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A REVIEW ON RENEWABLE ENERGY POWER GENERATION SYSTEMS

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ABSTRACT

Due to the depletion of coal and the increasing electricity demand, there has been a rapid increase in the use of renewable energy resources to generate electricity.Renewable energy sources such as solar, wind, and water are abundant and pollution-free, which allows for the most efficient use of renewable energy sources for power generation.In this context, it is primarily focused on the Floating Solar Photovoltaic Plant, which generates electricity from solar energy using photovoltaic cells mounted on floating water.This article discusses the floating photovoltaic cell in on-grid and off-grid hybrid energy systems, as well as the cooling techniques used in floating photovoltaic plants. It also discusses the floating power plant on wastewater, as well as the economic analysis of floating photovoltaic plants.

Keywords:*renewable energy,depletion, abundant, Photovoltaic, pollution-free.*

Introduction

The following renewable energy systems have been analyzed using a dynamic techno-economic simulation and optimization model: hybrid PV and wind energy systems, off-grid and on-grid PV energy systems, ground-mounted and floating PV energy systems, and floating and floating tracking PV energy systems and it show that solar photovoltaic (PV) systems are the best renewable energy source for use in a hybrid energy system. This article explores and illustrates some design options for enhancing the growth and performance of floating photovoltaic (FPV) systems. Since 2007, this technology has gained major worldwide attention, with medium and large FPVSs already operational in countries such as Japan, South Korea, India, and the United States.In this context, the potential of merging solar plants with traditional wastewater treatment systems is investigated. The study's major goal is to see how introducing an active water cooling system might improve an FPV plant's technological and economic performance.The key advantages of this strategy are an increase in energy output, a large decrease in evaporation rates, and water savings. Finally, the concept of developing an integrated air storage facility using a floating structure over water is discussed.

FLOATING SOLAR PV POWER PLANT

In recent times, floating photovoltaic technology has attracted increased interest both from a research and industry viewpoint due to the direct as well as indirect benefits of their installation. This chapter discusses the floating tracking photovoltaic system used in on- and off-grid hybrid energy systems, the cooling strategies used in floating solar photovoltaic power plants, and the economics of floating solar photovoltaic power plants.

Floating tracking PV systems in on and off-grid hybrid energy system

Floating photovoltaic systems have a higher electrical efficiency than fixed photovoltaic systems due to the cooling effect of the water body on the solar panels. This increases annual power output, as well as an increase in albedo and hence reflected solar radiation.The 2.4 kWp floating photovoltaic system converted energy at an average of 7.6 percent more efficiently than a ground-mounted photovoltaic system. The tracking system tracks the sun's movement to decrease the angle of incidence and so increase the direct fraction of solar radiation that strikes the photovoltaic surface.In 2010, Italy developed one of the first floating-tracking photovoltaic systems, followed by another in 2011 in Lake Colignola. PV systems are the optimal solution for integration into hybrid off- and on-grid energy systems at the designated location.

Cooling Techniques

A critical ambiguity exists in the functioning of a photovoltaic plant. Solar photovoltaic modules generate electricity using high irradiance, however increasing their working temperature reduces their efficiency.Furthermore, warming caused by excessive sun radiation is one of the primary high operating obstacles for photovoltaic panels. Cooling systems employ forced convection to remove heat generated by photovoltaic panels. There are two methods for lowering the working temperature of the photovoltaic panel: active and passive cooling.

Passive cooling technique

Without the need for additional power, passive cooling solutions are utilized. While passive cooling is a straightforward method of slightly cooling the panel, it is frequently somewhat slow in terms of cooling achievement. Additionally, high-performance enhancements are only possible with extremely expensive passive systems. It is quite straightforward to adapt but less efficient.

Active cooling technique

Active cooling systems entail more efficient yet faster procedures. Active cooling requires external electricity, such as blowers or pumps, to work. Due to the widespread availability of liquid coolants such as water, it frequently employs a high heat transfer mechanism that is more efficient than air-active cooling.

Immersion cooling

Immersion cooling enables the installation of photovoltaic panels underwater. Increased efficiency is achieved by the absorption of heat by water from photovoltaic panels.

Forced water circulation

Thermal pipes mounted on the rear of the panels can be used to reduce the working temperature of the modules, while water is employed as a fluid flowing to cool the cells.

Water spraying

A pump and related pipes spray water through sprinklers mounted on the front of photovoltaic modules in this arrangement. Immersion cooling is the most efficient technique of all the cooling techniques.

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Floating solar power plant to wastewater

Floating photovoltaic systems (FPVSs) are often constructed on bodies of water such as natural lakes or dam reservoirs, however, an Australian initiative is experimenting with floating solar systems on wastewater.Australia is a continent with an unusual amount of solar radiation mixed with a rather dry climate, making water conservation a priority.Covering a basin is an expensive task, but adopting a device capable of covering the basin and producing electricity at the same time, such as a floating photovoltaic plant, simplifies the process.The basin must be located near a town to minimize the cost of transmission of electrical energy, which is always the case for wastewater treatment basins.

Economic analysis

The economic analysis is conducted by comparing expenses, which are cash outflows, to revenue, which are cash inflows.Cash inflow, or money received for FSCPP, includes revenue from energy sales to utilities and additional revenue from carbon credits earned as a result of reduced GHG emissions.FSPP's entire investment consists of collector and power conversion unit investments (PCU). The expenditure analysis takes into account the cost of operation and maintenance of the collector and the power conversion unit.The findings of the analysis indicate that the floating power plant saves money on land and generates more MU than a land-based photovoltaic system throughout the plant's life.

Floating solar parks

Floating solar PV power plant

Conclusion

This article discusses floating solar energy systems and the effective cooling strategies employed in them. Floating photovoltaic systems have better electrical efficiency than fixed photovoltaic systems due to the cooling impact of the water body on the solar panels.This results in an increase in annual power production as well as albedo and so reflected solar radiation.This outlines the active and passive cooling techniques, as well as why immersion cooling is the most efficient way to cool floating photovoltaic panels.It discusses the floating solar power plant about wastewater and how it is an Australian project aimed at maximizing water efficiency. It also discusses the economic analysis of the floating solar power plant, which indicates that the floating power plant saves money on land and generates more MU than a land-based photovoltaic system throughout the plant's life.

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