E-ISSN: 3025-5481
DINASTI INFORMATION AND TECHNOLOGY
https://dinastirev.org/DIT dinasti.info@gmail.com +62 811 7404 455

DOI: https://doi.org/10.38035/dit.v1i1
Received: 3 July 2023, **Revised:** 14 July 2023, **Publish:** 16 July 2023

Analysis Repair End Voltage and shrink Technical with Reconfiguration Network 20 KV distribution on Feeder PT PLN (Persero) Service Unit Silago Customer (ULP) Sitiung

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Abstract: There is voltage drop at the tip feeder silago because length network feeder the resulted distribution Genre Power electricity to customer suboptimal . By Because That done analysis transfer burden network with method reconfigure network distribution voltage intermediate feeder the original syllabus is output from substation Connect (GH) Sungai Dareh Then moved to feeder river dareh that direct output from substation Main (GI) Lansek River with use ETAP application 19.01, so expected can repair voltage drop across the feeder sylago so that distribution Genre Power electricity to customer can be optimal.

Keyword: Voltage Drop, Displacement Burden Network Distribution, Reconfiguration Network Distribution.

INTRODUCTION

PT. PLN (Persero) is one of the state electricity companies that distributes electricity to the community. Because electricity is one of the important needs, therefore it is necessary to provide good, safe, reliable and quality electricity distribution services to customers to achieve customer satisfaction.

One index of the level of service quality is the magnitude of the voltage value on both the medium voltage and low voltage sides. The amount of voltage received by customers is influenced by voltage drop. Technical loss or voltage drop is one measure of the efficiency or inefficiency of an electric power distribution system. To increase efficiency, it is necessary to reduce technical distribution losses. Emphasis on technical losses can be done by uprating conductors, reconfiguring networks, withdrawing new networks or replacing tap connectors with joint sleeves. Network reconfiguration is a change in the pattern of network operations, this method is commonly used because it is easy to implement and costs little, so the gain and savings are large.

Distribution network reconfiguration is the process of changing the current value or impedance of the feeder or moving the supply point of a distribution transformer load from one feeder to another. Moving the load to another feeder means reducing the current flowing so that the voltage drop will be smaller. The main purpose of this load transfer is not a voltage correction but more priority to increase the reliability of substation transformer loading considerations or considerations due to changes in load.

To get an optimal network reconfiguration, it is done by simulating a 20KV ULP Sitiung medium voltage network in the ETAP power simulation application. The optimal operating pattern is obtained by simulating the existing network operating pattern with a new operating pattern.

In this research, an analysis of the voltage improvement at the end of the Silago feeder was carried out using the ETAP 19.01 Application by reconfiguring the Medium Voltage Distribution Network of the Silago Feeder which was originally supplied from the Sungai Dareh GH and then moved to the Sungai Dareh Feeder which is a direct output from the Sungai Lansek GI.

METHODS

In terms of distribution of electrical energy in the working area of PT. PLN (Persero) ULP Sitiung, the 20 kV distribution network system used is sourced from the Lansek Substation. However, because the energy supply source is quite far away and has a fairly high load, the energy distribution of the 20 kV system is not optimal, coupled with the high voltage losses on this distribution channel, causing the voltage drop at the Dareh River Switching Substation (GH) to be quite high. .

This is because the first source, namely the Lansek River GI, through the Dareh River feeder, which is the main supply at the Dareh River GH, is relatively far away and also has 3 outgoings at the Dareh River GH. One of them is the Silago feeder, which has a SUTM network length of 120.376 kms, causing a voltage drop at the end of the network. Therefore, a reconfiguration of the 20 kV network operating pattern was carried out, so that the voltage drop was not too far from the set value of SPLN N0. 72 of 1987.

Therefore, it is planned to move the network and load of the Silago feeder as well as the construction of 1 new express feeder which will be the main energy source for electrical energy needs in the Sungai Dareh GH.

With the transfer of the network and load of the Silago feeder as well as the construction of this new feeder express, it is expected that the voltage drop at the Dareh River GH can meet the set standards, so that the voltage at the Dareh River GH can be repaired, and can reduce losses (power losses).

Simulation Using E-TAP 19.0.1

Method calculation done with method compare condition electricity at the Dareh River GH before And after moved network feeder sylago at a time it was built express feeder new , with use ETAP 19.0.1 software then simulation can done with create single line diagrams and form configuration network on the ETAP layer and enter the required data in accordance condition field and the data obtained .

