating solar PV installations, advantages of floating solar power plants, types of floating structures for solar power plants

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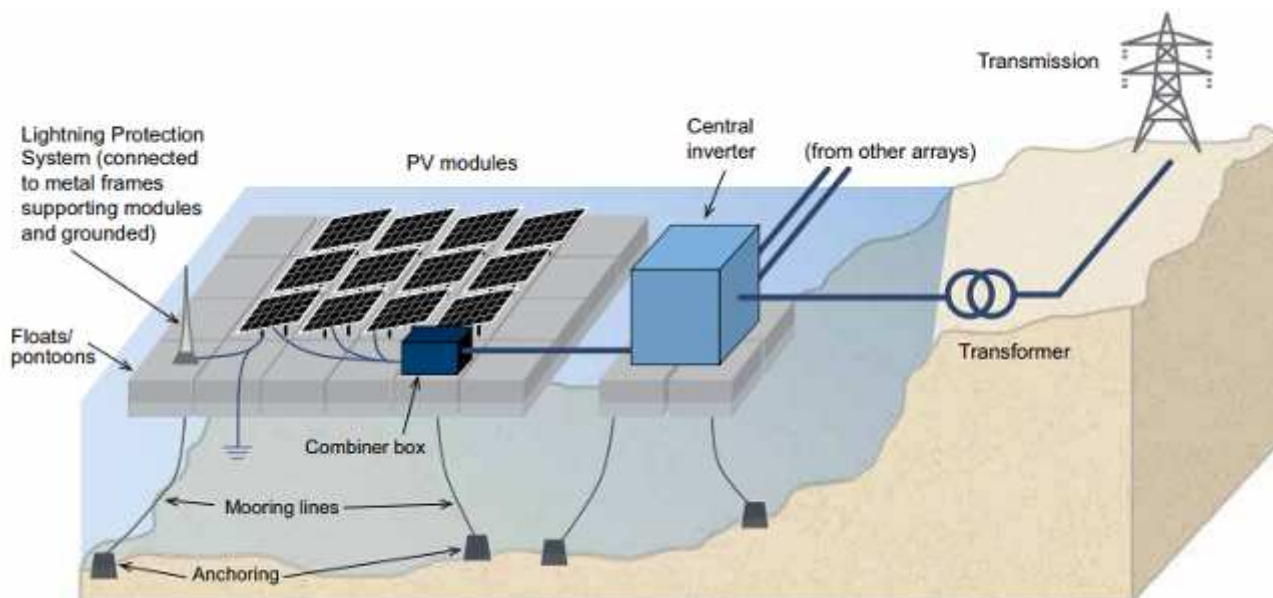
## I. INTRODUCTION

Water is critical for the survival of mankind. Since independence, the Indian authorities has been aggressively searching for answers to be self-enough in freshwater supplies. The biggest drawback in our country is power crisis. Around 70% coal is employed for generation of electrical energy. Irrigation and business production is get affected thanks to load shedding, daily shutdown, etcetera thus we'd like to maneuver towards renewable energy sources to come up with electricity. Now a days renewable energy supplies are growing quick not in barely India however several other countries. solar power is clean, economical compared to other energy. the employment of solar energy solar power decreases greenhouse effect. solar power is energy created by sun created through a nuclear method and this process crates heat and magnetic attraction radiations. To resolve the energy crisis solar power are a wonderful answer however to use land mounted scheme is that the demand of land that is incredibly pricey and fewer accessible to urge it. India can generate up to one.75 GW star powers from renewable energy sources and 1 GW of solar power in future ten years. As per the statesman National star Mission around 5000 MW has been commissioned until date in several components of the country. to create the country overwhelming inexperienced power in world, the progress isn't simply spare and desires arduous efforts by each state and state departments.

## II. Floating solar Panels

Construction of 'floating solar panels' is to make the electrical phenomenon system over water bodies rather than

typical places adore rooftops or open lands. This comparatively new concept has been trialed and enforced in regions endowed with abundance of daylight such as Australia, Asian nation and Israel. Floating solar system has PV concentrator that is incredibly light-weight weight and it floats on water bodies, mounted on anchored rafts float on the surface of irrigation canals, water reservoirs, quarry lakes, and tailing ponds. The floating system reduces the requirement of expensive land area, it also saves the drinkable that may rather be lost because of evaporation, reduces the expansion of algae. The star system shows the next potency because the panels are unbroken in cooler temperature than they'd air land area. The floating platforms are 100 percent recyclable, utilizing high density polythene which may face up to ultraviolet rays and corrosion. Floating solar is additionally referred to as 'SOLAR ARRAY. To date, FPV (Floating Photovoltaic's) has predominantly been set up on synthetic water bodies (e.g., handled wastewater garage ponds, reservoirs, and agricultural irrigation or retention ponds). The PV module generation deployed with FPV is just like conventional ground-or-roof-set up systems, however the modules are set up on a floating platform fabricated from plastic and stainless steel. Typically, more than one floating systems are linked with distinctive walkways to permit get admission to for operation and maintenance. These linked floating systems are anchored to the shore, to the lowest of the water body, or to floating anchors. The important electric system is living onshore, and strength is transmitted from the FPV gadget to this system and the grid or load through underwater cables.



