

Solar PV Grid-Connected System Analysis for Midlands State University, Zimbabwe

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Abstract

This study investigates the feasibility of implementing a grid-connected solar photovoltaic (PV) system for a university campus in Zimbabwe. The system, simulated using PVSyst software, aims to fulfill the university's increasing energy demands while prioritizing sustainability and reducing reliance on conventional energy sources. The study examines system deployment's energy production potential, return on investment, and CO₂ emissions reduction. The designed system has a performance ratio of 83.87%, indicating efficiency through the annual generation of 1834.21 kWh/kWp at an investment return of 292% with a net CO₂ emissions reduction potential of 33, 22.5 tCO₂ within its 30-year life. The study provides valuable insights into integrating renewable energy solutions within educational institutions and promotes collaboration among governmental bodies, investors, and the community to establish an effective PV system that aligns with the university's vision.

Keywords: Solar PV, electricity grid, renewable energy, sustainability, energy, and sustainable educational building