No.	Name of S/S	Year	Contents		Remark
NO.	Ivaine of 5/5	·	Equipment	Qty.	
9	Gomberi	2007	33/11kV 5MVA TR	1	Construction Start in 2006
1			33kV CB with CT	1	Construction Span 18 months
1			33kV DS	1	
			33kV CVT	1	
			Station Service TR	1	
J			Lightning Arrester	1	
1 1			Structure	1	
1 : .			Bus Material	# 1 The H	
			Protection Panel for TR	1	
1			Protection Panel for 33kV Line	1	
			11kV Cubicle	3	
1.5			Monitor Panel	1	
			Auxiliary Panel	1	
			DC Supply Equipment	1	
		,	Control House	1	
			Construction Material	1	
			Installation	1	
10	KCMC	2007	33kV CB with CT for Line	1	Coordination work
			33kV DS for Line	2	with Gomberi S/S construction
1		4.4.5	33kV CVT	2	
}	1.474		Protection Panel for 33kV Line	2	Construction Start in 2006
1.2			Construction Material	1	Construction Span 18 months
			Installation	1	
11	Boma	2005	33/11kV 5MVA TR	1	Construction Start in 2006
	Ngombe		33kV CB with CT	1	Construction Span 18 months
			33kV DS	1	
			Station Service TR	1	[관리] 인형 기업과 보관시
			Lightning Arrester	1	
	and the second		Structure	1	
			Bus Material	1	
			Protection Panel for TR	1	
}			Protection Panel for 33kV Line	1	
			11kV Cubicle	3	
			Monitor Panel	1	
] .			Auxiliary Panel	1	
			DC Supply Equipment	1	
İ	5		Control House	1	
			Construction Material	l	
L	<u>Landa de la companya /u>		Installation	<u> </u>	

7.3 Distribution Facilities Conceptual Design

(1) System Configuration

(a) 33kV distribution line

Recently, 33kV distribution lines are increasing though TANESCO has determined 11kV as the standard high-voltage distribution voltage. Because power demanding points in suburbs or remote places are far away from the power supply and small-scale towns and villages are scattered in a wide area, long distribution lines are required, causing a problem of voltage drops. To solve such problem, 33kV distribution is adopted.

Because the 33kV distribution line consists of only overhead lines, areas demanding power are in the same direction, and the load density is low, single circuit branch-type distribution system is used as standard.

(b) 11kV distribution line

Generally, the line is in a branch-type. In cities such as Dar es Salaam, lines are connected to neighboring lines via section switches and form loop circuits connected via manual switches that are normally open. The section switches installed on lines in cities are used not only for opening or closing the load. Their main purpose is to raise the supply reliability by interchanging the load between distribution lines.

On the other hand, it is a rare case to form loop circuits by section switches on the lines in Arusha and Moshi. As one of the characteristics of distribution lines in the country, the line branched from the trunk line is relatively long and it requires a long time to recover from any faults or problem. By installing a switch at a branch point of the long lines, a faulty line can be easily isolated, allowing continuous supply on the main line in good condition.

(c) Low-voltage distribution line

Low-voltage distribution facilities consist of pole transformers, low-voltage distribution line, and lead-in wires. The line should be in an independent branch type with the size varying depending on the transformer capacity.

(2) Basic concept of facilities maintenance/expansion plan

For the distribution facilities, when the relationships between the demand and facilities or between the area demand characteristics and service conditions are not well balanced, counteractions should be studied. Normally, when the distribution facilities are in the following conditions, quantitative and qualitative reinforcing actions should be studied:

- The maximum allowable current is usually exceeded.
- Voltage is dropped above the allowable range.
- The transformer load capacity is exceeded.

Generally, when planning expansion of the distribution facilities, the optimum plan is adopted by studying the gains and losses of the actions given below. Before starting the study, the distribution lines, load density, and load increase in the neighborhood should be thoroughly surveyed.

- Adding new feeders
- Upgrading high-voltage line conductors
- Installing voltage regulator
- Adding transformers (dividing low-voltage line)
- Increasing line capacity
- Relocating transformers to load center

Increasing substation bank capacity, Raising thickening high-/low-voltage lines, and performance increasing transformer capacity Quantitative reinforcement Increasing Constructing new substations, adding banks, installing new transformers, etc. quantity **Facilities** Using coated wires, devices protective against Raising salt damage and lightning, laying lines performance underground, etc. Qualitative. reinforcement Using steel pipe or concrete poles, replacing Renewing facilities deteriorated by aging such as wires, facilities cables, transformers, etc. Raising Connecting grid lines performance Increasing Installing new distribution lines and using quantity large-capacity lines Quantitative reinforcement Switching distribution line loads, changing Averaging starting points, installing or repositioning section switches, etc. Absorbing new demanders by 33kV Boosting distribution System Adopting network distribution or 33kV Raising performance overhead distribution method

Actual actions for reinforcing the facilities and system are given below.

Fig. 7.3.1 Reinforcing actions for distribution facilities and system

Qualitative

Measures

accidents

against

improvement

(3) Reserving public safety

Qualitative

reinforcement

Because the distribution facilities are installed in a wide area close to local communities, they have close relationships with general users and society. The facilities should provide high quality power while they are in a place accessible from public; that is, they should cope with both reserving public safety and supplying.

Adjusting substation outgoing voltage,

appropriate voltage by SVR, etc.

faulty section

appropriating transformer taps, maintaining

Performing automatic retransmission after

accident, reducing retransmission time limit,

and adopting system for automatic isolation of

Especially, the distribution facilities in a town or underground distribution facilities are placed closer to the public compared to ordinary overhead distribution facilities, requiring design of reliable devices and configuration to prevent public disasters from occurring. Actually, the live parts are to be concealed and fuses or relays are to be used for protection.

7.3.1 Setting Target Values for Expansion Plan

(1) Supply Reliability

The distribution facilities for Dar es Salaam have been much improved through Japanese aid and European financial cooperation. But, still now, deteriorated facilities, or facilities with insufficient capacity or functions are used for distribution in many areas.

Considering the revitalization of the economy and the progress of open economy in recent years, the demand for electric power is estimated to increase in the future. Moreover, because of improvement of the domestic and overseas investment environments accompanied by economical activities, reserving sufficient supply capacity for increased demand, improving the reliability, and promoting safety measures are urgently required.

TANESCO is very busy expanding and repairing facilities, taking measures for accidents that occur frequently, treating many complaints given from consumers, and so forth, and has not yet set definite targets for the service levels and supply reliability.

In order to expand and improve the facilities, aiming to stabilize the power supply in the future, it is indispensable to set targets such as service levels and reliability as prerequisites for setting the system expansion plan.

For supply reliability, the target value is set integrally considering service interruption time, its frequency, time for recovery from failures, influence on the users, etc. In this plan, no target values are to be set for service interruption time and frequency considering the current conditions of the distribution facilities maintenance and management. As for the system configuration and recovery time from failures for reserving the reliability, target levels should be set as described below.

(a) System configuration

The 33kV distribution line should be a single circuit overhead line of a tree form, which is the simplest type. Load break switches should be installed at major branch points to facilitate system operation.

The overhead 11kV distribution line in city area should be sectioned by section switches, each section linked to another distribution line. Thus, the service interruption range is limited to the section where a failure occurs. In the standard configuration, three sections and three links are to be used considering reliability, economics, system management, and serviceability. The distribution line in the suburbs should be a single circuit overhead line in tree form, like the 33kV distribution line mentioned above. In this plan, no underground system for trunk or interconnecting lines would be used.

(b) Setting and studying standards for supply reliability

The target times for recovery from failures are given below.

Table 7.3.1 Target times for recovery from failures

Reliability rank	Longest service interruption time
Service rank A	60 minutes
Service rank B	90 minutes
Service rank C	150 minutes
Service rank D	180 minutes

Note Service rank A: Major government and municipal offices, important facilities

Service rank B: Other government and municipal offices, industrial zone

Service rank C: Busy and shopping streets
Service rank D: Residential zone and others

(2) High-voltage distribution line plan

The 11kV distribution line is planned as described below. For distribution lines with heavy load and those with voltage drops exceeding the allowable limit, the load should be shared with the feeder from the expanded, upgraded or new substations, and the system is to be switched.

For deteriorated and small-sized wires in the trunk lines, reinforcing should be done by replacement or use of larger sized wires. The basic configuration for the distribution line in the city area should be 3 sections and 3 links and section switches should be installed. Thus reliability will be improved by interchanging the load efficiently and limiting the service interrupted area for accidents. For the distribution line in the suburbs, installing load break switches at major T-off points of a long branch line should reduce the service interruption time. The standards for distribution line capacity and maintaining of voltage are given below.

(a) Distribution line capacity

The standard capacities of the 11kV distribution line trunk section are given below (assuming that normal value is 3,000kVA/cct and maximum value is 5,000kVA/cct).

Normal capacity: 200A Short-time capacity: 300A

(b) Maintained voltage

The voltage drop of the distribution line should be limited to 10%.

(3) Low-voltage Distribution Line

Voltage drops and fluctuation for consumers are caused by too long low-voltage distribution line, insufficient wire size, deteriorated or improperly jointed wire, bad contacts, etc. Since the distribution transformer has a large capacity, supply area under a transformer is to be inevitably wide in many cases, causing long low-voltage line to be used.

To solve the problem above, small-capacity transformers should be used, sharing the load and reducing the supply area. When necessary, wires should be replaced with larger sized ones.

From the standpoint of facilities and public safety, insulated wires should desirably be used for all wires including lead-inr. The target voltage for the low-voltage distribution line is $231V \pm 15V$ for single-phase, and $402 \pm 40V$ for three-phase.

(4) Maintenance and operation system

Currently, the distribution facilities are deteriorated and maintenance operations are not well organized. Therefore, it is necessary to establish the system covering the entire maintenance and operations.

