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Lampiran 1 Perhitungan *Excel* Rugi - Rugi Penyulang Express 1

1. EXPRESS 1				
Losses JTM				
Rtotal Penyulang :		1,710	Rgawang : 1,710	
Jumlah Gardu :		1		
Zigma :		1		
Jam	Arus	Arus Gawang	JTM Losses	
1	58,900	58,900	17,802	
2	57,167	57,167	16,770	
3	56,233	56,233	16,226	
4	54,700	54,700	15,354	
5	56,333	56,333	16,284	
6	57,233	57,233	16,809	
7	58,767	58,767	17,721	
8	61,733	61,733	19,556	
9	69,800	69,800	25,000	
10	71,900	71,900	26,527	
11	76,200	76,200	29,795	
12	76,200	76,200	29,795	
13	74,167	74,167	28,226	
14	74,400	74,400	28,404	
15	74,833	74,833	28,736	
16	75,100	75,100	28,941	
17	72,000	72,000	26,601	
18	81,533	81,533	34,112	
19	86,833	86,833	38,691	
20	83,333	83,333	35,635	
21	80,867	80,867	33,556	
22	77,733	77,733	31,006	
23	70,867	70,867	25,770	
24	65,933	65,933	22,307	
Jumlah Losses JTM			609,624	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3		
	25	0,5		
	50	0,925		
	100	1,63		
	160	2,3		
	200	2,705		
	250	3,17		
	315	3,75		
Total			0	0
TOTAL LOSSES				609,624



Lampiran 2 Perhitungan *Excel* Rugi - Rugi Penyulang Bontomanai

2. BONTOMANAI				
Losses JTM				
Rtotal Penyulang :		10,584	Rgawang : 0,588	
Jumlah Gardu :		18		
Zigma :		2109		
Jam	Arus	Arus Gawang	JTM Losses	
1	4,833	0,269	0,268	
2	4,933	0,274	0,279	
3	4,733	0,263	0,257	
4	4,533	0,252	0,236	
5	5,233	0,291	0,314	
6	5,367	0,298	0,331	
7	5,433	0,302	0,339	
8	5,200	0,289	0,310	
9	5,567	0,309	0,356	
10	5,000	0,278	0,287	
11	5,233	0,291	0,314	
12	4,967	0,276	0,283	
13	4,767	0,265	0,261	
14	4,733	0,263	0,257	
15	4,633	0,257	0,247	
16	5,167	0,287	0,307	
17	6,067	0,337	0,423	
18	8,000	0,444	0,735	
19	8,400	0,467	0,810	
20	8,600	0,478	0,849	
21	8,167	0,454	0,766	
22	7,333	0,407	0,618	
23	6,033	0,335	0,418	
24	5,567	0,309	0,356	
Jumlah Losses JTM			9,622	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3	0	0
	25	0,5	9	108
	50	0,925	8	177,6
	100	1,63	1	39,12
	160	2,3	0	0
	200	2,705	0	0
	250	3,17	0	0
	315	3,75	0	0
Total			18	324,72
TOTAL LOSSES				334,342



Lampiran 3 Perhitungan *Excel* Rugi - Rugi Penyulang Bontomatene

3. BONTOMATENE				
Losses JTM				
Rtotal Penyulang :		6,719	Rgawang : 0,611	
Jumlah Gardu :		11		
Zigma :		506		
Jam	Arus	Arus Gawang	JTM Losses	
1	15,400	1,400	1,817	
2	15,167	1,379	1,763	
3	14,833	1,348	1,686	
4	14,900	1,355	1,701	
5	15,833	1,439	1,921	
6	16,367	1,488	2,053	
7	16,433	1,494	2,069	
8	15,300	1,391	1,794	
9	15,300	1,391	1,794	
10	16,033	1,458	1,970	
11	16,000	1,455	1,962	
12	16,333	1,485	2,044	
13	17,267	1,570	2,284	
14	17,100	1,555	2,241	
15	17,467	1,588	2,338	
16	15,433	1,403	1,825	
17	17,100	1,555	2,241	
18	13,667	1,242	1,431	
19	24,833	2,258	4,725	
20	25,000	2,273	4,789	
21	23,767	2,161	4,328	
22	22,033	2,003	3,720	
23	19,000	1,727	2,766	
24	17,967	1,633	2,473	
Jumlah Losses JTM			57,735	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi - rugi Trafo (kWh)
	16	0,3	0	0
	25	0,5	3	36
	50	0,925	7	155,4
	100	1,63	0	0
	160	2,3	1	55,2
	200	2,705	0	0
	250	3,17	0	0
	315	3,75	0	0
Jumlah Losses Trafo			11	246,6
TOTAL LOSSES				304,335



Lampiran 4 Perhitungan *Excel* Rugi - Rugi Penyulang Eremata

4. EREMATA				
Losses JTM				
Rtotal Penyulang :		6,855	Rgawang : 0,457	
Jumlah Gardu :		15		
Zigma :		1240		
Jam	Arus	Arus Gawang	JTM Losses	
1	2,700	0,180	0,055	
2	2,700	0,180	0,055	
3	2,700	0,180	0,055	
4	2,633	0,176	0,052	
5	2,933	0,196	0,065	
6	3,767	0,251	0,107	
7	2,933	0,196	0,065	
8	2,700	0,180	0,055	
9	3,433	0,229	0,089	
10	3,600	0,240	0,098	
11	3,500	0,233	0,093	
12	3,433	0,229	0,089	
13	3,333	0,222	0,084	
14	3,267	0,218	0,081	
15	2,967	0,198	0,067	
16	2,867	0,191	0,062	
17	2,967	0,198	0,067	
18	4,367	0,291	0,144	
19	4,867	0,324	0,179	
20	4,600	0,307	0,160	
21	3,967	0,264	0,119	
22	4,033	0,269	0,123	
23	3,567	0,238	0,096	
24	3,000	0,200	0,068	
Jumlah Losses JTM			2,127	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi - rugi Trafo (kWh)
	16	0,3	3	21,6
	25	0,5	5	60
	50	0,925	6	133,2
	100	1,63	0	0
	160	2,3	1	55,2
	200	2,705	0	0
	250	3,17	0	0
	315	3,75	0	0
Jumlah Losses Trafo			15	270
TOTAL LOSSES				272,127



