A-7 Field Report

PREPARATORY SURVEY
ON
THE PROJECT
FOR
RURAL ELECTRIFICATION PHASE III
IN
THE REPUBLIC OF UGANDA

THE FIRST FIELD SURVEY

FIELD REPORT

April 21st, 2011

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1. Introduction

In June 2009, the Government of the Republic of Uganda made a request for Grant Aid for the Project for Rural Electrification Phase III (the Project) to the Government of Japan. The Japan International Cooperation Agency (JICA), the official agency implementing technical cooperation, ODA loans, and Grant Aid, has conducted Data Collection Survey on Rural Electrification (the Previous Survey) from June to July, 2010. As a result of the Previous Survey, JICA decided to conduct a Preparatory Survey (the Survey) to formulate Outline Design, project plan, cost estimation and sent the Survey team for the First Field Survey (the Team), headed by Dr. Akira NIWA, Senior Advisor, JICA.

In order to build mutual understanding between the Ugandan side and the Team (Both Parties) on the technical and engineering aspects, this Field Report has been prepared based on the results of the first field survey and discussions with the Ugandan side, i.e., Rural Electrification Agency (REA) and Ministry of Energy and Mineral Development (MEMD). However, the final components of the Project will be decided by the Government of Japan.

Both parties confirmed the necessity and urgency of the requested sites, and evaluated the priority of the sites in terms of contributions to rural development through electrification, technical features, and environmental & social considerations as shown in Minutes of Discussions (M/D) signed by both parties on 8th April, 2011. Contents of main components and priority ranking confirmed by Both Parties are shown in Table 1, which is also as described in M/D.

Based on the discussion and agreement between Both Parties, a site survey was carried on three sites which was rated as Priority Ranking A and Priority Ranking B in M/D. Some components requested by the Government of Uganda have been constructed by itself after the request, and these components are omitted from the Project and the site survey. Scope of the site survey is shown in Table 2.

Table 1 Contents of main components and priority ranking confirmed by Both Parties

Project Site	Area(Region)	Priority Ranking[1]	Contents of main components[2]	Project Features
1	Baale-Galiraya (Central)[3]	C	- Supply and installation of 33kV distribution Lines (approx. 44.1km) and distribution transformers (33kV/415-230V)	Need socio-economic justification for 44km extension of the existing Kayunga-Baale line (JICA 1) Length of line passing CFRs*: approx. 10km
2	Bikira-Namirembe & Masaka-Nyabyajiwe (Central)	B	- Supply and installation of 33kV distribution Lines (approx. 93.9km) and distribution transformers (33kV/415-230V)	Recommendable for strengthening private participation in rural electrification Length of line passing CFRs*: approx. 8km
3	Kiganda-Mubende (Central)	C	- Supply and installation of 33kV distribution Lines (approx. 57.1km) and distribution transformers (33kV/415-230V)	Power to Kiganda will be supplied from Myanzi (Mityana)-Kiganda line, which is on-going grant project by Norway. This reduces on number of connections and consequently project benefit. Length of line passing CFRs*: approx. 4.5km
4	Iganga-Nakabugu & Mayuge-Lumino (Eastern)[4]	A	- Supply and installation of 33kV distribution Lines (approx. 160.8km) and distribution transformers (33kV/415-230V)	Highly recommendable for electrification of new district headquarters (Namayingo) and synergy with Interconnection of Electric Grids of Nile Equatorial Lakes Countries Project (NELSAP) Length of line passing CFRs*: approx. 1.5km
5	Kitagata-Kasaana & Kitagata-Kabwohe (Western)[5]	B	- Supply and installation of 33kV distribution Lines (approx. 58.7km) and distribution transformers (33kV/415-230V)	Highly recommendable for synergy with OVOP and NELSAP. Project scope has been reduced by various rural Electrification Projects funded by the Government of Uganda. The remaining project scope proposed to JICA is now limited to Kitagata-Kasaana-Kagati with spur to Rukondo, Rwanja-Karisizo, Kitagata-Mukibirizi and Rwobugimbi-Kitagata.
6	Hoima-Mbarara-Kinyara (Western)	C	- Supply and installation of 33kV distribution Lines (approx. 61.8km) and distribution transformers (33kV/415-230V)	Length of line passing CFRs*: None Need clarification of socio-economic benefit produced after connecting trading centers. Project scope has been reduced by various rural Electrification Projects funded by the Government of Uganda. The remaining project scope proposed to JICA is now limited to Hoima-Mbarara-Kinyara with spur to Kiryamboogi and Kyabasigya. Length of line passing CFRs*: approx. 7.5km

Notes:
(1) Factors which are considered in evaluation of priority ranking are: impacts to rural economy and development, features of benefits in electrification, access to electricity in the underserved area and environment.
(2) Content of main components is based on the results of the previous survey and additional information provided by REA. Modification in the quantities and additional new items/equipments will be determined based on the site survey.
(3) Length of the line originally requested was approx. 93.2km. However, project component of Kayunga-Busana and associated t-offs is under implementation with financing from the Government of Uganda.
(4) The line originally requested was Iganga-Nakabugu. However, it has been changed as Iganga-Kanlo because the project to supply the District headquarters at Luuka (Nakabugo) from Kanlo has been funded by the Government of Uganda.
(5) *CFR stands for Central Forest Reserve managed by NFA. The proposed alignments including those passing CFRs are along the existing roads.
(6) Information on wetland will be confirmed during the Second Field Survey of the Project.
(7) "Project Features" for Project Site 5 and Project Site 6 were corrected from ones in Annex-4, Minutes of Discussion signed on 8th April, 2011, because ones for Project Site 5 had been described in the column for Project Site 6. Accordingly, ones for Project Site 6 were added in the column for Project Site 6 above.

Table 2 Scope of the Site Survey

Priority A: Area-4

Extension of 33 kV distribution line in Iganga, Bugiri and Busia District

No.	Project Area	Length [km]
4.0	Iganga-Nakabugu, Mayuge-Lumino	137.7
4.1	Banda lugala	4.9
4.2	Haarembe	5.9
4.3	Matale Point	5.0
4.4	Busiro	7.3
	Subtotal	**160.8**

Priority B: Area-2

Extension of 33 kV distribution line in Masaka and Rakai District

No.	Project Area	Length [km]
2.0	Bikira-Namirembe-Masaka-Nyabyajiwe	80.9
2.2	Zzimwe	5.9
2.3	Nakaiyaga	3.3
2.4	Buwunga	3.8
	Subtotal	**93.9**

Area-5

Extension of 33 kV distribution line in Bushenyi and Rukungiri District

No.	Project Area	Length [km]
5.0	Kitagata-Kasaana-Kagati, Rwanja-Karisizo, Kitagata-Mukibirizi, Rwonbugirnhi-Kitagata	56.3
5.1	Kotoma	2.4
	Subtotal	**58.7**

Note: Gray-colored components are omitted from the Project in M/D

2. Information and Results of the Site Survey

2.1 Areas where the Site Survey was carried out

Based on the discussion and agreement between Both Parties, the site survey was carried on three sites which was rated as Priority Ranking A and Priority Ranking B in M/D. The location of areas where the site survey was carried out is shown in Figure 1.

Figure 1 Areas where the Site Survey was carried out

2.2 Beneficiary of the Project

2.2.1 Extension of 33 kV distribution line in Iganga, Bugiri and Busia District (Area-4)

(1) Primary beneficiaries

1) Potential Consumers

In the inland, main livelihoods of potential consumers are farming (cassava, maize, ground nut, beans, rice, millet, sugarcane), trading and they also have livestock (cattle, goat, chicken). All activities are in small scale. On the lake shore, the main livelihood is dominated by fishing of tilapia and Nile perch although they have farming. Approximate average monthly incomes are 50,000 - 100,000 UGX/household by farming, 150,000 - 200,000 UGX/household by fishing and

up to 950,000 UGX/household by trading.

Most trading centers have generators and solar panels for TV theaters, barber shops, lighting, charging for mobile phones and even distributing electricity for neighbor houses. Milling machines are also inevitable to process local food materials (maize, millet and cassava) for daily life. They also consume oils for kerosene lamp and tadoba as main lathing. They are willing the electricity for the activities done by the generators and solar panels, the lighting and to establish new businesses like food processing, cool storage, welding and carpentry.

The amounts of potential consumers are as follows.

- Trading center (TC): 37 TCs
- Household: 9,095 households
- Population: 69,990 persons

Table 1 Amounts of Potential Consumers in Area-4

No.	Size of TC	No. of TC	Household	Population	Remarks
1	Over 1,000 households	2	4,200	31,800	Namayingo TC is the district center of newly established district last year.
2	500 – 999 households	0	0	0	
3	100 – 499 households	24	4,340	34,080	
4	Under 100 households	11	555	4,110	
5	Total	37	9,095	69,990	

2) Public Facilities

(a) School

- Primary school: 101 schools
- Secondary school: 17 schools
- Tertiary school: 2 schools

(b) Health Center

- Health center IV: 2 centers
- Health center III: 5 centers
- Health center II: 8 centers

(2) Secondary beneficiaries

- Pulish population covered by schools and health centers

2.2.2 Extension of 33 kV distribution line in Masaka and Rakai District (Area-2)

(3) Primary beneficiaries

1) Potential Consumers

In the inland, main livelihoods of potential consumers are farming (pineapple, coffee, matoke, cassava, maize, beans, and sugarcane). Trading and they also have livestock (cattle, goat, and chicken). The pineries outstand in the farming activities. On the lake shore, the main livelihood is dominated by fishing of tilapia and Nile perch although they have farming. Approximate average

monthly incomes are 50,000 - 150,000 UGX/household by farming, 50,000 – 100,000 UGX/household by fishing and 300,000 UGX/household by trading in a comparatively large trading center in the area.

Most trading centers have generators and solar panels for TV theaters, barber shops, lighting, charging for mobile phones and even distributing electricity for neighbor houses. Milling machines are also inevitable to process local food materials (maize, millet and cassava) for daily life. They also consume oils for kerosene lamp and tadoba as main lighting. They are willing the electricity for the activities done by the generators and solar panels, the lighting and to establish new businesses like food processing (coffee factory, juice factory), cool storage for fish and milk.