**Figure 1: Components Of A Floating Solar Array**

**III. Advantages of Solar Floating Panels**

- A. Floating sun strength plant device usually generates extra energy than ground-mount and rooftop structures because of the cooling impact of the water.
- B. The floating structures are designed and engineered to face up to severe bodily stress, together with hurricane and hurricane conditions.
- C. These installations lessen water evaporation and algae increase with the aid of using shading the water.
- D. Geographically any water our bodies with considerable day light may be used to put in floating plants.
- E. Floating structures are 100% recyclable, making use of high- density polyethylene, that could resist ultraviolet
- F. Rays and resists corrosion.
- G. Number of modules deploying compares with the opposite system.
- H. Non-use (and disturbance) of land which conserves the nearby environment.
- I. Easy to erect and quicker deployment.

**IV. Disadvantades Of Solar Floating Panels**

- A. Long-term maintenance requirements and sturdiness of floating solar PV is nevertheless to be seen.
- B. Ecological and adverse impacts on water ecosystem.
- C. comparatively young and immature technology.
- D. Lack of experience and knowledge.
- E. Lack of cooperation from local distribution utility.
- F. Alternative energy concentration levels on floating platform.
- G. High waves and salt water possibly damage the solar panels over time.

**V. 500kwp Floating Solar Power Plant At Banasura Sagar, Kerala**

The Banasurasagar500kWp.Floating solar power plant situated in Kerala, the largest of its kind in India iscommissionedrecentlyintheBanasurasagarreservoir,aninnovativeprojectdonebytheKerala StateElectricity BoardLtd

**Project Location**

The project is located in the Banasurasagar dam reservoir in the state of kerala, adam originally constructed in the year 2005 for the purpose of the irrigation and reservoir in the Karamanth- odu a tributary of Kabani river and later for Kakkayam Generating station of Kerala State Electricity board ltd

**Major Components of the BanasuraSagar Floating power plant**

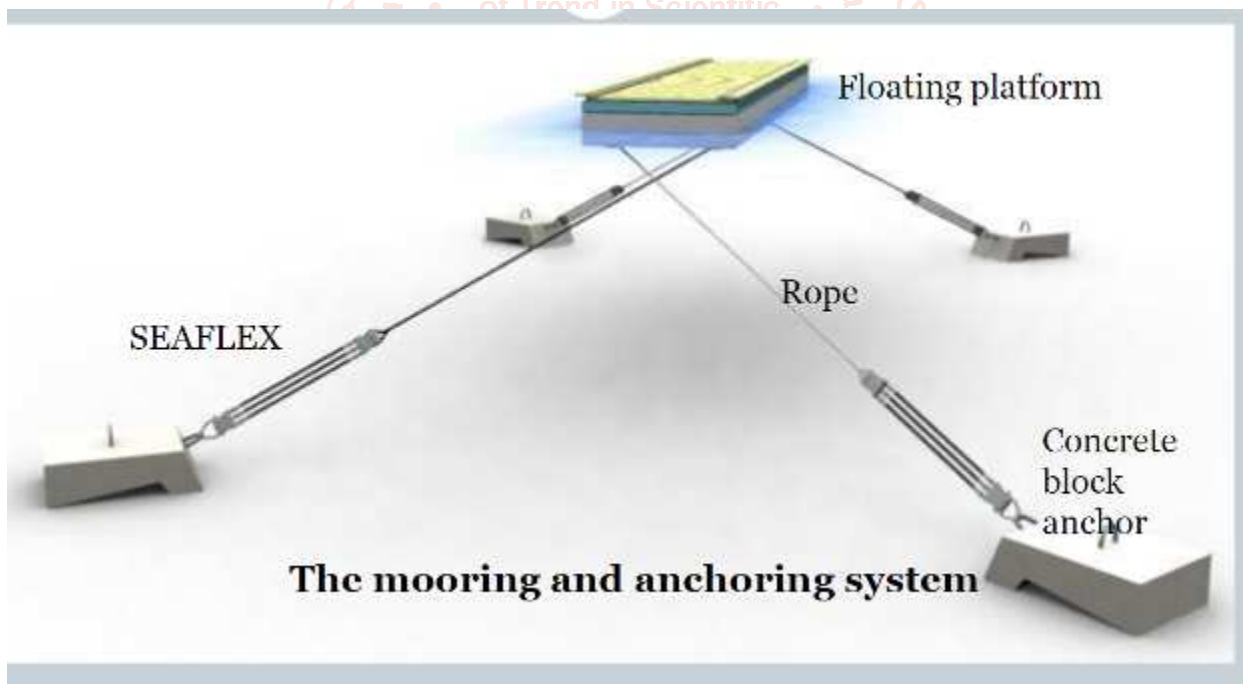
- The float made up of fibrocement platform
- The Mooring and anchoring system
- The PV modules and panels
- The string inverter
- The low voltage AC cables and its protection
- The step up transformer and HV cables
- The HV cable Management system
- The Scada system
- The ear thing and lighting protection
- Weather monitoring system



