

**Feasibility Study and Detail Design of  
Power System Development in Yangon City Project  
(North Okkalapa and North Dagon Township)  
The Republic of the Union of Myanmar**

**Summary Report (Revised)**

**October 2017**

**By**

**Provincial Electricity Authority**



# Table of Contents

	Page
<b>Table of Contents</b>	I
1. The Rational of the Project.....	1
2. Brief Description.....	2
3. Objective.....	4
4. Scope of Works.....	4
5. Implementation Period.....	5
6. Project Cost Estimates.....	5
7. Benefits of the project.....	8
8. Financial and Economic Effect.....	8
9. Conclusions.....	12
<b>Annex</b>	
Annex 1. Area map of the project	
Annex 2. Single line diagram of Existing power system	
Annex 3. Single line diagram of Planning power system	
Annex 4. List of Project and Scope of Work to be financed under NEDA Loan	
Annex 5. Current load of the Relevant Townships (MW) and Each Substation (MW)	
Annex 6. Electricity Consumption of North Okkalapa Township	
Annex 7. Number of Consumers in North Okkalapa Township	
Annex 8. GDP Growth Rate of North Okkalapa Township	
Annex 9. Electricity Tariffs	
Annex 10. Number of Consumers	
Annex 11. Output and Consumption of Electricity	
Annex 12. Sales of Electricity	
Annex 13. Unit Sold, Sales of Electricity and Other Income	
Annex 14. Consolidated Revenue Accounts	
Annex 15. Electricity Production, Cost and Average Selling Price	
Annex 16. Balance Sheet	

## List of Table

Table	Page
1. The Load Forecast of both township.....	2
2. Load forecast in North Okkalapa Township.....	3
3. The project implementation schedule .....	5
4. Financial unit cost modules .....	6
5. Economic unit cost modules.....	6
6. The investment cost of the project .....	7
7. Cost summary .....	7
8. The investment cost of two phases.....	8
9. Economic cost .....	9
10. The Financial Internal Rate of Return (FIRR).....	10
11. The Economic Internal Rate of Return (EIRR).....	11

## 1. The Rationale of the Project

Yangon is a former capital of the Republic of the Union of Myanmar. It is divided into 45 townships, and there are many business and industrial areas scattered around its downtown district. Presently, in Yangon city the problem of inadequacy of electricity supply and substandard quality of services. The current distribution system in the city has also been existed more than 30 years and lacked of good maintenance.

As realized that the said problem has noticeably hindered the economic growth of the country, Yangon Electricity Supply Corporation (YESC), which a government agency is responsible for providing power supply in Yangon city under the Ministry of Electricity and Energy has initiated a 5 years (2013-2017) plan to improve Yangon city's electrical system to be more efficient.

However, due to the limitation of budget for implementing the above 5 years (2013-2017) plan, and the project feasibility study has not been conducted yet, YESC requested the technical assistance from the Neighboring Countries Economic Development Cooperation Agency (Public Organization) (NEDA), Ministry of Finance of Thailand to implement the activities scheduled in this initiated plan for two important economic townships which are North Okkalapa and North Dagon. Therefore, the previous feasibility study in 2013 has been completed by NEDA. There were scopes of work as follow ; Construction and improvement of six (6) 66/33 kV or 66/11 kV substations, Construction of 66 kV transmission lines 66 cct-km., Construction and improvement of 11 kV distribution lines 150 cct-km., Installation of distribution transformer capacity of 75,720 kVA. The Project was scheduled to be implemented during 2013 – 2016 and its investment cost was about 1,768.889 Million Baht.

Presently, the substations and transmission lines in North Dagon Township has completed but there is an electricity shortage problem and risks of unreliable power supply in North Okkalapa Township. Therefore, YESC requested NEDA to revise the previous feasibility study in order to update scope of works and also investment cost of the project.

## 2. Brief Description

According to the survey and discussion between YESC and NEDA, the scope of works only in North Okkalapa township, Yangon city will be revised. The substation development of this project will be significant sources of electrical energy to cope with the high growth rate of increasing demand and to maintain service efficiency and reliability in the project area. Besides they will be also prepared to serve the unforeseen load, especially immediate requirements of business and industrial customers. Therefore, the consultant has reviewed the load forecast of North Okkalapa, Shwe Pauk Kan, and Wai Bar Gi Substations.

Based on previous report, load demand of North Okkalapa Township and North Dagon Township has been studied. In North Okkalapa Township, the electricity is supplied from North Okkalapa substation and one feeder of Shwe Pauk Kan substation. In North Dagon Township, the electricity is supplied from Kon Ba Day Thar substation and Bali substation. The load forecast is shown in Table 1.

**Table 1:** The Load Forecast of both township

Year	Load Growth (%)	Load Factor (%)
2014 - 2018	15.96	63.28
2019 – 2023	11.88	72.45
2024 – 2028	7.80	76.36
2029 - 2033	4.04	76.40

In this report, the new load forecast has been revised only in North Okklapa Township. Presently, there are three substations which are North Okkalapa, Shwe Pauk Kan and Wai Ba Gi substations electrified to the North Okkalapa Township area.

According to the report of load demand from YESC, the load growth of electricity consumption in North Okkalapa Township in 2014 and 2015 are 11.50% and 19.10% respectively. The average of load growth is 15.30% which is close to the 15.96% of load growth in 2014 – 2018 of previous report so that the concept of new load forecast in North Okkalapa Township is the same as previous report. The revised load forecast is shown in Table 2.

**Table 2:** Load forecast in North Okkalapa Township

Year	North Okkalapa Substation		Shwe Pauk Kan Substation		Wai Bar Gi Substation	
	(MW)	(kWh)	(MW)	(kWh)	(MW)	(kWh)
<b>2016</b>	<b>26.00</b>	<b>128,093,397</b>	<b>16.00</b>	<b>78,826,706</b>	<b>5.0</b>	<b>24,633,346</b>
2017	30.15	157,860,334	18.56	97,144,821	5.8	30,357,757
2018	34.97	183,086,416	21.52	112,668,564	6.7	35,208,926
2019	39.13	216,901,518	24.08	133,477,857	7.5	41,711,830
2020	43.78	242,669,418	26.94	149,335,027	8.4	46,667,196
2021	48.98	271,498,545	30.14	167,076,028	9.4	52,211,259
2022	54.80	303,752,572	33.72	186,924,660	10.5	58,413,956
2023	61.31	339,838,378	37.73	209,131,309	11.8	65,353,534
2024	66.09	419,433,488	40.67	258,112,916	12.7	80,660,286
2025	71.24	452,149,300	43.84	278,245,723	13.7	86,951,788
2026	76.80	487,416,946	47.26	299,948,890	14.8	93,734,028
2027	82.79	525,435,467	50.95	323,344,903	15.9	101,045,282
2028	89.25	566,419,434	54.92	348,565,805	17.2	108,926,814
2029	92.85	621,106,421	57.14	382,219,336	17.9	119,443,542
2030	96.60	646,199,120	59.45	397,660,997	18.6	124,269,062
2031	100.51	672,305,565	61.85	413,726,501	19.3	129,289,532
2032	104.57	699,466,710	64.35	430,441,052	20.1	134,512,829
2033	108.79	727,725,165	66.95	447,830,871	20.9	139,947,147
2034	113.19	757,521,870	69.65	466,167,304	21.8	145,677,283
2035	117.76	788,125,753	72.47	485,000,463	22.6	151,562,645
2036	122.52	819,966,034	75.40	504,594,482	23.6	157,685,776

### 3. Objective

The objectives of the project are:

- (1) To revise the scope of work in North Okkalapa Township
- (2) To maintain the sufficiency and continuity of supply.
- (3) To improve existing systems to achieve certain level of reliability.
- (4) To provide efficient service.

### 4. Scope of Works

The scope of work of this project is to construct the 66 kV transmission lines and substations in order to meet the growth of electricity demand with satisfactory voltage regulation, reliable service and low loss system. Also, the project consists of the expansion and reinforcement of distribution system and associated equipment in area as described below:

	Area/Detail of Work	Type / Quantity
1	<b>Construct New Substation/Extend Existing Substation</b>	
	North Okkalapa Substation	GIS Double Bus 3 Line Bay 2x30 MVA 10 Feeder
	Wai Bar Gi Substation	AIS H - Config 1 Line Bay 2x30 MVA 10 Feeder
	Shwe Pauk Kan Substation	GIS Double Bus 5 Line Bay 3x30 MVA 10 Feeder
2	<b>Construct New Transmission Line</b>	
	OH Line 1x400 A	3.343 cct.- km.
	OH Line 2x400 A	45.565 cct.- km.
	UG 1x500 XLPE	3.406 cct.- km.