Lampiran 5 Perhitungan *Excel* Rugi - Rugi Penyulang Bontobuki

5. BONTOBUKI				
Losses JTM				
Rtotal Penyulang :		14,821	Rgawang : 0,872	
Jumlah Gardu :		17		
Zigma :		1785		
Jam	Arus	Arus Gawang	JTM Losses	
1	3,433	0,202	0,190	
2	3,267	0,192	0,172	
3	3,267	0,192	0,172	
4	3,333	0,196	0,179	
5	3,400	0,200	0,187	
6	3,800	0,224	0,233	
7	3,767	0,222	0,229	
8	3,400	0,200	0,187	
9	3,200	0,188	0,165	
10	3,533	0,208	0,202	
11	3,667	0,216	0,217	
12	3,800	0,224	0,233	
13	3,433	0,202	0,190	
14	3,333	0,196	0,179	
15	2,967	0,175	0,142	
16	2,900	0,171	0,136	
17	3,833	0,225	0,237	
18	5,467	0,322	0,483	
19	6,233	0,367	0,628	
20	6,033	0,355	0,588	
21	5,567	0,327	0,501	
22	5,033	0,296	0,409	
23	4,167	0,245	0,280	
24	3,767	0,222	0,229	
Jumlah Losses JTM			6,372	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi - rugi Trafo (kWh)
	16	0,3	0	0
	25	0,5	5	60
	50	0,925	12	266,4
	100	1,63	0	0
	160	2,3	0	0
	200	2,705	0	0
	250	3,17	0	0
	315	3,75	0	0
Jumlah Losses Trafo			17	326,4
TOTAL LOSSES				332,772



Lampiran 6 Perhitungan *Excel* Rugi - Rugi Penyulang Express 2

6. EXPRESS 2				
Losses JTM				
Rtotal Penyulang :		2,216	Rgawang : 2,216	
Jumlah Gardu :		1		
Zigma :		1		
Jam	Arus	Arus Gawang	JTM Losses	
1	17,867	17,867	2,122	
2	17,733	17,733	2,090	
3	17,367	17,367	2,005	
4	17,333	17,333	1,997	
5	18,033	18,033	2,162	
6	18,733	18,733	2,333	
7	17,100	17,100	1,944	
8	17,767	17,767	2,098	
9	17,433	17,433	2,020	
10	18,333	18,333	2,234	
11	16,933	16,933	1,906	
12	17,300	17,300	1,989	
13	17,133	17,133	1,951	
14	17,200	17,200	1,966	
15	17,167	17,167	1,959	
16	16,933	16,933	1,906	
17	19,667	19,667	2,571	
18	24,667	24,667	4,044	
19	27,567	27,567	5,051	
20	27,233	27,233	4,930	
21	25,333	25,333	4,266	
22	25,200	25,200	4,221	
23	22,200	22,200	3,276	
24	20,133	20,133	2,694	
Jumlah Losses JTM			63,736	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3	0	0
	25	0,5	0	0
	50	0,925	0	0
	100	1,63	0	0
	160	2,3	0	0
	200	2,705	0	0
	250	3,17	0	0
	315	3,75	0	0
Jumlah Losses Trafo			0	0
TOTAL LOSSES				63,736



Lampiran 7 Perhitungan *Excel* Rugi - Rugi Jurusan Kota Timur

7. KOTA TIMUR				
Losses JTM				
Rtotal Penyulang :		1,397	Rgawang : 0,070	
Jumlah Gardu :		20		
Zigma :		2870		
Jam	Arus	Arus Gawang	JTM Losses	
1	18,433	0,922	0,511	
2	18,433	0,922	0,511	
3	17,900	0,895	0,482	
4	17,900	0,895	0,482	
5	17,900	0,895	0,482	
6	16,467	0,823	0,408	
7	16,467	0,823	0,408	
8	16,467	0,823	0,408	
9	16,467	0,823	0,408	
10	16,467	0,823	0,408	
11	16,467	0,823	0,408	
12	18,767	0,938	0,530	
13	18,767	0,938	0,530	
14	18,767	0,938	0,530	
15	20,433	1,022	0,628	
16	20,433	1,022	0,628	
17	21,033	1,052	0,665	
18	23,200	1,160	0,810	
19	23,967	1,198	0,864	
20	23,167	1,158	0,807	
21	23,167	1,158	0,807	
22	23,167	1,158	0,807	
23	23,167	1,158	0,807	
24	21,767	1,088	0,713	
Jumlah Losses JTM			14,040	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3		0
	25	0,5		0
	50	0,925	6	133,2
	100	1,63	3	117,36
	160	2,3	8	441,6
	200	2,705		0
	250	3,17	3	228,24
	315	3,75		0
Jumlah Losses Trafo			20	920,4
TOTAL LOSSES				934,440



Lampiran 8 Perhitungan *Excel* Rugi - Rugi Jurusan Tabang

8. TABANG				
Losses JTM				
Rtotal Penyulang :		3,497	Rgawang : 0,167	
Jumlah Gardu :		21		
Zigma :		3311		
Jam	Arus	Arus Gawang	JTM Losses	
1	17,133	0,816	1,101	
2	17,133	0,816	1,101	
3	17,367	0,827	1,131	
4	17,367	0,827	1,131	
5	17,367	0,827	1,131	
6	16,767	0,798	1,055	
7	16,767	0,798	1,055	
8	16,767	0,798	1,055	
9	16,767	0,798	1,055	
10	16,767	0,798	1,055	
11	16,767	0,798	1,055	
12	16,800	0,800	1,059	
13	16,800	0,800	1,059	
14	16,800	0,800	1,059	
15	17,600	0,838	1,162	
16	17,600	0,838	1,162	
17	19,700	0,938	1,456	
18	22,900	1,090	1,967	
19	24,733	1,178	2,295	
20	23,167	1,103	2,013	
21	23,167	1,103	2,013	
22	20,300	0,967	1,546	
23	20,300	0,967	1,546	
24	20,300	0,967	1,546	
Jumlah Losses JTM			31,805	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3		0
	25	0,5	6	72
	50	0,925	8	177,6
	100	1,63	6	234,72
	160	2,3		0
	200	2,705	1	64,92
	250	3,17		0
	315	3,75		0
Jumlah Losses Trafo			21	549,24
TOTAL LOSSES				581,045