(a) Establishing management organization

Management and personnel organizations should be established to perform appropriate maintenance operations. In addition, reserving materials and budgetary support are necessary to implement permanent measures that come after emergency actions,

(b) Periodical check and inspection

To prevent human and facilities accidents from occurring, periodic checks and inspections should be organized under certain standards.

Inspection means visually surveying facilities to maintain safety, grasp deterioration, and prevent accidents of the distribution line. Inspection should be carried out based on certain standards. Sample standards for inspection are given below.

Table 7.3.2 Sample standards for inspection

-[Objects	Frequency
	Overhe	 Poles, cross-arms, stays, pole cross-arm braces, conductors, and insulators Other nearby objects, trees, or obstacles 	Once a year
	ad lines	Transformers, load break switches, disconnecting switches, lightning arresters	Once a year
		Lead-in wires	Once a year
	Under-		
- 1	ground lines	Underground lines (including indoor metering device)	Once a year

Check means searching facilities for any troubles using tools and/or measuring instruments if necessary. A periodic check is done in a certain period of time and an unscheduled check is done to prevent troubles as required. See Table 7.4.1 for sample standards for a periodic check.

An unscheduled check should be done in the following cases:

- After natural disasters have occurred
- When troubles occur frequently on a line
- When accidents occur frequently or reclosing occurs frequently on a line
- When accidents or reclosing occur continuously
- When necessary

(c) Carrying out periodic measurement

For precise voltage management and grasping distribution line operating states, it is necessary to periodically measure the voltage and current and maintain the

measurement data. In addition, unscheduled measurement should be done in the following cases:

(i) Measuring transformer load current

- When transformer replacement is necessary accompanied by facilities addition or installation and forecasting of the current load is difficult
- When the transformer primary fuse has blown due to overload

(ii) Measuring high-voltage distribution line current and voltage

When major changes have occurred in the load and high-voltage distribution facilities and forecasting of the voltage and current is difficult

(iii) Measuring low-voltage distribution line current and voltage

When complaints are given from consumers or major changes have occurred in the load and low-voltage distribution facilities and forecasting of the voltage and current is difficult

(iv) Measuring grounding resistance

When it is necessary to know the grounding resistances of the outer box. of the high-voltage devices except the transformer tank, guard net, protective barrier, etc

(v) Measuring other values

When it is necessary to know the leakage current of the low-voltage facilities for leakage current research, etc.

7.3.2 Facilities Expansion Plan

Along with addition or construction of substations, reinforcement should be done by constructing overhead lines and replacing wires in the related areas as given in the table below.

Table 7.3.3 Distribution facilities expansion plan (Dar es Salaam)

	7.3.3 Distribution fac	New	Replacement	U/G line	Switch	
Year	Name of Feeder	(km)	(km)	(m)	(Qty.)	Remarks
2002	Mbezi - MB5	8.0		50	3	
	Bahari Beach - BB04	6.0		50	3	
	Bagamoyo	6,0		50	3	
	Sokoine - SK5	1.0		50	3	
	City Center - C9	2.0		50	3 : :	
	Kurasini - KR5	8.0		50	3	
	Mbagala -MB5	15.0		50	3	
	Mbagala -MB6	15.0		50	3	
	Ubungo - U9	6.0		50	3	
1,7	Mikocheni - MK5	13.0		50	3	
14,47	Tandale - MG6	8.0		50	3	
	Factory Zone III - F36	9.0		50	3	10.00
	Factory Zone III - F37	9.0		50	3	
2003	Ilala - D14	4.0		50	3	
	Ilala - D15	4.0		50	3	1988 1942 195
	Muhimbili - MH1	3.0		50	3	
	Muhimbili - MH2	3.0		50	3	
	Muhimbili - MH3	3.0		50	3	
	TOL - T01	17.0		50	3	
	TOL - T02	17.0		50	3	
	TOL - T03	17.0		50	3	13.45 1.15 4.4
	University - UN1	6.0	H10 27.3	50	3	
177	University - UN2	6.0		50	3	
	University - UN3	6.0		50	3	
	New Oysterbay - KN1	10.0		50	3	
	New Oysterbay - KN2	10.0		50	3	
	New Oysterbay - KN3	10.0		50	3	
1	Oysterbay - O7	6.0		50	3	
	Msasani - MS4	10.0	1 4 4	50	3	
	Msasani - MS5	10.0		50	3	
2004	Bahari Beach - BB05	12.0		50	3	
	Bahari Beach - BB06	12.0		50	3	
	Mburahati - BH1	7.0		50	3	
7	Mburahati - BH2	7.0		50	3	
- 4	Mburahati - BH3	7.0		50	3	
	Yombo - YB1	10.0		50	3	
	Yombo - YB2	10.0		50	3	
	Yombo - YB3	10.0		50	3	
	Kitunda - KT1	10.0		50	3	

Year	Name of Feeder	New	Replacement	U/G line	Switch	Remarks
		(km)	(km)	(m)	(Qty.)	
	Kitunda - KT2	10.0		50	3	
	Kitunda - KT3	10.0		50	3	
2005	Kawe - KWI	8.0		50	3	
	Kawe - KW2	8.0		50	3	
	Kawe - KW3	8.0		50	3	
	Ilala - D16	4.0		50	3	
	Kinondoni - KD1	6.0		50	3	
	Kinondoni - KD2	6.0		50	3	
	Kinondoni - KD3	6.0		50	3	
	Chang'ombe - CG6	7.0		50	3	
2006	Kunduchi - KDI	10.0		50	3	
	Kunduchi - KD2	10.0		50	3	
	Kunduchi - KD3	10.0		50	3	
	Kigogo - KG1	10.0		50	3	
	Kigogo - KG2	10.0		50	3	
	Kigogo - KG3	10.0		50	3	
	Kurasini - KR6	10.0		50	3	
2007	Mbezi - MB6	6.0		50	3	
	Kariakoo - KA5	4.0		50	3	
	Kariakoo - KA6	4.0		50	3	
2008	Msasani - MS6	10.0		50	3	
11 11	Msasani - MS7	10.0		50	3	
2009	TOL - T04	10.0		50	3	1 2
	Factory Zone III - F37	9.0	1 4 1.1	50	3	
	11kV Line Total	529.0		3,150	189	
2004	33kV Tabata Line	14.0				33kV D/L
	33kV Kigamboni Line	25.0				33kV D/L
	33kV Line Total	39.0				

Table 7.3.4 Distribution facilities expansion plan (Arusha)

Year	Name of Feeder	New (km)	Replacement (km)	U/G line (m)	Switch (Qty.)	Remarks
2002	Mt. Meru - M01		8.0	50	1	
	Mt. Meru - M02		10.0	50	1	S/S TR Expansion S/S TR Expansion
	Mt. Meru - M03		13.0	50	1	
	Mt. Meru - M04	٠.	5.0	50	. 1	
2003	Unga Ltd F2		70.0	50	1 : .	
	Unga Ltd F3		6.0	50	1 :	
	Unga Ltd F4	3.0		50	3	

Year	Name of Feeder	New (km)	Réplacement (km)	U/G line (m)	Switch (Qty.)	Remarks
	Monduli - M01	0.1		50	3	: :
	Monduli - M02	1.0		50	3	New S/S Construction
J. 7 15	Monduli - M03	1.0		50	3	Construction
	Kiltex -Kiltex		5.0	50	1	
	Kiltex -Breweries		5.0	50	: 1	
	Sakina - S01	3.0		50	. 3	
	Sakina - S02	3.0		50	3	New S/S Construction
	Sakina - S03	3.0		50	3	Construction
2005	Njiro B - NB1	3.0		50	3	
	Njiro B - NB2	3.0		50	3	New S/S Construction
	Njiro B - NB3	3.0	1.00	50	3	Construction
2007	Themi - T01		25.0	50	1	S/S TR
	Themi - T02	3.0		50	3	Expansion
	11kV Line Total	27.0	147.0	1,000	42	

Table 7.3.5 Distribution facilities expansion plan (Moshi)

Year	Name of Feeder	New (km)	Replacement (km)	U/G line (m)	Switch (Qty.)	Remarks
2002	Boma Mbuzi - Kibo		10.0	50	1	
1 1	Boma Mbuzi - Town		10.0	50	5 t 1 t	
	Boma Mbuzi - Boma		10.0	50	1	
	Boma Mbuzi - B04	5.0		50	3	
	Boma Mbuzi - B05	5.0		50	3	
	Trade School - M1		10.0	50	3	
	Trade School - M2		10,0	50	3	
	Trade School - M3		10.0	50	3	
	Machame - Spare		15.0	50	1	
	YMCA	5.0			3	4.1
	l IkV Line Total	15.0	75.0	450	22	
2003	33kV Kifaru-Himo Line	18				33kV D/L

7.3.3 Basic Design

(1) 33kV Distribution Line

(a) Conductor

The conductor used in this project should have sufficient capacity for supplying demanded power for the related grid section, provide satisfactory mechanical strength and anti-corrosiveness, and be of advantageous price. The conductors to be studied are hard-drawn copper stranded conductor (HDCC), aluminum alloy stranded conductor

(AAC), and aluminum cable steel reinforced (ACSR). Of these, ACSR is assumed to be totally advantageous and satisfies the TANESCO standards. Thus, ACSR is adopted.

From the standpoint of construction and maintenance, it is advantageous to select only a few conductor sizes and make them standards. In consideration of sharing with the 11kV distribution line and interchanging of materials, ACSR 100mm² and 150mm² are adopted.

(b) Anti-corrosive design

Though Dar es Salaam is a coastal city facing the Indian Ocean, strong wind seldom blows and salty spray is rarely carried to the land. In addition, there is appropriate rainfall. Thus, the possibility of salty dirt stuck to the insulators is assumed to be low. However, the conditions may be severer than in inland areas, and influence by salty dirt should be considered especially when selecting pin insulators. Salt contamination is not be considered for Moshi and Arusha.