The project scope of works can be summarized as follows:

- (1) Construction and improvement of three (3) 66/33 kV or 66/11 kV substations
- (2) Construction of 66 kV transmission lines 52.314 cct-km.

## 5. Implementation Period

The Project is scheduled to be implemented during 2018 - 2020. The major work in 2018 will be the activities on survey, design, map drafting, bidding documents preparation, procurement of materials, equipment and vehicles, resource preparation. The construction will be started in 2019 and completed in the mid of 2020.

**Table 3:** The project implementation schedule

Power System Development in Yangon City Project (North Okkalapa and North Dagon Township)																	
The Republic of the Union of Myanmar																	
Implementation Schedule																	
ID	Task Name	2017				2018				2019				2020			
		Q1	Q2	Q3	Q4												
1	Project Feasibility Study																
2	Financial Arrangement																
3	Project Implementation Phase																
	3.1 Bid Invitation																
	3.2 Bid Evaluation																
	3.3 Approval																
	3.4 Award of construction																
	3.5 Construction																

## 6. Project Cost Estimation

The financial and economic unit cost modules for estimating all major facilities are shown in table 4 and 5 respectively. The investment cost of the project and cost summary are shown in table 6 and 7 respectively. In addition, the investment cost is divided into two phases as shown in table 8.



**Table 4: Financial unit cost modules**

Construction Cost of Yangon Project																						Base on Standard Price 2017 Expressed in Baht			
Details	Quant.	Unit	Foreign						Thailand						Myanmar					Total					
			Equipment	Labor	Transport	Factor F	Escalation	FC Total	Equipment	Labor	Transport	Factor F	Supervision	Escalation	Thailand Total	Equipment	Labor	Transport	Civil		Factor F	Escalation	Myanmar Total		
<b>1. Substation</b>																									
1.1 SHEW PAUK KAN SUBSTATION	1	Unit	95,101,022	2,565,598	1,426,515	10,503,872	1,972,312	111,569,320	128,598,081	2,738,287	1,928,971	14,126,126	7,995,920	8,022,651	163,410,036	-	-	14,500,000	30,714,349	1,450,000	2,409,280	49,073,629	324,052,985		
1.2 WAI BAR GI SUBSTATION	1	Unit	7,916,237	287,227	118,744	882,154	165,642	9,370,004	103,549,493	2,556,204	118,744	11,411,848	6,459,536	1,713,591	125,809,415	-	-	8,000,000	24,389,825	800,000	1,713,591	34,903,416	170,082,834		
1.3 NORTH OKKALAPA SUBSTATION	1	Unit	81,829,097	2,161,942	1,227,436	9,033,158	1,696,156	95,947,790	103,890,694	2,224,336	1,558,360	11,413,379	6,460,403	6,482,001	132,029,174	-	-	11,000,000	26,915,549	1,100,000	2,014,373	41,029,922	269,006,886		
<b>Total (1)</b>			184,846,356	5,014,767	2,772,695	20,419,185	3,834,110	216,887,113	336,038,268	7,518,827	3,606,075	36,951,353	20,915,860	16,218,242	421,248,625	-	-	33,500,000	82,019,723	3,350,000	6,137,244	125,006,967	763,142,705		
<b>2. Transmission Line</b>																									
2.1 EAST DAGON SUBSTATION - SHWE PAU KAN SUBSTATION	18.8	cct.-km.	-	-	-	-	-	-	82,732,162	14,972,596	14,972,596	9,868,181	6,732,999	6,674,651	135,953,185	15,264,450	-	9,100,000	43,919,700	1,541,709	3,605,109	73,430,969	209,384,154		
2.2 EAST DAGON SUBSTATION - NORTH OKKALAPA SUBSTATION	20.6	cct.-km.	-	-	-	-	-	-	18,431,784	1,497,109	921,589	2,012,818	1,144,966	1,239,547	25,247,814	-	-	9,850,000	508,556	-	10,358,556	20,717,111	45,964,925		
2.3 SHWE PAU KAN SUBSTATION - WAI BAR GI SUBSTATION	3.4	cct.-km.	-	-	-	-	-	-	7,817,996	1,577,053	503,431	948,900	734,843	597,990	12,180,212	2,250,620	-	1,750,000	5,920,200	227,313	523,948	10,672,081	22,852,293		
2.4 SHWE PAUKAN SUBSTATION - NORTH OKKALAPA SUBSTATION	4.5	cct.-km.	-	-	-	-	-	-	18,424,317	3,038,104	1,059,917	2,167,705	1,299,257	1,341,828	27,331,127	2,774,020	-	2,300,000	7,077,400	280,176	641,843	13,073,439	40,404,566		
2.5 NORTH OKKALAPA SUBSTATION - SEIN PAN MYAIM SUBSTATION	5.1	cct.-km.	-	-	-	-	-	-	72,038,848	9,421,205	3,659,317	8,227,465	3,496,848	5,000,039	101,843,724	1,147,500	-	2,300,000	2,999,700	115,898	338,853	6,901,950	108,745,674		
<b>Total (2)</b>	52.3		-	-	-	-	-	-	199,445,107	30,506,068	21,116,850	23,225,069	13,408,913	14,854,055	302,556,062	21,436,590	-	25,300,000	60,425,556	2,165,096	15,468,309	124,795,550	427,351,612		
<b>3. Distribution Line</b>																									
3.1 Construction 11 kV Distribution Line	50.6	cct.-km.	-	-	-	-	-	-	69,420,812	4,005,001	3,471,040	7,416,007	3,393,701	6,186,891	93,893,452	-	-	-	-	-	18,154,248	1,668,680	19,822,929	113,716,381	
3.2 Improvement 11 kV Distribution Line	40.87	cct.-km.	-	-	-	-	-	-	40,337,254	3,207,138	2,123,351	4,397,984	2,761,386	3,726,467	56,553,580	-	-	-	-	-	23,593,041	2,203,039	25,796,080	82,349,661	
<b>Total (3)</b>	91.47		-	-	-	-	-	-	109,758,066	7,212,138	5,594,391	11,813,991	6,155,087	9,913,358	150,447,032	-	-	-	-	-	41,747,290	3,871,719	45,619,009	196,066,640	
<b>4. Distribution Transformer</b>																									
4.1 160 kVA, 3-P	136	sets	31,713	-	-	3,203	3,238	38,154	33,099,374	1,909,557	1,654,969	3,535,902	1,618,094	2,949,868	44,767,764	-	-	-	-	-	-	-	-	44,805,918	
4.2 315 kVA, 3-P	69	sets	15,997	-	-	1,616	1,633	19,246	19,160,196	1,523,390	1,008,592	2,089,042	1,311,659	1,770,072	26,862,950	-	-	-	-	-	-	-	-	26,882,196	
<b>Total (4)</b>	205		47,710	-	-	4,819	4,871	57,399	52,259,570	3,432,948	2,663,560	5,624,944	2,929,752	4,719,940	71,630,714	-	-	-	-	-	-	-	-	71,688,114	
<b>Grandtotal (1+2+3+4)</b>			184,894,066	5,014,767	2,772,695	20,424,003	3,838,981	216,944,513	697,501,012	48,669,981	32,980,777	77,615,357	43,409,613	45,705,594	945,882,433	21,436,590	-	58,800,000	184,192,568	5,515,096	25,477,272	295,421,526	1,458,248,471		