Lampiran 9 Perhitungan *Excel* Rugi - Rugi Jurusan Kota Selatan

9. KOTA SELATAN				
Losses JTM				
Rtotal Penyulang :		1,365	Rgawang : 0,068	
Jumlah Gardu :		20		
Zigma :		2870		
Jam	Arus	Arus Gawang	JTM Losses	
1	31,600	1,580	1,467	
2	31,600	1,580	1,467	
3	31,400	1,570	1,449	
4	31,400	1,570	1,449	
5	31,400	1,570	1,449	
6	27,767	1,388	1,133	
7	27,767	1,388	1,133	
8	27,767	1,388	1,133	
9	27,767	1,388	1,133	
10	27,767	1,388	1,133	
11	27,767	1,388	1,133	
12	27,167	1,358	1,084	
13	27,167	1,358	1,084	
14	27,167	1,358	1,084	
15	31,433	1,572	1,452	
16	31,433	1,572	1,452	
17	32,067	1,603	1,511	
18	36,633	1,832	1,972	
19	38,367	1,918	2,163	
20	37,433	1,872	2,059	
21	33,100	1,655	1,610	
22	33,100	1,655	1,610	
23	33,100	1,655	1,610	
24	33,100	1,655	1,610	
Jumlah Losses JTM			34,380	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3		0
	25	0,5		0
	50	0,925	7	155,4
	100	1,63	6	234,72
	160	2,3	5	276
	200	2,705	2	129,84
	250	3,17		0
	315	3,75		0
Jumlah Losses Trafo			20	795,96
TOTAL LOSSES				830,340



Lampiran 10 Perhitungan *Excel* Rugi - Rugi Jurusan Bontosikuyu

10. BONTOSIKUYU				
Losses JTM				
Rtotal Penyulang :		18,205	Rgawang :	0,587
Jumlah Gardu :		31		
Zigma :		10416		
Jam	Arus	Arus Gawang	JTM Losses	
1	18,500	0,597	6,535	
2	18,500	0,597	6,535	
3	19,567	0,631	7,311	
4	19,567	0,631	7,311	
5	19,567	0,631	7,311	
6	18,633	0,601	6,630	
7	18,633	0,601	6,630	
8	18,633	0,601	6,630	
9	18,633	0,601	6,630	
10	18,633	0,601	6,630	
11	18,633	0,601	6,630	
12	18,800	0,606	6,749	
13	18,800	0,606	6,749	
14	18,800	0,606	6,749	
15	18,333	0,591	6,418	
16	18,333	0,591	6,418	
17	19,833	0,640	7,511	
18	24,500	0,790	11,462	
19	26,633	0,859	13,545	
20	26,333	0,849	13,242	
21	23,933	0,772	10,938	
22	23,933	0,772	10,938	
23	23,933	0,772	10,938	
24	23,933	0,772	10,938	
Jumlah Losses JTM			197,379	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi - rugi Trafo (kWh)
	16	0,3		0
	25	0,5	13	156
	50	0,925	13	288,6
	100	1,63	5	195,6
	160	2,3		0
	200	2,705		0
	250	3,17		0
	315	3,75		0
Jumlah Losses Trafo			31	640,2
TOTAL LOSSES				837,579



Lampiran 11 Perhitungan *Excel* Rugi - Rugi Jurusan Bonelohe

11. BONELOHE				
Losses JTM				
Rtotal Penyulang :		11,035	Rgawang : 0,849	
Jumlah Gardu :		13		
Zigma :		819		
Jam	Arus	Arus Gawang	JTM Losses	
1	2,90	0,223	0,104	
2	2,90	0,223	0,104	
3	2,83	0,218	0,099	
4	2,83	0,218	0,099	
5	2,83	0,218	0,099	
6	3,00	0,231	0,111	
7	3,00	0,231	0,111	
8	3,00	0,231	0,111	
9	3,00	0,231	0,111	
10	3,00	0,231	0,111	
11	3,00	0,231	0,111	
12	3,60	0,277	0,160	
13	3,60	0,277	0,160	
14	3,60	0,277	0,160	
15	3,73	0,287	0,172	
16	3,73	0,287	0,172	
17	3,20	0,246	0,126	
18	4,67	0,359	0,269	
19	5,00	0,385	0,309	
20	4,67	0,359	0,269	
21	3,77	0,290	0,175	
22	3,77	0,290	0,175	
23	3,77	0,290	0,175	
24	3,77	0,290	0,175	
Jumlah Losses JTM			3,668	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3	2	14,4
	25	0,5	3	36
	50	0,925	6	133,2
	100	1,63	1	39,12
	160	2,3	1	55,2
	200	2,705		0
	250	3,17		0
	315	3,75		0
Jumlah Losses Trafo			13	277,92
TOTAL LOSSES				281,588



Lampiran 12 Perhitungan *Excel* Rugi - Rugi Jurusan Pamatata

12. PAMATATA				
Losses JTM				
Rtotal Penyulang :		7,527	Rgawang : 0,289	
Jumlah Gardu :		26		
Zigma :		6201		
Jam	Arus	Arus Gawang	JTM Losses	
1	6,967	0,268	0,387	
2	6,967	0,268	0,387	
3	6,900	0,265	0,379	
4	6,900	0,265	0,379	
5	6,900	0,265	0,379	
6	7,533	0,290	0,452	
7	7,533	0,290	0,452	
8	7,533	0,290	0,452	
9	7,533	0,290	0,452	
10	7,533	0,290	0,452	
11	7,533	0,290	0,452	
12	6,900	0,265	0,379	
13	6,900	0,265	0,379	
14	6,900	0,265	0,379	
15	7,333	0,282	0,428	
16	7,333	0,282	0,428	
17	7,767	0,299	0,481	
18	10,900	0,419	0,947	
19	11,867	0,456	1,122	
20	11,533	0,444	1,060	
21	9,467	0,364	0,714	
22	9,467	0,364	0,714	
23	9,467	0,364	0,714	
24	9,467	0,364	0,714	
Jumlah Losses JTM			13,083	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3	2	14,4
	25	0,5	15	180
	50	0,925	8	177,6
	100	1,63	1	39,12
	160	2,3		0
	200	2,705		0
	250	3,17		0
	315	3,75		0
Jumlah Losses Trafo			26	411,12
TOTAL LOSSES				424,203



Lampiran 13 Perhitungan *Excel* Rugi - Rugi Jurusan Appatanah

13. APPATANAH				
13. Losses JTM				
Rtotal Penyulang :		10,843	Rgawang :	0,602
Jumlah Gardu :		18		
Zigma :		2109		
Jam	Arus	Arus Gawang	JTM Losses	
1	2,667	0,148	0,084	
2	2,667	0,148	0,084	
3	2,530	0,141	0,075	
4	2,530	0,141	0,075	
5	2,530	0,141	0,075	
6	3,030	0,168	0,108	
7	3,030	0,168	0,108	
8	3,030	0,168	0,108	
9	3,030	0,168	0,108	
10	3,030	0,168	0,108	
11	3,030	0,168	0,108	
12	2,443	0,136	0,070	
13	2,443	0,136	0,070	
14	2,443	0,136	0,070	
15	2,427	0,135	0,069	
16	2,427	0,135	0,069	
17	2,667	0,148	0,084	
18	3,923	0,218	0,181	
19	4,383	0,244	0,226	
20	4,220	0,234	0,209	
21	3,633	0,202	0,155	
22	3,633	0,202	0,155	
23	3,633	0,202	0,155	
24	3,633	0,202	0,155	
Jumlah Losses JTM			2,712	
Losses Trafo				
	Kapasitas Trafo (kVA)	Rugi-Rugi Standart Trafo (kW)	Jumlah Trafo (Unit)	Rugi -rugi Trafo (kWh)
	16	0,3		0
	25	0,5	8	96
	50	0,925	9	199,8
	100	1,63	1	39,12
	160	2,3		0
	200	2,705		0
	250	3,17		0
	315	3,75		0
Jumlah Losses Trafo			18	334,92
TOTAL LOSSES				337,632