(c) Conductor arrangement and assembling

There are various conductor arrangements such as horizontal, vertical, and triangular. Considering cooperation with the existing facilities, triangular arrangement is adopted for cities, and horizontal arrangement for the suburbs. See Fig.s 7.4.1 to 7.4.3 for standard assembling.

(d) Supports

There are various supports for the 33kV transmission line such as concrete, steel pipe, and wooden poles. A concrete pole has a high mechanical strength, long life, and a high reliability, but is heavy, and requires a special trailer and machines for construction. A steel pipe pole has a high mechanical strength, can be assembled separately, and has a superior sight, but the price is the highest among the three. A wooden pole has inferior strength and life than the others, but the price is the lowest. Because TANESCO uses wooden poles in most facilities and has experience on using many wooden poles, wooden poles are to be used basically.

(e) Major device specifications

The general specifications of the major devices and materials used for the 33kV distribution lines of this project are given below.

(i) Wires

Applied standards	BS 125, Part 2	실하면 보고 함께 되는 것
Type	ACSR 150	ACSR 100
Stranding	Al 30/2.65, St 7/2.59	Al 6/4.72, St 7/1.57
Calculated section area	194.9 mm ²	118.5 mm ²
Outer diameter	18.13 mm	14.15 mm
Weight per unit length	725.6 kg/km	394.3 kg/km
Tensile strength	7,060 kg	3,330 kg
Electric resistance	0.1828 Ω/km	0.2733 Ω/km
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(ii) Pin type insulators

Applied standards BS 137, Part 1 Rated voltage 33kV

CHAPTER 7 CONCEPTUAL DESIGN OF TARGET FACILITIES

Wet flashover voltage at commercial frequency 95kV 50% impulse flashover voltage (positive) 215kV

(iii) Suspension insulators

Applied standards IEC 383

Outside dimensions 254mm x 146mm

Wet flashover voltage at commercial frequency 50% impulse flashover voltage (positive) 125kV Maximum tension load 4,000 kg

(iv) Lightning arrester

Applied standards IEC 99, IEC 37

Rated voltage 42kV
Nominal discharge current 10 kA
Maximum residual voltage 140 kV

(v) 33kV power cable

Applied standards IEC 502

Type XLPE insulated

Nominal section area 185 mm²

Electric resistance $0.0601 \, \Omega / \text{km}$ at $20 \, ^{\circ}\text{C}$ Insulation resistance $2,000 \, \text{M} \, \Omega - \text{km}$ at $20 \, ^{\circ}\text{C}$

(2) 11kV Distribution Line

(a) Wire

ACSR 100 mm² is adopted as the standard wire used by TANESCO for the 11kV distribution line.

(b) Wire arrangement and assembling

The current assembling for the overhead distribution line is of the wishbone type or horizontal arrangement. Recently, facilities are made of the horizontal arrangement, which is easy for construction and has a simple cross-arm form. The horizontal arrangement allows easy wiring of the lead or jumper wires to the pole mounted equipment when adding transformers or section switches and is more economical than other assembling method because it requires shorter poles. Thus, the horizontal arrangement is the optimum assembling method in an area where occupied space can be easily reserved and therefore is mostly used in distribution lines. In this project, the horizontal arrangement method is adopted considering the factors above and cooperation with the existing facilities. Fig.s 7.4.3 and 7.4.4 show the standard assembling.

(c) Supports

Similarly to the 33kV transmission line, wooden poles are basically used in consideration of economics and cooperation with the existing facilities. However, steel pipe poles are to be used for the overhead trunk section of the feeder led out from a new substation in the urban area.

(d) Underground cable

The feeder led out from a new substation is connected through an underground cable to the structures or poles outside the substation. This cable should also match the standards of TANESCO, that is, 11kV steel armored CV cable 185mm² (11kV CVMAZV 185mm²).

(e) Major devices and materials

The general specifications of the major devices and materials used for the 11kV distribution lines of this project are given below.

(i) Conductors

Applied standards	BS 125, Part 2
Type	ACSR 100
Stranding	Al 6/4.72, St 7/1.57
Calculated section area	118.5 mm ²
Outer diameter	14.15 mm
Weight per unit length	394.3 kg/km
Tensile strength	3,330 kg
Electric registeres	0.2722 O /lon

(ii) Pin type insulators

Applied standards	BS 137, Part 1
Rated voltage	33kV
Wet flashover voltage at commercial frequency	95kV
50% impulse flashover voltage (positive)	215kV

(iii) Suspension insulators

Applied standards	IEC 383
Outside dimensions	254mm x 146mm
Wet flashover voltage at commercial frequency	45kV
50% impulse flashover voltage (positive)	125kV
Maximum tension load	4,000 kg

(iv) Lightning arrester

Applied standards	EC 99, IEC 37
Rated voltage	42kV
Discharge start voltage at commercial frequency	21kV
Lightning impulse discharge start voltage	50kV
Nominal discharge current	5 kA
Maximum residual voltage	50 kV

(v) 11kV power cable

) HKV power cable	
Applied standards	IEC 502
Туре	XLPE insulated
Nominal section area	185 mm ²
Electric resistance	0.0991 Ω/km at 20°C
Insulation resistance	1,500M Ω -km at 20°C

(3) Low-voltage Distribution Line

(i) Conductors

Applied standards BS 125, Part 1 Type AAC 50mm² Stranding 7/3.10 Calculated section area 52.83 mm² Outer diameter 9.30 mm Weight per unit length 145 kg/km Tensile strength 8.28 kN $0.5419\,\Omega/\mathrm{km}$ Electric resistance

(ii) Low-voltage fuse cut-out

Rated voltage 415V Rated current 400A Rated frequency 50 Hz

(iii) Insulator and fittings

Insulator Low-voltage shackle insulator

Metal fittings Low-voltage rack

Stay Galvanized steel stranded wire

(iv) Watt-hour meter

Type Single-phase two-wire Three-phase four-wire

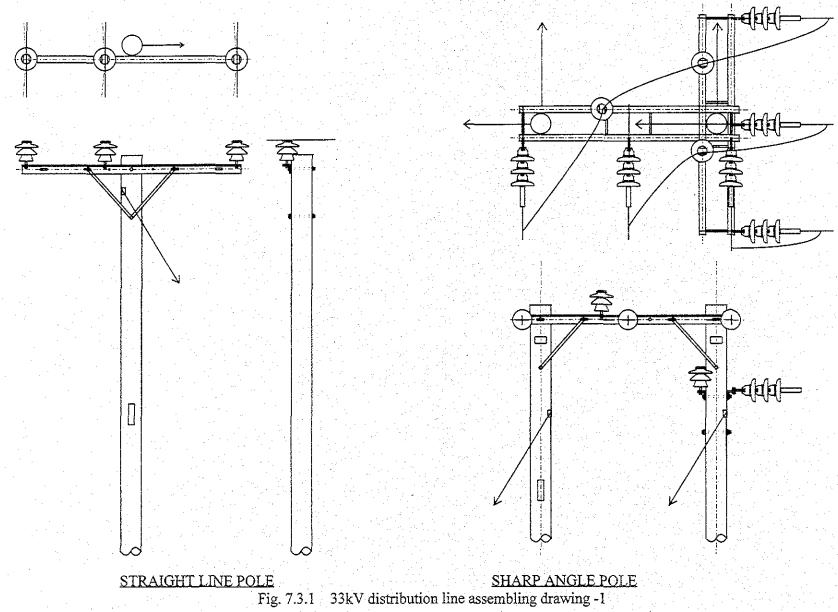
Rated voltage 240 V 415/240 V
Rated current 15 (60) A 20 (80) A
Rated frequency 50 Hz 50 Hz
Accuracy Class 2 Class 2

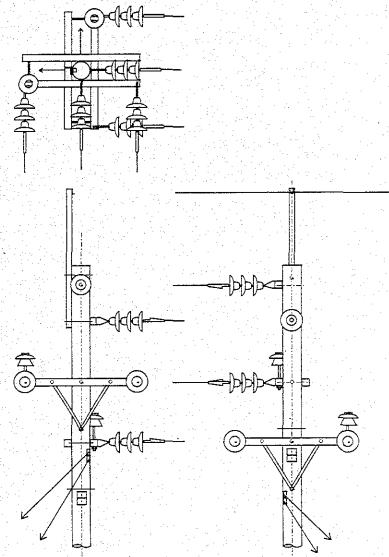
Table 7.3.6 Inspection and check items for distribution line

Type	4 4 4 11 1 4	Check item	Attention
Waadan mala		Deteriorated, burnt	
Wooden pole		Damage by birds, bird nest	
Steel pipe pole		Rusted, deformed	Especially, rusty near ground
	Datamia matica	Metal part rusted, deformed	
Steel tower	Deterioration	Bolt/nut loosened, dropped	
		Base split, cracked, peeled off	
Cananata mala		Split, cracked, peeled off	
Concrete pole		Red rust spread	
	C	Ground wire cut	
	Grounding	Insulation coating deteriorated	
		Inclined, floated, sunk	
		Insufficient length	Insufficient separation from others
Pole	Others	State of soil near pole	Loosened, broken, insufficient setting
	Others	Vehicle accident	Damaged by accident
		Trouble in lifting	
		Number plate	Attachment fault, unclear characters