**Table 5: Economic unit cost modules**

Construction Cost of Yangon Project																						Base on Standard Price 2017 Expressed in Baht			
Details	Quant.	Unit	Foreign						Thailand						Myanmar					Total					
			Equipment	Labor	Transport	Factor F	Escalation	FC Total	Equipment	Labor	Transport	Factor F	Supervision	Escalation	Thailand Total	Equipment	Labor	Transport	Civil		Factor F	Escalation	Myanmar Total		
<b>1. Substation</b>																									
1.1 SHEW PAUK KAN SUBSTATION	1	Unit	95,101,022	2,565,598	1,426,515	10,503,872	-	109,597,008	118,310,235	2,519,224	1,678,205	12,996,036	7,356,247	-	142,859,946	-	-	14,500,000	30,714,349	1,450,000	-	46,664,349	299,121,303		
1.2 WAI BAR GI SUBSTATION	1	Unit	7,916,237	287,227	118,744	882,154	-	9,204,362	95,265,534	2,351,708	103,307	10,498,900	5,942,773	-	114,162,221	-	-	8,000,000	24,389,825	800,000	-	33,189,825	156,556,608		
1.3 NORTH OKKALAPA SUBSTATION	1	Unit	81,829,097	2,161,942	1,227,436	9,033,158	-	94,251,634	95,579,438	2,046,389	1,355,774	10,500,309	5,943,571	-	115,425,481	-	-	11,000,000	26,915,549	1,100,000	-	39,015,549	248,692,464		
<b>Total (1)</b>			184,846,356	5,014,767	2,772,695	20,419,185	-	213,053,003	309,155,207	6,917,321	3,137,285	33,995,245	19,242,591	-	372,447,649	-	-	33,500,000	82,019,723	3,350,000	-	118,869,723	704,370,375		
<b>2. Transmission Line</b>																									
2.1 EAST DAGON SUBSTATION - SHWE PAU KAN SUBSTATION	18.8	cct.-km.	-	-	-	-	-	-	76,113,589	13,774,788	13,026,159	9,078,726	6,194,359	-	118,187,622	15,264,450	-	9,100,000	43,919,700	1,541,709	-	69,825,859	188,013,481		
2.2 EAST DAGON SUBSTATION - NORTH OKKALAPA SUBSTATION	20.6	cct.-km.	-	-	-	-	-	-	16,957,241	1,377,341	801,783	1,851,793	1,053,369	-	22,041,526	-	-	9,850,000	508,556	-	-	10,358,556	32,400,081		
2.3 SHWE PAU KAN SUBSTATION - WAI BAR GI SUBSTATION	3.4	cct.-km.	-	-	-	-	-	-	7,192,556	1,450,889	437,985	872,988	676,056	-	10,630,473	2,250,620	-	1,750,000	5,920,200	227,313	-	10,148,133	20,778,605		
2.4 SHWE PAUKAN SUBSTATION - NORTH OKKALAPA SUBSTATION	4.5	cct.-km.	-	-	-	-	-	-	16,950,372	2,795,056	922,128	1,994,288	1,195,316	-	23,857,160	2,774,020	-	2,300,000	7,077,400	280,176	-	12,431,596	36,288,756		
2.5 NORTH OKKALAPA SUBSTATION - SEIN PAN MYAIM SUBSTATION	5.1	cct.-km.	-	-	-	-	-	-	66,275,740	8,667,509	3,183,606	7,569,268	3,217,100	-	88,913,224	1,147,500	-	2,300,000	2,999,700	115,898	-	6,563,098	95,476,321		
<b>Total (2)</b>	52.3		-	-	-	-	-	-	183,489,498	28,065,583	18,371,660	21,367,063	12,336,200	-	263,630,004	21,436,590	-	25,300,000	60,425,556	2,165,096	-	109,327,241	372,957,245		
<b>3. Distribution Line</b>																									
3.1 Construction 11 kV Distribution Line	50.6	cct.-km.	-	-	-	-	-	-	63,867,147	3,684,601	3,019,805	6,822,727	3,122,205	-	80,516,484	-	-	-	-	-	18,154,248	-	18,154,248	98,670,733	
3.2 Improvement 11 kV Distribution Line	40.87	cct.-km.	-	-	-	-	-	-	37,110,274	2,950,567	1,847,315	4,046,145	2,540,475	-	48,494,776	-	-	-	-	-	23,593,041	-	23,593,041	72,087,818	
<b>Total (3)</b>	91.47		-	-	-	-	-	-	100,977,421	6,635,167	4,867,120	10,868,871	5,662,680	-	129,011,260	-	-	-	-	-	41,747,290	-	41,747,290	170,578,550	
<b>4. Distribution Transformer</b>																									
4.1 160 kVA, 3-P	136	sets	31,713	-	-	3,203	-	34,916	30,451,425	1,756,793	1,439,823	3,253,030	1,488,646	-	38,389,716	-	-	-	-	-	-	-	-	38,424,632	
4.2 315 kVA, 3-P	69	sets	15,997	-	-	1,616	-	17,612	17,627,380	1,401,519	877,475	1,921,919	1,206,726	-	23,035,019	-	-	-	-	-	-	-	-	23,052,631	
<b>Total (4)</b>	205		47,710	-	-	4,819	-	52,528	48,078,805	3,158,312	2,317,297	5,174,949	2,695,372	-	61,424,735	-	-	-	-	-	-	-	-	61,477,263	
<b>Grandtotal (1+2+3+4)</b>			184,894,066	5,014,767	2,772,695	20,424,003	-	213,105,531	641,700,931	44,776,383	28,693,363	71,406,128	39,936,844	-	826,513,648	21,436,590	-	58,800,000	184,192,568	5,515,096	-	269,944,254	1,309,563,434		

**Table 6** :The investment cost of the project

Unit: Million Baht

No.	Detail	Cost
1	Substation	716.037
2	Transmission Line	383.620
3	Distribution Line	176.126
4	Distribution Transformer	64.034
5	Supervision Cost	43.410
6	Escalation	75.021
Total		1,458.248

**Table 7**: Cost summary

Unit: Million Baht

COST SUMMARY					
No.	Detail	Foreign	Thailand	Myanmar	Total
1	Equipment Cost	184.894	697.501	21.437*	903.832
2	Labor Cost (Installation Cost)	5.015	48.670	-	53.685
3	Transportation Cost	2.773	32.981	58.800	94.554
4	Civil Work	-	-	184.193	184.193
5	Contingency Cost	20.424	77.615	5.515	103.554
6	Supervision Cost	-	43.410	-	43.410
7	Escalation	3.839	45.705	25.476	75.020
Total (=1+2+3+4+5+6+7)		216.945	945.882	295.421	1,458.248

Remark: \* The round concrete pole of transmission system is supplied by Myanmar.



**Table 8:** The investment cost of two phases

No.	Details	Inv. Cost	Phase I	Phase II
1	Substation	716.037	1,099.657	
2	Transmission Line	383.620		
3	Distribution Line	176.126		240.160
4	Distribution Transformer	64.034		
5	Supervision Cost	43.410	34.325	9.085
6	Escalation	75.021	56.511	18.510
	<b>Total</b>	<b>1,458.248</b>	<b>1,190.493</b>	<b>267.755</b>

## 7. Benefits of the project

7.1 Enhance the capacity of the power supply system to support the growth of electricity demand in the project area that increased from 26.00 MW in 2016 to be 76.80 MW in 2026. The average growth in this period is 11.44%

7.2 Improve power system reliability and efficiency. The results of improvement are presented as follows:

- Energy losses are reduced from 71,932,547 kWh/year to be 50,497,855 kWh/year (29.80% reduction)
- Energy not supplied which due to power transformer overload (606,182,907 kWh/year) is all solved.
- The minimum voltage in the system is improved to be 89.55% instead of 70.10%.

7.3 Decrease operation and maintenance problems in the power system.

7.4 Increase the competitiveness of the country.

## 8. Financial and Economic Effect

### 8.1 Financial analysis

8.1.1 The financial costs of this project are calculated as:

- 1) The capital investment of substations, transmission lines and distribution systems are scheduled in construction the period 2019 – 2020.
- 2) Operating and Maintenance costs of 1.5% of project investment.
- 3) Administration cost of 3.05% of electric revenue.
- 4) Energy costs based on cost of purchasing the incremental energy required for this project.



8.1.2 The benefits of this project are calculated from the incremental energy which is possible for this project. Revenues from energy sales are based on YESC's present tariff rate applied to incremental energy.

## 8.2 Economic Analysis

8.2.1 The economic costs of the project are calculated as same as the financial costs as mentioned in 8.1.1. In addition, there are the adjustments on the financial costs of capital by using conversion factor as same as previous report. The economic cost is illustrated in Table 9.

**Table 9:** Economic cost

Unit: Million Baht

No.	Detail	COST SUMMARY			
		Foreign	Thailand	Myanmar	Total
1	Equipment Cost	184.894	641.701	21.437	848.032
2	Labor Cost	5.015	44.776	-	49.791
3	Transportation Cost	2.773	28.693	58.800	90.266
4	Civil Work	-	-	184.193	184.193
5	Contingency Cost	20.424	71.405	5.515	97.344
6	Supervision Cost	-	39.937	-	39.937
Total (=1+2+3+4+5+6)		213.106	826.512	269.945	1,309.563

8.2.2 The economic benefits of the project can be evaluated by:

1) The saving of fuel consumption for electricity production. Diesel price is estimated to be 6.543 Baht/kWh.

2) The incremental Gross Regional Product (GRP) per electricity unit use in the project area as same as previous report.

3) The saving of generator for supply overload. Generator price is estimated to be 12,000 Baht/kW and operation and maintenance cost is 15% of generator price.