Lampiran 14 Katalog Kabelindo Spesifikasi Standar Penghantar AAAC

All Aluminium Alloy Conductor AAAC

Standard Specification : SPLN 41-8

Application : Used for overhead power transmission purpose, medium tension. Overhead system and distribution network

Construction
Conductor : Circular stranded All Aluminum Alloy Conductor – AAAC



Cross Section Area		No. of Wires	Diameter of Wires	Approx. Overall Diameter	Approx. Weight of Conductor	DC Resistance at 20°C Max.	Current Carrying Capacity *	Calculated Breaking Load	Standard Length
Nominal	Metric								
mm ²	mm ²	pcs	mm	mm	kg/km	Ohm/km	A	kN	m
16	17	7	1.75	5.3	46	1,955	100	480	10,000
25	28	7	2.25	6.8	76	1,183	135	790	10,000
35	34	7	2.50	7.5	94	0,958	155	980	10,000
50	49	7	3.00	9.0	135	0,665	195	1,410	10,000
50	46	19	1.75	8.8	126	0,724	185	1,300	10,000
55	58	7	3.25	9.8	160	0,567	215	1,655	10,000
70	76	19	2.25	11.3	208	0,438	255	2,150	5,000
95	93	19	2.50	12.5	256	0,355	290	2,660	5,000
100	99	7	4.25	12.8	272	0,332	300	2,830	5,000
120	113	19	2.75	13.8	310	0,293	325	3,220	5,000
150	158	19	3.25	16.3	434	0,210	405	4,490	5,000
150	147	37	2.25	15.8	406	0,225	385	4,190	5,000
185	182	37	2.50	17.5	501	0,183	440	5,175	5,000
240	239	19	4.00	20.0	670	0,137	525	6,805	3,000
240	243	61	2.25	20.3	657	0,139	525	6,910	3,000
300	299	61	2.50	22.5	827	0,111	605	8,530	3,000
400	431	61	3.00	27.0	1,191	0,077	760	12,290	2,000
500	506	61	3.25	29.3	1,398	0,066	835	14,420	2,000
630	643	91	3.00	33.0	1,782	0,052	965	18,330	1,500
800	755	91	3.25	35.8	2,091	0,044	1,075	21,515	1,000
1000	1005	91	3.75	41.3	2,784	0,033	1,265	28,640	1,000

Remark : • Ambient temperature : 35°C • Wind Velocity : 0.6 m/Sec
• Continuous operating temperature of conductor : 80°C



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Lampiran 15 Katalog Kabelindo Spesifikasi Standar Penghantar AAACS

All Aluminium Alloy Conductor, XLPE Sheath Protection AAAC-S

Standard Specification : SPLN 41-10

Application : Used for overhead power transmission lines and distribution

Construction

Conductor : All Aluminium Alloy Conductor (AAAC), circular stranded according to SPLN 41-8

Protection : Cross-Linked PolyEthylene (XLPE) Sheathed, complied with SPLN 41-9



CONSTRUCTION										
Cross - Section of Conductor	mm ²	35 mm	50 mm	70 mm	95 mm	120 mm	150 mm	185 mm	240 mm	
Number of wires	pcs	7	19	19	19	19	19	37	37	61
Diameter of wires mm	mm	2.5	1.75	2.25	2.5	2.75	3.25	2.25	2.5	2.25
Diameter of Conductor (approx.)	mm	7.5	8.8	11.3	12.5	13.8	16.3	15.8	17.5	20.3
Thickness of Insulation (nom.)	mm	3	3	3	3	3	3	3	3	3
Overall Cable Diameter (approx.)	mm	13.5	14.8	17.3	18.5	19.8	22.3	21.8	23.5	26.3

ELECTRICAL										
AC Voltage Test	kV/min	13/5								
Max. Conductor DC Resistance at 20°C	Ω/km	0.958	0.724	0.438	0.355	0.293	0.21	0.225	0.183	0.139
Min. Insulation Resistance at 20°C	MΩ/km	1,000	900	900	800	800	800	800	800	700

CURRENT RATINGS										
In Air	at 30°C	Amp.	167	200	275	315	356	423	423	586
	at 40°C	Amp.	150	180	246	282	319	378	378	523

SHORT CIRCUIT CURRENT										
Max. Permissible Short Circuit Current For	0.1 Scd.	kA	10.63	15.18	21.25	28.84	36.43	45.54	45.54	56.16
	0.5 Scd.	kA	4.75	6.79	9.5	12.9	16.29	20.36	20.36	25.12
	1.0 Scd.	kA	3.36	4.80	6.72	9.12	11.52	14.40	14.40	17.76

MECHANICAL										
Rated Ultimate Strength	kg	980	1,300	2,150	2,660	3,220	4,490	4,190	5,175	6,910
Minimum Bending Radius	mm	243	266	311	333	356	401	392	423	473

DELIVERY										
Standard Delivery Length	mm	2,000	1,000	2,000	1,000	1,000	1,000	1,000	1,000	1,000
Drum Type		09C	09C	15A	11A	15A	15A	15A	15A	14B
Cable Weight (approx.)	kg/km	195	268	345	407	475	628	593	700	893



Lampiran 16 Katalog Kabelindo Spesifikasi Standar Penghantar MVTIC

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THREE CORES ALUMINIUM XLPE INSULATED MEDIUM VOLTAGE CABLE

SPECIFICATION : SPLN 43-5

NFA2XSY-T 12/20 (24) kV

Aluminium Conductor, XLPE Insulated,
Copper Wire / Tape Screened, PVC Sheathed Cable
With Zinc-coated Round Steel Wire Messenger



