Cover Page

Project Title: **Design and Optimization of a Hybrid Solar Photovoltaic/Diesel Energy System Using HOMER Software**

Academic Year: 2024-2025

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Format:

- Single space, Times New Roman.
- 12 pt,
- Maximum 1 page.

Abstract Body:

Items must be provided in the Abstract:

- Why do you think this project is important? Please explain the significance of this Project in brief.
- In your point of view, what are the important aspects that should be covered in the project?
- Objective(s): In your view, please explain the main objectives of the project.
- Methodology: Give a brief outline of the application development process.
- Had this project been done before? Are there any similar applications available today?

- **Note:** Please deliver this abstract early to ensure that your Project has been approved by the department's projects committee. **Registration will not be done without this approval.**

Project's Abstract:

Energy access in Palestine faces serious challenges due to political instability, high dependency on imported electricity, and limited local energy resources. The West Bank has an abundance of solar potential, but it is not yet entirely utilized. In order to provide a dependable, economical, and sustainable energy solution, this study explores the design and optimization of a hybrid solar photovoltaic (SPV) and diesel generator (DG) system for the Palestinian Museum in Ramallah. The objective is to use HOMER and PVsyst software to assess the hybrid system's technical, financial, and environmental feasibility. Based on real energy consumption data, sun irradiance, and system component specifications, these tools made simulation and performance analysis possible. In order to model a 230 kWp grid-connected PV system, 576 modules and inverters with a combined output of 220 kWac were used. The diesel generator was used in times of solar shortages because the PV system was not built with battery storage. It was also utilized when the grid was unavailable. The system can generate 364,653 kWh yearly, according to PVsyst results, with a performance ratio of 80.84%. Strong economic viability is demonstrated by the system's low levelized cost of energy (LCOE) of 0.0307 USD/kWh, 3.2-year payback period, and internal rate of return of 31.33%. In terms of the environment, the system lowers CO_2 emissions by about 394.7 tons per year. These results were confirmed by HOMER simulations, which found that the PV/Grid system had the lowest COE at 0.0835 USD/kWh, while the PV/40 kW DG hybrid system provided reduced emissions and increased reliability with an 83% solar energy ratio compared to diesel-only options. A renewable energy fraction of 84.8% was achieved by the hybrid arrangement, highlighting the financial and environmental benefits of greater solar integration. By offering an affordable and appropriate hybrid renewable system model, this study helps close the energy gaps in Palestine and promotes resilience, energy independence, and long-term sustainability in areas challenged by conflict and a lack of energy.

Keywords: Solar photovoltaic, Hybrid system, HOMER, Solar Photo-Voltaic, Diesel Generator, Solar/Diesel hybrid energy, Palestine.