In summary, Financial analysis and Economic analysis of the project, in term of internal rates of return (FIRR and EIRR), are 12.63% and 21.79% respectively as shown in Table 10 and 11. The Financial Internal Rate of Return (FIRR) and the Economic Internal Rate of Return (EIRR) are calculated from analysis of benefit and cost streams over the project life of the 25 years study period.



**Table 10: The Financial Internal Rate of Return (FIRR)**

<b>Power System Development in Yangon City Project (North Okkalapa and North Dagon Townships)</b>										
<b>The Republic of the Union of Myanmar</b>										
<b>Financial Internal Rate of Return</b>										
<b>Alternative 3</b>								<b>12.63% DISCOUNT RATE</b>		
Fiscal Year	Electric Revenue	Total Benefits	Project Investment	O/M Cost 1.50% of Proj. Inv.	Administration Cost 3.05% of Electric Revenue	Energy Cost	Total Costs	Net Benefits	Present Worth	Present Worth
	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)
2018										
2019			1,020.774				1,020.774	(1,020.774)		906.333
2020			437.475				437.475	(437.475)		344.881
2021	454.050	454.050		21.874	13.849	398.149	433.872	20.178	317.818	303.694
2022	575.272	575.272		21.874	17.546	498.969	538.389	36.883	357.525	334.602
2023	710.564	710.564		21.874	21.672	611.773	655.319	55.245	392.098	361.613
2024	936.177	936.177		21.874	28.553	795.291	845.718	90.459	458.677	414.357
2025	1,062.174	1,062.174		21.874	32.396	897.564	951.834	110.340	462.065	414.065
2026	1,194.889	1,194.889		21.874	36.444	1,007.805	1,066.123	128.766	461.523	411.787
2027	1,221.894	1,221.894		21.874	37.268	1,007.805	1,066.947	154.947	419.042	365.904
2028	1,249.509	1,249.509		21.874	38.110	1,007.805	1,067.789	181.720	380.471	325.138
2029	1,346.704	1,346.704		21.874	41.074	1,062.194	1,125.142	221.562	364.093	304.192
2030	1,377.139	1,377.139		21.874	42.003	1,062.194	1,126.071	251.068	330.580	270.311
2031	1,408.262	1,408.262		21.874	42.952	1,062.194	1,127.020	281.242	300.151	240.209
2032	1,440.089	1,440.089		21.874	43.923	1,062.194	1,127.991	312.098	272.524	213.462
2033	1,472.635	1,472.635		21.874	44.915	1,062.194	1,128.983	343.652	247.439	189.697
2034	1,674.305	1,674.305		21.874	51.066	1,062.751	1,135.691	538.614	249.785	169.430
2035	1,712.144	1,712.144		21.874	52.220	1,062.751	1,136.845	575.299	226.793	150.588
2036	1,750.839	1,750.839		21.874	53.401	1,062.751	1,138.026	612.813	205.918	133.844
2037	1,790.407	1,790.407		21.874	54.607	1,062.751	1,139.232	651.175	186.964	118.965
2038	1,830.871	1,830.871		21.874	55.842	1,062.751	1,140.467	690.404	169.755	105.742
2039	1,872.248	1,872.248		21.874	57.104	1,062.751	1,141.729	730.519	154.130	93.991
2040	1,914.561	1,914.561		21.874	58.394	1,062.751	1,143.019	771.542	139.943	83.548
2041	1,957.830	1,957.830		21.874	59.714	1,062.751	1,144.339	813.491	127.061	74.267
2042	2,002.077	2,002.077		21.874	61.063	1,062.751	1,145.688	856.389	115.366	66.018
2043	2,047.324	2,047.324	(212.250)	21.874	62.443	1,062.751	934.818	1,112.506	104.747	47.828
							<b>FIRR</b>	<b>12.63%</b>	<b>6,444.468</b>	<b>6,444.466</b>

**Table 11:** The Economic Internal Rate of Return (EIRR)

Power System Development in Yangon City Project (North Okkalapa and North Dagon Townships)													
The Republic of the Union of Myanmar													
Economic Internal Rate of Return													
												21.79%	DISCOUNT RATE
Fiscal Year	Outage Cost	GDP	Generator	O/M Cost of Generator	Total Benefits	Project Investment	O/M Cost 1.50% of Proj. Inv.	Administration Cost 3.05% of Electric Revenue	Energy Cost	Total Costs	Net Benefits	Present Worth	Present Worth
	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.Baht)	(M.USD)	(M.USD)
2018													
2019						916.694				916.694	(916.694)		752.679
2020						392.869				392.869	(392.869)		264.862
2021	401.366	0.071	112.812	74.765	589.014		19.643	13.849	398.149	431.641	157.373	326.049	238.935
2022	558.924	0.079	126.216	93.697	778.916		19.643	17.546	498.969	536.158	242.758	354.024	243.689
2023	735.201	0.088	141.216	114.880	991.385		19.643	21.672	611.773	653.088	338.297	369.974	243.725
2024	989.991	0.128	103.728	130.439	1,224.286		19.643	28.553	795.291	843.487	380.799	375.143	258.459
2025	1,149.805	0.080	111.828	147.213	1,408.926		19.643	32.396	897.564	949.603	459.323	354.477	238.914
2026	1,322.085	0.086	120.540	165.294	1,608.005		19.643	36.444	1,007.805	1,063.892	544.113	332.179	219.777
2027	1,322.085	0.086		165.294	1,487.465		19.643	37.268	1,007.805	1,064.716	422.749	252.300	180.595
2028	1,322.085	0.086		165.294	1,487.465		19.643	38.110	1,007.805	1,065.558	421.907	207.159	148.400
2029	1,322.085	0.086		165.294	1,487.465		19.643	41.074	1,062.194	1,122.911	364.554	170.094	128.407
2030	1,322.085	0.086		165.294	1,487.465		19.643	42.003	1,062.194	1,123.840	363.625	139.661	105.519
2031	1,322.085	0.086		165.294	1,487.465		19.643	42.952	1,062.194	1,124.789	362.676	114.673	86.713
2032	1,322.085	0.086		165.294	1,487.465		19.643	43.923	1,062.194	1,125.760	361.705	94.156	71.260
2033	1,322.085	0.086		165.294	1,487.465		19.643	44.915	1,062.194	1,126.752	360.713	77.309	58.562
2034	1,322.085	0.086		165.294	1,487.465		19.643	51.066	1,062.751	1,133.460	354.005	63.477	48.370
2035	1,322.085	0.086		165.294	1,487.465		19.643	52.220	1,062.751	1,134.614	352.851	52.120	39.756
2036	1,322.085	0.086		165.294	1,487.465		19.643	53.401	1,062.751	1,135.795	351.670	42.795	32.677
2037	1,322.085	0.086		165.294	1,487.465		19.643	54.607	1,062.751	1,137.001	350.464	35.138	26.859
2038	1,322.085	0.086		165.294	1,487.465		19.643	55.842	1,062.751	1,138.236	349.229	28.851	22.077
2039	1,322.085	0.086		165.294	1,487.465		19.643	57.104	1,062.751	1,139.498	347.967	23.689	18.147
2040	1,322.085	0.086		165.294	1,487.465		19.643	58.394	1,062.751	1,140.788	346.677	19.451	14.917
2041	1,322.085	0.086		165.294	1,487.465		19.643	59.714	1,062.751	1,142.108	345.357	15.970	12.262
2042	1,322.085	0.086		165.294	1,487.465		19.643	61.063	1,062.751	1,143.457	344.008	13.113	10.080
2043	1,322.085	0.086		165.294	1,487.465	(188.135)	19.643	62.443	1,062.751	956.702	530.763	10.767	6.925
										<b>EIRR</b>	<b>21.79%</b>	<b>3,472.569</b>	<b>3,472.566</b>

## 9. Conclusions

Completion of this project will secure continuity of supply, increase reliability and provide acceptable service quality for the present and potential customers in the project area.

The Power System Development in Yangon City (North Okkalapa) covering three (3) substations areas will result in a financial internal rate of return of 12.63% and an economic internal rate of return of 21.79%. The project is worth for the investment.