The amounts of potential consumers are as follows.

- Trading center (TC): 13 TCs
- Household: 1,980 households
- Population: 9,300 persons

Table 2 Amounts of Potential Consumers in Area-2

No.	Size of TC	No. of TC	Household	Population	Remarks
1	Over 1,000 households	1	1,000	3,000	
2	500 – 999 households	0	0	0	
3	100 – 499 households	7	790	5,250	
4	Under 100 households	5	190	1,050	
5	Total	13	1,980	9,300	

2) Public Facilities

(a) School

- Primary school: 25 schools
- Secondary school: 5 schools
- Tertiary school: 3 schools

(b) Health Center

- Health center III: 2 centers
- Health center II: 1 centers
- Health center I: 2 centers

(4) Secondary beneficiaries

Pulish population covered by schools and health centers

2.2.3 Extension of 33 kV distribution line in Bushenyi and Rukungin District (Area-5)

(5) Primary beneficiaries

1) Potential Consumers

Main livelihoods of potential consumers are farming (matoke, coffee, cassava, beans), trading and they also have livestock (cattle, goat, chicken). The land use of Area-5 is dominated by ranch

for cattle. Coffee is also outstanding in local agricultural crops. Approximate average monthly incomes are 50,000 - 100,000 UGX/household by farming.

Most trading centers have generators for TV theaters, barber shops, lighting, and charging for mobile phones. Milling machines are also inevitable to process local food materials (maize, millet and cassava) for daily life. They also consume oils for kerosene lamp and tadoba as main lighting. They are willing the electricity for the activities done by the generators, the lighting and to establish new businesses like coffee factory, cool storage, welding and carpentry.

The amounts of potential consumers are as follows.

- Trading center (TC): 10 TCs
- Household: 985 households
- Population: 6,860 persons

Table 3 Amounts of Potential Consumers in Area-5

No.	Size of TC	No. of TC	Household	Population	Remarks
1	Over 1,000 households	0	0	0	
2	500 – 999 households	0	0	0	
3	100 – 499 households	4	770	5,540	
4	Under 100 households	6	215	1,320	
5	Total	10	985	6,860	

2) Public Facilities

(a) School

- Primary school: 20 schools
- Secondary school: 4 schools
- Tertiary school: 2 schools

(b) Health Center

- Health center III: 2 centers
- Health center II: 2 centers

(6) Secondary beneficiaries

Pulish population covered by schools and health centers

2.3 Network Diagrams and Route Maps of the Project

2.3.1 Extension of 33 kV distribution line in Iganga, Bugiri and Busia District (Area-4)

The requested component in Area-4 had been separated into two parts. A part had been a distribution line from Iganga to Nakabugu. The other had been distribution lines from Mayuge to Lumino. Through discussion between Both Parties, it had been confirmed that Nakabugu, which is the biggest demand area in the former part, has already been electrified by 33 kV distribution line from Kaliro. Therefore, the electrification between Kiyungi and Iganga had been requested in discussion before the site survey. However, it was confirmed through the site survey that the part is also under construction of 33 kV distribution lines by UEDCL. As the result, it is agreed between

Both Parties that the part shall be omitted from the Project.

As the result of the site survey, it was also agreed between Both Parties that the other part is 33 kV distribution lines between Mayuge (Connection Point A) and Lumino (Connection Point B) including T-off lines to Busiro and Bumeru. Around Nankoma area, which is located in middle between Mayuge and Lumino, has been already electrified, and the requested distribution lines of the part are also separated into two parts. It is composed of construction of 33 kV distribution lines between Mayuge (Connection Point A) and Nankoma (Connection Point B), and ones between Nankoma (Connection Point C) to Lumino (Connection Point D) including T-off lines to Busiro and Bumeru. They are finally the components of the Project in Area-4.

Based on the results of the site survey, their network diagram and route maps of distribution lines are shown in "ANNEX" of this Field Report. And number of Tracing Centers where distribution transformers shall be installed was specified as 37, which is also shown in socio-economic data in "ANNEX" of this Field Report.

Based on the results of the site survey, Total Length of the distribution line is Approx. 130 km. And length of the distribution lines of the component of the Project in Area-4 is as follows;

➢Line from Mayuge (Connection A) to Nankoma (Connection B):	Approx. 22 km
➢Line from Nankoma (Connection C) to Lumino (Connection D):	Approx. 45 km
➢T-off line to Busiro:	Approx. 30 km
➢T-off line to Bumeru:	Approx. 33 km

And it was agreed by Both Parties that T-off Lines to Matale Point (4.2) and Haarembe (4.2) shall be omitted from the Project, because they are very small villages and appropriateness for the Japan's grant aid was not confirmed.

2.3.2 Extension of 33 kV distribution line in Masaka and Rakai District (Area-2)

The requested component in Area-2 had originally been construction of 33 kV distribution lines between Masaka and Kyotera. However, it was confirmed through the site survey that 33 kV distribution line between Kyambazi and Ndeeba-Lwaggle, which are located in middle between Masaka and Kyotera, including a T-off Line to Dimo Landing Site is under construction (However the line will be connected to existing 11kV line and operated in 11kV). The component of the Project in Area-5 is separated into two parts. A part is a distribution line from Nyendo (Connection Point A) to Kyanbazi including a T-off line to Namirembe. The other is a distribution line from Ndeeba-Lwaggulwe to Kyoterra (Connection Point B).

Based on the results of the site survey, their network diagram and route maps of distribution lines are shown in "ANNEX" of this Field Report. Number of Tracing Centers where distribution transformers shall be installed was specified as 13, which is also shown in socio-economic data in "ANNEX" of this Field Report.

Based on the results of the site survey, Total Length of the distribution line is Approx. 65 km. And length of the distribution lines of the component of the Project in Area-2 is as follows;

- Line from Nyendo (Connection A) to Kyambazi: Approx. 36 km
- Line from Nankoma (Connection C) to Ndeeba-Lwaggle: Approx. 29 km

Based on the results of the site survey, it was agreed by Both Parties that T-off Lines to Zzimwe (2.2) shall be omitted from the Project, because it is a very small village and appropriateness for the Japan's grant aid was not confirmed.

2.3.3 Extension of 33 kV distribution line in Bushenyi and Rukungin District (Area-5)

Concerning Area-5, construction of 33 kV distribution line in length of 86.0 km had been originally requested. It had been confirmed through discussion between Both Parties that some part of the requested component has been already constructed or under construction by the Ugandan side. Therefore, construction of 33 kV distribution line in length of 58.7 km had been specified in M/D as the components of the Project. However, it was confirmed through the site survey that most of the distribution lines in the length of 58.7 km specified in M/D has also been constructed or under construction. The rest of the requested lines were separated to four parts and the length of each part is less than 10 km.

Area between Kabwohe and Kitagata has already been electrified or under construction in 11 kV, and this area shall be omitted from the Project. While, area between Kitagata and Karisizo has already been electrified or under construction in 33 kV, and this area shall also be omitted from the Project.

Based on the results of the site survey, the component of the Project in Area-5 are composed of a line from Kitagata (Connection A) to Furuma including a T-off line to Katoma, a line from Kitagata (Connection B) to Katagi including Kassana, a line from Kitagata (Connection C) to Rukondo, and a T-off line to Kihanga which is a branch line from the line between Kitagata and Karisizo already under construction. They shall be in 33 kV.

Based on the results of the site survey, their network diagram and route maps of distribution lines are shown in "ANNEX" of this Field Report. Number of Tracing Centers where distribution transformers shall be installed was specified as 10, which is also shown in socio-economic data in "ANNEX" of this Field Report.

Based on the results of the site survey, Length of the distribution lines of the component of the Project in Area-5 is as follows;

- Line from Kitagata (Connection A) to Furuma including a T-off line to Katoma: Approx. 8 km
- Line from Kitagata (Connection B) to Katagi including Kassana: Approx. 10 km
- Line from Kitagata (Connection C) to Rukondo: Approx. 4 km
- T-off line to Kihanga: Approx. 8 km

2.4 Environmental and Social Considerations

2.4.1 Environmental and Social Aspects

In the field survey, environmental and social aspects in the Areas are summarized as follows.

Table 4 Environmental and Social Aspects in the Areas

Area	Area-4	Area-2	Area-5
District	Mayuge, Bugiri, Namayingo, Busia	Masaka, Rakai	Busheny, Rukungiri
Topography	- Hilly site - Lake shore site	- Hilly site - Lake shore site	- Mountainous site - Both sides along the routes are rather steep slopes.
Land Use	- cultivated lands, Ranch - Woodlot (forestry)	- Ranch, cultivated lands (pinery) - Woodlot (forestry)	- Ranch, cultivated lands - Woodlot (forestry)
Socio-economy	- Farming: cassava, maize, ground nut, beans, rice, millet, sugarcane - Fishing: tilapia, Nile perch - Livestock: cattle, goat, chicken - Approx. average monthly income: 50,000 - 100,000 (farming), 150,000 - 200,000 (fishing), up to 950,000 (trading) UGX/household	- Farming: pineapple, coffee, matoke, cassava, maize, beans, sugarcane - Fishing: tilapia, Nile perch - Livestock: cattle, goat, chicken - Trading: retailers - Approx. average monthly income: 50,000 - 150,000 (farming), 300,000 (trading) UGX/household	- Farming: matoke, coffee, cassava, beans - Livestock: cattle, goat, chicken - Trading: retailers - Approx. average monthly income: 50,000 - 100,000 (farming) UGX/household
Forest Reserve	- Irimbi CFR (Bugiri): Approx. 500m on the route	- Nabukonge CFR (Masaka): Approx. 500m on the route - Kitasi CFR (Masaka): Approx. 500m on the route - Mujuzi CFR (Masaka): Approx. 2km on the route	None
Wetland	- Common wetlands - There are few wetlands and most them are seasonal ones. - Local people have been cultivating the wetlands	- Common wetlands - There are permanent wetlands - The route in Rakai passes a wetland at 2km	- Common wetlands - There are permanent wetlands
Suggestions from EOs*	- Water flow in the wetlands should not be obstructed by poles - Embankment for pole installation in the wetlands should be shorten from roads - No erosion from the embankment - Involvement of communities (local councils), district offices and sub-counties - Sensitization for workers and local peoples - Conserve cultural and valuable trees and re-plantation - Electricity is a step for improving livelihood leading to conserve environment - Prevent preservatives of poles being into the wetlands		

Note: * EO (Environment Officer)

2.4.2 Location of the 33kV Distribution Lines

In three Areas, the structures along the requested routes are built set-back especially in the trading centers. However, the other lands along the routes are mostly used for cropland, ranch and woodlot except natural vegetation and wetlands. Some branch routes are located along very narrow roads. The major aspects of roads on the requested routes are as follows.