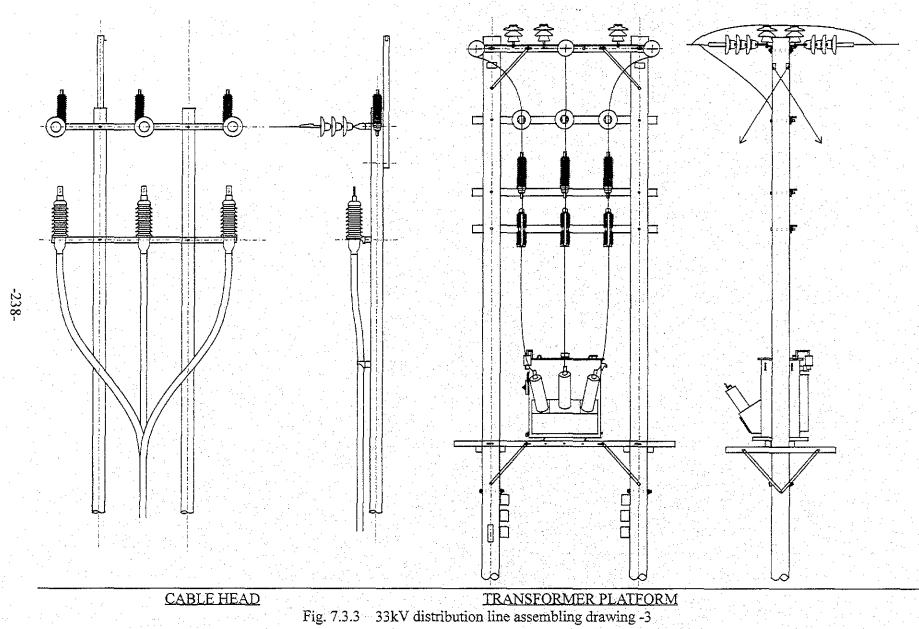
Туре		Check item	Attention
	Separation	Separation from high-/low-voltage line	
	Deparation	Separation from road	
100		Wire cut, corroded, loosened	
Cana		Block/anchor lifted	
Stay	0.1	State of soil near stay	
	Others	Stay insulator damaged	
		Pole brace corrosion	
		Metal piece deformed, loosened	
		Assembling metal piece corroded,	
		rusted, cracked	
	Deterioration	Inclined, bent, dropped	
Assembling		Bolt/nut loosened, dropped	
metal		Angle inappropriate	
		Obstacle	
	Others	Indicator error	
		Attachment error	
		Damaged, cracked, spotted, bad	
Insulators		Binding wire dropped, loosened	
mountois		Nut loosened, dropped, corroded	
		Separation from buildings	
		Separation from overhead low-current	
	Separation	line	
		Separation from antennas, trees	
		Height above road	
	Height above	Height above railway	
	ground	Others	
		One stripe or span connected at three or	Connection point discolored,
		less points	deformed
	Defect	Conductor cut, damaged	Carefully check neutral conductor.
Wire	Delect	Arc traces, tracking traces	Carcinity check neutral conductor,
		Coating damaged	
	<u></u>	Sag inappropriate, uneven	
	Sag	Interval between lines	
		Kite, obstacles hung	
		Stolen	
		Separation from lead-down or jumper	
	Others	separation from lead-down or jumper wire	
		Bolt connector loosened	
		Insulation treatment point error	
	A	Case rusted, corroded, cracked	
	Appearance	Bushing damaged, cracked, spotted	
		Oil leakage	
T		Silica gel error	
Transformer		Separation from lead-down and lead-in	
	Others	wires	
		Abnormal heating or noise	
		Lead wire support/connection error	
	L	Mount position error	

Туре		Check item	Attention
		Operation cord or rod error	
		Operation handle or open/close	
		indicator error	
Switch		Contactor or operating mechanism	
		error	
		Lead wire support or connection error	
		Heating trace	
		Damaged, cracked, spotted	
		Connecting screw loosened	
		Holder or cover damaged	
Fuse switch		Lead wire error	
		Lead wire support or connection error	
and the second		Fuse unmatched	
		Porcelain damaged or spotted	
Lightning		Connection line type unmatched	
arrester		Connection line cut	
		Connection terminal error	
		Separation from buildings	
	G	Separation from overhead low-current	
	Separation	line de la	
		Separation from antennas, trees	
		Insufficient height above ground	
	Height above	Insufficient height of attaching point	
	ground	Height above ground of high-voltage	
Lead-in wire		lead-in wire	
Leau-III Wile	Line	Insulation coating damaged	
	LING.	Size of 2.6 mm or more used	
		Metal piece or insulator damaged	
		Sag, binding wire state	
	Others	Contact with building or antenna stay	
	Omers	Bolt or nut dropped	
		Lead-in box terminal discolored,	
		loosened	
		Instrument box damaged	
	Appearance	Attaching state abnormal	Inclined 3 degrees or less
		Attaching position inappropriate	Check for vibration or dust.
Watt-hour meter		Sealing error	Lack of seal
	Others	Wiring error	
	Omers	Instrument box damaged or spotted	
		Cable deteriorated	





STRAIGHT LINE POLE
Fig. 7.3.2 33kV distribution line assembling drawing -2



7.4 Approximate Construction Cost

On the basis of conceptual design mentioned above, the Team estimated the approximate construction cost of each project. The calculated costs are shown in from Tables 7.4.1 to 7.4.4.

Basically, the estimation method is based on the cost of similar projects carried out in Tanzania in the past. The Team executed further study such as economic analysis, determination of priority of the projects, modification of master plan and so on with the result of estimation.

Table 7.4.1 Approximate Construction Cost(Dar es Salaam) (Case-A)Unit: US\$1,000

	Name of S/S	Specification	Туре	foreign		Remark	Name of Transmission Line	Specification	Type	foreign	local	Remark	Specification	foreign	-	Remark	goreign(total)	local(total)) Tota
2002 Mbe		33kV 15MVAx1	RÆ	1 238		2x15>1x15							Distribution	3593		7 33kV and 11kV			
	iari Beach S/S	33kV 15MVAx1	New	923		On Going	Tegeta-Bahari Beach	33kV 100mm2 2cdt 13km	New	869		On Going 1 cet					<u>.</u>		
	jamoyo S/S	33kV 5MVAX1	New	1082	154		Tegera-Bagamoyo	33kV 100mm2 2cct 60km	Naw	9138	977	On Going 2cct			1			1	1
	coine S/S	33KV 15MVAX1	Expansion	892	131		City Center-Sokoins	33kV 100mm2 1cdt 3km	Reinforce	183	18)					1		
City	Center S/S	33kV Leadout	Expansion	192	31	Soxoine Line				1			1		J		1		
City	Center S/S	33KV 30MVAx1	R/E	1415	215	1x15>1x30	-										1		
Kura	asini S/S	33kV 15MVAx1	Expansion	708	108		illota-Kurasini	33kV 150mm2 1 cdt 7.1km	Reconductor	395	47		1	1		T	1		
Kura	asini S/S	Switchgear	Replace	282	38			The state of the s						1	1,00	7	1		
Mba	agala SJS	32KV 15MVAX1	Expansion	831	123				I remove the manual states		~~~~						-		
	ingo S/S	33kV 15MVAX1	Expansion	7908	1185	On Going			***************************************					1			- [
	ocheni S/S	33kV 15MVAx1	Expansion	808	127	and the second		and the state of t									\$		
	dare S/S	33KV 15MVAXT	Expansion	854	131		Ubungo-Tandale 7ap	33xV 100mm2 2cdt 1km	New	152	46	2cct			·		. [
	omeni S/S	33kV 15MVAx1	New	877	131	On Going	Magomeni-Magomeni Tap	33kV 100mm2 1cdt 1km	New	54			· [.	\$	f	
FZIII		33kv 15MVAx1	Expansion	73t	108		magorifeti magorifetti Tap	SURV TOOMINE TEST TRAIT	. 110#	"		1					f	<u> </u>	
	nisus dika S/S	33kV 15MVAX1	New	922	138		FZ !!I-Tandilka	33kV 100mm2 2cdt Skm	Moure	373		1 cct		1			Š .		. [
	II S/S	33kV Leadout	Emansion	192	31	Tandika Line	ra: ir satiutiko	33XV 100111112 20013NII	New	313		1 461 ·							
FZI					1.00	талока спе	I			ļ				-	-]	ļ	
		Panel, others	Replace	223	31										. i				
FZII	I S/S	Switchgear etc	Replace	231	. 31		\$		di <u>e</u> capagaga a			a aminja simer saaraansa					· [_
			Substatat	20270	3032		ļ		Subtotal	11242	1222		(Subtotal	3883		<u> </u>	35195	427	1 36
2003 Ilala		33kV 15MVAX1	Expansion	1192	177				Partman a managanana				Distribution	4999	2:	3 33kV and 11kV		1	
	lmbill S/S	33kV 15MVAX1	New	954	131		liala-Muhimbili	33kV 100mm2 1cdt 5km	New	326	38								
lala		33kV Leadout	Expansion	192		Muhimbili Line	1.					The state and the second state of the second						,	
TOL		33kV 15MVAXI	New	885	131		liala-YOL	33kV 100mm2 2cdt 5km	New	373	44	1 cct					1		.]
((2)8		33kV Leadout	Expansion	192	31	TOL Line	1			J				diam'r.					
	versity S/S	33kV 15MVAX1	New .	854	131		Ubungo-University	33kV t00mm2 tcd: 7km	New	380	. 44			1	i		j.		}
Ubur	ingo S/S	33kV Leadout	Expansion	192	31	University Line			1			***		1.	1		B.		
New	Oysterbay S/S	132KV 45MVAx2	New	5200	777		Ubungo-New Oysterbay	132kV 240mm2 1cdt 6.5km	New	1883	587	1		1	1		ž ·	1	
i	·	33ky 15MVAx2					1	1.75	į.	1					1.		ř	i	1
Ubun	ngo S/S	132kV Leadout	Expansion	392	62	NOB Line									}		Ž.	}	
Cysts	erbay S/S	33kV 15MVAxt	R/E	1385	208	2x5->1x15	New Oysterday Oysterday	33kV 150mm2 2cdt 1.8km	New	126	15	1 cct		1.			i i	1	1
Msas	sani S/S	33kV 15MVAX1	Expansion	1192	177	100 mm	New Oysterbay-Msasan!	33kV 150mm2 2cdt 5km	New	394	46	1 cct		· ·		**************	I		1
			Subtotal	12530	1887	Company of the control of the contro			Subtotal	3482	754		Subtotal	4999	23	31.	21011	266	4 2
2004 Baha	ari Beach S/S	33kV 15MVAX1	Expansion	1115	169		<u> </u>		-			<u> </u>	Distribution	5181		33kV and 11kV			
		33kV Leadout	Expansion	200		Bahari Beach Line				1		and the state of t						[
		33ky 15MVAXI	New	854	131	Dallan Daggii Diro	Ubungo-Mbrahati	33kV 100mm2 1cdt 4km	New	217	26								
		33kV Leadout	Expansion	192		Mbrahati ∐ne	Cutingo moranes	SSRY IDOITING TOUR STATE	1304							and the second			
	100 S/S	132KV 45MVAx1		3385	508	A CALL OF A CONTRACTOR OF THE SECOND CO.	FZ III-Yomba	132kV 240mm2 1cdt 8.5km	New	1883	567		. ,			<u> </u>			
York			New	3385	อนชา	2000 - 100 -	PZ IIPTOMEO	132KV 24UMM2 16016,5KM	New	.1883	307		:	I	{	.			4
		33kV 15MVAX1	New	. :		Yomba Line	* - *			for greaters of						A separate of			
FZ:III	18/8	132xV Leadout	Expansion	492		Tompa Una	kanana mananananan menerahan menerahan menerahan menerahan menerahan menerahan menerahan menerahan menerahan m	132kV 248mm2 1cdt 10km	New		557			Į]		4-
		2014145161914		0.5			Yombo-Mbagala Yombo Mbagala	33kV:100mm2 1cdt:3.9km	New	2216	25	ļ				.	.)		
		33kV 15MVAx1	New	854	131		Yombo-Kitunda			212		}	1	1	}	1 1 1 1	1	}	1
		132XV 45MVAx1	Expansion	2523	377	The State of	Kurasini-Mbagala	132kV 248mm2 1cdt 16km	New	3545	1067			1	7 1 1		i		
		132kV 45ktVAX2	Expansion	3738	582	gan og grag forstær.	Ilala-Kurasini	132kV 248mm2 1cdt 10km	New	2216	667			.		ļ			
liala S	2/3	132kV Leadout	Expansion	492		Kurasini Line	مستساكتها فالملاء مامانا	and the second community of the second	المناسومية والمواد	1				ļ	and the same		i		
			Subtotal	13845	2094				Subtotal	10289	3018		Subtotal	5181	24		29315	5136	5 34
2005 Kawe		33ky 15Myaxi	New	854	131		Mbezi-Kawe	33kV 100mm2 1cdt 9km	New	499	57		Distribution	1920		33KV and 11kV	I		
Mbezi		33kV Leadout	Expansion	185	31	Kawe Line	l		1	L		<u> </u>							
Kunon		33kV 15MVAXI	New	854	131		Mikocheni-Kinondoni	33kV 100mm2 1 cdt 6km	New	435	50		I						Ι
Mikoc	cheni S/S	33kV Leadout	Expansion	269	38	Mnandoni Line								-		†	1		- Francisco
		33kV 15MVAx1	Expansion	800	123	an international contract	Kurasini-Chang'ombe	33kV 120mm2 1cdt 3km	Reinforce	166	19			1	···	· · · · · · · · · · · · · · · · · · ·	\$		
Chan					,	in . to a series of the series	The second of th	Land a company to the company of the control of	Subtotal	1098	125	D	3		, .	1 *			1

