

Floating Solar Power Plants

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ABSTRACT: The steady decline in energy efficiency and the increase in energy demand are largely focused on renewable energy sources. These environmentally friendly and sustainable in nature. Solar energy production has several advantages over other forms of energy, but the biggest problem that arises is the availability of land to plant a power plant and its cost. New solar technology, which means a floating solar plant will solve this issue. A floating solar plant can be installed in any body of water that will not only directly reduce the cost of land but also increase the amount of energy production through the cooling effect of water. This paper presents the technical details of solar floating plants. The benefits of solar floating plants will be introduced.

INTRODUCTION: These days, the market for solar energy is increasing because of introduction of Renewable Portfolio

Standard (RPS). Therefore, a vigorous research is held on the alternatives against the lack of sites to

install the overland photovoltaic (PV) systems. The photovoltaic system, discussed in this paper is a new technology of solar power generation that involves the utilization of water sources available in dams, reservoirs, and other water bodies. This method allows efficient use of nation's soil without causing any damage to it. Until 2012, Korea applied Renewable Energy Certificate (REC) value of 1.0 to the floating PV systems which was similar to the general PV systems. But later on, realizing the technological value and necessity of floating PV systems, Korea has announced that the REC value will be 1.5 for such power plants, which is the same value as BIP (Building Integrated Photovoltaic Systems), from the year 2013. This paper briefly highlights the 500KW floating PV systems that are developed and installed in Kerala waters, and comparing its utility with the PV systems installed on land on the basis of power generation.



Floating Solar Power Plant

I. WORKING

The PV floating power generation is based on combination of PV plant technology and floating technology. It consists of:

Floating System

A floating body that allows the installation of PV module.

Mooring System

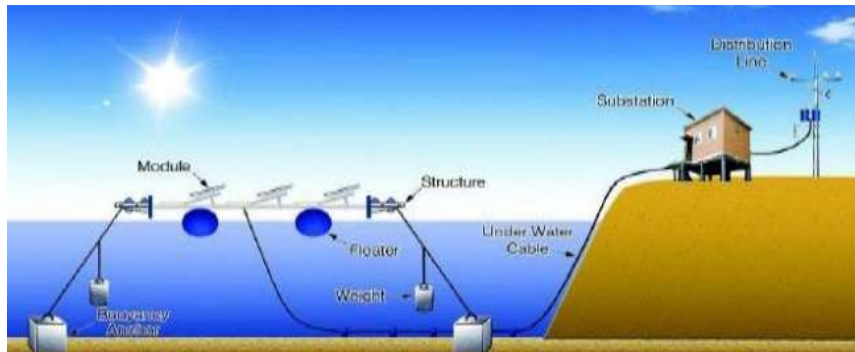
It can adjust to water level fluctuations while maintaining its position in the southward direction.

PV System

It is a PV generation device which is similar to electrical junction boxes. These are installed on the top of floating system.

Underwater Cables

These are used to transfer the generated power to land from the PV system development. As a technology of new generation, these can replace the existing power plants which are installed on the top of woodlands, farmlands and buildings.



Working of a floating solar power plant

II. ADVANTAGES

The main reason for the growing popularity of floating solar power plants is their reliance on the world's largest power plant sets. These plants can be incorporated into natural and man-made water bodies such as ponds, water treatment plants, municipal storage plants among others.

Some of the benefits of floating solar power plants are:

High Performance of Panels:

The effect of water cooling on the installed PV modules, helps to reduce the heat loss which increases the efficiency of the panels. Plant operators want to work 5-16% more efficiently from floating solar power plants compared to ground PV plants.

Longevity:

The cooling effect of the modules reduces the long-term decrease in the temperature of the solar modules thus leading to a higher module and plant health.

Water Conservation:

Floating solar power plants can help reduce evaporation from water bodies. Since, most solar power plants are installed in inland water bodies,

they can help save water for people in urban and arid regions.

Easy cleaning and minimal water use:

Regular cleaning of solar modules is easy as water is readily available. Also, the loss of water is minimal as the water used to clean the panels returns to the ponds.

III. MARKET SCENARIO

The floating power station, which has the potential to generate electricity, is made up of an existing cargo ship. In general, floating power plants tend to be self-propelled and can go overseas and connect to the national grid, where needed. A floating power station can be an alternative to hydro power plants as these types of power plants can accommodate energy increases, especially in remote and rural areas. Floating energy plants also have certain advantages that will help drive the floating energy market. Some of these benefits include faster electricity supply in areas with limited infrastructure, can be exported to areas where electricity is needed, requires less space compared to power plants, and provides safe electricity in the event of earthquakes and floods.



Cargo ship directed by solar panels

IV. FUTURE GOALS

A preliminary study of the discovery of a 600MW floating solar plant in Madhya Pradesh has been completed, and the plant production of the plant is expected to start in 2022 or 2023.

Prepared for development in the Omkareshwar dam, a 2,000-hectare project will cost an estimated INR 30 billion (US \$ 420 million) to upgrade.

The Madhya Pradesh provincial government stated that the International Finance Corporation, the World Bank and the Power Grid had granted joint venture approval for the construction of the projects, and the Madhya Pradesh Power Management Company had agreed to purchase 400MW of power for the project.

According to a World Bank report, the installed capacity increased more than 100 times from 2014-2018, to 1.1GW.

The largest supplier till date is the 41MW floating power station at the Hapcheon dam in South Korea. Q-CELLS headquartered in Seoul received approval for the project from K-water (Korea Water Resources Institute) in November and said it would be the world's largest PV built in the dam, as well as the largest PV plant approved in Korea.

The plant will generate enough solar power to meet the annual energy needs of 60,000 people, which is more than the actual number of 44,434 people in the Hapcheon-gun, the region in which it will be located. All electricity from the project will be sold to a local state-owned company.



World's largest plant in China

V. RESULTS AND DISCUSSION

As floating power plants are installed on water bodies, these panels are naturally cooled. Due to this, the temperature of panels is less in comparison to rooftop solar power plants. Thus,

making these more durable as there is less stress on them. The cost of floating solar power plant is slightly more than the rooftop power plants, but if the problem of land scarcity is taken into account, the cost of installation of floating power plants is negligible with production profits of useful land.

VI. CONCLUSION

After all the facts mentioned above, it is quite evident that the floating solar system will pave way for a much better system for energy conservation. With the development of the solar photovoltaic system, a floating solar power plant is playing an important role. The beauty of the floating system is that it reduces evaporation, thus helping to preserve the water levels during the worst summer. When the panels are installed on a floating platform, the problem of heat generated by solar panels on earth is solved to a great extent. This floating technology is durable, expensive, flexible and has a short installation time. With this development, India could meet its energy demand in the future.

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