-Annex-

## Annex Content

- Annex 1. Area map of the project
- Annex 2. Single line diagram of Existing power system
- Annex 3. Single line diagram of Planning power system
- Annex 4. List of Project and Scope of Work to be financed under NEDA Loan
- Annex 5. Current load of the Relevant Townships (MW) and Each Substation (MW)
- Annex 6. Electricity Consumption of North Okkalapa Township
- Annex 7. Number of Consumers in North Okkalapa Township
- Annex 8. GDP Growth Rate of North Okkalapa Township
- Annex 9. Electricity Tariffs
- Annex 10. Number of Consumers
- Annex 11. Output and Consumption of Electricity
- Annex 12. Sales of Electricity
- Annex 13. Unit Sold, Sales of Electricity and Other Income
- Annex 14. Consolidated Revenue Accounts
- Annex 15. Electricity Production, Cost and Average Selling Price
- Annex 16. Balance Sheet

# Annex 1. Area map of the project

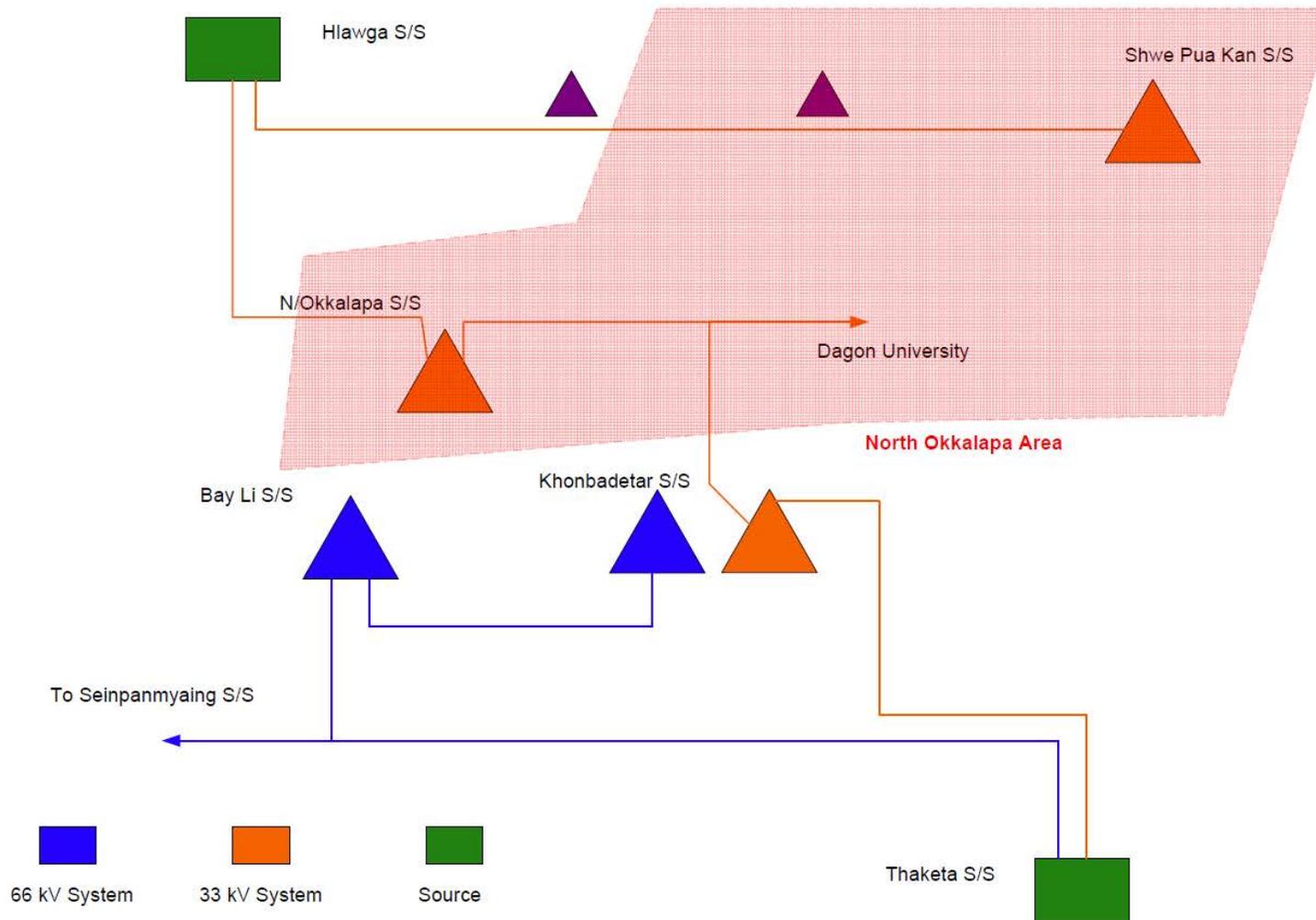


 Substation

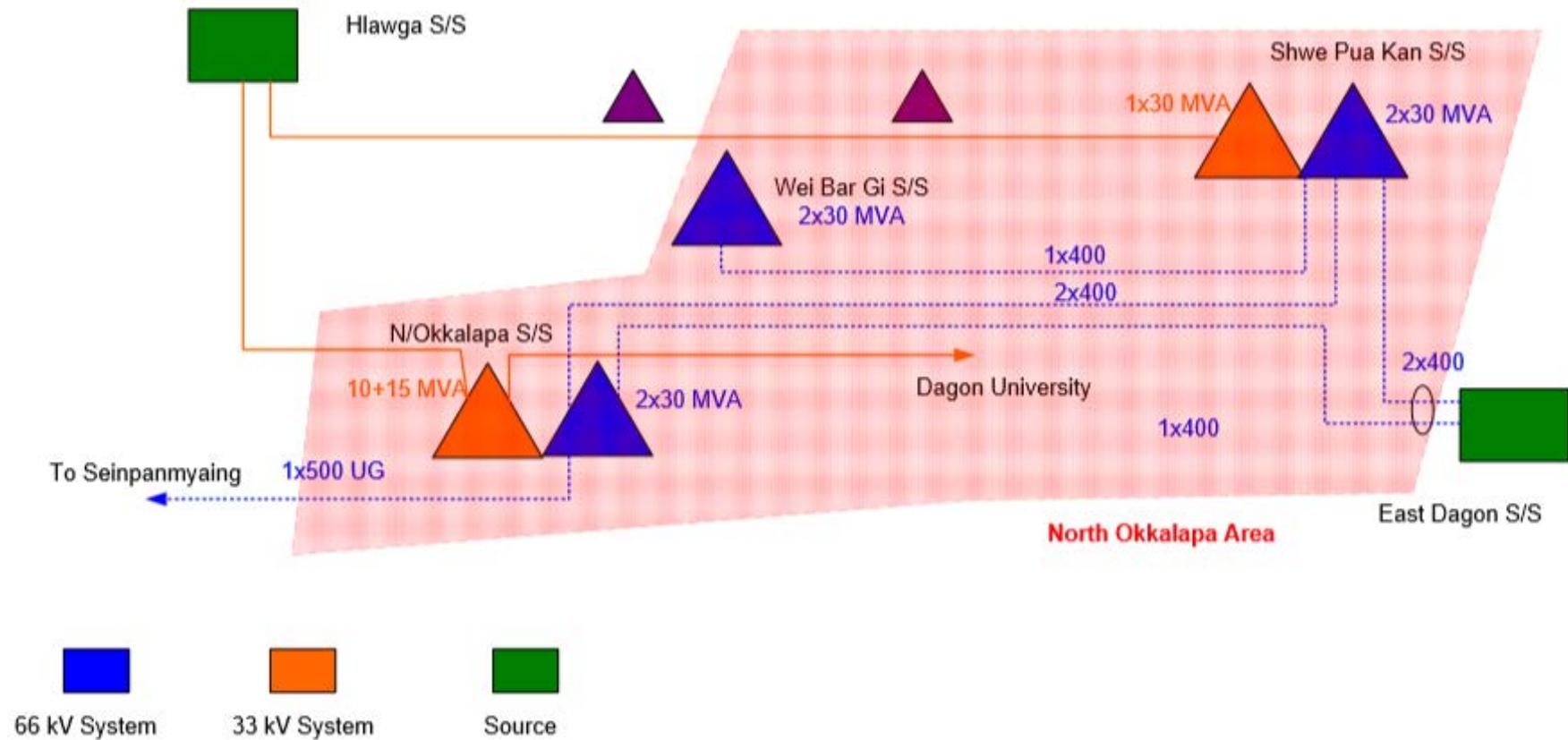
 Planning transmission line

 Source

## Annex 2. Single line diagram of existing power system



### Annex 3. Single line diagram of planning power system



## Annex 4. List of project and scope of work to be financed under NEDA loan

Sr.	Item	Name of Project	Scope of Work (Original)	Scope of Work (To be Revised)	Remarks
		<b>1 Substation</b>			
		<b>1 New Substation</b>			
	1	Wai Bar Gi Substation, North Okkalar Pa Township	66/11 kV, 2 x 25 MVA GIS, 11 kV 10 Out	Installed Capacity of each Transformer should be 30 MVA and Capacitor Bank with the relevant installed capacity should be added.	To Proceed with NEDA Loan
	2	Shwe Pau Kan Substation, North Okkalar Pa Township	66/11 kV, 2 x 25 MVA & 1 x 30 MVA GIS, 11 kV 10 Out	Installed Capacity of each Transformer should be 30 MVA and Capacitor Bank with the relevant installed capacity should be added.	To Proceed with NEDA Loan
	3	North Okkalapa Substation, North Okkalar Pa Township	66/11 kV, 2 x 25 MVA GIS, 11 kV 10 Out	Installed Capacity of each Transformer should be 30 MVA and Capacitor Bank with the relevant installed capacity should be added.	To Proceed with NEDA Loan
		<b>2 Upgrade Substation</b>			
	1	Sein Pan Myaing Substation, Mayangone Township	66 kV Switch Bay Extension		No need to proceed with NEDA Loan
	2	Kon Ba Day Thar Sustation, North Dagon Township	66/11 kV, 2 x 25 MVA AIS, 11 kV 5 Out		No need to proceed with NEDA Loan
	3	Bali Substation, North Dagon Township	66/11 kV, 2 x 25 MVA AIS, 11 kV 5 Out		To Proceed with NEDA Loan
		<b>2 Transmission Line</b>			
		<b>1 Overhead Line (62.674 ckt-km)</b>			
	1	East Dagon S/S - Shwe Pau Kan S/S	66 kV O/H 1 x TB 400 mm <sup>2</sup> AAC, 18.571 ckt-km	Need to be Discussed on Pole Structure	To Proceed with NEDA Loan
	2	East Dagon S/S - North Okkalapa S/S	66 kV O/H 1 x TB 400 mm <sup>2</sup> AAC, 20.091 ckt-km	Need to be Discussed on Pole Structure	To Proceed with NEDA Loan
	3	East Dagon S/S - Kon Ba Day Thar S/S	66 kV O/H 1 400 mm <sup>2</sup> AAC, 14.207 ckt-km		No need to proceed with NEDA Loan
	4	Shwe Pau Kan S/S - Wai Bar Gi S/S	66 kV O/H 1 400 mm <sup>2</sup> AAC, 3.343 ckt-km		To Proceed with NEDA Loan
	5	Shwe Pau Kan S/S - North Okkalapa S/S	66 kV O/H 1 400 mm <sup>2</sup> AAC, 4.332 ckt-km	Need to be Discussed on Pole Structure	To Proceed with NEDA Loan
	6	North Okkalapa S/S - Sein Pan Myaing S/S	66 kV O/H 1 400 mm <sup>2</sup> AAC, 2.130 ckt-km		To Proceed with NEDA Loan
		<b>2 Underground (3.358 km)</b>			
	1	East Dagon S/S - Shwe Pau Kan S/S	66 kV U/G 3 x 500 mm <sup>2</sup> XLPE, 76 m (Direct Burial)		To Proceed with NEDA Loan
	2	East Dagon S/S - North Okkalapa S/S	66 kV U/G 3 x 500 mm <sup>2</sup> XLPE, 175 m (Direct Burial)		To Proceed with NEDA Loan
	3	Shwe Pau Kan S/S - Wai Bar Gi S/S	66 kV U/G 3 x 500 mm <sup>2</sup> XLPE, 90 m (Direct Burial)		To Proceed with NEDA Loan
	4	Shwe Pau Kan S/S - North Okkalapa S/S	66 kV U/G 3 x 500 mm <sup>2</sup> XLPE, 130 m (Direct Burial)		To Proceed with NEDA Loan