-240-

					٠.							: 1							
			٠.										and the second						
Year	Name of S/S	Specification	Турв	foreign	local	Remark	Name of Transmission Line	Specification	Type	foreign	local	Remark	Specification	foreign	local	Remark	(foreign(total)	local(total)	Total
2006	Kunduchi S/S	33kV 15MVAXI	New	854	131	1	Tegeta-Kunduch!	33KV 100mm2 1cdt 3.2km	New	174	20		Distribution	2350	11	33KV and 11KV			
	Tegeta S/S	33kV Leadout	Expansion	282	36	8 Kunduchi Line								1		I	T		
	City Center 5/5	33KV 30MVAX1	R/E	1038		4 1x15>1x30									1	[1		
	Kigogo S/S	33KV 15MVAx1	New	854	131	1	itals-Kigogo	33kV 100mm2 1cdt 12km	New	\$52	76				1 1				
	Itala S/S	33XV Leadout	Expansion	185	3:	Kigego Lina	.1				ii	L	i			·	1:		
	Kurasini S/S	33kV 15MVAxt	Rapiace	777	11:	5			e i de citato in accusa a			1	l	1		1:	i		
	itala S/S	132KV 45MVAxt	Expansion	2077	31!	5	Ubungo-ilala	132kV 240mm2 1cdt 7.5km	Reinforce	403				1			1		
		33kV 15MVAX1	Expansion				llaia-City Center #2	33kV 100mm2 1cdt 2.8km	Reconductor	152	18	Toot	ſ	1		L	. H		
1			Subtotal	6047	915	5		<u> </u>	Subtotal	1381	199	L:	Subtotal	2360	15		9788	1125	10913
2007	Mbezi S/S	33kV 15MVAx1	Expansion	777	115	S	Tégeta-Mbezi	33kV 100mm2 1 cdt 8.4km	Reimorce	455	53		Distribution	508	2	33kV and 11kV			
	Tegeta S/S,	33kV Leadout	Expansion	262	38	8 Mbezi Line												1	
	Karlakoo S/S	33kV 15MVAx1	Expansion	1215	185	5	liela-Kartskoo	33kV 100mm2 1 cdt 1.3km	Reinforce	71			1	1					
	ilata S/S	33kV Leadout	Expansion	185	31	1 Kariakoo Line	1]		I		1					
			Subtotal	2439	380	9	Suktotal		Subtotal	527	31		Subtotal	508	2		3474	432	3906
2000	Measani S/S	33KV 15MVAX1	Expansion 1	877	131	1							Distribution	674	. 3	33kV and 11kV			
			Subtotal	877	131	1					-	1	Subtotal	674	3		1551	134	1685
2009	TOLS/S	33KV 15MVAX1	Expansion	1185	. 17	7					i		Distribution	843	3	33kV and 11kV			
	Itala SIS	33kV Leadout	Expansion	185	31	1 TOL Line	The state of the s	J					1	-		1			
	FZ III S/S	33KV 15MVAx1	Expansion	785	11:	5								1					
	Tandika S/S	33KV 15MVAX1	Expansion	1023		4							1						
	FZ III S/S	33KV Leadout	Expansion	185		1 Tandika Line]			1			
	Upungo S/S	132kV 50MVAx1	Expansion	1631		5	1						1		}	1			
			Subtotal	4994	754	4	1	<u> </u>					Subtotal	643	3		5837	757	6394
2010	, in term of																8	D	S
			Total	63964	963	6		1	Total	28011	5380		Total	19968	92		111943	15108	
		1	Substation	1		7360	0		Transmissio	П	1	33391	Distribution		1	2006	Grand Total		127051

