

A REVIEW ON FLOATING PHOTOVOLTALIC POWER PLANT

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Abstract- The human population is increasing day by day since the census of 2010 the population have increased by 19.5 million which is about 6.3% increase. With increase in the population the power consumption also increases because of which there is a rapid growth in the renewable power generation including solar, wind, hydroelectricity. 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, so to overcome this major problem an innovative technology have been taken into use of installing solar panel over water bodies, reservoir, lakes, etc. This paper will aim to review floating solar panels installed in the world

1. INTRODUCTION

Almost two-third of the power of the world is generated by the fossil fuels (63.3%). Fossil fuels are nonrenewable source of energy and with rapid increase in consumption of fossil fuel over the recent years these fossil fuel will get deplete by 2060. Even the supply is not regular for those who are accessing electricity. Shutdowns and load-shedding interrupts irrigation and manufacturing across the different parts of the world. That's why there is a rapid increase in the demand of renewable sources of power especially solar energy as solar panels are easy to install and operate and also it is considered as clean energy and the most efficient source of electricity. Due to lack of area instead of installing solar panel on ground it can be installed on the water bodies. The energy obtained from solar PV system is renewable, eco-friendly and sustainable with long life of system. There are various advantages of floating solar PV power plant compared to roof top and ground mounted such as better efficiency of solar panels due to cooling of panel by air above the water bodies, it reduces water evaporation and because of shading of water it reduces algae growth.

2. FLOATING PHOTOVOLTALIC SYSTEM

Floating photovoltaic system is type of a system in which the solar panels are installed over the water bodies like water reservoirs, lakes, canals, dams, ocean, etc. Since to produce 1MW of electricity we need to install the solar panels over an area of one hector (which is equal to one rugby field) so to install solar panels over one hector and maintaining it means a lot of money have to invest and also, research suggests that solar panels installed on land surfaces results in the reduction of yields, as the ground gets heated up and affects the rear surfaces of solar panel. Studies also suggests that if the rear surfaces of solar panels are placed on the top of the water, the solar panels will be able to cool themselves more efficiently which means they will last longer and they can shade the water they float on which reduces evaporation by up to 70%, also their ability to generate power goes up as high as to 16%.

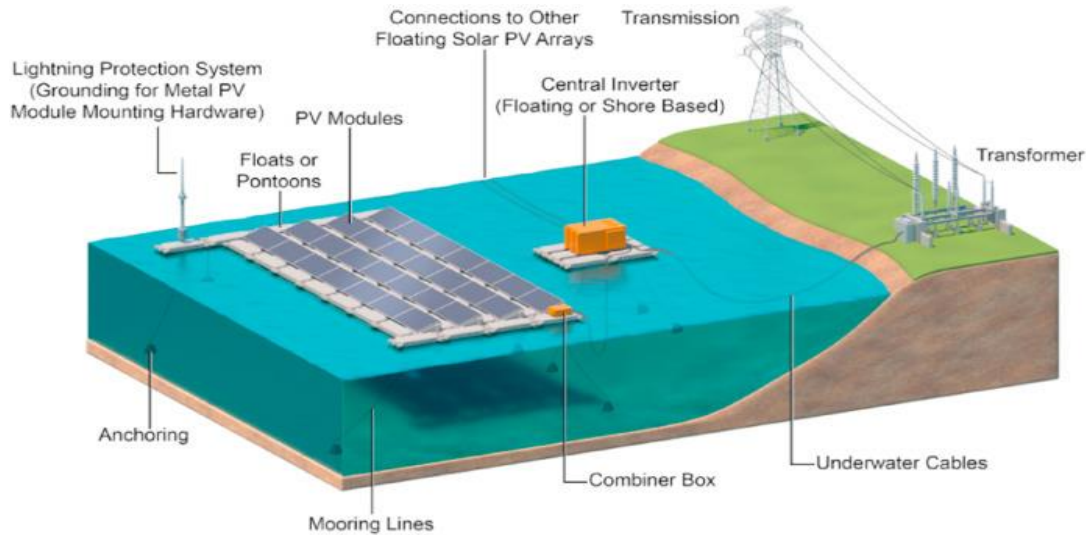


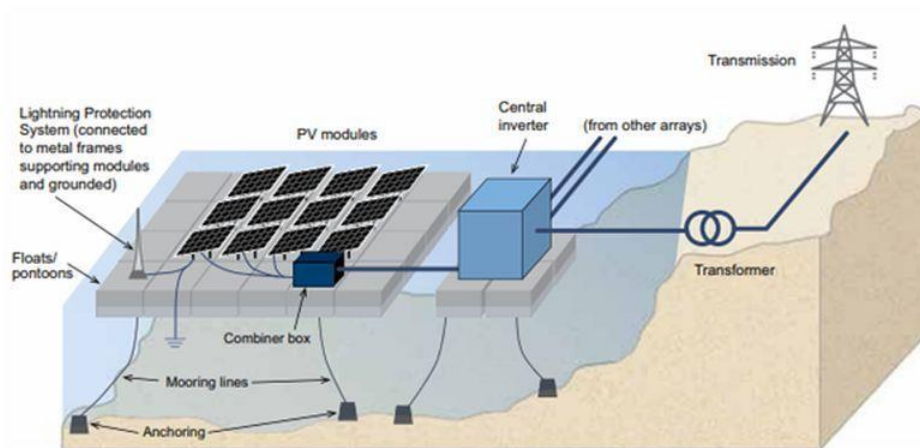
Fig.1. Floating PV Structure

2.1 Pontoons- are also known as floating structure, which keeps the solar panels floating on water, they are like boxes which have enough buoyancy to keep solar panels floating. The structure is design in such a way that it can hold number of panels.