DIMENSIONAL DATA		3 CORES								
Nominal cross sectional area	mm ²	3x35+50	3x50+50	3x70+50	3x95+50	3x120+50	3x150+50	3x185+50	3x240+50	3x300+50
Conductor diameter (approx.)	mm	7.1	8.20	10.1	11.8	13.2	14.2	16.1	18.3	20.8
Messenger conductor diameter (approx.)	mm	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Nominal insulation thickness	mm	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Insulation diameter (approx.)	mm	19.7	20.9	22.5	24.3	25.7	26.8	28.8	30.9	33.1
Nominal area of copper screen	mm ²	16	16	16	16	16	16	16	16	16
Nominal sheath thickness	mm	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2
Overall Cable diameter (approx.)	mm	55	57	62	65	71	74	78	84	88
Cable Net. Weight (approx.)	Kg/km	2,800	3,100	3,520	3,895	4,290	4,800	5,200	6,010	6,815
Standard length per-reel	m	500	500	500	500	250	250	250	250	250
Minimum bending radius	mm	470	500	905	580	620	650	700	760	820

ELECTRICAL DATA										
Min. DC Insulation resistance at 20°C	Ω/km	1,400	1,300	1,100	1,000	900	900	800	700	700
Max. DC conductor resistance at 20°C	Ω/km	0.868	0.641	0.443	0.320	0.253	0.206	0.164	0.125	0.100
Capacitance per-phase	μF/km	0.106	0.116	0.128	0.141	0.152	0.160	0.175	0.189	0.206
Inductance per-phase	mH/km	0.418	0.400	0.382	0.365	0.354	0.346	0.333	0.324	0.312
Max. short circuit current of	kA/sec conductor	3.45	4.89	6.81	9.19	11.58	14.43	17.68	22.98	28.68
	screen	2.77	2.92	3.14	3.38	3.57	4.66	3.95	4.35	4.62
Max. current carrying capacity at 30°C	A	142	165	204	247	287	326	375	438	485
AC Test Voltage	kV/5 min	30								



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Lampiran 17 Katalog Kabelindo Spesifikasi Standar Penghantar Tanah XLPE

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THREE CORES COPPER / ALUMINIUM XLPE INSULATED ARMoured MEDIUM VOLTAGE CABLE

SPECIFICATION : SPLN 43-5

N2XSEYBY / NA2XSEYBY 12/20 (24) kV

Copper / Aluminium Conductor, XLPE Insulated,
Copper Wire / Tape Screened, Water Blocking Tape,
Zinc-coated Double Steel Tape Armoured, PVC Sheathed Cable



DIMENSIONAL DATA			3 CORES									
Nominal cross sectional area	mm ²		35	50	70	95	120	150	185	240	300	400
Conductor diameter (approx.)	mm		7.1	8.25	9.9	11.7	13.1	14.3	16.3	18.7	20.9	23.7
Nominal insulation thickness	mm		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Insulation diameter (approx.)	mm		20.3	21.5	23.1	24.7	26.3	27.5	29.3	31.5	33.6	36.7
Nominal area of copper screen	mm		16	16	16	16	16	25	25	25	25	35
Nominal sheath thickness	mm		3.4	3.5	3.7	3.8	3.8	4.1	4.2	4.4	4.6	4.8
Overall Cable (approx.)	mm		65	68	72	76	79	84	88	93	101	107
Cable Net. Weight (approx.)	kg/km	Cu	5,865	6,362	7,345	8,510	9,627	12,498	13,323	15,565	18,198	21,671
		Al	5,198	5,500	6,124	6,808	7,474	9,065	9,990	11,160	12,740	14,740
Standard length per-reel	m		500	500	500	250	250	250	250	250	200	200
Minimum bending radius	mm		975	1,020	1,080	1,140	1,185	1,260	1,320	1,395	1,500	1,602

ELECTRICAL DATA												
Min. DC Insulation resistance at 20°C			1,400	1,300	1,100	1,000	900	900	800	700	700	600
Max. DC conductor resistance at 20°C	Ω/km	Cu	0.524	0.387	0.268	0.193	0.153	0.124	0.099	0.0754	0.0601	0.0470
		Al	0.868	0.641	0.443	0.320	0.253	0.206	0.164	0.125	0.102	0.0788
Capacitance per-phase	μF/km		0.123	0.175	0.196	0.217	0.238	0.254	0.275	0.305	0.332	0.369
Inductance per-phase	mH/km		0.399	0.380	0.358	0.338	0.328	0.319	0.306	0.293	0.284	0.276
Max. short circuit current of conductor	kA/sec	Cu	5.18	7.10	10.26	13.88	17.35	21.43	27.00	34.78	43.41	57.00
		Al	3.45	5.02	6.10	8.89	10.95	14.02	17.05	22.79	28.03	38.01
Max short circuit current of screen	kA/sec		2.92	3.05	3.00	3.00	3.00	4.60	4.60	4.60	4.60	6.40
Max. current carrying capacity at 30°C	In Air	A	Cu	173	221	275	335	380	430	492	580	669
		Al	139	134	205	237	279	315	366	428	470	544
	In Ground	A	Cu	171	183	223	264	297	338	380	440	496
		Al	132	142	174	203	238	264	295	339	389	430
AC Test Voltage	kV/5 min		30.5									



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Lampiran 18 Katalog Trafindo Spesifikasi Standar Transformator Distribusi

PT. Trafindo Prima Perkasa adalah pabrik transformator terbesar di Indonesia. Sejak berdiri di tahun 1981, merek TRAFINDO sangat dikenal dengan mutu dan kehandalan yang baik.

Sistem pengendalian mutu kami bersertifikasi ISO, dan tentunya produk-produk TRAFINDO bersertifikasi LMK, serta memenuhi persyaratan SLI.

Dengan standar PLN 2007 yang lebih efisien, transformator TRAFINDO turut mendukung perkembangan distribusi listrik di seluruh Indonesia.