Table 7.4.2 Approximate Construction Cost(Dar es Salaam) (Case-B)Unit: US\$1,000

Year	Name of S/S	Specification		foreign	local	Remark	Name of Transmission Line	Specification	Турв	foreign	local	Remark	Specification	foreign	tocal	. Remark	(scc)ngisna)	local(lolal)	Total
2002	Mbazi S/S	33kV 15MVAx1	R/E	1238	185	2x15>1x15						Company of the same of the sam	Distribution	2725]1;	3 33kV and 11kV	. 🕻	l	.
ı	Behari Beach S/S	33KV 15MVAX1	New	923	138	On Going	Tegela-Bahari Beach	33kV 100mm2 2cdt 13km	New	969		On Going 1 cct		<u>i</u>	l	<u> </u>	. [
	Bagamoyo S/S	33KV 5MVAx1	New	1062	154		Tegeta-Bagamoyo	33kV 100mm2 2cdt 50km	New	9136	977	On Going 2cct	· [1	!				
٠ ا	City Center S/S	33KV 30MVAX1	R/E	1415	215	1x15>1x30		-			. ,				I				
	Kurasini S/S	Switchgear	Replace	262	38				1					-1					1
	Ubungo S/S	33ky 15MVAx1	Expansion	7908	1185	On Goina	1								i			1	1 "
	Mikacheni S/S	33KV 15MVAX1	Expansion	908	123	. I was are not a "to the green and a con-	A STATE OF THE PROPERTY OF THE	and the second s			-			-				l	
	Magomeni S/S	33KV 15MVAXI	New	877		On Going	Magomani-Magoman) Tap	33kV 100mm2 1 cdt 1 km	New	54	6	Million and the analysis of the man	~ · • · · · · · · · · · · · · · · · · ·				1		† · · · ·
	Tandika S/S	33kV 15MVAX1	New	923	138		FZ III-Tandilka	33KV 100mm2 2cdt 5km	New	373		icet	[· [# (- f		
						Tandika Une	r z ne rancinca	JORY TOURING LANCE SIGN.										d const	
	FZ III SJS	33kV Leadout	Expansion	192		Hallowa Cite		and the second s					- [- 			1		
	ZIS/S	Panel others	Replace	223	31							Alexander and a second and a second							
i	FZ II S/S	Switchgear etc	Replace	231	31		Lanca and a commercial section of section			40000			ور در میکند سرای در	ختصت ا					ىنى ساد
		1	Subtotal	16062	2400				Subtotal	10532	1145		Subtotal	2725		3	29319	3553	3 32
	Sokolne S/S	33kV 15MVAxt	Expansion	892	131		City Center-Sokoine	33kV 100mm2 1 cdt 3km	Reinforce	163	19	e Marie de la companya	Distribution	4192	11	8 33KV and 11 kV		L	.]
ŀ	City Center S/S	33kV Leadout	Expansion	192	. 31	Sokolne Une	<u> </u>		7					La cons					
- 1	Tandale S/S	33kV 15MVAx1	Expansion	854	131		Ubungo-Tandale Tap	33kV 100mm2 2cdt 1km	New	152	16	2cct .				_i		<u>.</u>	.1.
	Ubunga SJS	33kV Leadout	Expansion			Tandale Line		1.]		1	
	FZ III S/S	33kV 15MVAx1	Expansion	731	108			1	7.										1
	New Oysterbay S/S	132KV 45MVAx2	New	5200	777	f	Ubungo-New Oystarbay	1132kV 240mm2 1 cd1 8.5km	New	1883	587							i	
- 1	,	33KV 15MVAV2	1	1						j .	J .		1 .	1	1	1	3	1	
	Joungo S/S	132KV Leadout	Expansion	392	62	NOB Line											1	f	[
	Dysterbay S/S	33kV 15MVAx1	RÆ	1385		2x5>1x15	New Cysterbay Cysterbay	33kV 150mm2 2cdt 1.5km	New	126	15	1 cct		100,000			· j - · · · · · · · · · · · · · · · · ·		1
-	Systeman Sta	33KY 13MY74K1	Subtotal	9646	1448		tten ojaleiday ojaleiday	3314 130111112 2001 110141	Subtotal	2324	617		Subtotal	4192	15	a	16162	2084	18:
		1					 	 	Junior	2324	916					2 33KV and 11kV	10 302	2004	10.
	ubagala S/S	33KV 15MVAx1	Expansion	931	123			والمستعدد والمناز المناز المستعدد والمرازات			diam's area		Distribution	4635	4	2 33KV 200 11KV	. 🕽		1
	Nuhimbili S/S	33kV 15MVAx1	New	854	. 131		IIIala-Muhimbili	33kV 100mm2 1cdt 6km.	New	326	38	· · · · · · · · · · · · · · · · · · ·							
- 1	lala S/S	33kV Leadout	Expansion	192	31	Muhimbili Line	1	1									1		
ľ	rol, s/s	33kV 15MVAX1	New	985	131		itala-TOL	33kV 100mm2 2cdt 5km	New	373	44	1 cct							
ļ	lala S/S	33kV Leadout	Expansion	- 192	31	TOL Line		V5.4			1 1			4				1	1
l	Jawersity S/S	33KV 15MVAX1	New	854	131		Ubungo-University	33kV 100mm2 1cdt 7km	New	380	44			ļ					1
` i	Jounge SJS	33kV Leadout	Expansion	192	31	University Line			1						· · · · · · · · · · · · · · · · · · ·			}	1
	rombe S/S	132KV 45MVAX1	New	3385	508	*	FZ III-Yambo	132kV 240mm2 1cdt 8,5km	New	1883	567	Same and the same of the same						1	1
ſ		33kV 15MVAx1	New				1			1		Minimum Commission of the Comm	***	· • · · · · · · · · · · · · · · · · · ·	ļ	1			1
	Z (II \$/\$	132kV Leadout	Expansion	492	77	Yombo Une	and the property of the second	The second secon											
		10247 600000		7.5	4 4 4 7		Yombo-Mbagala	132ky 240mm2 1cdt 10km	New	2216	667	, , , , , , , , , , , , , , , , , , ,	· • ····· · · · · · · · · · · · · · ·				ļ		1
· · ·	Clunda S/S	33KV 15MVAx1	New	854	131		Yembo-Kitunda	33kV 100mm2 1cdt 3.9km .	New	212	25								
		132KV 45MVAx1			377		Kurasini-Mbagala	132kV 240mm2 1 cdt 16km	New	3545	1067	P. Sanara and desired and an extension	· 🛊 · · · · ·	-		we a second and			-
	ibagala S/S		Expansion	2523							687							and a marrier of	.]
	Kurasini S/S	132kV 45MVAx2	Expansion	3738	562		Ilala-Kurasini	132kV 240mm2 1cdt 10km	New	2218	00/					:			ļ
- 1	lala S/S	132kV Leadout	Expansion	492		Kurasini Une	Linguisting, and the same and			1				.,		<u> </u>			1
ŀ	Kurasıni S/S	33kV 15MVAx1	Expansion	708	108	1	Ilala-Kurasini	33kV 150mm2 1cdt 7.1km	Reconductor					.1	L		1	L	1
}			Subtotal	16192	2449		<u> </u>		Subtotal	11546	3166		Subtotal	4635	z		32373	5637	7 38
105	Abrahati S/S	33kV 15MVAx1	New	854	131		Ubungo-Mbrahati	33kV 100mm2 1cdt 4km	New	217	25		Distribution	.1401	1	7 33kV and 11kV	8 .		
- h	Jounge S/S	33KV Leadout	Expansion	192	31	Mbrahati Line								1	I	T	1		ľ
	Asasani S/S	33KV 15MVAx1	Expansion	1192	177		New Oysterbay-Msasani	33kV 150mm2 2cdt 5km	New	394	46	1 cct					. [
			Subtotal	2238	339	f			Subtotal	611	71	- Charles and the source	Subtotal	1401	} <u>-</u>	71	4250	417	44
neli	Gnondon) S/S	33kV 15MVAx1	New.	854	131		Mikocheni-Kinondoni	33kV 100mm2 1cdt 8km	New	435	50		Distribution	2462	. 11	1 33kV and 11kV		7.1	+
							MINOCITEMPTATION	Jaky Toblishiz reacont	. ITEM				- Distribution	2402	i	SORT AILU TINY			
	Alkocheni S/S	33KV Leadout	Excansion	289	131	Kinondoni Lina	Transport	2004/4/20000000000000000000000000000000	· inchia									·	
	Cawe SIS	33kV 15MVAx1	New	854			Mtrezi-Kawe	33kV 100mm2 1cdt 9km	New	489	21				ļ				
	ibezi S/S	33kV Leadout	Expansion	185		Kawe Line		La contraction and a second	Jaitan						l	11			.1
- 11	City Center S/S	33KV 30MVAX1	RÆ	1038	154	1x15>1x30			.1	1						1::			1
	Curasini S/S	33KV 15MVAx3	Raptace	777	115				1						1	1	1		1
- 1:				Part of the state of the		present the rest of the con-	The same that the same of the same that the same same	132kV 240mm2 1cdt 7.5km	The last and a second	403	0.2	alalane men en en en en en en		. [,	f		· H		1
	lala S/S	132KV 45MVAx1	Expansion	2077	315		Ubungo-liala	I I JAKY ZAUMIMA I CULT. JAM	Reinforce	1 403				-	1	1.	li .	3	i'
		132KV 45MVAX1	Expansion Expansion	2077	315	<u>, </u>	Ubungo-iiala Iiala-City Center #2	33kV 100mm2 1cdt 2.8km	Reconductor		18	1cct				+		:	-} ~

* .	٠.	erina ilganisa Tanahari																
Ye	ar	Name of S/S	Specification	Туре	foreign !	local Remark	Name of Transmission Line	Specification	. Type	foreign.	local	Remark	Specification	foreign	local Remark	kcreign(totat)	iocal(total)	Total
	C07	Behari Beach S/S	33KV 15MVAX1	Expansion	1115	159				1			Distribution	2824	13 33KV and 11kV			
		Tegeta S/S	33kV Leadout	Expansion	200	31 Bahari Beach Line				[1		,
			33KV 15MVAx1	New:	854	131	Tegeta-Kunduchi	33kV 100mm2 1cdt 3.2km	New	174	20	1				-	Ť	
			33kV Leadoul 33kV 15MVAX1	Expansion	262	38 Kunduchi Line	Hal- M	DOT: (4.00			7.0						1	
100		Kigogo S/S Bala S/S	33kV Leadout	New Expansion	954	131 31 Kigogo Line	ilala-Kigogo	33kV 100mm2 1cdt 12km	New	852						. [
	۱.	mana 5/5	Son Loadour	Copulision	"	31 ragege Ente	Tegeta-Mbezi	33kV 100mm2 1cdt 8.4km.	Reinforce	456	53		-					
							· · · · · · · · · · · · · · · · · · ·	The first that they are proportion to the same and the sa					1			1		
<u> </u>		** . ** *** *		Subtotal	3470	531			Subtotai	1282	149		Subtotal	2824	13	7576	693	
21	008	Changombe S/S	33KV 15MVAX1	Expansion	800	123	Kurasini-Chang'ombe	33kV 120mm2 1 cdt 3km	Reinforce	166	19		Distribution	242	1 33KV and 11kV		المناوعين	
1.				Subtotal	800			and a committee to the committee of the committee of	<u></u>	4		and the second second			and the second	J		أنسجد
· —	000	Mbed S/S	33kV 15MVAxt	Expansion	777	123	·	<u> </u>	Subtotal	166	19		Subtotal Distribution	242 1190		1208	143	1351
-21			33kV Leadout:	Expansion	262	38 Mbezi Line		State of the second	175.3			,	Distribution	1 1 30	0 Sake and Like			
		Msasani S/S	33kV 15MVAx1	Expansion	877	131			1	1								
**							The state of the s	The same of the sa		1	***************************************		an Indian State of the State of		F	1		
	II.						The second secon			1								
							to the property of the second second second second second			ļ		and a said of the street, and and						
			00111451814	Subtota	1916	284	N-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		10	-	ļ		Subtotal	1190		3106	290	3396
40			33kV 15MVAX1 33kV Leadout	Expansion Expansion	1215 185	195 31 Karlakog Line	llala-Kariakoo	33kV 100mm2 1 cdt 1.3km	Reinforce	71	}		· [-				1.0	
			33kV 15MVAX1	Expansion	1192	177				-						-1	;	
			00117	Subtotal	2582	393		and the state of the second state of the secon	Subtotal	71	В		al comment of the com-			0	0	
		· · · · · · · · · · · · · · · · · · ·		Total	58970	8882			Total	28011			Total	19871	92	108652	14354	
	-			Substation		67852	l	L	Transmissio	n		3332	Notification	1	1976	3 Grand Total	1	121066