2.2 Mooring system-is a system which consist of mooring line, anchor and connector. The mooring line connects to anchor on seafloor to floating structure to keep it steady.

2.3 Solar Module - It is PV Generation equipment, similar to electric junction boxes, which are installed on top of the floating system. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, a solar inverter, and sometimes a battery and/or solar tracker and interconnection wiring. Mostly crystalline solar PV modules have been used for the floating solar systems.

2.4 Cabling - Due to their outdoor usage, solar cables are specifically designed to be resistant against UV radiation and extremely high temperature fluctuations and are generally unaffected by the weather.



Source: Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore (NUS).

3. Floating PV in India

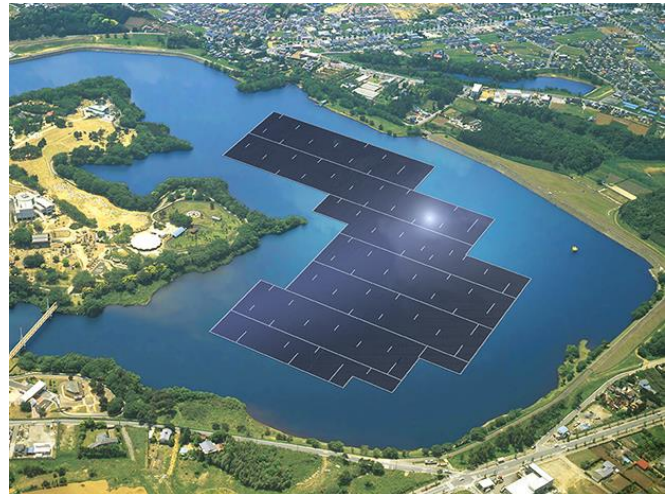
India is the largest production of renewable electricity. As of 27 November 2020, 38% of India's installed electricity is from renewable sources. Majority of it comes from solar energy but due to increasing population of India the availability of land has decreased due to which installing floating PV can help to deal with this problem. Therefore Madhya Pradesh government made an announcement of establishing world's largest floating PV. It will be installed in the backwaters of the Omkareshwar dam and cover approximately 2000ha of water area in Khandwa district. These panels will have the capacity to automatically adjust their position when the water level at the dam is low. The state's renewable energy minister Hardeep Singh Dang said the project will require an investment of \$410m (INR30bn). PTI quoted the minister as saying that survey work for the transmission line to Khandwa sub-station will begin this month.

4. The future looks bright for Floating PV

- Many countries are opting for floating PV instead of solar panels installed on ground due to land unavailability
- In the recent years prices of solar panel has come down dramatically
- New technologies will increase efficiency of solar cells

5. Various countries installing floating PV

5.1 Japan- Japan is the most developed country in the world they believe in building structure not around the water bodies but on the water bodies. The world's first floating solar plant was built in Japan, in Aichi Prefecture in central Honshu. The country's many inland lakes and reservoirs are now home to 73 of the world's 100 largest floating solar plants and account for half of those plants' 246 megawatts of solar capacity. The biggest Japanese floating solar plant sits behind the Yamakura Dam at Ichihara in Chiba Prefecture. It covers 18 hectares, can power nearly 5,000 homes and is saving more than 8,000 tonnes of CO₂ a year.



5.2 China- Chinese state-owned developer CECEP has completed a 70MW floating solar project – the largest in the world – at a former coal-mining area of Anhui Province, China, in collaboration with French floating solar specialist Ciel & Terre.



EPC services were provided by China Energy Conservation Solar Technology and the China Energy Engineering Group Shanxi Electric Power Design Institute. A brand new 18km 110V overhead line was also built which can generate up to 77,693MWh of electricity in its first year, equivalent to the power consumption of nearly 21,000 households.

It is currently the largest floating PV plant on the same reservoir in the world, nearby, China-based firm Three Gorges New Energy has already partially connected a 150MW floating PV project to the grid, which is likely to become the largest plant globally once fully commissioned.

5.3 South Korea- In south Korea they have built a 25 MW floating solar plant on a reservoir in Goheung county, in the South Korean province of Jeollanam.

The company finished the first 9 MW phase of the project last October, but it did not connect the second 16 MW portion to the grid until now. It built the project with its plastic floaters and corrosion-resistant alloy steel frames. It did not reveal any other technical details. They have also announced building two more large-scale PV projects in Korea – a 40 MW plant at the Hapcheon hydro-electric power dam and 72 MW of capacity at the Saemangeum sea wall on the Yellow Sea. For the Saemangeum project, it has also built a new 300 MW factory to produce floaters and frames, it added.



6. PLUS POINTS OF FLOATING PV

- The floating solar panel installation provides shelter to the body of water and reduces the evaporation from these ponds, reservoirs, and the lakes.
- Floating PV are more efficient and effect as compare to solar panels which are install on ground.
- The biggest benefit of floating PV is that it takes the unuse space over the water bodies and land space is left for future development.
- Another biggest advantage of solar panels on water is that cleaning cost of it is very low as it is mostly clean by water.
- It can also provide fast supply of electricity to areas with limited infrastructure.

CONCLUSION

Although the initial cost of installation of floating PV is high but floating PV can provide that money back within a year. Solar panels installed on water can provide you more electricity than compares to solar panels on ground, so it more efficient and effect than it. Floating PV has various environmental benefits such as it reduces water evaporation, occupies the unuse place over the water bodies that in turn saves the land for future development. This paper provides a brief review about floating PV and its benefits.

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