- Area-4: The main requested route along the road between Mayuge TC and Lumino TC is managed by UNRA. It can be seen that the road reserve is secured even not certainly 15m from the road center in the TCs. LC I chairpersons or local council members interviewed in the field survey are aware of the road reserve along the main route.
- Area-2: The requested routes are located along rather wider district roads.
- Area-5: All roads are narrow passing in mountainous site.

On that basis, the road reserves of selected routes should be cleared according to road classification of national and district levels, if REA will use the road reserves for the Project. Even in case that REA will not use the road reserve, distances to be kept from them should be cleared.

Meanwhile, REA's policies and procedures how to secure the routes of 33kV distribution lines should be confirmed. REA will take the following steps for compensation on the routes.

- Community meeting
- Survey and Explanation to persons whose properties are affected
- Agreement with the wayleaves consent form
- Evaluation of properties on the routes with the wayleaves assessment form
- Preparation of evaluation report
- Submission of the evaluation report to a Chief Government Valuer in Ministry of Land
- Assessment and authorization by a Chief Government Valuer

Explanation of evaluation results to the affected owners and payment

2.4.3 Environmental Certificate (EC)

REA shall obtain an Environmental Certificate (EC) from NEMA to implement the Project. As the first step, REA shall submit NEMA a Project Brief which describes the outline of the project, likely impacts caused by the Project and the mitigation measures. NEMA will determine whether or not the Project is exempted from an EIA based on the Project Brief. For obtaining the EC with the Project Brief exempted from the EIA, one of important issue is negative impact on natural environment especially on the central forest reserves (CFR) and wetlands.

In the requested areas, most lands along the requested routes are cultivated already and the Environment Officers say the wetlands have common aspects in the country. In this context, the 33 kV distribution lines can minimally affect the natural environment. The major aspects of nature are as follows. Regarding these aspects, Area-4 will have the least negative impacts on the natural environment by the Project.

- Area-4: The Area has totally gently undulating hills in topography and the requested route passes a CFR named Irimbi CFR which is used for industrial and commercial plantation on rocky hill in the short length at approximately 500m. In the inland, there are seasonal wetlands that the local people have been cultivating, and few wetlands on the lakeshore area.
- Area-2: In Masaka District, the topography is hilly and the requested routes pass through three CFRs and several permanent wetlands. One of them, Mujuji CFR, is located along the shore of Lake Victoria. In the route of Rakai District, there are gently undulating hills and no CFRs but the route passes a permanent wetland at approximately 2km.
- Area-5: There are no CFRs although several wetlands are located, and Area-5 has mountainous topography. Lands along the requested routes are rather steep slopes than the other Areas. Several trading centers are also built on the slopes.

3. Priority of the Requested Sites

Based on the discussion and agreement between Both Parties, the site survey was carried on three sites which was rated as Priority Ranking A and Priority Ranking B in M/D. The areas where the site survey was carried out were shown in following Table.

Table 5 Areas where Site Survey was carried out

Rate	Areas	Components
Priority A	Area-4	Extension of 33 kV distribution linein Iganga, Bugiri and Busia District
Priority B	Area-2	Extension of 33 kV distribution line in Masaka and Rakai District
Priority B	Area-5	Extension of 33 kV distribution line in Bushenyi and Rukungin District

Concerning Area-5, construction of 33 kV distribution line in length of 86.0 km had been originally requested. It had been confirmed through discussion between Both Parties that some part of the requested component has been already constructed by the Ugandan side, and construction of 33 kV distribution line in length of 58.7 km had been specified in M/D as the components of the Project. However, it was confirmed through the site survey that most of the distribution line in the length of 58.7 km specified in M/D has also been constructed or under construction. The rest of the requested lines were separated to four parts and the length of each part is less than 10 km. Therefore, the scale of the components is considered to be too small for the Japan's grant aid project, and the scale merit is not expected. It is strongly recommended that the component is constructed with budget of the Ugandan side.

Following Table shows the total number of Trading Centers, public facilities such as schools and health centers, and general households from the site survey. Comparing with Area-4 and Area-2, the number of those in Area-4 is extremely bigger than those in Area-2, even though difference of the length of the components is took into consideration.

Table 6 Areas where Site Survey was carried out

Areas	Length [km]	Trading Center	Schools			Health Center				Households
			Primary	Secondary	Tertiary	IV	III	II	I	
Area-4	150	37	101	17	2	2	5	8	0	9095
Area-2	65	13	23	5	3	0	2	1	2	1980
[redacted]										

Notes: The numbers described above are specified based on the results of the site survey

Based on the results of the site survey, the Team prioritized the components of the Project as follows in consideration of contributions to activities of public facilities and general households, and project effectiveness.

Table 7 Priority Rankin of the Components

Priority Ranking	Areas	Components	* Length [km]
1st	Area-4	Extension of 33 kV distribution lines in Iganga, Bugiri and Busia District	Approx. 130 km
2nd	Area-2	Extension of 33 kV distribution line in Masaka and Rakai District	Approx. 65 km
3rd	Area-5	Extension of 33 kV distribution line in Bushenyi and Rukungiri District	Approx. 30 km

Notes:*The length is specified based on the results of the site survey

4. Design Conditions and Technical Specifications

4.1 Design Conditions

Design conditions to be applied to the Project are described as follows.

4.1.1 Climatic Conditions

Natural conditions for the equipments and facilities design are described as follows.

Table 8 Climatic Conditions for the equipments and facilities design

Item		The Project Area		
		Area-4 (Iganga, Bugiri and Busia District)	Area-2 (Masaka and Rakai District)	Area-5 (Bushenyi and Rukungiri District)
Altitude		Less than 1,000m	Less than 1,000m	Less than 1,500m
Ambient Temperature	Maximum	35℃	33℃	30℃
	Minimum	15℃	12℃	10℃
	Mean	25℃	22℃	20℃
Maximum Humidity		85%	80%	75%
Max. Wind Velocity		20m/sec.	15m/sec.	25m/sec.
Rainfall		2,200mm/year	2,500mm/year	2,700mm/year
Seismic Force		Horizontal 0.1G	Horizontal 0.1G	Horizontal 0.1G
Soil Bearing Capacity		5 ton/m^2	5 ton/m^2	10 ton/m^2

Source: UGANDA DISTRICTS Information Handbook (2007-2008)

4.1.2 Basic Electrical Design Conditions

(1) Electric System (Voltage and Wiring System)

Voltage, wiring, frequency and earthing system to be applied for the 33kV distribution line shall be the same as those of the existing facilities. The summary of the electrical system concerned with the Project is shown in the following Table

Table 9 Summary of Electricity System

Nominal Voltage	33 kV
Maximum Voltage	36 kV
Wiring Method	3 phase, 3 wires
Frequency	50 Hz
Earthing System	Effective Earth
Earth Fault Current	25kA
Lightning Impulse Withstand Voltage (LIWV)	170kV
Commercial Frequency Withstand Voltage	70kV
Creepage distance	16 mm / kV
Overhead Grounding Wire	Not Required

(2) Other Electrical Systems

1) Color coding

Applicable color coding shall be in accordance with IEC standard, Red, Yellow, Blue and Black (Neutral).

2) Safety Factor

Following Safety Factor shall be maintained in all design and construction works:

- Pole, Foundations: 2.0
- Conductor, Crossarms: 2.5
- Insulators: 2.0

3) Clearance for Conductors

Clearance on 33kV overhead line shall be as follows:

- Minimum Clearance
  - Phase to phase: 430 mm
  - Phase to ground 380 mm
- Minimum Height from Ground Level
  - Road Crossing: 7.5 m
  - Roadside 6.5 m

4) Electrical Pole Span Length

- Single and double pole: Maximum 100m
- Three member pole: Maximum 300m

5) Load Break Switch

Load Break Switch shall be installed at major branching point and at intervals of about 13km for inspection and maintenance of the 33kV distribution line.

6) Auto Recloser

Auto Recloser shall be installed at major connection point or branch point.

7) Metering Unit

Metering Unit shall be installed at connection point where the operator (UMEME, FERDSULT, others) is not yet decided.

4.1.3 Applicable Codes / Standards and Units

(1) Applicable Codes/Standards

The following Japanese and International standards/codes shall be generally applied to the Project as well as the Uganda National Primary Grid Code and other technical standards specified by REA.

- International Electrotechnical Commission (IEC)
- British Standard (BS)
- International Standardization Organization (ISO)
- Japanese Industrial Standard (JIS)
- Japanese Electrotechnical Commission (JEC)
- The Standard of Japan Electrical Manufacturer's Association (JEM)
- Japan Cable Maker's Association Standard (JCS)
- Other Japanese and International Standards concerned

(2) Units

Unit of length, area, volume, mass (weight), etc. used in the Project (such as Design, manufacturing, Installation, Testing and Reporting) shall be in accordance with the International System of Units (SI) unless otherwise specified.

4.2 Basic Technical Specifications

Basic technical specifications of major equipment and materials are described as follows.

