

ABSTRAK

ARDYAN SYS ARIANTO. Analisis Pengaruh Penambahan Transformator Terhadap Penurunan Rugi Daya Di PT PLN (Persero) ULP Enrekang. Dibimbing oleh HENDRIANTO HUSADA, IR., M.T.

Kualitas distribusi tenaga listrik di PT PLN (Persero) ULP Enrekang, khususnya pada Gardu PETE, menghadapi kendala teknis berupa tingginya *voltage drop* dan rugi daya (*power losses*) akibat panjangnya radius jaringan serta kondisi *overload* pada transformator. Penelitian ini bertujuan untuk mengevaluasi kinerja jaringan kondisi eksisting, menganalisis efektivitas penambahan transformator sisip (*insert trafo*) yang dikombinasikan dengan *reconductoring*, serta merancang strategi *preventive maintenance* untuk keberlanjutan sistem. Metode penelitian menggunakan pendekatan kuantitatif berbasis simulasi *software* ETAP 19.0.1 yang divalidasi dengan perhitungan manual dan pengukuran lapangan. Hasil analisis kondisi eksisting menunjukkan tegangan ujung kritis sebesar 81,22% dan pembebanan trafo mencapai 90,16%. Simulasi perbaikan melalui penyisipan trafo berkapasitas 100 kVA dan penggantian penghantar terbukti efektif menaikkan tegangan pelayanan di SMPN 1 Enrekang secara signifikan menjadi 98,11% serta menurunkan beban trafo ke level aman. Penelitian ini menyimpulkan bahwa rekayasa jaringan tersebut mampu mengatasi *undervoltage* dan menekan rugi daya. Guna menjaga keandalan aset baru tersebut, direkomendasikan penerapan jadwal pemeliharaan berbasis waktu (*time-based maintenance*) yang meliputi penyeimbangan beban (*load balancing*) dan inspeksi termal secara berkala.

Kata kunci: Rugi daya, *voltage drop*, transformator sisip, *reconductoring*, *preventive maintenance*.

ABSTRACT

ARDYAN SYS ARIANTO. *Analysis of Power Loss Reduction Through the Addition and Maintenance of Transformers on the Distribution Line at PT PLN (Persero) ULP Enrekang. Supervised by HENDRIANTO HUSADA, IR., M.T.*

The quality of electric power distribution at PT PLN (Persero) ULP Enrekang, specifically at the PETE Substation, faces technical constraints regarding high voltage drop and power losses due to the long network radius and transformer overload conditions. This study aims to evaluate the performance of the existing network, analyze the effectiveness of adding an insert transformer combined with reconductoring, and design a preventive maintenance strategy for system sustainability. The research method employs a quantitative approach based on ETAP 19.0.1 software simulation, validated by manual calculations and field measurements. The analysis of the existing condition revealed a critical end voltage of 81.22% and transformer loading reaching 90.16%. Simulation of improvements through the insertion of a 100 kVA transformer and conductor replacement proved effective in significantly increasing the service voltage at SMPN 1 Enrekang to 98.11% and reducing transformer load to a safe level. This study concludes that such network engineering successfully resolves undervoltage issues and minimizes power losses. To maintain the reliability of the new assets, the implementation of a time-based maintenance schedule, including load balancing and periodic thermal inspection, is recommended.

Keywords: *power losses, distribution transformer, feeder optimization, preventive maintenance*