	5	North Okkalapa S/S - Sein Pan Myaing S/S	66 kV U/G 3 x 500 mm <sup>2</sup> XLPE, 2,887 m (Direct Burial)		To Proceed with NEDA Loan
		<b>3 Distribution Line (150 ckt-km)</b>			
	1	Construction New 11 kV Distribution Line	11 kV 120 mm <sup>2</sup> SAC O/H, about 70 cct.-km.	Reallocate to N. Dagon T/S only and need to be revised on original FS	To Proceed with NEDA Loan
	2	Replacement Existing 11 kV Distribution Line	11 kV 120 mm <sup>2</sup> SAC O/H, about 80 cct.-km.		
		<b>Distribution Transformer</b>			
	1	11/0.4 kV, 160 kVA 3Phase X'mer on Concrete Pole	237 Sets (37.92 MVA)	Reallocate to N. Dagon T/S only and need to be revised on original FS and change all the X'mer Capacity to 160 kVA	To Proceed with NEDA Loan
	2	11/0.4 kV, 315 kVA 3Phase X'mer on H Frame	120 Sets (37.80 MVA)		

Annex 5. Current Load of the relevant Townships (MW) and Each Substation (MW)

No.	Name of Township	Day Load	Night Load
1	North Okkalapa	29.00	30.00
2	North Dagon	31.14	32.60
3	Shwe Pauk Kan	12.40	13.05

No.	Name of Substation	Maximum Load
1	Wai Bar Gi	5
2	North Okkalapa	26
3	Shwe Pauk Kan	16
4	Balley	5

## Annex 6. Electricity Consumption of North Okkalapa Township

No	Year	Domestic	Domestic Power	Small Power	Industrial	Bulk	Street Lighting	Temporary	Departmental Use	Total
		(kWh)	(kWh)	(kWh)	(kWh)	(kWh)	(kWh)	(kWh)	(kWh)	(kWh)
1	2013-2014	66161800	2042245	5897039	18649887	2919286	792212	8927	60024	96531420
2	2014-2015	74606927	2139582	7699212	18985441	3150595	890540	96119	61056	107629472
3	2015-2016	90827227	2690632	9025266	21036887	3356266	906833	284578	60636	128188325
4	2016-2017 <small>(to 2016 October)</small>	62642003	1952791	5874515	14017712	2160814	630356	157860	36015	87472066

## Annex 7. Number of consumers in North Okkalapa Township

No.	Year	Domestic	Domestic Power	Small Power	Industrial	Bulk	Street Lighting	Temporary	Departmental Use	Total
1	2013-2014	39767	428	976	110	13	10	3	3	41310
2	2014-2015	41836	449	1048	118	13	15	98	3	43580
3	2015-2016	44389	484	1113	133	13	20	98	3	46253
4	2016-2017 <small>(to 2016 October)</small>	46488	499	1138	142	14	22	100	3	48406

Annex 8. GDP growth rate of North Okkalapa Township

<b>No.</b>	<b>FY Year</b>	<b>All Sectors</b>	<b>Electric Sector</b>
1	2013-2014	11.60%	9.80%
2	2014-2015	7.20%	5.50%
3	2015-2016	8.70%	5.70%

## Annex 9. Electricity Tariffs

Sr No	CONSUMER CATEGORY	ENERGY CHARGES (KYATS PER UNIT)		CAPACITY CHARGES (KYATS PER HORSE POWER)	FIXED CHARGES ie METER Service Charges
		Domestic Used	Commercial Used		
1	General Purpose	1-100units•35Kyats 101-200units•40Kyats 201units and above •50Kyats	1-500units•75Kyats 501-10,000units•100Kyats 10,001-50,000units•125Kyats 50,001-200,000units•150Kyats 200,001-300,000units•125Kyats 300,000units and above•100Kyats	-	Single Phase 500
2	Domestic Power	1-100units•35Kyats 101-200units•40Kyats 201units and above •50Kyats	1-500units•75Kyats 501-10,000units•100Kyats 10,001-50,000units•125Kyats 50,001-200,000units•150Kyats 200,001-300,000units•125Kyats 300,000units and above•100Kyats	-	Single Phase 500 Three Phase 2000
3	Small Power	-	1-500units•75Kyats 501-10,000units•100Kyats 10,001-50,000units•125Kyats 50,001-200,000units•150Kyats 200,001-300,000units•125Kyats 300,000units and above•100Kyats	200	Single Phase 500 Three Phase 2000
4	Industrial	-	1-500units•75Kyats 501-10,000units•100Kyats 10,001-50,000units•125Kyats 50,001-200,000units•150Kyats 200,001-300,000units•125Kyats 300,000units and above•100Kyats	200	Three Phase 2000 C.T Meter 5000
5	Bulk	1-100units•35Kyats 101-200units•40Kyats 201units and above •50Kyats	1-500units•75Kyats 501-10,000units•100Kyats 10,001-50,000units•125Kyats 50,001-200,000units•150Kyats 200,001-300,000units•125Kyats 300,000units and above•100Kyats	200	Three Phase 2000 C.T Meter 5000
6	Street Lighting	1-100units•35Kyats 101-200units•40Kyats 201units and above •50Kyats	-	-	-
7	Temporary Lighting	-	1-500units•75Kyats 501-10,000units•100Kyats 10,001-50,000units•125Kyats 50,001-200,000units•150Kyats 200,001-300,000units•125Kyats 300,000units and above•100Kyats	200	Single Phase 500 Three Phase 2000