Standar SPLN D3 yang kami jadikan acuan adalah:

- SPLN: D3.002-1: 2007, untuk trafo tiga fasa dan satu fasa (Trafo non CSP)
- SPLN: D3.002-2: 2008, untuk trafo satu fasa (CSP)

Tabel spesifikasi

Capacity	Vector Group	Dimension Approximately (mm)			No Load Losses	Load Losses at 75° C	Total Losses	Impedance at 75° C	Oil Volume	Transformer Total Weight
KVA		Length	Width	Height	Watt	Watt	Watt	%	Liters	kgs
A. CSP Transformer										
50	II-0	860	765	1230	120	585	705	2.85	130	355
B. 1 Phase Transformer										
25	II-0	560	670	1250	70	370	440	2.5	88	335
50	II-0	560	670	1380	120	585	705	2.5	112	445
C. 3 Phase Transformer										
25	Yzn-5	1030	555	1020	75	425	500	4.0	120	415
50	Yzn-5	1170	600	1080	125	800	925	4.0	160	615
	YNyn-0	1100	670	1070	125	800	925	4.0	165	565
100	Yzn-5	1065	700	1150	210	1420	1630	4.0	188	690
	YNyn-0	1095	745	1175	210	1420	1630	4.0	220	720
160	Yzn-5	1170	700	1185	300	2000	2300	4.0	276	955
	YNyn-0	1240	670	1200	300	2000	2300	4.0	270	955
200	YNyn-0	1240	790	1295	355	2350	2705	4.0	282	1115
	Dyn-5	1100	810	1315	355	2350	2705	4.0	245	1060
250	YNyn-0	1320	790	1290	420	2750	3170	4.0	320	1260
	Dyn5	1115	825	1425	420	2750	3170	4.0	320	1305
315	Dyn5	1360	810	1450	500	3250	3750	4.0	285	1415
400	Dyn5	1495	900	1615	595	3850	4445	4.0	510	1990
630	Dyn5	1600	960	1740	835	5400	6235	4.0	615	2665
1000	Dyn5	1830	1215	1660	1100	8550	9650	5.0	712	3285
1250	Dyn5	1860	1215	1730	1400	10600	12000	5.5	815	3705

* Tolerance ± 2%

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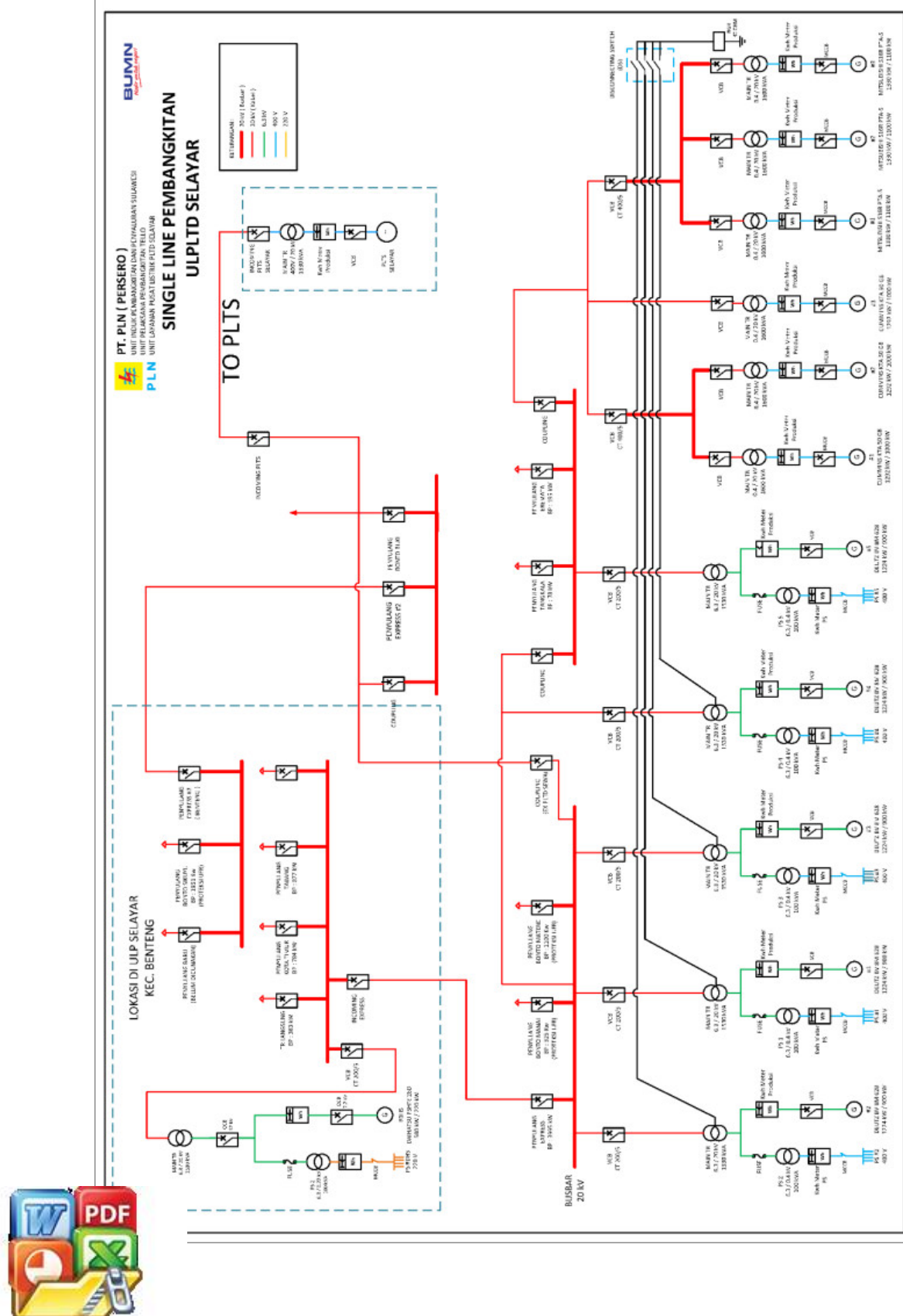