Manual Calculation

Calculations carried out in study This is calculation to magnitude voltage drop value as well as magnitude loss power that occurs in distribution energy to GH Sungai Dareh And each outgoing feeder . Method calculation done with based on on voltage data send , which calculates the voltage drop per channel in accordance with the data obtained so that found mark arriving voltage _ to each feeder , and furthermore calculate the total voltage drop with reduce voltage Send to voltage accept it , then calculating losses or losses power occurring in the line that .

RESULTS AND DISCUSSION

Results

Description Data

Table 1. Results Measurement Before And After the application Stage 19.01

NO	FEEDER	TEGANGAN SEBELUM (KV)		TEGANGAN SESUDAH (KV)	
		PANGKAL	UJUNG	PANGKAL	UJUNG
1	F. SUNGAI DAREH	20,7	19,07	20,7	20,4
2	F. SILAGO	19,07	18,22	20,4	19,52
3	F. KAMPUNG SURAU	19,07	-	19,68	-
4	F. GUNUNG MEDAN	19,07	-	19,68	-
5	F. EXP PULAU PUNJUNG	20,7	-	20,7	19,68

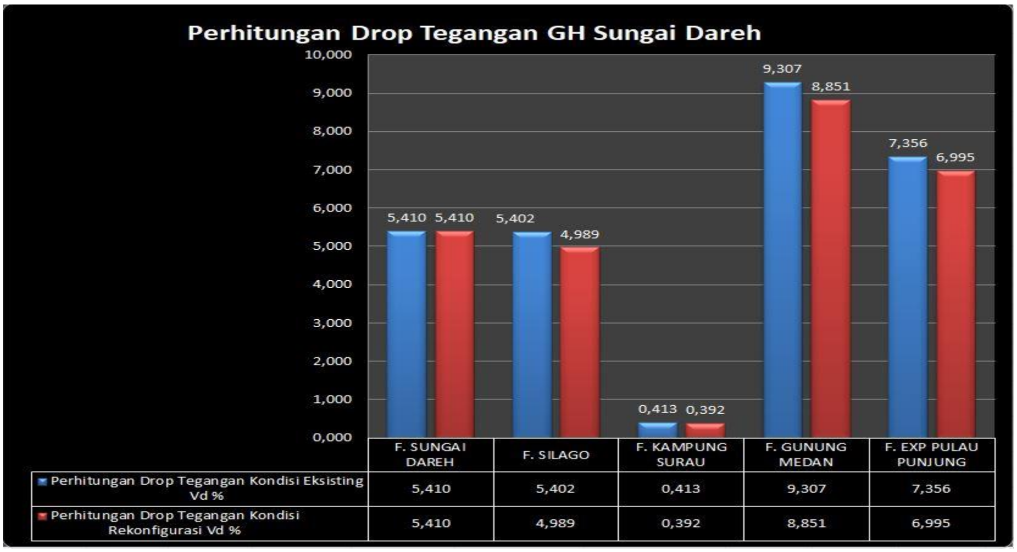

Figure 1. Graph _ Difference Voltage at GH Sungai Dareh

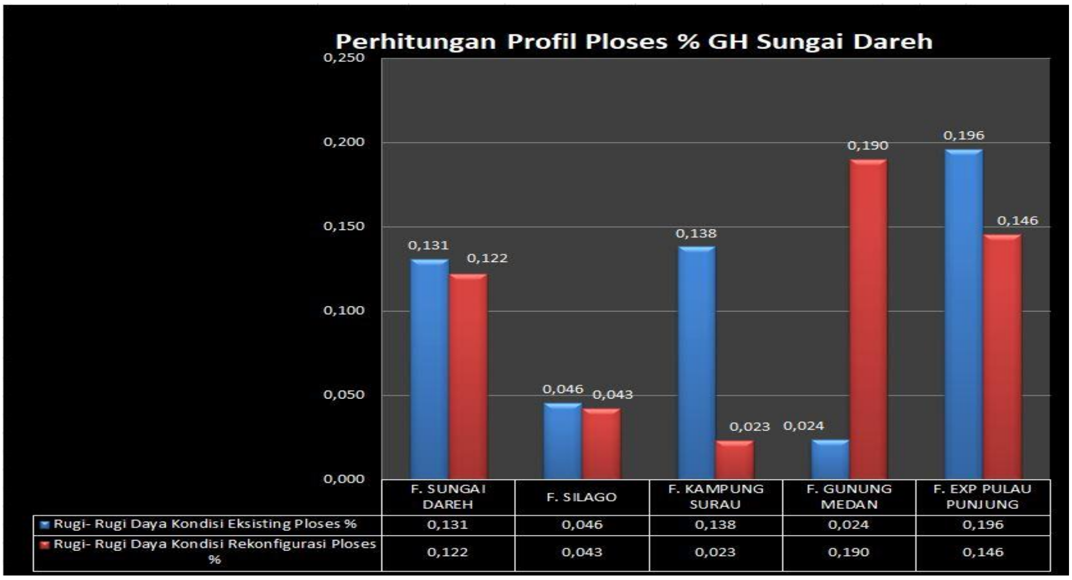

Figure 2 . Graph of Differences in Losses in Sungai Dareh GH

From the table above can seen results measurement voltage before done Substation bus reconfiguration Dareh River connection Where feeder Dareh River with condition Still carry all Outgoing in Sungai Dareh GH .

