

## INTISARI

Penelitian ini mengkaji kelayakan teknis dan finansial integrasi pengisian daya kendaraan listrik (*EV*) di rumah pada jaringan distribusi tegangan rendah pedesaan milik PLN, seiring meningkatnya adopsi *EV* (Mobil dan motor listrik) di Indonesia. Simulasi dilakukan menggunakan ETAP untuk tiga skenario waktu pengisian—siang, sore (beban puncak), dan malam hari—dengan tingkat penetrasi *EV* dari 0% hingga 50%. Evaluasi teknis mencakup profil tegangan, pembebanan trafo dan kabel, serta rugi-rugi daya, baik sebelum maupun sesudah diterapkannya solusi berupa penambahan trafo sisip. Hasil menunjukkan bahwa tekanan sistem mulai muncul pada penetrasi 20–30%, dengan kondisi sore hari sebagai skenario paling kritis. Strategi penambahan trafo terbukti mampu meningkatkan profil tegangan dan menurunkan rugi-rugi hingga 48%. Analisis finansial menggunakan metode *NPV*, *IRR*, *BCR*, dan *payback period* menunjukkan bahwa investasi ini layak, khususnya pada skenario sore hari yang memberikan manfaat ekonomi tertinggi. Penelitian ini merekomendasikan pengisian malam hari sebagai pilihan paling stabil secara teknis, sementara pengisian sore hari memberikan keuntungan finansial terbesar.

**Kata kunci** – Pengisian kendaraan listrik di rumah, PLN, Perencanaan

## **ABSTRACT**

*This study investigates the technical and financial feasibility of integrating electric vehicle (EV) Home Charging into a rural low-voltage distribution network managed by PLN, in response to Indonesia's growing EV adoption. Simulations were conducted using ETAP under three charging scenarios—daytime, evening peak, and overnight—with EV penetration levels ranging from 0% to 50%. Technical assessments focused on voltage profiles, transformer and line loading, and network losses, both before and after applying a solution strategy involving the addition of an injection transformer. Results showed that system stress begins at 20–30% EV penetration, with evening peak loads being the most critical. The transformer solution significantly improved voltage conditions and reduced losses by up to 48%. A financial analysis using NPV, IRR, BCR, and payback period confirmed that the investment is viable, especially under peak load conditions, which yielded the highest economic return. The findings highlight that while overnight charging is technically most stable, evening charging offers the greatest financial benefit.*

**Keywords :** Home Charging, Hosting capacity, PLN