

PENERAPAN METODE CUT OFF SINGLE PHI INCOMER TERHADAP KEANDALAN DAN KEAMANAN SISTEM TRANSMISI TENAGA LISTRIK SUTT 150 KV TEGINENENG – METRO

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ABSTRAK

Transformasi arsitektur jaringan transmisi melalui skema *cut off* merupakan strategi krusial untuk memitigasi risiko pemadaman meluas pada sistem kelistrikan dengan interkoneksi kompleks, seperti pada jalur SUTT 150 kV Tegineneng–Metro di wilayah Lampung. Penelitian ini difokuskan pada evaluasi parameter keandalan sistem akibat kerentanan terhadap gangguan hubung singkat yang memengaruhi indeks kontinuitas pelayanan. Metodologi penelitian mencakup analisis aliran daya (*load flow*) menggunakan perangkat lunak ETAP serta perhitungan matematis terhadap nilai *Mean Time Between Failures* (MTBF) untuk mengukur rata-rata waktu antar kegagalan pada komponen transmisi. Hasil evaluasi menunjukkan peningkatan efisiensi yang signifikan, di mana rugi-rugi daya (*power losses*) pada jalur Sribawono–Metro–Tegineneng berhasil direduksi sebesar 53%, dari 1.517 kW menjadi 712,6 kW. Selain efisiensi daya, terjadi perbaikan profil tegangan yang substansial pada sisi distribusi; tegangan operasional pada GI Metro dan GI Sribawono yang sebelumnya berada pada kondisi kritis sebesar 17,7 kV, berhasil ditingkatkan masing-masing menjadi 18,6 kV dan 18,7 kV, sehingga kini telah memenuhi standar operasional nasional. Penerapan metode ini secara teknis juga mampu meningkatkan nilai MTBF, yang mengindikasikan bahwa sistem memiliki ketahanan lebih tinggi terhadap frekuensi gangguan berulang. Optimalisasi isolasi gangguan dan perbaikan kualitas tegangan ini membuktikan bahwa metode *cut off single phi incomer* efektif dalam memperkuat stabilitas serta keandalan jangka panjang infrastruktur transmisi di Lampung.

Kata Kunci: keandalan sistem, keamanan sistem, cut off single phi incomer, SUTT 150 kV, transmisi tenaga listrik.

IMPLEMENTATION OF THE SINGLE PHI INCOMER CUT OFF METHOD ON THE RELIABILITY AND SECURITY OF THE 150 KV SUTT TEGINENENG – METRO ELECTRIC POWER TRANSMISSION SYSTEM

ABSTRACT

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The transformation of network architecture through a cut-off scheme is a crucial strategy for mitigating the risk of widespread blackouts in complex interconnected power systems, such as the 150 kV Tegineneng–Metro transmission line in the Lampung region. This study focuses on evaluating system reliability parameters due to vulnerability to short-circuit faults that affect service continuity indices. The research methodology includes load flow analysis using ETAP software and mathematical calculations of Mean Time Between Failures (MTBF) to measure the average time between transmission component failures. The results indicate a significant increase in efficiency, where power losses on the Sribawono–Metro–Tegineneng line were reduced by 53%, from 1,517 kW to 712.6 kW. In addition to power efficiency, there is a substantial improvement in the voltage profile on the distribution side; the operational voltage at the Metro and Sribawono Substations, which were previously at a critical undervoltage condition of 17.7 kV, were successfully increased to 18.6 kV and 18.7 kV, respectively, thereby meeting national operational standards. Technically, the implementation of this method also improves the MTBF value, indicating higher system resilience against recurring fault frequencies. The optimization of fault isolation and improved voltage quality prove that the cut-off single phi incomer method is effective in strengthening the long-term stability and reliability of the transmission infrastructure in Lampung.

Keywords: *system reliability, system security, single phi incomer cut off, SUTT 150 kV, electric power transmission.*