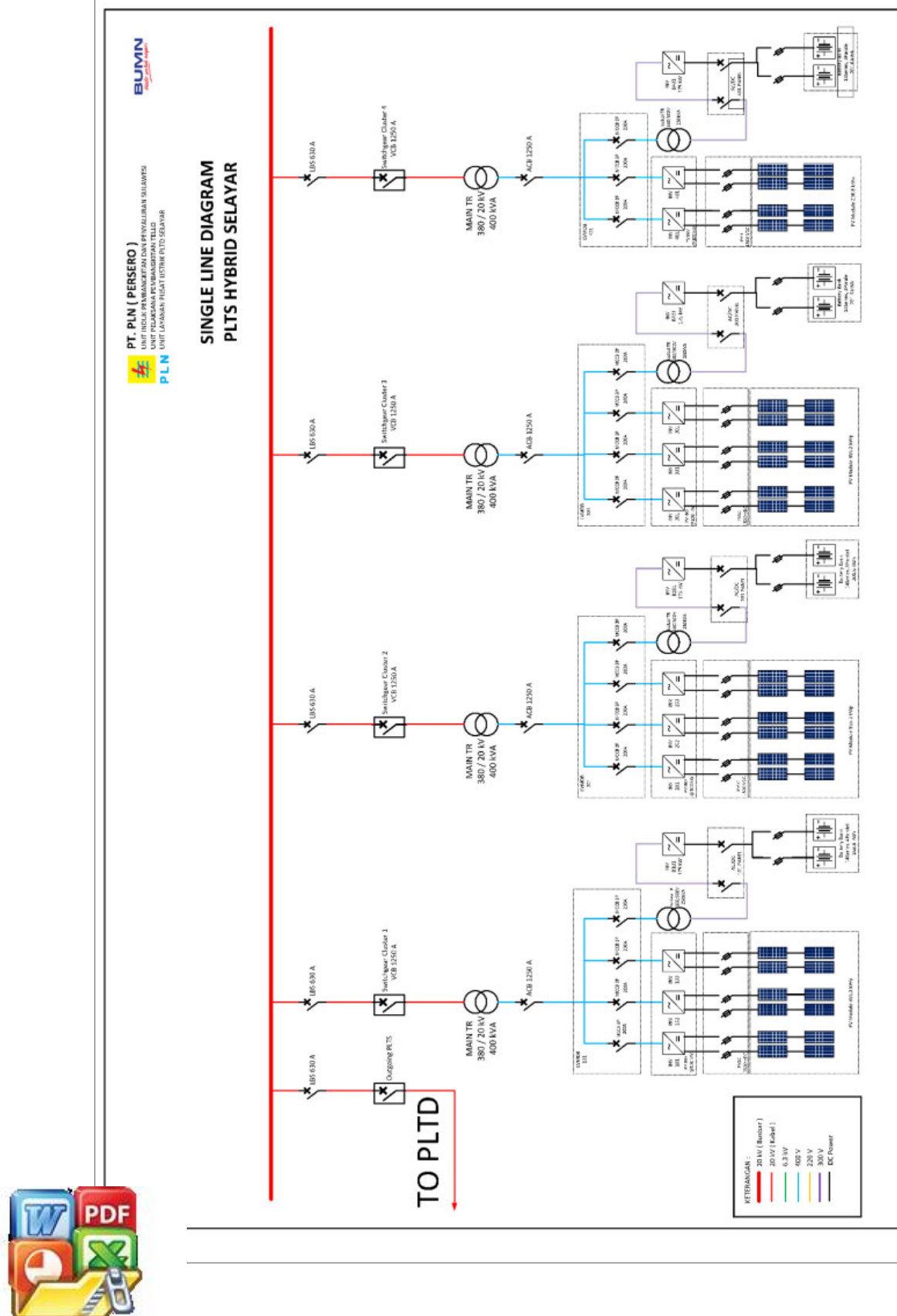
Lampiran 19 Perhitungan Rate Arus

Jam / Penumpang	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Express 1	58.900	57.167	56.233	54.700	56.333	57.233	58.767	61.733	69.800	71.900	76.200	76.200	74.167	74.400	74.833	75.100	72.000	81.533	86.833	83.333	80.867	77.733	70.867	65.933	Rate
	54.70	56.23	56.33	57.17	57.23	58.77	58.90	61.73	65.93	69.80	70.87	71.90	72.00	74.17	74.40	74.83	75.10	76.20	76.20	77.73	80.87	81.53	83.33	86.83	Rate
	2.73%	0.18%	1.46%	0.12%	0.12%	2.61%	0.23%	4.59%	6.37%	5.54%	1.51%	1.44%	0.14%	2.92%	0.31%	0.58%	0.36%	1.44%	0.00%	1.97%	3.87%	0.82%	2.16%	4.03%	1.972%
Bontomanai	4.833	4.933	4.733	4.533	5.233	5.367	5.433	5.200	5.567	5.000	5.233	4.967	4.767	4.733	4.633	5.167	5.433	5.567	6.033	6.067	7.333	8.000	8.167	8.400	Rate
	4.533	4.633	4.733	4.733	4.767	4.833	4.933	4.967	5.000	5.167	5.200	5.233	5.233	5.367	5.433	5.567	5.567	6.033	6.067	7.333	8.000	8.167	8.400	Rate	
	2.16%	2.11%	0.00%	0.70%	1.38%	2.03%	2.03%	0.67%	0.67%	3.23%	0.64%	0.64%	0.00%	2.48%	1.23%	2.40%	0.00%	7.73%	0.55%	17.27%	8.33%	2.04%	2.78%	2.33%	2.668%
Bontomatene	15.400	15.167	14.833	14.900	15.833	16.367	16.433	15.300	15.300	16.033	16.000	16.333	17.267	17.100	17.467	15.433	17.100	13.667	24.833	25.000	23.767	22.033	19.000	17.967	Rate
	13.67	14.83	14.90	15.17	15.30	15.30	15.40	15.43	15.83	16.00	16.03	16.33	16.37	16.43	17.10	17.10	17.27	17.47	17.97	19.00	22.03	23.77	24.83	25.00	Rate
	7.87%	0.45%	1.76%	0.87%	0.00%	0.00%	0.65%	0.22%	2.53%	1.04%	0.21%	1.84%	0.20%	0.41%	3.90%	0.00%	0.97%	1.15%	2.78%	5.44%	13.77%	7.29%	4.30%	0.67%	2.594%
Eremata	2.700	2.700	2.700	2.633	2.933	3.767	2.933	2.700	3.433	3.600	3.500	3.433	3.333	3.267	2.967	2.867	2.967	4.367	4.867	4.600	3.967	4.033	3.567	3.000	Rate
	2.63	2.70	2.70	2.70	2.70	2.87	2.93	2.93	2.97	3.00	3.27	3.33	3.43	3.43	3.50	3.57	3.60	3.77	4.03	4.37	4.60	4.87	4.60	4.87	Rate
	2.47%	0.00%	0.00%	0.00%	0.00%	5.81%	2.27%	0.00%	1.12%	0.00%	1.11%	8.16%	2.00%	2.91%	0.00%	1.90%	1.87%	0.93%	4.42%	5.04%	1.65%	7.63%	5.07%	5.48%	2.803%
Bontobuki	3.433	3.267	3.267	3.333	3.400	3.800	3.767	3.400	3.200	3.533	3.667	3.800	3.433	3.333	2.967	2.900	3.833	5.467	6.233	6.033	5.567	5.033	4.167	3.767	Rate
	2.90	2.97	3.20	3.27	3.27	3.33	3.33	3.40	3.40	3.43	3.43	3.53	3.67	3.77	3.77	3.80	3.80	3.83	4.17	5.03	5.47	5.57	6.03	6.23	Rate
	2.25%	7.29%	2.04%	0.00%	0.00%	2.00%	0.00%	1.96%	0.00%	0.97%	0.00%	2.83%	3.64%	2.65%	0.00%	0.88%	0.00%	0.87%	8.00%	17.22%	7.93%	1.80%	7.73%	3.21%	3.185%
Express 2	17.867	17.733	17.367	17.333	18.033	18.733	17.100	17.767	17.433	18.333	16.933	17.300	17.133	17.200	17.167	16.933	19.667	24.667	27.567	27.233	25.333	25.200	22.200	20.133	Rate
	16.93	16.93	17.10	17.13	17.17	17.20	17.30	17.33	17.37	17.43	17.73	17.77	17.87	18.03	18.33	18.73	19.67	20.13	22.20	24.67	25.20	25.33	27.23	27.57	Rate
	0.00%	0.00%	0.37%	0.19%	0.19%	0.19%	0.58%	0.19%	0.19%	0.38%	1.69%	0.19%	0.56%	0.32%	1.64%	2.14%	4.75%	2.32%	9.31%	10.00%	2.12%	0.53%	6.98%	1.21%	2.054%
Kota Timor	18.43	18.43	17.90	17.90	17.90	16.47	16.47	16.47	16.47	16.47	16.47	18.77	18.77	18.77	18.77	20.43	21.03	23.20	23.97	23.17	23.17	23.17	23.17	21.77	Rate
