

Evaluation of a 50MW Two-Axis Tracking Photovoltaic Power Plant for Al-Jagbob, Libya: Energetic, Economic, and Environmental Impact Analysis

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Abstract : This paper investigates the application of large scale (LS-PV) two-axis tracking photovoltaic power plant in Al-Jagbob, Libya. A 50MW PV-grid connected (two-axis tracking) power plant design in Al-Jagbob, Libya has been carried out presently. A hetero-junction with intrinsic thin layer (HIT) type PV module has been selected and modeled. A Microsoft Excel-VBA program has been constructed to compute slope radiation, dew-point, sky temperature, and then cell temperature, maximum power output and module efficiency for this system, for tracking system. The results for energy production show that the total energy output is 128.5 GWh/year. The average module efficiency is 16.6%. The electricity generation capacity factor (CF) and solar capacity factor (SCF) were found to be 29.3% and 70.4% respectively. A 50MW two axis tracking power plant with a total energy output of 128.5 GWh/year would reduce CO₂ pollution by 85,581 tonnes of each year. The payback time for the proposed LS-PV photovoltaic power plant was found to be 4 years.

Keywords : large PV power plant, solar energy, environmental impact, dual-axis tracking system

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