## Annex 10. Number of Consumers

Sr. No.	YEAR	GENERAL PURPOSE+ Departmental	DOMESTIC POWER	SMALL POWER	INDUSTRIAL	BULK	STREET LIGHTING	TEMPORARY LIGHTING	COMPANY	TOTAL
1	2011-2012	842,750	31,080	16,551	3,562	2,187	734	315	-	897,179
2	2012-2013	894,742	32,020	16,690	3,899	2,406	758	340	-	950,855
3	2013-2014	912,589	33,133	15,193	4,033	2,570	718	601	57,922	1,026,759
4	2014-2015	918,371	34,057	15,527	4,046	2,590	877	1,176	130,099	1,106,743
5	2015-2016	681,874	16,143	9,977	2,399	1,942	1,152	899	477,976	1,192,362

## Annex 11. Output and Consumption of Electricity

(KWH IN MILLION)

YEAR	OUT - PUT			CONSUMPTION				
	PURCHASE	DIESEL	TOTAL	DOMESTIC	INDUSTRIAL POWER	BULK	OTHERS	TOTAL
2011-2012	4,365.150	0.12	4,365.27	1,693.625	1,204.408	604.690	22.055	3,524.778
2012-2013	4,612.770	0.12	4,612.89	1,874.968	1,202.020	648.747	26.740	3,752.475
2013-2014	5,197.010	0.11	5,197.12	2,018.021	1,330.547	691.118	206.841	4,246.527
2014-2015	5,981.570	1.45	5,983.02	2,274.997	1,539.109	750.539	357.018	4,921.663
2015-2016	6,705.043	3.07	6,708.11	1,844.179	1,013.192	542.595	2,513.316	5,913.282

## Annex 12. Sales of Electricity

( KYATS IN MILLION )

YEAR	DOMESTIC		INDUSTRIAL POWER		BULK		OTHER		TOTAL	
	UNITS (MILLION KWH)	VALUE KYATS	UNITS (MILLION KWH)	VALUE KYATS	UNITS (MILLION KWH)	VALUE KYATS	UNITS MILLION KWH	VALUE KYATS	UNITS MILLION KWH	VALUE KYATS
2011-2012	1,693.625	62,531.233	1,204.408	62,513.290	604.690	22,568.069	22.055	669.156	3,524.778	148,281.748
2012-2013	1,874.968	86,858.032	1,202.020	86,680.115	648.747	39,020.316	26.740	838.260	3,752.475	213,396.723
2013-2014	2,018.021	90,100.436	1,330.547	98,795.963	691.118	42,216.918	206.841	9,702.111	4,246.527	240,815.428
2014-2015	2,274.997	113,101.967	1,539.109	184,389.459	750.539	69,478.017	357.018	23,577.377	4,921.663	390,546.820
2015-2016	1,844.179	89,968.055	1,013.192	120,465.612	542.595	49,278.252	2,513.316	181,628.375	5,913.282	441,340.294

## Annex 13. Unit Sold, Sales of Electricity and Other Income

( UNITS IN MILLION )

( KYATS IN MILLION )

PARTICULARS	2011-2012		2012-2013		2013-2014		2014-2015		2015-2016	
	UNIT	AMOUNT	UNIT	AMOUNT	UNIT	AMOUNT	UNIT	AMOUNT	UNIT	AMOUNT
<b>SALES OF ELECTRICITY</b>	<b>3524.780</b>	<b>148,255.799</b>	<b>3752.476</b>	<b>213,403.546</b>	<b>4246.529</b>	<b>240,544.449</b>	<b>4921.663</b>	<b>390769.779</b>	<b>5913.282</b>	<b>440249.778</b>
GENERAL PURPOSE	1516.470	56,231.214	1679.047	77,160.176	1803.935	79,312.631	2023.420	99344.375	1674.148	79649.532
DOMESTIC POWER	177.150	6,294.475	195.921	9,697.437	214.086	10,786.750	251.577	13757.105	170.028	10317.224
SMALL POWER	150.600	8,802.586	151.819	11,682.407	142.055	10,860.576	154.185	14799.207	126.248	12152.253
INDUSTRIAL	1053.810	53,707.453	1050.200	74,822.220	1188.492	87,928.382	1384.924	169556.948	886.945	108302.526
BULK	604.690	22,551.626	648.747	38,995.039	691.118	42,163.701	750.538	69475.583	542.596	49256.896
STREET LIGHT	16.110	456.193	18.016	655.884	18.880	685.086	21.040	1017.606	15.188	778.210
TEMPORARY LIGHTING	1.940	98.287	2.783	182.375	4.841	382.823	7.779	791.069	5.886	612.151
DEPARTMENTAL	4.010	113.965	5.943	208.008	6.000	210.261	5.957	259.184	3.972	257.469
COMPANY					177.112	8,214.239	322.243	21768.702	2488.271	178923.517
<b>OTHER INCOME</b>		<b>2,041.904</b>		<b>3,118.030</b>		<b>3,668.842</b>		<b>2653.933</b>		<b>4389.295</b>
RENT OF PROPERTIES	-	2.422	-	2.785	-	2.882	-	2.919	-	2.896
SALE OF UNSERVICEBLE STORES	-	0.049	-	22.405	-	14.446	-	3.500	-	110.465
SALE OF TENDER FORMS	-	1.890	-	5.890	-	7.463	-	11.520	-	7.848
COMPENSATION	-	397.158	-	152.716	-	112.764	-	143.031	-	1824.371
PROFIT & LOSS ON REALISATION OF ASSETS	-	92.463	-	129.928	-	93.592	-	79.946	-	88.830
INSTALLATION FEES	-	300.807	-	256.591	-	324.047	-	388.283	-	343.168
INTERNAL WIRING	-	534.410	-	627.130	-	791.221	-	1033.868	-	893.133
RE-CONNECTION FEES	-	571.443	-	661.370	-	709.606	-	794.927	-	885.074
MISCELLANEOUS INCOME	-	141.068	-	145.096	-	171.981	-	195.939	-	215.361
DIFFERENT EXCHANGE RATE	-	0.194	-	1,114.119	-	1,440.840	-		-	18.149
DONATION FOR RELIEF ACCOUNT	-	-	-	-	-	-	-	-	-	-
DONATION ACCOUNT	-	-	-	-	-	-	-	-	-	-
<b>TOTAL</b>	<b>3524.780</b>	<b>150,297.703</b>	<b>3752.476</b>	<b>216,521.576</b>	<b>4246.529</b>	<b>244,213.291</b>	<b>4921.663</b>	<b>393423.712</b>	<b>5913.282</b>	<b>444639.073</b>

## Annex 14. Consolidated Revenue Accounts

( KYATS IN MILLION )