	16.47	16.47	16.47	16.47	16.47	16.47	17.90	17.90	17.90	18.43	18.43	18.77	18.77	18.77	18.77	20.43	21.03	21.77	23.17	23.17	23.17	23.17	23.20	23.97	Rate
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.01%	0.00%	0.00%	2.89%	0.00%	1.78%	0.00%	0.00%	8.16%	0.00%	2.85%	3.37%	6.04%	0.00%	0.00%	0.00%	0.14%	3.20%	1.584%
Tabang	17.13	17.13	17.37	17.37	17.37	16.77	16.77	16.77	16.77	16.77	16.77	16.80	16.80	16.80	17.60	17.60	19.70	22.90	24.73	23.17	23.17	20.30	20.30	20.30	Rate
	16.77	16.77	16.77	16.77	16.77	16.77	16.80	16.80	16.80	16.80	17.13	17.13	17.37	17.37	17.60	17.60	19.70	20.30	20.30	20.30	22.90	23.17	23.17	24.73	Rate
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%	0.00%	0.00%	1.95%	0.00%	1.34%	0.00%	1.33%	0.00%	10.86%	2.96%	0.00%	0.00%	11.35%	1.15%	0.00%	6.33%	162%
Kota Selatan	31.60	31.60	31.40	31.40	31.40	27.77	27.77	27.77	27.77	27.77	27.77	27.17	27.17	27.17	31.43	31.43	32.07	36.63	38.37	37.43	33.10	33.10	33.10	33.10	Rate
	27.17	27.17	27.17	27.17	27.17	27.77	27.77	27.77	27.77	27.77	31.40	31.40	31.43	31.43	31.60	31.60	32.07	33.10	33.10	33.10	36.63	37.43	38.37	Rate	
	0.00%	0.00%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.57%	0.00%	0.11%	0.00%	0.53%	0.00%	1.46%	3.12%	0.00%	0.00%	0.00%	9.65%	2.14%	2.43%	1.44%
Bontosikuyu	18.50	19.57	19.57	19.57	19.57	18.63	18.63	18.63	18.63	18.63	18.63	18.80	18.80	18.80	18.80	19.57	19.57	19.83	24.50	26.63	26.33	23.93	23.93	23.93	Rate
	18.33	18.33	18.50	18.50	18.63	18.63	18.63	18.63	18.63	18.63	18.80	18.80	18.80	18.80	19.57	19.57	19.83	23.93	23.93	23.93	24.50	26.33	26.63	26.63	Rate
	0.00%	0.90%	0.00%	0.72%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.89%	0.00%	0.00%	0.00%	3.92%	0.00%	1.34%	17.13%	0.00%	0.00%	0.00%	2.31%	6.96%	1.13%	1.53%
Bonelohe	2.90	2.90	2.83	2.83	2.83	3.00	3.00	3.00	3.00	3.00	3.00	3.80	3.80	3.80	3.73	3.73	3.20	4.67	5.00	4.67	3.77	3.77	3.77	3.77	Rate
	2.83	2.83	2.83	2.90	2.90	3.00	3.00	3.00	3.00	3.00	3.00	3.20	3.60	3.60	3.60	3.73	3.73	3.77	3.77	3.77	3.77	4.67	4.67	5.00	Rate
	0.00%	0.00%	0.00%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.25%	1.11%	0.00%	0.00%	3.57%	0.00%	0.88%	0.00%	0.00%	0.00%	19.29%	0.00%	6.67%	2.32%
Pamatata	6.97	6.97	6.90	6.90	6.90	7.53	7.53	7.53	7.53	7.53	7.53	7.53	6.90	6.90	6.90	7.33	7.33	7.77	10.90	11.87	11.53	9.47	9.47	9.47	Rate
	6.90	6.90	6.90	6.90	6.90	6.90	6.97	6.97	7.33	7.33	7.53	7.53	7.53	7.53	7.53	7.53	7.77	9.47	9.47	9.47	10.90	11.53	11.87	11.87	Rate
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.96%	0.00%	5.00%	0.00%	2.85%	0.00%	0.00%	0.00%	0.00%	0.00%	3.00%	17.96%	0.00%	0.00%	0.00%	13.15%	5.49%	2.81%	2.22%
Appatanah	2.67	2.67	2.53	2.53	2.53	3.03	3.03	3.03	3.03	3.03	3.03	2.44	2.44	2.44	2.44	2.44	2.67	3.92	4.36	4.22	3.63	3.63	3.63	3.63	Rate
	2.43	2.43	2.44	2.44	2.44	2.53	2.53	2.53	2.67	2.67	2.67	3.03	3.03	3.03	3.03	3.03	3.03	3.63	3.63	3.63	3.63	3.92	4.22	4.36	Rate
	0.00%	0.68%	0.00%	0.00%	0.00%	3.43%	0.00%	0.00%	5.13%	0.00%	0.00%	11.99%	0.00%	0.00%	0.00%	0.00%	0.00%	16.61%	0.00%	0.00%	0.00%	7.39%	7.03%	3.73%	2.43%



Lampiran 20 SLD Pembangkitan ULPLTD Selayar



Lampiran 21 SLD PLTS *Hybrid* Selayar



**SINGLE LINE DIAGRAM SISTEM 20 KV (KONDISI NORMAL)
PLN UP3 BULUKUMBA
SISTEM SELAYAR**

