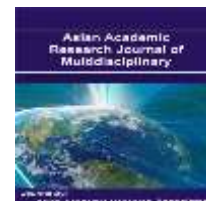




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GREEN ROOF TOWARDS ENHANCING THE EFFICIENCY OF PHOTOVOLTAICS IN NIGERIA

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Abstract

It is observed from the installation at the two female hostels of Nnamdi Azikiwe University, Awka, Nigeria that photovoltaic (PV) panels get hot in sunny days. The resultant effect is the decrease in the operating efficiency through various means. Several approaches have been proved effective at cooling the panels. Experiments show that green roofs are thermally cool, outperforming even white roofs over their life. On a hot sunny day, it is proven that a green roof can be 25°C cooler than a typical roof thereby improving the efficiency of the photovoltaic (PV) panel by as much as fifteen percent. There exists other methods typically used to cool PVs which include spraying, wicking and combined PV/thermal systems to remove or capture and utilize excess heat from the PVs but they require complex mechanical systems. Through the employment of a green roof to create a cool microclimate for the PVs, a quantifiable benefit is obtained by passive means. This system is termed, Green Roof Integrated Photovoltaics (GRIPV). In this paper, it is noted that the amount of cooling from a green roof is highly dependent on climate which include the amount of rainfall, relative humidity and typical ambient temperature of a region. This paper also shows that in a PV system that is roof known as the System Integrative Photovoltaic SIPV design, the PVs benefit from the thermal properties of the green roof while roof simultaneously benefits by reduced scorching from the partial shading of the array. The resulting relationship between the PVs and the microclimate created by the green roof increases the roof's value proposition and is potentially beneficial to the increased efficiency of the PVs and the microclimate created by the green roof increases the roof's value proposition and potentially beneficial to the increased efficiency of the PVs.

Keywords: PVs, efficiency, greenroof, and microclimate

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