Table 10 Basic technical specifications of major equipments

Equipment	Specifications
(1) Distribution Transformers	
1) Applicable Standard	IEC, JIS, JEC, JEM or Equivalent
2) Type	Oil immersed, Hermetically-sealed, Outdoor, Pole-mount type
3) Nominal Voltage	33,000/415-240 V
4) Impedance Voltage	4-5 %
5) Tapping Voltage (%) on HV Side	±2.5 %, ±5.0 % (no voltage tap changer)
6) Phase	HV:3 phases , LV :3 phase,4-wire
7) Frequency	50 Hz
8) Vector Symbol	Dyn11
9) Capacity	50, 100, 200 kVA
10) Efficiency (%)	50 kVA:97.2<, 100 kVA:97.7<, 200 kVA:98<
11) Accessories	-Name Plate -Oil temperature indicator and breather
(2) Load Break Switch	
1) Applicable Standard	IEC, JIS, JEC, JEM or Equivalent
2) Type	Manual Operation
3) Rated Nominal Current	630 A
4) Rated Voltage	33 kV
5) Rated Frequency	50 Hz
6) LIWV	170 kV
7) Rated Breaking Capacity	630 A (at load current)
8) Rated Short-Time Current	16 kA (1 sec.)
9) Creepage Distance	min. 825 mm
10) Accessories	-Name Plate -Operation mechanism -Hot-dipped galvanized steel support with fixing material (Cross Arm Set, etc)
(3) Fused Cutout Switches	
1) Applicable Standard	IEC, JIS, JEC, JEM or Equivalent
2) Type	Outdoor Type
3) Rated Current of Unit	100 A
4) Rated Voltage	33 kV
5) Rated Frequency	50 Hz
6) LIWV	170 kV
7) Interrupting Current	8 kA
8) Fuse	6 A to 25 A (depending on the size of Tr.)
9) Operation	To be operated by rod from the ground
10) Accessories	-Hook 5 m, -Hot-dipped galvanized steel support with fixing material

Equipment	Specifications
(4) Lightning Arrester	
1) Applicable Standard	IEC, JIS, JEC, JEM or Equivalent
2) Type	Outdoor, Zinc-oxide, Gapless Type
3) Nominal System Voltage	33 kV
4) Rated Voltage	Minimum 30 kV (rms)
5) Nominal Discharge Current	5 kA (8/20 μs)
6) Protection Ratio	Minimum 1.2
7) Accessories	Hot-dipped galvanized steel support with fixing material
(5) Metering Unit	
1) Applicable Standard	IEC or Equivalent
2) Metering Unit	33 kV STC 18kA -1sec 200 or 100 Amp, Outdoor oil filled, Pole mounted (CT-VT) Class:33,000:110 Volt/50 VA/Class 0.2 2xCT: 200-100-50:1 Amp/10 VA Class 0.2
3) Electric Meter (Remarks: Electric Meter is to be provided two(2)) (Main and Checking)	KWhr & kVar Import/Export Measurement, KVAh Derivation 16 times of use 4V free out put relays, Load Profiling (450 days, 1 channel, 30 mins), 3-Phase,
4) Control Cable	3-Wire, 50 Hz, Voltage 110 V, Current:/1 A, Class 0.2
5) Outdoor Metering Kiosk	Min. 2.5 mm^2 7C cu, 10m
6) Terminal Blocks	Waterproof type, with pad-lock (spare key: 3pcs)
7) Cable Ties	13 way 1 lot
(6) Auto Recloser	
1) Applicable Standard	IEC or Equivalent
2) Type	Pole mounting, gas insulated auto circuit recloser
3) Continuous Current Capacity	630A
4) Rated Short-Time Current	16 kA (1 sec.)
5) Control Cubicle	Simple programming is provided from the control panel. Closing and tripping is from high quality and long life batteries which charge capacitors. Control cubicle is stainless steel enclosure.
6) Accessories	- Voltage transformers (33kV/110V, Accuracy class 1.0, 50VA) - Surge arresters (10kA, 8/20 μs) - Control cables - Fixing materials for electrical pole - Relay software - Technical and installation manual
(7) Conductor for 33kV Distribution Line	
1) Applicable standard	IEC or Equivalent
2) Type	All Aluminum Alloy Conductor (AAAC)
3) Size	100 mm^2
4) Length per a Drum	2,000 m

Equipment	Specifications
(8) Wooden Pole with Pole Cap	
1) Wooden Pole	
▪ Material	Creosoted wooden pole
▪ Length	11 m /12 m / 15 m
▪ Diameter at top Min.	11 m(190-210mm) / 12m(210-235mm)
2) Pole Cap	
▪ Material	15m(220-245mm)
▪ Accessories	Steel Plates/Iron Sheets Nail (Q'ty 2 pcs/cap)

5. Data Collection of connecting situations in the Previous JICA's Project Area

The Ugandan side shall prepare answers for the questionnaire, which asks the record of the number of connected customers, customer category, and electricity consumption for the sites of the previous projects (JICA I and II) by April 26, 2011.

6. Questionnaire for the Second Field Survey

For basic design of the Project, the Ugandan side shall prepare answers for the questionnaire for the second field survey attached in this Field Report as Part 5 of "ANNEX" **before the second field survey**.

7. List of Parties Concerned in the Recipient Country

Name	Employment Position
Ministry of Energy and Mineral Development (MEMD)	
Eng. Moses Murengezi	Advisor to Chairman (EMSWG)
Mr. Sajjabi J. Fredrick	Senior Energy Officer
Emmanuel Sande Nsubuga	Energy Officer (Electrical)
Ministry of Finance, Planning and Economic Development (MFPED)	
Ms. Jennifer Muwuliza	AG. Commissioner Aid Liaison Department
Mr. Mugagga Denis	Economist – Aid Liaison Department
Mr. Tomohito Kanaizuka	ODA Loan Advisor Aid Liaison Department
Rural Electrification Agency (REA)	
Mr. Benon Bena	Manager Investment Planning & Promotion
Mr. Philip F.P.Ggayi	Senior Planning Engineer
Mr. Werike K. Godfrey	Manager Project Monitoring & Evaluation
Mr. Muguwa Andrew	Senior Planning Engineer
Ms. Deborah Nantume	Senior Construction Engineer
Ms. Flavia Uwayezu	Project Engineer Planning
Ms. Joan Kayanga Mutiibwa	Project Engineer Construction
Mr. James Gideon Liita	Wayleaves Officer
Mr. Daniel Mugarura	Intern
Uganda Electricity Transmission Company Ltd. (UETCL)	
Mr. Eriasi Kiyenba	Managing Director/CEO
Uganda Electricity Generation Company Ltd. (UEGCL)	
Mr. Dan W Mayanja	Technical Manager
Mr. Kitayimwa Godfrey	Electrical Engineer
Mr. Kanzira Milton	Procurement Financial Specialist
Mr. Jimmy. C. Oconel	Hedonic Engineer / Consultant
Mr. Otim Moses	Environmental Specialist
National Environment Management Authority (NEMA)	
Mr. Francis Ogwal	Natural Resource Management Specialist (Biodiversity & Rangelands)
Mr. Alex Winyi Kiiza	Environmental Impact Assessment Officer

Ministry of Water and Environment (MWE)	
Ms. Lucy Iyango	Assistant Commissioner Wetlands
Uganda National Road Authority (UNRA)	
Mr. Patrick Muleme	Project Engineer – Technical Services
National Forestry Authority (NFA)	
Mr. Paul Musamali Buyerah	Director Corporate Affairs
Electricity Regulatory Authority (ERA)	
Eng. Semitala Norbert	Director, Technical Regulation
Mr. Patrick J. Mwesige	Director Financial & Admin' Services
Ferdsult Engineering Services Ltd.	
Mr. Simbwa Emeil	Projects Manager
Umeme Limited	
Mr. Ssonko Asuman	Supervisor of Hamanve s/s
Mr. Michael Oputo	District Manager Iganga and Kamuli
Mr. Sande John Baptist	Technical Officer
Hydromax Limited	
Mr. Maheshwara Reddy	Executive Director
Mr. Sentumbwe Godfrey	General Manager
Masaka District	
Ms. Rose Nakyejwe	Environment Officer
Mr. Behwera Wilson	Wetland Officer
Rakai District	
Mr. Kiyingi Jamil	Wetland Officer
Mayuge District	
Mr. Mr. Aramu Thomas	Environment Officer
Bugiri District	
Ms. Benadet Kauma	Assistant Environmental Officer

Busia District

Mr. Johnson Erienyu	Forest Officer
Ms. Teopista Namajja	Municipality Environmental Officer

Royal Norwegian Embassy

Ms. Katrin C. Lervik	Energy Counsellor

The World Bank Uganda Country Office

Somin Mukherji	Senior Financial Analyst Sustainable Development Department Africa Region

KfW Development Bank

Dr. Jan Martin Witte	Senior Project Manager
Mr. Klaus Gihr	Division Chief Sub-Saharan Africa Energy Transport Telecommunication

Wildlife Conservation Society

Mr. Andy Plumptre	Director Albertine Rift
Ms. Sarah Prinsloo	Staff

JICA Uganda Office

Mr. Tetsuo Seki	Chief Representative
Ms. Akiko Nanami	Representative
Ms. Masae Iijima	Project Formulation Adviser
Mr. Daniel Rutabingwa	Consultant for Infrastructure Sector

ANNEX

PART 1

Extension of 33 kV distribution line in Iganga, Bugiri and Busia District (Area-4)

