

## RINGKASAN

### ANALISIS PENINGKATAN INDEKS KEANDALAN PADA SISTEM DISTRIBUSI 20 KV DENGAN PERALATAN *RECLOSER* DI GARDU INDUK WONOSOBO MENGGUNAKAN METODE FMEA (*FAILURE MODE EFFECT ANALYSIS*) DAN *SECTION TECHNIQUE*

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Kualitas energi listrik yang diterima konsumen sangat dipengaruhi oleh keandalan sistem distribusi dan Keandalan sistem distribusi tenaga listrik sangat dipengaruhi oleh konfigurasi sistem, perangkat pengaman yang terpasang, dan sistem proteksinya. Konfigurasi yang benar, peralatan yang andal, dan pengoperasian sistem secara otomatis akan membawa kinerja yang baik ke sistem distribusi sehingga dapat disimpulkan bahwa sistem proteksi dengan konfigurasi yang tepat dapat menghasilkan keandalan sistem distribusi yang baik dan semakin baik pengopreasian sistem distribusi maka semakin baik juga kualitas energi listrik yang diterima konsumen.

Penelitian ini memiliki tujuan untuk menganalisis keandalan sistem distribusi pada salah satu penyulang di Gardu Induk Wonosobo dengan metode FMEA dan *section technique* dengan menghtiung indeks keandalan sistem distribusi 20 kV yang digunakan adalah SAIFI, SAIDI dan CAIDI. Jika nilai indeks keandalan masih dibawah standar yang ditetapkan PT.PLN maka akan dilakukan upaya peningkatan indeks keandalan dengan menggunakan peralatan *reloser* yang kemudian akan dilakukan analisis pada sistem proteksinya.

Hasil yang didapat dari penelitian ini menunjukkan nilai SAIFI, SAIDI dan CAIDI berdasarkan perhitungan FMEA sebesar 5,104 *fault/customer/yr* , 15,5418 *hour/customer/yr* dan 3,0445 *hour/interruption*; berdasarkan perhitungan *section technique* sebesar 5,16123 *fault/customer/yr* , 16,1083 *hour/customer/yr* dan 3,121 *hour/interruption*; berdasarkan simulasi ETAP kondisi existing sebesar 5,0252 *fault/customer/yr*, 15,621 *hour/customer/yr* dan dan 3,109 *hour/interruption*. Karena indeks nilai SAIFI yang masih di bawah standar yang ditetapkan PLN maka dilakukan analisis perbaikan dan peningkatan keandalan. Pada upaya perbaikan pertama nilai SAIFI, SAIDI dan CAIDI sebesar 3,653 *fault/customer/yr* dan 14,4558 *hour/customer/yr* dan 3,957 *hour/interruption*; Pada upaya perbaikan kedua nilai SAIFI, SAIDI dan CAIDI sebesar 3,5702 *fault/customer/yr* dan 14,5738 *hour/customer/yr* dan 4,082 *hour/interruption*; Pada upaya perbaikan ketiga nilai SAIFI, SAIDI dan CAIDI sebesar 3,4772 *fault/customer/yr* dan 14,2637 *hour/customer/yr* dan 4,102 *hour/interruption*. Pada upaya perbaikan ketiga nilai SAIFI dan SAIDI sudah diatas standar SPLN 68-2;1986 untuk daerah Jawa-Bali sebesar 3,531 *fault/customer/yr* dan 23,1 *hour/customer/yr*.

Kata kunci : sistem distribusi, keandalan, indeks keandalan , FMEA, *section technique*, SAIFI, SAIDI, CAIDI, *Recloser*.



## **SUMMARY**

### ***ANALYSIS OF RELIABILITY IMPROVEMENT ON A 20 KV DISTRIBUTION SYSTEM WITH RECLOSER EQUIPMENT AT WONOSOBO SUBSTANCE USING FAILURE MODE EFFECT ANALYSIS AND SECTION TECHNIQUE METHODS***

Rafli Nur Faizi

*The quality of electrical energy received by consumers is strongly influenced by the reliability of the distribution system and the reliability of the electric power distribution system is strongly influenced by the system configuration, installed safety devices, and protection systems. Correct configuration, reliable equipment, and automatic system operation will bring good performance to the distribution system so it can be concluded that a protection system with the right configuration can produce good distribution system reliability and the better distribution system operation, the better energy quality electricity received by consumers*

*This study aims to analyze the reliability of the distribution system at one of the feeders at the Wonosobo Substation using the FMEA method and the section technique by calculating the reliability index of the 20 kV distribution system used, namely SAIFI, SAIDI and CAIDI. If the value of the reliability index is still below the standard set by PT. PLN, efforts will be made to increase the reliability index by using reloser equipment which will then be analyzed on the protection system.*

*The results obtained from this study show the value of SAIFI, SAIDI and CAIDI based on FMEA calculations of 5.104 fault/customer/yr , 15.5418 hour/customer/yr and 3.0445 hour/interruption; based on the calculation of the section technique of 5.16123 fault/customer/yr , 16.1083 hour/customer/yr and 3.121 hour/interruption; based on ETAP simulation, the existing condition is 5.0252 fault/customer/yr, 15,621 hour/customer/yr and 3,109 hour/interruption. Because the SAIFI value index is still below the standard set by PLN, an analysis of repairs and reliability improvements is carried out. In the first repair effort, the values of SAIFI, SAIDI and CAIDI were 3.653 fault/customer/yr and 14.4558 hour/customer/yr and 3.957hour/interruption; In an effort to repair the two values of SAIFI, SAIDI and CAIDI of 3.5702 fault/customer/yr and 14.5738 hour/customer/yr and 4.082 hour/interruption; In the third repair effort, the values of SAIFI, SAIDI and CAIDI were 3.4772 fault/customer/yr and 14.2637 hour/customer/yr and 4.102 hour/interruption. In the third improvement effort, the SAIFI and SAIDI values were already above the SPLN standard of 68-2;1986 for the Java-Bali area of 3,531 faults/customer/yr and 23.1 hour/customer/yr.*

*Keywords : Distribution Systems, reliability, software index, FMEA, Section technique, SAIFI, SAIDI, CAIDI, recloser.*