**Figure 2: Ferro Cement Platforms**

**Mooring and anchoring system**

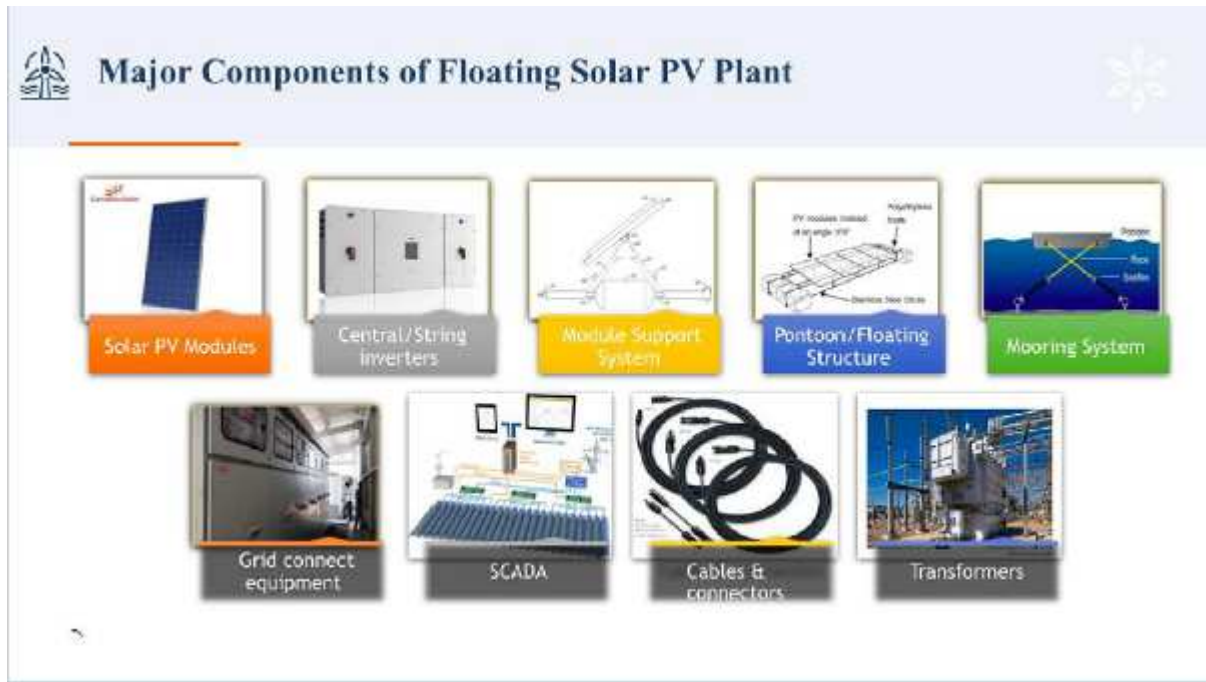
- This project uses the SEAFLEX mooring system which consists of a SEAFLEX and a rope to hold the float in position against external forces and water level
- The SEAFLEX is the active part of the mooring, adjusting for water level changes while also taking care of forces.
- SEAFLEX is always tensioned at lowest water level



**Figure 3: The mooring and anchoring system**

**Scada system**

- The Scada system in the plant is connected to the inverters, whether monitoring station and metering equipments, other monitoring devices . The scada system is having the facility for
- Device monitoring –Inverters , Metering and Weather station
- Alarms
- Trends
- Technical Reports and
- Executive reports



**Figure 4: Major components of solar PV plant**

**Conclusion**

- The details of the floating power plant and its installation on the fibrocement float has been discussed in this report. The solar plant and the 11 kV substation are placed over the fibrocement platform and the DC to AC conversion is done near the plant itself as a result of which there is savings in the cost of the DC cable
- As the power is converted to MV 11kV alternating current, the power loss is reduced in this typical design.
- The mooring and anchoring system used in this plant has proven to sustain in recent heavy floods in kerala
- Even though the cost of the fibrocement float is higher than that of HDPE panels, fibrocement platform is made in the site itself which is certainly an advantage in difficult terrain
- In this typical design, the 11kV substation is placed over the float and the float has the flexibility to place bigger capacity transformers in case of future expansion
- The floating plant requires less space compared landing based plants. The area requirement for the Banasura Project is app 1.23 acres for 0.5 MW where as the land requirement for equivalent land based system is 2 to 2.5 acres
- The floating solar environment especially in the reservoir will be comparatively cleaner than that of land based power plant and hence the maintenance cycle can be reduced
- There is no land cost or land development cost etc in floating solar power plant and the floating plant can be installed in short time comparatively

- The power evacuation cost of the floating plant in the reservoir connected with the hydro plant will be less as there will be nearby substations for the hydro plants
- The shadow in the reservoir will be comparatively low and hence the available power generation time in the floating solar will be more than that of land based pVplants
- Floating plants if used in the cooling reservoirs will have the advantage of less water evaporation and the better utilization of the available space
- The efficiency of the plant is directly related to the cleanliness of the modules. The PV modules can be easily cleaned in floating plants. Also the reservoir water can be used for cooling of the modules which in turn increases the efficiency

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