Rural Electrification Phase III Socio-economic Data in Area-4

	Trading Center	Parish	Sub-county	Schools			Health Center				Households	Remarks
				Primary	Secondary	Tertiary	IV	III	II	I		
1	Maloa	Maloa	Mpungwe	3	0	0	0	0	1	0	100	
2	Mpungwe	Majji	Mpungwe	5	1	0	0	0	0	0	450	
3	Namabandu	Kasasi	Makatu	3	0	0	0	0	0	0	100	
4	Buwongo	Makatu	Makatu	1	0	0	0	0	0	0	120	
5	Makatu	Makatu	Makatu	2	2	0	0	1	0	0	150	
6	Nandiwe	Kasasi	Makatu	1	0	0	0	0	0	0	200	
7	Bwalula	Isegero	Nankoma	2	1	0	0	0	0	0	300	
8	Matovu	Matovu	Nankoma	2	0	0	0	0	0	0	200	
9	Nabigingo	Nanigingo	Buhidha	2	0	0	0	0	1	0	200	
10	Irimbi	Kitanda	Mutaeere	2	0	0	0	0	0	0	30	
11	Mayuge-Bukholi	Mayuge	Budaya	5	0	0	0	1	0	0	1200	
12	Budde	Buswolya	Budaya	0	0	0	0	0	0	0	100	
13	Nsugo	Kiliyo	Buyinja	7	1	0	0	0	1	0	350	
14	Namuyingo	Namuyingo	Namuyingo T.C.	21	7	1	1	0	0	0	3000	
15	Lwangosia	Lwangosia	Buyinja	4	1	0	1	0	0	0	90	
16	Nairobi	Buweyo	Banda	1	0	0	0	0	0	0	40	
17	Latolo	Latolo	Banda	1	1	0	0	1	0	0	260	
18	Kilindisi	Latolo	Banda	2	0	0	0	0	0	0	15	
19	Lugala	Lugala	Banda	3	0	0	0	0	1	0	300	
20	Busuna	Buchumba	Banda	1	0	0	0	0	0	0	100	
21	Bucito	Bujuwanga	Banda	2	0	0	0	0	1	0	100	
22	Busito Landing Site	Bujuwanga	Banda	3	0	0	0	0	0	0	150	
23	Bumeru A	Bushimo	Mutumba	5	0	0	0	0	0	0	50	
24	Bumeru B	Buchimo	Mutumba	1	0	0	0	0	0	0	100	

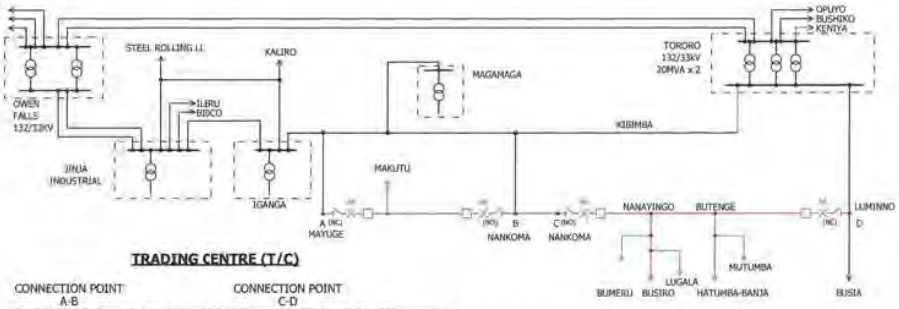
Route Map for Extension of 33 kV Distribution Line in Iganga, Bugiri and Busia District (Area-4)

Rural Electrification Phase III Socio-economic Data in Area-4

	Trading Center	Parish	Sub-county	Schools			Health Center				Households	Remarks
				Primary	Secondary	Tertiary	IV	III	II	I		
25	Buchimo	Buchimo	Mutumba	2	1	0	0	0	0	0	40	
26	Mulombi B	Muwema	Mutumba	1	0	0	0	0	1	0	100	
27	Butebey A	Muwema	Mutumba	1	0	0	0	0	0	0	40	
28	Mutumba	Mutumba	Mutumba	3	1	0	0	1	0	0	200	
29	Hatumba-Banja	Bululc	Mutumba	1	0	0	0	0	0	0	150	
30	Nabusera	Bululc	Mutumba	1	0	0	0	0	0	0	100	
31	Farm	Sinde	Buhemba	1	0	0	0	0	1	0	200	
32	Lunyo	Busisbaa	Lunyo	2	1	0	0	1	0	0	260	
33	Buwanga	Nalwire	Lunyo	1	0	1	0	0	0	0	80	
34	Hukemo	Nalwire	Lunyo	3	0	0	0	0	0	0	150	
35	Mundindi	Mundindi	Busime	4	0	0	0	0	1	0	70	
36	Lumuli	Rukaka	Busime	1	0	0	0	0	0	0	50	
37	Mwembe-Tayari	Busime	Busime	1	0	0	0	0	0	0	50	
	Total			101	17	2	2	5	8	0	9095	

PART 2

Extension of 33 kV distribution line in Masaka and Rakai District (Area-2)



TRADING CENTRE (T/C)

CONNECTION POINT A-B

No.	NAME OF T/C
1	MAINA
2	MPUNUGWE
3	NAMABUNDU
4	BUWONGO
5	MAKUTU
6	NONDWE
7	BWALULA
8	MATOVU

CONNECTION POINT C-D

No.	NAME OF T/C
9	NABIGINGO
10	IRIMBI
11	MAYUGE-BUKHOLI
12	BUDDE
13	NSANGO
14	NAMAYINGO
15	LWANGOSIA
16	NAIRONI
17	LUTOLO
18	KILINDINI
19	LUGALA
20	BUSUMA
21	BUSIRO
22	BUSIRO LANDING SIDE
23	BUMERU-A
24	BUMERU-B

No.	NAME OF T/C
25	BUCHIMO
26	MALOMBI-B
27	BUTEBEY-A
28	MUTUMBA
29	HATUMBA-BANJA
30	NAMUSERA
31	FARM
32	LUNYO
33	BUWANGO
34	HUKEMO
35	MUNDINDI
36	LUMULI
37	MWEMBE-TAYARI

SYMBOLS
: EXISTING
: PLANNING
: THE PROJECT
: LBS
: AUTO RECLOSER
: METERING UNIT
: NORMAL CLOSE
: NORMAL OPEN

NETWORK DIAGRAM
AREA-4 (IGANGA, BUGIRI AND BUSIA DISTRICT)

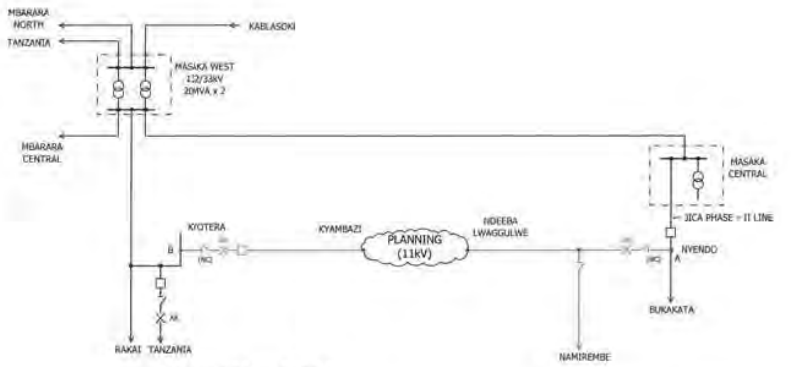
Route Map for Extension of 33 kV Distribution Line in Masaka and Rakai District (Area-2)

Socio-economic Data in Area-2

	Trading Center	Parish	Sub-county	Schools			Health Center				Households	Remarks
				Primary	Secondary	Tertiary	IV	III	II	I		
1	Buwunga	Buwunga	Buwungi	3	0	0	0	0	0	1	120	
2	Nakaiyaga	Nalozaale	Buwungi	1	0	1	0	0	0	1	100	
3	Namirembe	Buyinga	Kyanamukaka	1	0	0	0	0	0	0	1000	
4	Bukeri	Kanywa	Buwungi	3	1	0	0	1	0	0	50	
5	Nkunkwe	Kanywa	Buwungi	3	0	0	0	0	0	0	100	
6	Narozari	Bugere	Buwungi	1	1	1	0	0	0	0	10	
7	Kyambazi	Kyantale	Kyanamkaka	2	0	0	0	0	0	0	80	
8	Ndeeba Lwaggulwe	Lagguhwe	Kyaliga	2	1	0	0	0	0	0	120	
9	Kayanja	Kayanja	Lwankoni	0	0	0	0	0	1	0	30	
10	Byafula	Kayanja	Lwankoni	2	0	0	0	0	0	0	20	
11	Kabawanga	Bisanja	Kabira	2	0	0	0	0	0	0	100	
12	Kabira	Njala	Kabira	2	1	0	0	1	0	0	120	
13	Kifuta	Njala	Kabira	3	1	1	0	0	0	0	130	
	Total			25	5	3	0	2	1	2	1980	

PART 3

Extension of 33 kV distribution line in Bushenyi and Rukungiri District (Area-5)



TRADING CENTRE (T/C)

CONNECTION A-NKUNKWE

No.	NAME OF T/C
1	BUWUNGA
2	NAKAIYAGA
3	NAMIREMBE
4	BUKERI
5	NKUNKWE
6	NAROZARI
7	KYAMBAZI

CONNECTION B-NDEEBA LWAGGULWE

No.	NAME OF T/C
8	NDEEBA LWAGGULWE
9	KAYANJA
10	BYAFULA
11	KABAWANGA
12	KABIRA
13	KIFUTA

SYMBOLS
: EXISTING
: THE PROJECT
: LBS
: AUTO RECLOSER
: METERING UNIT
(NC) : NORMAL CLOSE
(NO) : NORMAL OPEN

NETWORK DIAGRAM
AREA-2 (MASAKA AND RAKAI DISTRICT)

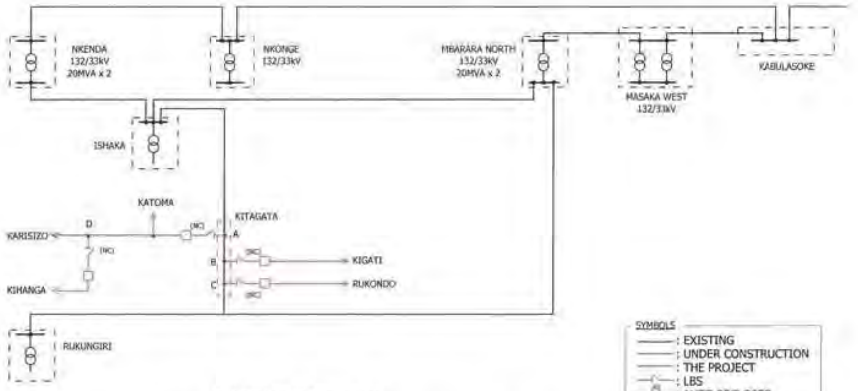
Route Map for Extension of 33 kV Distribution Line in Bushenyi and Rukungiri District (Area-5)