Table 7.4.3 Approximate Construction Cost(Arusha, Moshi) (Case-A) Unit: US\$1,000

	Name of S/S	Specification	Тура	foreign	locai Rei	nark Name of Transmission Line	Specification	Type	foreign	total	Remark	Specification	foreign	local	Remark	foreign(total)	local(total)	Total
200	2 Njiro S/S	Switchgear	Replace	908	92							Distribution	752		Arusha			1
		132KV 45MVAx1	Expansion	2531	262							Distribution	1826	6	Kilimanjaro			1
	Mt. Meru S/S	33KV TOMVAX3	Expansion	1646	246	Njiro-MtMeru	33KV 100mm2 7.3km	Reinforce	397	45		1	1		}			}
	Kiyungi SrS	Switchgear etc	Replace	1085	162								1					
	1 1 1 1 1 1 1 1 1 1 1	132/33kV 45MVAxT	Expansion	1762	252													
	Boma Mbuzi	Switchgear etc	Replace	915	92	Kiyungi-Boma Mbuzi	33kV 100mm2 7km	Reinforce	380	44					1			
		33kV 10MVAxI	Expansion	592	85								1.1		1 1 4 4 4 1 1 1			
	Trade School S/S	33kV 10MVAx1	RÆ	1208	185	Kiyungi-Trade School	33kV 100mm2 10km	Reinforce	543	. 63					}. ···		i ·	}
	Machame S/S	33kV SMVAXI	R/E	138	23 1x2.5->1>													ļ
	YMCA SIS	33KV 10MVAX1	New	531	77 On going	*											ļ -	
	Marangu Sw/S	33KV	New	731	108	Kiyungi-Marangu	33KV 100mm2 43km	New	2336	271		· · · • · · · · · · · · · · · · · · · ·				· ·		
	wateriifin DASD	3384	Subtotal	12047	1594		DON' COLLETZ 43RT	Suintotal	3656	424		Subtotal	2578	11		18281	2029	200
							33kV 100mm2 5,8km	Reinforce								70,081	2029	24
2003	Unga LTD SIS	33KV 10MVAX3	RÆ	2131	323 2x5>3x1		33KV 10Umm2 5,8Km	Keruorce	315	37		Distribution	2376		Arusha			
	Kittex SJS	33KV 10MVAXI	RÆ	723	108 1x5>1x1				ļ <u></u>			Distribution	305	3	Kilimanjaro			
	Usa River S/S	33KV 10MVAx1	Ne₩	652	100	Nilro-Usa River	33kV 100mm2 21.3km	New	1157	134							ļ.,	
						Tengeru-Usa River	33KV 100mm2 12.5km	New	679	79		and management in the second						
	Monduli S/S	33kV 10MVAx1	New	662	100	Niro-Mondul	33KV 100mm2 38.6km	New	2097	243			1		L			
	Same	Switchgear etc	Raplace	339	54				.	Ì. I	and the same	1		1 .		. [
			1]		•									1000	. 1		
	l		Subtotat	4516	685			Subtotal	4248	493		Subtotal	2682	12		11446	1190	125
2004	Saldna S/S	33kV 10MVAX1	New	682	190	Njiro-Sakina	33kV 100mm2 13.2km	New	717	83		Distribution	0	0	Arusha	1		
						Mt.Mony-Sakina	33kV 100mm2 8.1km	New	440	51		Distribution	742	3	Kilimanjaro	1		
	KCMC S/S	33kV 10MVAx1	New	662	100	Trade School-KCMC	33kV 100mm2 3.7km	New	201	. 23		1				1		
		33kV Leadout	Expansion	195	31 KCMC Lin								· · · · · · · · · · · · · · · · · · ·			1		
			Suptotal	1509	231			Subtotal	1358	157		Subtotal	742	3		3609	391	40
2005	Niro B S/S	33KV 1BMVAx1	New	662	109	Njiro-Njiro B	33kV 100mm2 3km	New	163	19		Distribution	361	7	Arusha			
	7777 40		P			Njiro-Krungi	132kV 240mm2 70km	Reinforce	7755	2334	(1/2)	Distribution	1,045		Kilimaniaro			
	**	t the same of the													Commental	¶re tiree tileet		
	li e e e e e e e e e e e e e e e e e e e	5 5	1						1		and the first of the second	i i	1 .		!			
0000	1		(Cultivitati					Contrated	7019			Contract of the	4400	-		9000	2460	424
	Allien Dir	22014 (CD20 / Bud	Subtotal	662	100			Subtotal	7918	2353		Subtotal	1486	7		9986	2460	124
1000	Njiro S/S	220kV 60MVAx1	Expansion	4508	677	Nijer Kharnei	1 22M 240mm 2 70mm				mm .	Subtotal	1486			9986	2460	124
1006		132KV 45MVAX1	Expansion Expansion	4508	677	Njiro-Kiyungi	132kV 240mm2 70km	Reinfarce	7755	2334	(2/2)	Subtotal	1486	7		9986	2460	124
2006	Gomben S/S	132KV 45MVAX1 33KV 5MVAX1	Expansion Expansion New	4508 569	677	KCMC-Gomberi	132kV 240mm2 70km 33kV 100mm2 4,9km				(2/2)	Subtotal	1486			9986	2460	124
1006	Comben S/S	132kV 45MVAx1 33kV 5MVAx1 33kV Leadout	Expansion Expansion New Expansion	4508 569 185	677 85 31 Gomberi L	KCMC-Gomberi		Reinfarce	7755	2334	(2/2)	Subtotal	1486			9986	2460	124
2006	Gomben S/S	132KV 45MVAX1 33KV 5MVAX1	Expansion Expansion New Expansion Expansion	4508 569 185 438	677 85 31 Gombert L 62 Nilro Line	KCMC-Gomberi		Reinfarce New	7755 266	2334 31	272)	Subtotal	1486			And a series of the series of		
	Gomben S/S KCMC Kyungi S/S	132kV 45MVAX1 33kV 5MVAX1 33kV Leadout 132kV Leadout	Expansion Expansion New Expansion Expansion Subtotal	4508 569 185 438 5700	677 85 31 Gombert L 62 Nitro Line 855	KCMC-Gomberi		Reinfarce	7755	2334						9986	2450 3220	124
	Gomben S/S KCMC Kyung: S/S Themi S/S	132kV 45MVAX1 33kV 5MVAX1 33kV Leadout 132kV Leadout 33kV 10MVAX1	Expansion Expansion New Expansion Expansion Subsortal Expansion	4508 569 185 438 5700	85 31 Gombert L 62 Nitro Line 855	KCMC-Gomberi		Reinfarce New	7755 266	2334 31		Distribution	521		Arusha	And a series of the series of		
	Gomben S/S KCMC Kyung: S/S Themi S/S	132kV 45MVAX1 33kV 5MVAX1 33kV Leadout 132kV Leadout	Expansion Expansion New Expansion Expansion Subtotal	4508 569 185 438 5700	677 85 31 Gombert L 62 Nitro Line 855	KCMC-Gomberi		Reinfarce New	7755 266	2334 31	(273)				Arusha Kilimanjaro	And a series of the series of		
	Gomben S/S KCMC Kyung: S/S Themi S/S	132kV 45MVAX1 33kV 5MVAX1 33kV Leadout 132kV Leadout 33kV 10MVAX1	Expansion Expansion New Expansion Expansion Subsortal Expansion New	4508 569 185 438 5700 1115 589	677 85 31 Gombert L 62 Nitro Line 855 169 85	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31	(13)	Distribution Distribution	521 1045			13724	3220	755
2007	Comben S/S KCMC Kyungi S/S Themi S/S Boma Ngombe S/S	132kV 45MVAX1 33kV 5MVAX1 33kV Leadout 132kV Leadout 33kV 10MVAX1	Expansion Expansion New Expansion Expansion Subsortal Expansion	4508 569 185 438 5700	85 31 Gombert L 62 Nitro Line 855	KCMC-Gomberi		Reinfarce New	7755 266	2334 31	(273)	Distribution	521			And a series of the series of		
	Comben S/S KCMC Kyungi S/S Themi S/S Boma Ngombe S/S	132kV 45MVAX1 33kV 5MVAX1 33kV Leadout 132kV Leadout 33kV 10MVAX1	Expansion Expansion New Expansion Expansion Subsortal Expansion New	4508 569 185 438 5700 1115 589	677 85 31 Gombert L 62 Nitro Line 855 169 85	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31	223	Distribution Oistribution Subtrat Distribution	521 1045	5 8		13724	3220	755
2007	Comben S/S KCMC Kyungi S/S Themi S/S Boma Ngombe S/S	132kV 45MVAx1 33kV 5MVAx1 33kV Leadout 132kV Leadout 33kV 10MVAx1 33kV 5MVAx1	Expansion Expansion New Expansion Expansion Subsotal Expansion New Subsotal	4508 569 185 438 5700 1115 589	677 85 31 Gombert L 62 Nitro Line 855 169 85	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31		Distribution Distribution Subtotal	521 1045	5 8 0	Kilimanjaro	13724	3220	755
2007	Comben S/S KCMC Kyungi S/S Themi S/S Boma Ngombe S/S	132kV 45MVAX1 33kV 5MVAX1 33kV Leadout 132kV Leadout 33kV 10MVAX1	Expansion Expansion New Expansion Expansion Subsortal Expansion New	4508 569 185 438 5700 1115 589	677 85 31 Gombert L 62 Nitro Line 855 169 85	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31		Distribution Oistribution Subtrat Distribution	521 1045 1666	5 8 0	Kilimanjaro Arusha	13724	3220	755
2007 2008	Comben S/S KCMC Kyungi S/S Themi S/S Boma Ngombe S/S	132kV 45MVAx1 33kV 5MVAx1 33kV Leadout 132kV Leadout 33kV 10MVAx1 33kV 5MVAx1	Expansion Expansion New Expansion Expansion Subsotal Expansion New Subsotal	4508 569 185 438 5700 1115 589	677 85 31 Gombert L 62 Nitro Line 855 169 85	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31	273	Distribution Distribution Subtrate Distribution Distribution	521 1045 1666 0	5 8 0	Kilimanjaro Arusha	13721	3220	765
2007	Comben S/S KCMC Kryungi S/S Themi S/S Bome Ngombe S/S	132kV 45MVAXT 33kV 5MVAXT 33kV Leadout 132kV Leadout 33kV 10MVAXT 33kV 5MVAXT	Expansion Expansion New Expansion Expansion Substotal Expansion New Substotal	4508 569 185 438 5700 1115 589	677 85 31 Combert L 62 Nylro Line 855 109 85 254	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31	223	Distribution Distribution Subtrate Distribution Distribution	521 1045 1666 0	5 8 0	Kilimanjaro Arusha	13721	3220	766
2007	Comben S/S KCMC K/yungi S/S Themi S/S Boma Ngombe S/S Usa River S/S Sakina 3/S	132KV 45MVAKT 33KV 5MVAKT 33KV Leadout 132KV Leadout 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT	Expansion Expansion Expansion Expansion Expansion Expansion Subtotal Expansion New Subtotal	4508 569 185 439 5700 1115 569 1684	677 85 31 Gombert U 62 Nitro Line 855 169 855 254	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31	273	Distribution Distribution Subtrate Distribution Distribution	521 1045 1666 0	5 8 0	Kilimanjaro Arusha	13721	3220	766
2007	Comben S/S KCMC Kryungi S/S Themi S/S Bome Ngombe S/S	1 32/kV 4/5MV/Akt 33/kV 5MV/Akt 33/kV Leadout 1 32/kV Leadout 33/kV 10/MV/Akt 33/kV 5MV/Akt	Expansion Expansion New Expansion Expansion Subtrotal Expansion New Subtrotal Expansion Expansion Expansion Expansion Expansion Expansion Expansion Expansion Expansion	4508 569 185 439 5700 1115 569 1684 738 738	677 85 31 Combert L 62 Nylro Line 855 109 85 254	KCMC-Gomberi		Reinforce New Subtotal	7755 266	2334 31	273	Distribution Oistribution Subtotal Distribution Distribution Subtotal	521 1045 1666 0	5 8 0	Kilimanjaro Arusha	13721 3350 1045	\$220 262 5	75 3
2007 2008 2008	Gomben SIS KCMC Kryungi SIS Themi SIS Boma Ngombe SIS Usa Rher SIS Sakina SIS Kyungi SIS	132KV 45MVAKT 33KV 5MVAKT 33KV Leadout 132KV Leadout 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT	Expansion Expansion Expansion Expansion Expansion Expansion Subtrotal Expansion New Subtrotal	4508 569 185 439 5700 1115 569 1684	677 85 31 Gombert U 62 Nitro Line 855 169 855 254	KCMC-Gomberi		Reinfarce New Subtottal	7755 266	2334 31		Distribution Distribution Subtrate Distribution Distribution	521 1045 1666 0	5 8 0	Kilimanjaro Arusha	13721	3220	765 30
2007	Gomben SIS KCMC Kryungi SIS Themi SIS Boma Ngombe SIS Usa Rher SIS Sakina SIS Kyungi SIS	132KV 45MVAKT 33KV 5MVAKT 33KV Leadout 132KV Leadout 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT	Expansion Expansion New Expansion Expansion Subtrotal Expansion New Subtrotal Expansion Expansion Expansion Expansion Expansion Expansion Expansion Expansion Expansion	4508 569 185 439 5700 1115 569 1684 738 738	677 85 31 Combert L 62 Nylro Line 855 109 85 254	KCMC-Gomberi		Reinfarce New Subtottal	7755 266	2334 31	273	Distribution Oistribution Subtotal Distribution Distribution Subtotal	521 1045 1666 0	5 8 0	Kilimanjaro Arusha	13721 3350 1045	\$220 262 5	766
2007 2008 2008	Gomben SIS KCMC Kryungi SIS Themi SIS Boma Ngombe SIS Usa Rher SIS Sakina SIS Kyungi SIS	132KV 45MVAKT 33KV 5MVAKT 33KV Leadout 132KV Leadout 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT 33KV 10MVAKT	Expansion Expansion New Expansion Expansion Subtrotal Expansion New Subtrotal Expansion Expansion Expansion Expansion Expansion Expansion Expansion Expansion Expansion	4508 569 185 439 5700 1115 569 1684 738 738	677 85 31 Combert L 62 Nylro Line 855 109 85 254	KCMC-Gomberi		Reinfarce New Subtottal	7755 266	2334 31	273	Distribution Oistribution Subtotal Distribution Distribution Subtotal	521 1045 1666 0	5 8 0	Kilimanjaro Arusha Kilimanjaro	13721 3350 1045	\$220 262 5	?5% 3¢