PARTICULARS	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
<b>INCOME</b>					
SALE OF ELECTRICITY	148,255.799	213,403.546	240,544.449	390,769.779	440,249.778
OTHER INCOME	2,041.905	3,118.030	3,668.842	2,653.933	4,389.295
<b>TOTAL INCOME</b>	<b>150,297.704</b>	<b>216,521.576</b>	<b>244,213.291</b>	<b>393,423.712</b>	<b>444,639.073</b>
<b>GENERATION</b>					
SALARIES AND WAGES	0.259				
FUEL CONSUMPTION	126.003	111.879	140.518	127.228	121.401
PURCHASE OF ELECTRICITY	87,302.979	177,313.986	207,880.376	340,949.510	382,187.426
DEPRECIATION	5.189	3.285	166.047	501.685	511.593
MAINTENANCE, REPAIRS AND OTHER EXPENSES		1.000	3.172	121.075	2.289
<b>GENERATION EXPENSES:-</b>	<b>87,434.430</b>	<b>177,430.150</b>	<b>208,190.113</b>	<b>341,699.498</b>	<b>382,822.709</b>
<b>TRANSMISSION</b>					
SALARIES AND WAGES					
DEPRECIATION	4.304	4.304	4.304	31.726	31.726
MAINTENANCE, REPAIRS AND OTHER EXPENSES					
<b>TRANSMISSION EXPENSES:-</b>	<b>4.304</b>	<b>4.304</b>	<b>4.304</b>	<b>31.726</b>	<b>31.726</b>
<b>DISTRIBUTION</b>					
SALARIES AND WAGES	669.034	566.454	930.382	1,426.047	1,801.168
DEPRECIATION	4,070.244	4,521.414	7,163.466	8,834.378	11,968.475
MAINTENANCE, REPAIRS AND OTHER EXPENSES	1,389.400	1,525.922	2,133.352	1,232.549	2,078.700
<b>DISTRIBUTION EXPENSES:-</b>	<b>6,128.678</b>	<b>6,613.790</b>	<b>10,227.200</b>	<b>11,492.974</b>	<b>15,848.343</b>
<b>ADMINISTRATION</b>					
SALARIES AND WAGES	1,879.752	2,279.854	3,018.079	5,128.396	5,130.104
DEPRECIATION	202.873	212.784	219.264	333.958	456.958
MAINTENANCE, REPAIRS AND OTHER EXPENSES	1,658.656	3,605.108	4,203.197	2,028.824	1,636.375
COMMERCIAL TAX	3,857.952	3,144.438	1,618.965	2,359.912	2,789.615
<b>ADMINISTRATION EXPENSES:-</b>	<b>7,599.233</b>	<b>9,242.184</b>	<b>9,059.505</b>	<b>9,851.090</b>	<b>10,013.052</b>
<b>TOTAL EXPENSES:-</b>	<b>101,166.645</b>	<b>193,290.428</b>	<b>227,481.122</b>	<b>363,075.288</b>	<b>408,715.830</b>
PROFIT/LOSS BEFORE TAXATION AND STATE	<b>49,131.059</b>	<b>23,231.148</b>	<b>16,732.169</b>	<b>30,348.424</b>	<b>35,923.243</b>
CONTRIBUTION					
INCOME TAX	14,739.317	5,807.787	4,183.042	7,587.106	8,980.811
PROFIT & LOSS ADJUSTMENT ACCOUNT	21.137				
STATE CONTRIBUTION	32,281.563	4,646.229	3,346.434	6,069.685	7,184.649
<b>PROFIT FOR THE YEAR</b>	<b>2,131.316</b>	<b>12,777.132</b>	<b>9,202.693</b>	<b>16,691.633</b>	<b>19,757.783</b>

## Annex 15. Electricity Production, Cost and Average Selling Price

(KYATS IN MILLION)

No.	PARTICULARS	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
1	UNIT PURCHASE	4,365.150	4,612.770	5,197.009	5,981.570	6,705.043
2	<u>LOSS</u>					
	( a ) CONSUMPTION BY STATION AUXILLIARIES					
	( b ) LOSSES IN GENERATION, TRANSMISSION, DISTRIBUTION	846.488	860.287	950.484	1,059.907	791.761
3	UNIT CONSUMED	3,524.778	3,752.482	4,246.527	4,921.663	5,913.282
4	TOTAL INCOME ( SALE OF ELECTRICITY)	148,255.799	213,403.546	240,544.449	390,769.779	440,249.778
5	<u>PRODUCTION COST</u>					
	( 1 ) SALARIES AND WAGES	2,549.045	2,846.308	3,948.461	6,554.443	6,931.272
	( 2 ) FUEL CONSUMPTION	126.003	111.879	140.518	127.228	121.401
	( 3 ) PURCHASE OF ELECTRICITY	87,302.979	177,313.986	207,880.376	340,949.510	382,187.426
	( 4 ) DEPRECIATION	4,282.610	4,741.787	7,553.081	9,701.747	12,968.752
	( 5 ) MAINTENANCE, REPAIRS AND OTHER EXPENSES	3,048.056	5,132.030	6,339.721	3,382.448	3,717.364
	( 6 ) COMMERCIAL TAX	3,857.952	3,144.438	1,618.965	2,359.912	2,789.615
6	TOTAL PRODUCTION COST (EXCLUDING INTEREST)	101,166.645	193,290.428	227,481.122	363,075.288	408,715.830
7	TOTAL PRODUCTION COST	101,166.645	193,290.428	227,481.122	363,075.288	408,715.830
8	COST PER UNIT (6/3)	28.70	51.51	53.58	73.77	69.12
9	AVERAGE SELLING PRICE PER UNIT (4/3)	42.06	56.86	56.66	79.40	74.45

## Annex 16. Balance Sheet

( KYATS IN MILLION )

PARTICULARS	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
<b>ASSETS : -</b>					
<b>FIXED ASSETS</b>					
CAPITAL EXPENDITURES	102,290.242	118,031.198	161,149.990	206,655.296	275,214.728
LESS: -ACCUMULATED PROVISION FOR DEPRECIATION	15,943.005	21,101.185	28,779.001	38,812.510	51,956.103
<b>NET CAPITAL EXPENDITURES</b>	<b>86,347.237</b>	<b>96,930.013</b>	<b>132,370.989</b>	<b>167,842.786</b>	<b>223,258.625</b>
TREASURY BONDS					
<b>CURRENT ASSETS</b>					
GENERAL STORES	12,979.882	37,654.962	32,482.637	31,359.929	15,800.018
FUEL, PETROL, OIL & LUBRICANT	48.083	22.548	14.957	49.360	62.707
SUNDRY DEBTORS	172.403	1,291.196	1,026.771	9,213.684	668.102
CONTRIBUTION OF CASH BALANCES			11,309.850		
WIND RELIFE PAY ADVANCE					
ADVANCE TO OFFICERS	190.329	0.314	7.000		
CURRENT ACCOUNT(YESB & POLEINDS)	2.493	2.493			
CURRENT ACCOUNT(YESB & ESE)				2,896.762	
COMMUTED PENSION					321.688
CUMSTOMS DEPOSIT			374.000		372.519
COMSUMER'S ACCOUNT	17,850.358	17,416.342	23,079.762	36,933.353	41,480.229
NAGIS	0.314	0.314	0.284	0.284	0.284
CASH EXCESS OR SHORT	1.574				
CASH IN HAND			0.176		
CASH IN TRANSIT		24.496	4.003	87.927	
CASH IN BANK				122,389.721	180,589.624
BANK BALANCE	1,370.659	66,101.658	101,135.196		
BANK BALANCE SEPERATE	1,945.645	1,945.645			
	<b>34,561.740</b>	<b>124,459.968</b>	<b>169,434.636</b>	<b>202,931.020</b>	<b>239,295.171</b>
<b>TOTAL ASSETS</b>	<b>120,908.977</b>	<b>221,389.981</b>	<b>301,805.625</b>	<b>370,773.806</b>	<b>462,553.796</b>
PROFIT FOR THE YEAR	2,131.316	12,777.132	9,202.693	16,691.633	19,757.784
PROFIT & LOSS ACCOUNT	58,774.949	58,824.598	71,694.358	81,032.931	97,425.589
CURRENT ACCOUNT(MEPE & YESB)	7,536.885	7,536.885	7,536.885	7,536.885	7,536.885
CONCRETE POLEPLANT		852.515	850.022	850.022	850.022
	<b>68,443.150</b>	<b>79,991.130</b>	<b>89,283.958</b>	<b>106,111.471</b>	<b>125,570.280</b>
CAPITAL INVESTMENT	1,587.551	13,783.501	14,682.881	21,142.557	19,662.635
SEPERATE	945.390	945.390	945.390	57,790.559	72,793.944
GOVERNMENT ACCOUNT - 2		59,390.842	106,113.835	147,611.786	155,239.667
<b>NON CURRENT LIABILITIES</b>					
LOAN				2,944.529	10,829.627
<b>CURRENT LIABILITIES</b>					
GENERAL PROVIDENT FUND	666.805	666.805	666.805	666.805	1,030.889
SOCIAL SECURITY BOND	0.238				0.146
COMSUMER'S DEPOSITS	6,923.965	8,676.474	11,537.697	15,309.844	18,685.887
PURCHASE OF ELECTRICITY(MEPE)	8,397.333	16,750.453	20,773.183	3,634.801	36,866.292
CURRENT		194.648	320.748		
WORK DEPOSIT	510.654	142.218	11.735	68.585	13.584
SUNDRY CREDITORS	2,152.306	1,892.436	5,950.296	10,515.841	16,871.215
CURRENT ACCOUNT (MEPE & YESB)	7,378.558	7,405.118	8,379.058	4,977.028	4,977.028
CURRENT ACCOUNT (ESE & YESB)	229.917	229.917	229.917		12.602
NAGIS	0.031	0.031			
SEPERATE+CONCRETE POLE PLANT	23,673.079	31,321.018	42,903.122		
ADVANCE			7.000		
	<b>49,932.886</b>	<b>67,279.118</b>	<b>90,779.561</b>	<b>35,172.904</b>	<b>78,457.643</b>
<b>TOTAL LIABILITIES</b>	<b>120,908.977</b>	<b>221,389.981</b>	<b>301,805.625</b>	<b>370,773.806</b>	<b>462,553.796</b>