Socio-economic Data in Area-5

	Trading Center	Parish	Sub-county	Schools			Health Center				Households	Remarks
				Primary	Secondary	Tertiary	IV	III	II	I		
1	Kasaana	Kasaana West	Kitagata	3	2	1	0	1	0	0	300	
2	Nyakibere	Kasaana East	Kitagata	0	0	0	0	0	0	0	25	
3	Kagati	Kasaana East	Kitagata	4	0	0	0	0	1	0	150	
4	Rukondo A	Rukondo	Kitagata	4	1	0	0	0	1	0	200	
5	Rukondo B	Rukondo	Kitagata	2	1	0	0	0	0	0	20	
6	Bwoma	Kyaushakara	Kitagata	1	0	0	0	0	0	0	40	
7	Katoma	Kyaushakara	Kitagata	2	0	0	0	0	0	0	120	
8	Furuma II	Bukongora	Mutara	2	0	0	0	0	0	0	20	
9	Furuma I	Bukongora	Mutara	0	0	1	0	0	0	0	30	
10	Kihanga	Kihanga	Buhenga	2	0	0	0	1	0	0	80	
	Total			20	4	2	0	2	2	0	985	

PART 4

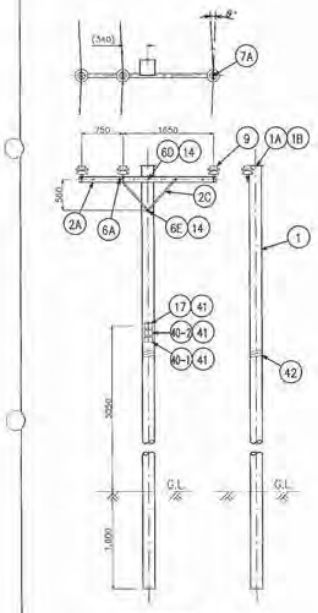
Pole Assembly Drawing for Distribution Line



TRADING CENTRE (T/C)

CONNECTION A-KATOMA		CONNECTION B-KAGATI		CONNECTION C-RUKONDO		CONNECTION D-KIHANGA	
No.	NAME OF T/C	No.	NAME OF T/C	No.	NAME OF T/C	No.	NAME OF T/C
6	BWOMA	1	KASAANA	4	RUKONDO-A	11	KIHANGA
7	KATOMA	2	NYAKIBERE	5	RUKONDO-B		
8	FURUMA-II	3	KAGAYI				
9	FURUMA-I						

NETWORK DIAGRAM
AREA-5 (BUSHENYI AND RUKUNGIN DISTRICT)



STRAIGHT LINE POLE 0≦θ≦5

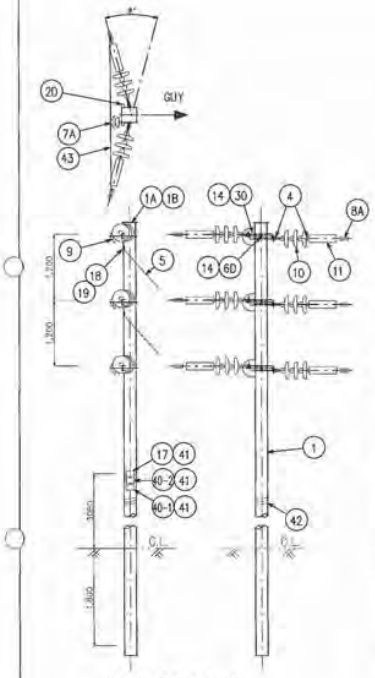
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (12m)	1	木柱 (12m)
1A	Pole Cap	1	電柱頭部キャップ
1B	Pole Cap Nails	2	キャップ固定釘
2A	Crossarm L100X75X7-2500	1	鋼材 L100X75X7-2500
2C	Crossarm Brace	2	補強用アーム
6A	Bolt & Nut M16x500(Crossarm/Bracket)	2	ボルト・ナット M16x500
6D	Bolt & Nut M16x700(Crossarm/Bracket)	1	ボルト・ナット M16x700
6E	Bolt & Nut M16x100(Pole/Bracket)	2	ボルト・ナット M16x100
7A	Preformed Tie-Tie	2	引留線クランプ
9	33kV Pin Insulator	3	33kV ピン碍子
14	Square Washer	2	角座金
17	Number Plate	1	プレート
40-1	Danger Plate	1	危険標示
40-2	ODA Plate	1	ODA マーク
41	Nail (for Plate)	12	釘 (プレート用)
42	Anti Climbing Barbed Wire(2m)	1	昇柱防止用有刺鉄線(2m)

SCALE 1/60

TITLE TYPE A
INTERMEDIATE(Angle 0 to 5 deg.)
引通し柱 (0度~5度)

DRG.NO. T-01

A2-1



LIGHT ANGLE POLE 5≦θ≦30

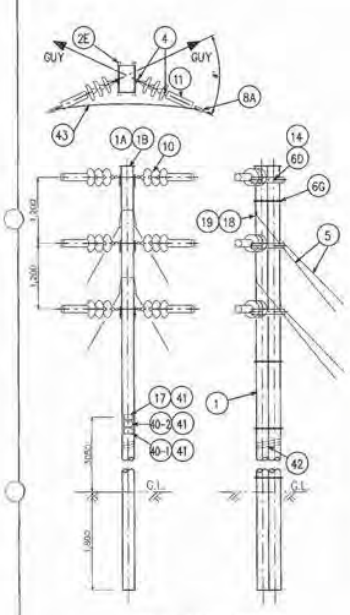
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (12m)	1	木柱 (12m)
1A	Pole Cap	1	電柱頭部キャップ
1B	Pole Cap Nails	2	キャップ固定釘
2D	Crossarm CV2X150X15-300	3	鋼材 CV2X150X15-300
4	Anchor Shackle	8	アンカーシャックル
5	Ball Clevis	8	ボールクレビス
9	Socket Eye	8	ソケットアイ
5A	Strain Plate	3	歪取プレート
5B	Dead End Grip for Pole	2	引留グリップ(木柱用)
5C	Dead End Grip for Thimble	2	引留グリップ
5D	Dead End Grip for Insulator	4	引留グリップ(碍子用)
5E	Stay Wire 45sqmm (15m)	2	支線
5F	Stay Insulator 33kV	2	引留碍子
5G	Stay Rod	2	支線ロット
5H-1	Stay Plate	2	支線プレート
5H-2	Stay Anchor	2	支線アンカー
7E	Turnbuckle	2	ターンバックル
5J	Ivy Protection	2	ラッ被覆
6D	Bolt & Nut M16x350(Crossarm/Pole)	3	ボルト・ナット M16x350
7A	Preformed Tie-Tie	3	引留ラッ
8A	Connector CAI 100/AI 100	6	コネクター
9	33kV Pin Insulator	3	33kV ピン碍子
10	Disc Insulator	18	懸垂碍子
11-1	Dead End Clamp	6	引留ラッランプ
11-2	Adaptor for Dead End Clamp	6	引留ラッランプ用ボルト
14	Square Washer	12	角座金
17	Number Plate	1	プレート
18	Nail	20	釘(碍子用)
19	Shackle	20	シャックル
40-1	Danger Plate	1	危険標示
40-2	ODA Plate	1	ODA マーク
41	Nail (for Plate)	12	釘 (プレート用)
42	Anti Climbing Barbed Wire(2m)	1	昇柱防止用有刺鉄線(2m)
43	Conductor (AAAC 150sqmm)	50m	電線

SCALE 1/60

TITLE TYPE B
LIGHT ANGLE POLE(Angle 5 to 30deg)
角度柱 (5度~30度)

DRG.NO. T-02

A2-2



HEAVY ANGLE POLE 30≦θ≦50

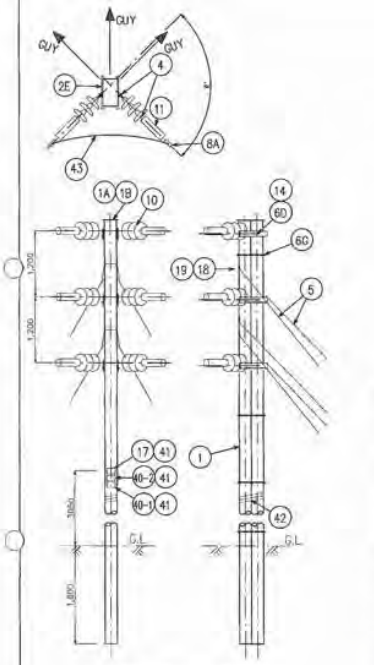
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (12m)	3	木柱 (12m)
1A	Pole Cap	3	電柱頭部キャップ
1B	Pole Cap Nails	4	キャップ固定釘
2C	Crossarm L100X75X7-600	6	鋼材 L100X75X7-600
4	Anchor Shackle	6	アンカーシャックル
5	Ball Clevis	6	ボールクレビス
9	Socket Eye	6	ソケットアイ
5A	Strain Plate	6	歪取プレート
5B	Dead End Grip for Pole	4	引留グリップ(木柱用)
5C	Dead End Grip for Thimble	4	引留グリップ
5D	Dead End Grip for Insulator	8	引留グリップ(碍子用)
5E	Stay Wire 45sqmm (15m)	4	支線
5F	Stay Insulator 33kV	4	引留碍子
5G	Stay Rod	4	支線ロット
5H-1	Stay Plate	4	支線プレート
5H-2	Stay Anchor	4	支線アンカー
7E	Turnbuckle	4	ターンバックル
5J	Ivy Protection	4	ラッ被覆
6D	Bolt & Nut M16x350(Crossarm/Pole)	6	ボルト・ナット M16x350
8C	Bolt & Nut M20x800 with square washer	4	四角ワッシャ M20x800 角座金
8A	Connector CAI 100/AI 100	6	コネクター
10	Disc Insulator	18	懸垂碍子
11-1	Dead End Clamp	6	引留ラッランプ
11-2	Adaptor for Dead End Clamp	6	引留ラッランプ用ボルト
14	Square Washer	12	角座金
17	Number Plate	1	プレート
18	Nail	20	釘(碍子用)
19	Shackle	20	シャックル
40-1	Danger Plate	1	危険標示
40-2	ODA Plate	1	ODA マーク
41	Nail (for Plate)	12	釘 (プレート用)
42	Anti Climbing Barbed Wire(2m)	2	昇柱防止用有刺鉄線(2m)
43	Conductor (AAAC 150sqmm)	60m	電線

