

ABSTRAK

ANALISIS KINERJA DAN KELAYAKAN EKONOMI PLTS *ON-GRID* UNTUK SPKLU DENGAN VARIASI *SOILING LOSS*

Oleh:

Magdalena Manullang

Pengaruh *soiling loss* terhadap kinerja dan kelayakan ekonomi sistem PLTS *On-Grid* untuk SPKLU dianalisis melalui skenario *No Cleaning* dan *With Cleaning*. Sistem dirancang menggunakan perangkat lunak PV Syst dengan kapasitas 5 kWp yang terdiri dari modul fotovoltaik 500 Wp dan inverter 5 kWac. Evaluasi kinerja sistem dilakukan menggunakan parameter *Performance Ratio* (PR), sedangkan analisis ekonomi meliputi *Net Present Value* (NPV), *Discounted Payback Period* (DPP), *Profitability Index* (PI), dan *Levelized Cost of Energy* (LCOE). Hasil penelitian menunjukkan bahwa kondisi *With Cleaning* memberikan performa sistem yang lebih baik dengan nilai PR sebesar 81% dibandingkan 80,1% pada kondisi *No Cleaning*. Dari aspek ekonomi, kondisi *No Cleaning* menghasilkan NPV sebesar Rp20.156.211, PI sebesar 1,24, DPP selama 14,27 tahun, dan LCOE sebesar Rp707,09/kWh, sedangkan kondisi *With Cleaning* menghasilkan NPV sebesar Rp21.519.808, PI sebesar 1,26, DPP selama 13,90 tahun, dan LCOE sebesar Rp698,87/kWh. Hasil tersebut menunjukkan bahwa pembersihan modul surya secara berkala mampu mengurangi dampak *soiling loss* sehingga meningkatkan performa dan kelayakan ekonomi sistem PLTS *On-Grid* pada SPKLU.

Kata kunci: PLTS *On-Grid*, SPKLU, *Soiling Loss*, Kelayakan Ekonomi.

ABSTRACT

PERFORMANCE AND ECONOMIC FEASIBILITY ANALYSIS OF AN ON-GRID PHOTOVOLTAIC SYSTEM FOR ELECTRIC VEHICLE CHARGING STATIONS CONSIDERING SOILING LOSS VARIATIONS

By:

Magdalena Manullang

The effect of fouling losses on the performance and economic feasibility of an On-Grid Solar Power Plant (PLTS) system for EVCS is analyzed through scenarios Without Cleaning and *With Cleaning*. This system is designed using PVSyst software with a capacity of 5 kWp consisting of 500 Wp photovoltaic modules and a 5 kWac inverter. System performance evaluation is carried out using the Performance Ratio (PR) parameter, while the economic analysis includes Net Present Value (NPV), Discounted Payback Period (DPP), Profitability Index (PI), and Average Cost of Energy (LCOE). The results show that the *With Cleaning* condition provides better system performance with a PR value of 81% compared to 80.1% in the *No Cleaning* condition. From the economic aspect, the condition Without Cleaning produces an NPV of Rp20,156,211, PI of 1.24, DPP of 14.27 years, and LCOE of Rp707.09/kWh, while the condition *With Cleaning* produces an NPV of Rp21,519,808, PI of 1.26, DPP of 13.90 years, and LCOE of Rp698.87/kWh. These results indicate that regular cleaning of solar modules can reduce the impact of losses due to dirt, thereby improving the performance and economic feasibility of the On-Grid PLTS system at EVCS.

Key Words: PLTS On-Grid, EVCS, Soiling Loss, Economic Feasibility