Table 7.4.4 Approximate Construction Cost(Arusha, Moshi) (Case-B) Unit: US\$1,000

	Name of S/S	DIOAIIIIAIC					L, MOSIII) (Case I Name of Transmission Line	Specification			وأعامهم	i siccio	Tarres de la companya del companya del companya de la companya de	umaneko er			restriction is a series		
rear	Name of S/S	Switchgear	Type Replace	foreign 908		Remark	Name of Transmission Line	Specification	Type	foreign.	local	Remark	Specification :	foreign 752	locsi	Remark	(creign(total)	iocal(total)	Total
2002	INDIO SIS	132KV 45MVAX1	Expansion	2531	26		enem a cheganana a cammer.	THE RESIDENCE AND ADDRESS OF THE PARTY OF TH		}·			Distribution	2131		Arusha Kilimanjaro		ji ']
	Mt. Meru S/S	33kV 10MVAx3	Expansion	1646			Niiro-Mt.Meru	33kV 100mm2 7,3km	Reinforce	397	46					Leurienjere.	· · · · · · · · · · · · · · · · · · ·		j
	Kiyungi S/S	Switchgear etc	Replace	1085					,				1	1 .				i '	1
- '		132/33kV 45MVAX1	Expansion	1762	26	2		rango nga nagagang bang tanggan dan dan sak		1							[j · · · ·
	Boma Mbuzi	Switchgear etc	Replace	915			(Klyungi-Boma Mbuzi	33kV 100mm2 7km	Reinforce	380	44				· · · · · · · ·		j	i	
_		33kV 10MVAx1	Expansion	592										1		1		i	
	Trade School S/S	33KV 10MVAx1	RVE	1208	18	5	Klyung-Trade School	33KV 100mm2 10km	Reinforce	543	63		1	1		1		i :	1
1	YMCA S/S	33kV 10MVAx1	New	531	7.	On going				1							1	i	7
	Marangu Sw/S	33kV	New	731			Kiyungi-Marangu	33kV 100mm2 43km	New	2336	271					I	<u>i</u> 1	i	Ì
			Subtotal	11909			<u> </u>		Sublotal	3656	424		Subtotal	2983	13		16448	2008	204
003	Unga LTD S/S	33KV 10MVAX3	R/E	2131		3 2x5->3x10	Niiro-Unga LTD	33kV 106mm2 5.8km	Reinforce	315	37		Distribution	1850		Arusha		(
	Kinex S/S	33kV 10MVAx1	R/E	723		B 1x5>1x10		The state of the s					Distribution	G		Kilimanjaro		1	
	Machame S/S	33kV 5MVAvd	R/E	138		3 1x2:5>1x5		to and the second						1				i '	
	Same	Switchgear etc	Replace	338	5	4				1	N 1		•			1 1 1	1	i	1
			Subtotal	3330	504				Subtotal	1			Subjectal				-\	554	60
co.	Usa River S/S	33kV 10MVAx1	New				Njiro-Usa River	33kV 100mm2 21,3km		315				1850	9	1	5495	334	154
JUN	OSA HIVEI SIS	338Y TURNYALI	NEW	882	10		Tangero-Usa River	33kV 100mm2 12.5km	New New	1157	. 134 79		Distribution	528		Arusha		į	
	Mondell S/S	33kV 10MVAx1	New	662	100	d	Njiro-Monduli	33KV 100mm2 38.6km	New	679 2097	243		Distribution	742		Kilimanjaro	- [jes	j
. :	MUNUUM AVA	JORY TOWYCKI	Subtotal	1324			INJITO-MOTIDOII	SSKY TOURING SOURCE	Subtotal	3933	456		Subtotal	1253		J	6525	661	71
nn s	Saidna S/S	33kV 10MVAx1	New	562			Njiro-Sakina	33ky 100mm2 13.2km	New	717	83		Distribution	361		Arusha	1 00/01	. ממ	- 7
•••	Sakina ara	SSAY TUMPAKI	1 TO 1	602	! • .	1	Mt Meru-Sakina	33kV 100mm2 8.1km	New	440		ing a succession of the succession of	Distribution	1045		Kilimaniaro		p	
	r mari					the contraction	Nilro-Kiyungi	132kV 240mm2 70km	Reinforce	7755		(10)	Custingeni	1040		Militarilato	4		
	KCMC S/S	33KV 10MVAx1	New	562	- 100	a	Trade School-KCMC	33kV 100mm2 3.7km	New	201	23	11127	1	1		l	1. 1	i ,	
	Trade School	33kV Leadout	Expansion	185		KCMC Line					20	to the second						i i	
		ten et transcor	Subtotal	1509					Subtotal	9113	2491		Subtotai	1406	7		12028	2729	147
008	Njiro B S/S	33KV 10MVAx1	New	662	10	0	Njiro-Njiro B	33kV 100mm2 3km	New	163	19		Distribution	361	2	Arusha			
	NJIro S/S	220KV 60MVAx1	Expansion	4508	67	7							Distribution	0		Kilimanjaro		r	
		132kV 45MVAx1	Expansion	1			Nilro-Kayungi	132kV 240mm2 70km	Reinforce	7755	2334	(2/2)		1				i	1
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