

Optimum Tilt and Azimuth Angles for Solar Photovoltaic Systems in South-West Nigeria

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Abstract:

The performance of a photovoltaic (PV) solar module is affected by its orientation and angle of tilt with respect to the horizontal plane. Solar PV systems are among the most important renewable energy sources that can satisfy the world's energy requirements. In this study, the effect of tilt and azimuth angles on PV systems performance in the South-West region of Nigeria was investigated. The methodology include the use of simple basic components such as a 40W mono-crystalline PV panel, a locally-fabricated flexible panel carrier, thermometer, multi-meters and cables to obtain readings for different slopes and orientation angles of the solar panel. The investigations involved tilting the module at different slope angles of 0°, 5°, 7°, 15°, 20°, 25°, 30°, 35°, 40°, 45°, 55°, 70° and 90°; while oriented in eight geographical directions of North, South, East, West, North-East, North-West, South-East and South-West. Analysis of the results show that the optimum energy yield for a solar PV installation in this region is obtained when the solar panels are oriented southward and sloped at an angle of 20°. Details of the experimental processes and result analysis are presented in this paper.

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I. Introduction

E [1], [2]. Rising energy demand is a growing concern for all countries of the world today. For developing countries especially, future economic growth is largely dependent on meeting this demand with affordable, reliable, sustainable and environment-friendly energy sources otherwise known as renewable energy resources.

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