SCALE 1/60

TITLE TYPE C
HEAVY ANGLE POLE(Angle30 to 50deg)
角度柱 (30度~50度)

DRG.NO. T-03

A2-3



HEAVY ANGLE POLE 50≦θ≦90

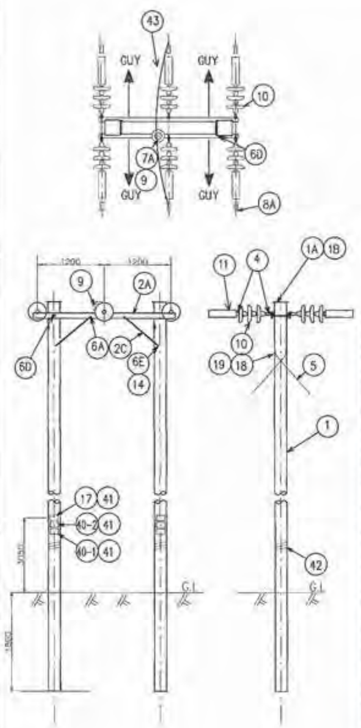
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (12m)	3	木柱 (12m)
1A	Pole Cap	3	電柱頭部キャップ
1B	Pole Cap Nails	4	キャップ固定釘
2C	Crossarm L100X75X7-600	6	鋼材 L100X75X7-600
4	Anchor Shackle	6	アンカーシャックル
5	Ball Clevis	6	ボールクレビス
9	Socket Eye	6	ソケットアイ
5A	Strain Plate	5	歪取プレート
5B	Dead End Grip for Pole	5	引留グリップ(木柱用)
5C	Dead End Grip for Thimble	5	引留グリップ
5D	Dead End Grip for Insulator	10	引留グリップ(碍子用)
5E	Stay Wire 45sqmm (15m)	5	支線
5F	Stay Insulator 33kV	5	引留碍子
5G	Stay Rod	5	支線ロット
5H-1	Stay Plate	5	支線プレート
5H-2	Stay Anchor	5	支線アンカー
7E	Turnbuckle	5	ターンバックル
5J	Ivy Protection	5	ラッ被覆
6D	Bolt & Nut M16x350(Crossarm/Pole)	5	ボルト・ナット M16x350
8C	Bolt & Nut M20x800 with square washer	6	四角ワッシャ M20x800 角座金
8A	Connector CAI 100/AI 100	6	コネクター
10	Disc Insulator	18	懸垂碍子
11-1	Dead End Clamp	8	引留ラッランプ
11-2	Adaptor for Dead End Clamp	8	引留ラッランプ用ボルト
14	Square Washer	12	角座金
17	Number Plate	1	プレート
18	Nail	20	釘(碍子用)
19	Shackle	20	シャックル
40-1	Danger Plate	1	危険標示
40-2	ODA Plate	1	ODA マーク
41	Nail (for Plate)	12	釘 (プレート用)
42	Anti Climbing Barbed Wire(2m)	2	昇柱防止用有刺鉄線(2m)
43	Conductor (AAAC 150sqmm)	50m	電線

SCALE 1/60

TITLE TYPE D
HEAVY ANGLE POLE(Angle 50to 90deg)
角度柱 (50度~90度)

DRG.NO. T-04

A2-4

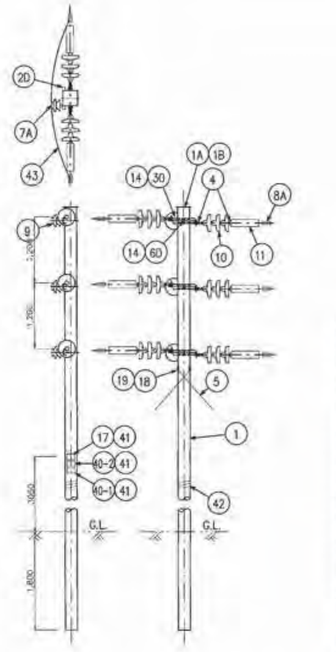


PART NO.	DESCRIPTION	QTY	[illegible]
1	Wooden Pole (12m)	2	[illegible] (12m)
1A	Pole Cap	2	[illegible]
1B	Pole Cap Nails	4	[illegible]
2A	Crossarm L100X75X7-2500	2	[illegible] L100X75X7-2500
2C	Crossarm Brace	4	[illegible]
4A	Anchor Shackle	6	[illegible]
4B	Ball Clevis	6	[illegible]
4C	Socket Eye	6	[illegible]
5A	Strain Plate	4	[illegible]
5B	Dead End Grip for Pole	4	[illegible]
5C	Dead End Grip for Thimble	4	[illegible]
5D	Dead End Grip for Insulator	8	[illegible]
5E	Stay Wire 45sqmm (15m)	4	[illegible]
5F	Stay Insulator 33kV	4	[illegible]
5G	Stay Rod	4	[illegible]
5H-1	Stay Plate	4	[illegible]
5H-2	Stay Anchor	4	[illegible]
5I	Turnbuckle	4	[illegible]
5J	Ivy Protection	4	[illegible]
6A	Bolt & Nut M16x50(Crossarm/Brace)	4	ボルトナット M16x50
6D	Bolt & Nut M16x350(Crossarm/Pole)	4	ボルトナット M16x350
6E	Bolt & Nut M16x400(Pole/Brace)	1	ボルトナット M16x400
7A	Preformed Top Tie	1	[illegible]
8A	Connector (Al 100/Al 100)	6	コネクター
9	33kV Pin Insulator	1	33kV ピン碍子
10	Disc Insulator	18	[illegible]
11-1	Dead End Clamp	6	[illegible]
11-2	Adapter for Dead End Clamp	6	[illegible]
14	Square Washer	4	[illegible]
17	Number Plate	1	プレート
18	Nail	5	[illegible]
19	Staple	8	ステップル
40-1	Danger Plate	1	[illegible]
40-2	ODA Plate	1	ODAマーク
41	Nail (for Plate)	12	[illegible]
42	Anti Climbing Barbed Wire(7m)	2	[illegible] (7m)
43	Conductor (AAAC 100sqmm)	10m	[illegible]

SCALE 1/60

TITLE TYPE E SECTION POLE 両留止柱

DRG.NO. T-05

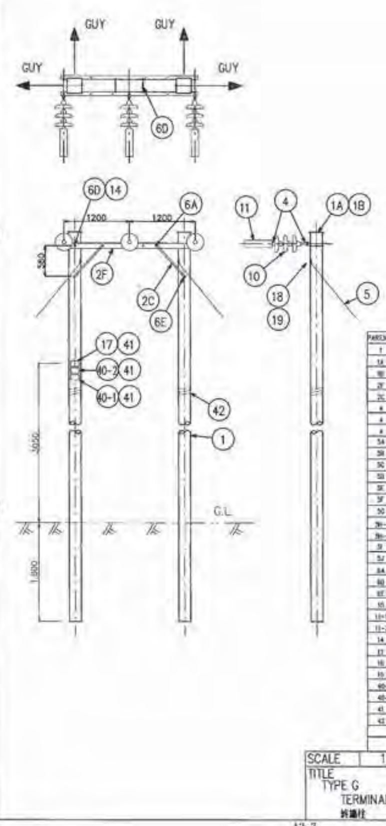


PART NO.	DESCRIPTION	QTY	[illegible]
1	Wooden Pole (12m)	1	[illegible] (12m)
1A	Pole Cap	1	[illegible]
1B	Pole Cap Nails	2	[illegible]
2D	Crossarm C100X50X5-300	3	[illegible] C100X50X5-300
4A	Anchor Shackle	6	[illegible]
4B	Ball Clevis	6	[illegible]
4C	Socket Eye	6	[illegible]
5A	Strain Plate	2	[illegible]
5B	Dead End Grip for Pole	2	[illegible]
5C	Dead End Grip for Thimble	2	[illegible]
5D	Dead End Grip for Insulator	4	[illegible]
5E	Stay Wire 45sqmm (15m)	2	[illegible]
5F	Stay Insulator 33kV	2	[illegible]
5G	Stay Rod	2	[illegible]
5H-1	Stay Plate	2	[illegible]
5H-2	Stay Anchor	2	[illegible]
5I	Turnbuckle	2	[illegible]
5J	Ivy Protection	2	[illegible]
6D	Bolt & Nut M16x350(Crossarm/Pole)	3	ボルトナット M16x350
7A	Preformed Top Tie	1	[illegible]
8A	Connector (Al 100/Al 100)	6	コネクター
9	33kV Pin Insulator	1	33kV ピン碍子
10	Disc Insulator	18	[illegible]
11-1	Dead End Clamp	6	[illegible]
11-2	Adapter for Dead End Clamp	6	[illegible]
14	Square Washer	3	[illegible]
17	Number Plate	1	プレート
18	Nail	8	[illegible]
19	Staple	8	ステップル
30	Eye Bolt(M20x300)	6	アイボルト
40-1	Danger Plate	1	[illegible]
40-2	ODA Plate	1	ODAマーク
41	Nail (for Plate)	12	[illegible]
42	Anti Climbing Barbed Wire(7m)	1	[illegible] (7m)
43	Conductor (100 sqmm)	10m	[illegible]

SCALE 1/60

TITLE TYPE F SECTION POLE (VERTICAL) 両引留柱(垂直)