After done reconfiguration network on Substation Dareh River connection with condition feeder Silago is supplied from feeder of the Dareh River And throughout Outgoing

GH Sungai Dareh ie feeder Village surau And feeder Mount Medan supplied from feeder Exp Island Arbor . So that obtained increase voltage in both Outgoing side of GH Balitan .

Flow chart (Flowchart)

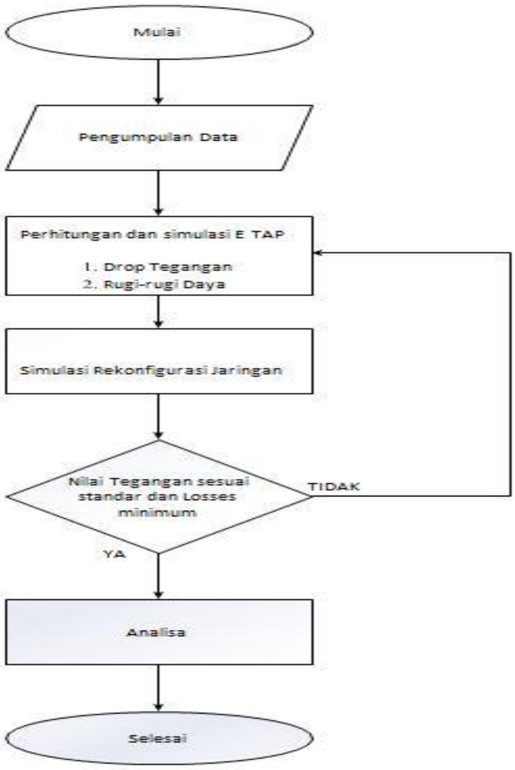

Figure 3 . Flow chart

Manual Calculation

1. Calculation of Conductor Voltage Drop

   Based on table 1 to calculate the voltage drop using the following formula:

   $$\mathbf{Vd = \sqrt{3}\ .\ I\ .\ \ell(R\cos\varphi + jX\sin\varphi)}$$

   Where :

   ℓ = Channel Length (Km)
   I = Current (Amperes)
   Z= (R + jX) = 0.2162 + j 0.3305 Ω/Km
   R = 0.2162 Ω
   X = 0.3305 Ω
   Vk = 20 kV
   Cosφ = 0.90
   Sin φ = 0.43

   $$\mathbf{[Vd] = \sqrt{R^2 + JX^2}}$$

   $$\mathbf{Vd\ (\%) = Vd/Vk \times 100\%}$$

2. Calculation of Power Losses

   Based on table 1 to calculate conductor power losses by using the following formula:

   $$\mathbf{Ploses = 3 \times i^2 \times \ell \times R}$$

   $$\mathbf{Pk = \sqrt{3} \times V \times I \times \ell \times Cos\rho}$$

   $$\mathbf{Ploses}\ (\%) = \frac{\mathbf{Pl}}{\mathbf{Pk}}\, x\ 100\%$$

Where :

