

**PERANCANGAN PLTS TERHUBUNG JARINGAN DI ATAP GEDUNG
DENTAL LEARNING CENTER FAKULTAS KEDOKTERAN GIGI UGM
UNTUK MENUNJANG KEBUTUHAN LISTRIK SISTEM
PENCAHAYAAN**

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INTISARI

Pemanasan global semakin ekstrim akibat peningkatan emisi CO₂ hasil pembakaran bahan bakar fosil. Dalam menanggulangi pemanasan global, dibutuhkan transisi energi berbasis fosil menjadi energi terbarukan. Indonesia sebagai negara khatulistiwa, memiliki potensi besar untuk memanfaatkan energi matahari sebagai energi bersih untuk pembangkitan listrik. Penelitian ini dilakukan untuk mendapatkan rancangan PLTS yang layak secara teknis dan ekonomis untuk diterapkan di Gedung DLC FKG UGM dengan latar belakang gedung bersertifikasi *green building*, namun belum dapat memasok listrik secara mandiri.

Perancangan dilakukan menggunakan *software* PVSyst. Penelitian ini mengajukan empat rancangan konfigurasi sistem yang sesuai dengan kebutuhan listrik pencahayaan Gedung DLC. Analisis teknis dan ekonomi kemudian diterapkan pada hasil simulasi untuk menentukan sistem yang paling optimal.

Hasil simulasi dan analisis menunjukkan rancangan sistem yang paling optimal adalah sistem A2 yang menggunakan modul PV Jinko Solar 540 Wp sebanyak 24 unit dan inverter Growatt 10 kW dengan kapasitas total 12,96 kWp serta produksi 15.298,84 kWh/tahun dengan *array yield* sebesar 1.180 kWh/kWp/tahun. Sistem memiliki *Solar fraction* sebesar 63,42%, *performance ratio* sebesar 76,96%, dan dapat menghemat emisi karbon sebanyak 225,64 tCO₂ selama masa hidupnya. Diketahui bahwa LCOE sistem sebesar Rp499/kWh dan NPV Rp48.364.721 dengan masa pengembalian investasi selama 10,88 tahun.

Kata kunci: Emisi CO₂, Energi Terbarukan, Gedung DLC, Pemanasan Global, PLTS

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DESIGN OF A GRID-CONNECTED ROOFTOP SOLAR POWER PLANT THE DENTAL LEARNING CENTER BUILDING FACULTY OF DENTISTRY UGM TO SUPPORT THE LIGHTING ELECTRICITY SYSTEM

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ABSTRACT

Global warming has escalated to the extreme due to the increase in CO₂ gas resulting from fossil fuels combustion. In tackling global warming, the transition from fossil-based energy to renewable energy is needed. Indonesia, as an equatorial country, has great potential to utilize solar energy as clean energy for electricity generation. This research was conducted to obtain a solar power plant design that is technically and economically feasible to be implemented in the DLC FKG UGM Building. This stems from the background of the building which have been certified as green buildings, but are yet able to independently supply the building electricity.

The design was carried out using PVSyst software. The research proposed four system configuration designs that suit the electrical lighting needs of the DLC Building. Furthermore, the results of the simulation are carried out by employing technical and economic analysis to determine the most optimal system.

The results of the simulation and analysis show that the most optimal system design is the A2 system. The system uses 24 units of Jinko Solar 540 Wp PV modules and a 10 kW Growatt inverter with a total system capacity of 12.96 kWp. The system can produce 15,298.84 kWh/year with an array yield of 1,180 kWh/kWp/year. Other than that, from the technical analysis, the result suggests that the system's solar fraction is 63.42% with the performance ratio of 76.96%. The system can save carbon emissions as much as 225.64 tCO₂. On the other hand, the economic analysis shows that the LCOE of the system is IDR 499/kWh while the NPV is IDR 48.364.721 with a payback period of 10,88 years.

Keywords: CO₂ Emission, Renewable Energy, DLC Building, Global warming, Solar Power Plant

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