R = 0.2162

Cosφ = 0.9

Discussion

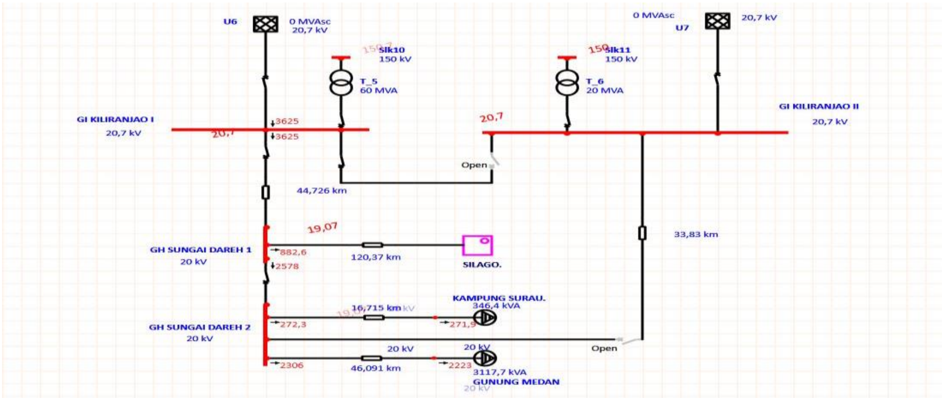

Figure 4. SLD Simulation Before network reconfiguration at Sungai Dareh GH

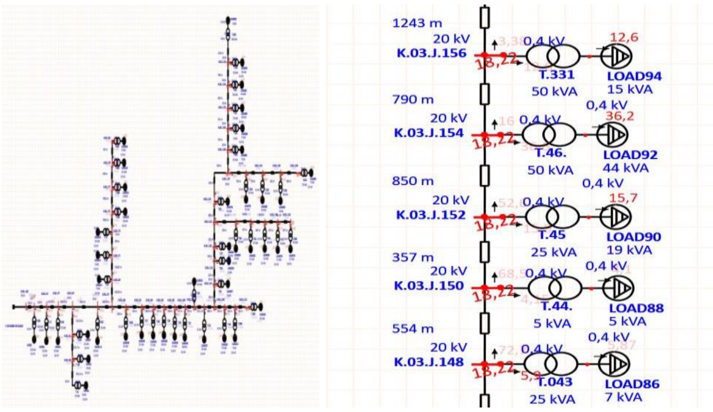

Figure 5. SLD Simulation Before reconfiguration Feeder Silago

Based on Figure 5, seen burden on feeder sylago own voltage at the tip network low so that cause not enough maximum distribution of electrical energy to customer .

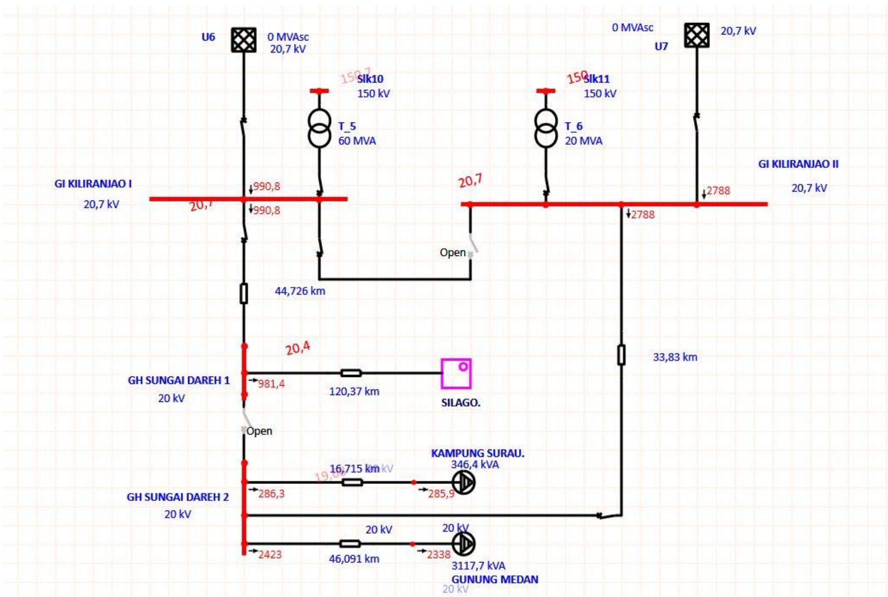

Figure 6. Simulation SLD After network reconfiguration at Sungai Dareh GH

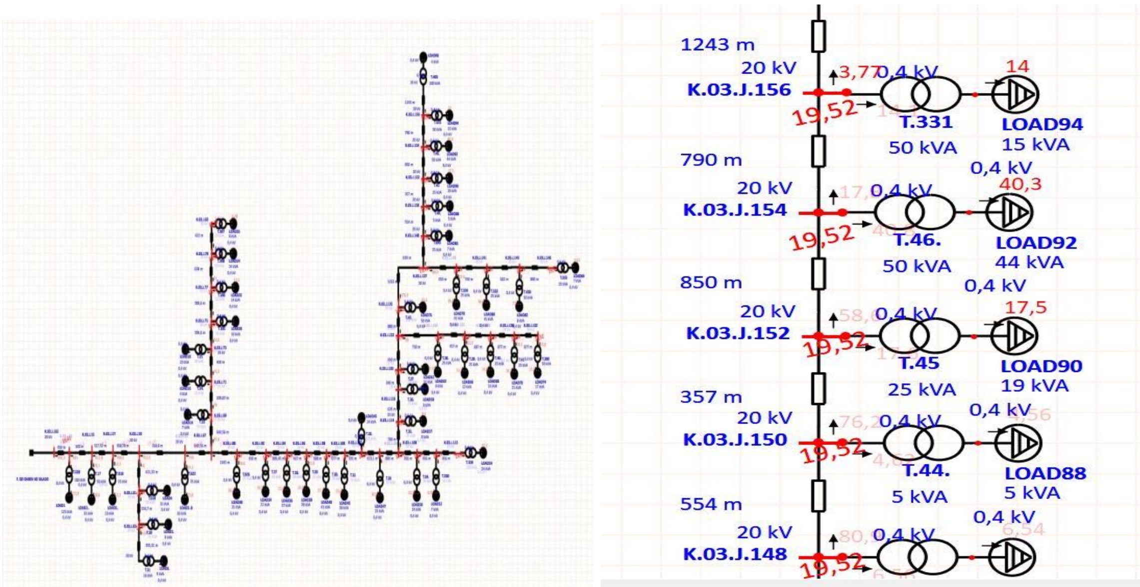

Figure 7. After Simulation SLD reconfiguration Feeder Silago

Based on Figure 7, seen burden on feeder sylago Already experience quite an increase significant , so distribution of electrical energy to customer Can maximum .

Table 2. Results Simulation Losses Power at Dareh River GH

NO	FEEDER	RUGI-RUGI DAYA SEBELUM			RUGI-RUGI DAYA SESUDAH		
		Plosses (KW)	Pk (KW)	Plosses %	Plosses (KW)	Pk (KW)	Plosses %
1	F. SUNGAI DAREH	104433,421	86490,870	1,207	104433,421	85237,380	1,225
2	F. SILAGO	31230,349	71484,060	0,437	31230,349	73170,889	0,427
3	F. KAMPUNG SURAU	1311,803	5459,318	0,240	1311,803	5633,947	0,233
4	F. GUNUNG MEDAN	242146,443	123168,016	1,966	242146,443	127107,842	1,905
5	F. EXP PULAU PUNJUNG	315966,787	130840,502	2,415	315966,787	124393,289	2,540

Table 3. Manual Calculation of Voltage Drop

NO	Feeder	Perhitungan Drop Tegangan Kondisi Eksisting	Perhitungan Drop Tegangan Kondisi Rekonfigurasi
		Vd %	Vd %
1	F. SUNGAI DAREH	5,410	5,410
2	F. SILAGO	5,402	4,989
3	F. KAMPUNG SURAU	0,413	0,392
4	F. GUNUNG MEDAN	9,307	8,851
5	F. EXP PULAU PUNJUNG	7,356	6,995

Table 4. Manual Calculation of Losses Power

NO	Feeder	Rugi- Rugi Daya Kondisi Eksisting	Rugi- Rugi Daya Kondisi Rekonfigurasi
		Ploses %	Ploses %
1	F. SUNGAI DAREH	0,131	0,122
2	F. SILAGO	0,046	0,043
3	F. KAMPUNG SURAU	0,138	0,023
4	F. GUNUNG MEDAN	0,024	0,190
5	F. EXP PULAU PUNJUNG	0,196	0,146

CONCLUSION

Improving the quality of service and efficiency of electricity distribution at the Sungai Dareh GH, especially in the Silago feeder , can be done by reconfiguring the Network by tapping the Silago feeder network to the Dareh River feeder and adding a New Express network which is supplied from the Sungai Lansek Substation as well as solving the outgoing GH Sungai load. Dareh by moving the burden of Silago's feeders. From the results of the simulation and manual calculations that the author has done, several advantages were found, namely: 1. Network reconfiguration on the Silago feeder and load transfer can increase the voltage at Sungai Dareh GH so that it can optimize the distribution of electric power to customers and increase sales kWh. 2. Network Reconfiguration at Sungai Dareh GH will have 2 supplies from Sungai Lansek Substation, namely the Pulau Punjung Express feeder as the main supplier and the Sungai Dareh feeder as a backup, so that if there is a disturbance or maintenance it can simplify maneuvers and minimize blackouts.

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