DRG.NO. T-06

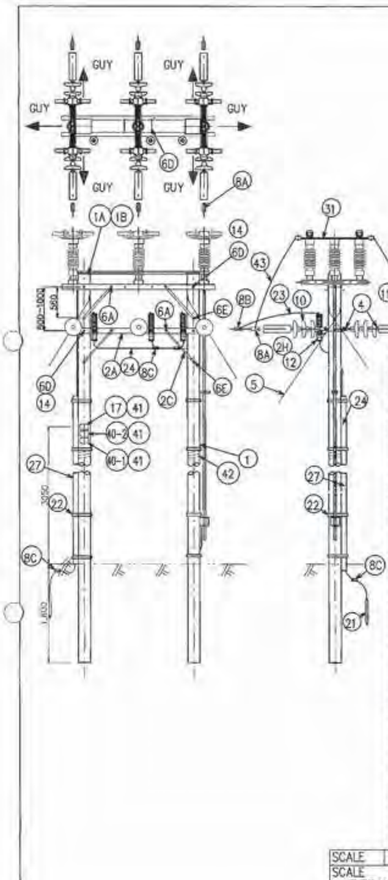


PART NO.	DESCRIPTION	QTY	[illegible]
1	Wooden Pole (12m)	2	[illegible] (12m)
1A	Pole Cap	2	[illegible]
1B	Pole Cap Nails	4	[illegible]
2F	Crossarm L100X100X10-2500	2	[illegible] L100X100X10-2500
2C	Crossarm Brace	4	[illegible]
4A	Anchor Shackle	3	[illegible]
4B	Ball Clevis	3	[illegible]
4C	Socket Eye	3	[illegible]
5A	Strain Plate	4	[illegible]
5B	Dead End Grip for Pole	4	[illegible]
5C	Dead End Grip for Thimble	4	[illegible]
5D	Dead End Grip for Insulator	8	[illegible]
5E	Stay Wire 45sqmm (15m)	4	[illegible]
5F	Stay Insulator 33kV	4	[illegible]
5G	Stay Rod	4	[illegible]
5H-1	Stay Plate	4	[illegible]
5H-2	Stay Anchor	4	[illegible]
5I	Turnbuckle	4	[illegible]
5J	Ivy Protection	4	[illegible]
6A	Bolt & Nut M16x50(Crossarm/Brace)	4	ボルトナット M16x50
6D	Bolt & Nut M16x350(Crossarm/Pole)	4	ボルトナット M16x350
6E	Bolt & Nut M16x400(Pole/Brace)	2	ボルトナット M16x400
10	Disc Insulator	9	[illegible]
11-1	Dead End Clamp	3	[illegible]
11-2	Adapter for Dead End Clamp	3	[illegible]
14	Square Washer	4	[illegible]
17	Number Plate	1	プレート
18	Nail	16	[illegible]
19	Staple	16	ステップル
40-1	Danger Plate	1	[illegible]
40-2	ODA Plate	1	ODAマーク
41	Nail (for Plate)	12	[illegible]
42	Anti Climbing Barbed Wire(7m)	2	[illegible] (7m)

SCALE 1/60

TITLE TYPE G TERMINAL POLE 終端柱

DRG.NO. T-07

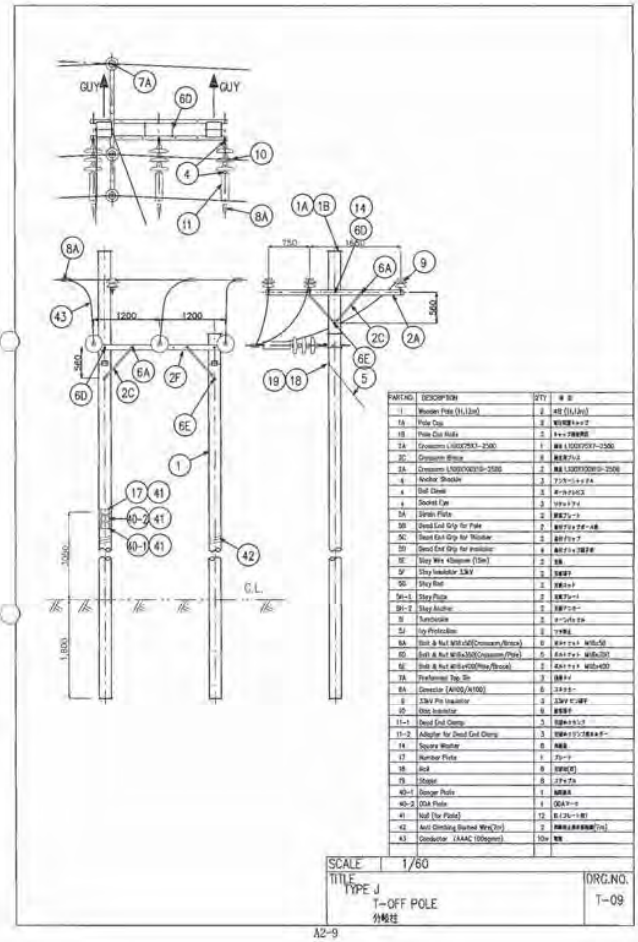


PART NO.	DESCRIPTION	QTY	[illegible]
1	Wooden Pole (12m)	2	[illegible] (12m)
1A	Pole Cap	2	[illegible]
1B	Pole Cap Nails	4	[illegible]
2A	Crossarm L100X75X7-2500	2	[illegible]
2C	Crossarm Brace	4	[illegible]
2H	Support for Bracket	1	[illegible]
4A	Anchor Shackle	6	[illegible]
4B	Ball Clevis	6	[illegible]
4C	Socket Eye	6	[illegible]
5A	Strain Plate	6	[illegible]
5B	Dead End Grip for Pole	6	[illegible]
5C	Dead End Grip for Thimble	6	[illegible]
5D	Dead End Grip for Insulator	12	[illegible]
5E	Stay Wire 45sqmm (15m)	6	[illegible] 45sqmm (15m)
5F	Stay Insulator 33kV	6	[illegible]
5G	Stay Rod	6	[illegible]
5H-1	Stay Plate	6	[illegible]
5H-2	Stay Anchor	6	[illegible]
5I	Turnbuckle	6	[illegible]
5J	Ivy Protection	6	[illegible]
6A	Bolt & Nut M16x50(Crossarm/Brace)	8	[illegible]
6D	Bolt & Nut M16x350(Crossarm/Pole)	8	[illegible]
6E	Bolt & Nut M16x400(Pole/Brace)	4	[illegible]
8A	Connector (Al 100/Al 100)	6	コネクター
8B	Connector (Al 100/Al 50)	3	コネクター
8C	Connector (CU14/CU14)	2	コネクター
10	Disc Insulator	18	[illegible]
11-1	Dead End Clamp	6	[illegible]
11-2	Adapter for Dead End Clamp	6	[illegible]
12	33kV Lightning Arrester	3	33kV [illegible]
14	Square Washer	4	[illegible]
17	Number Plate	1	プレート
18	Nail	24	[illegible]
19	Staple	24	ステップル
21	Ground rod	2	[illegible]
22	IBT band	8	バンド
23	Drop Wire (AAAC 50sqmm)	10m	[illegible]
24	Ground Wire(IV 14sqmm)	30m	[illegible] IV 14sqmm
27	PVC Protection Pipe L=4m	2	PVC保護パイプ L=4m
31	Load Break Switch Assembly	1	[illegible]
40-1	Danger Plate	1	[illegible]
40-2	ODA Plate	1	ODAマーク
41	Nail (for Plate)	12	[illegible]
42	Anti Climbing Barbed Wire(7m)	2	[illegible] (7m)
43	Conductor (AAAC 100sqmm)	10m	[illegible]

SCALE 1/60

SCALE TYPE H LOAD BREAK SWITCH POLE 線路開閉柱

DRG.NO. T-08



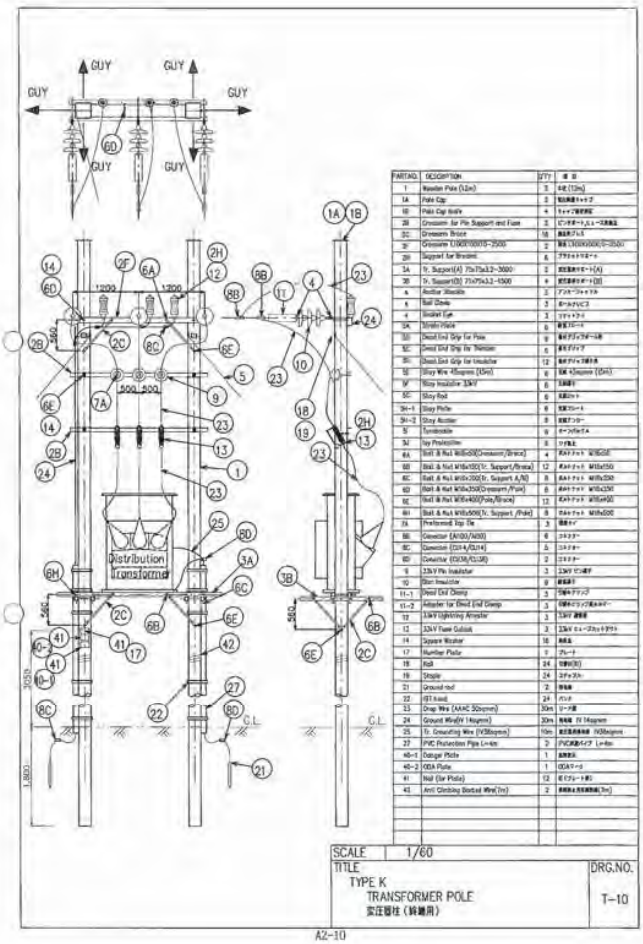
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (11.2m)	1	木柱 (11.2m)
1A	Pole Cap	1	電柱頭部キャップ
1B	Pole Cap Nails	3	キャップ釘使用数
1C	Pole Cut Nails	3	キャップ釘使用数
2A	Crossarm L100X100X10-2500	1	腕金 L100X100X10-2500
2C	Crossarm Brace	4	腕金用アング
2A	Crossarm L100X100X10-2500	2	腕金 L100X100X10-2500
4	Anchor Shackle	2	アンカーシャックル
4	Bolt Clevis	3	ボールクレビス
4	Socket Eye	3	ソケットアイ
5A	Strain Plate	2	腕金プレート
5B	Dead End Grip for Pole	3	電柱デッドエンド金具
5C	Dead End Grip for Tribster	6	腕金デッドエンド金具
5D	Dead End Grip for Insulator	6	腕金デッドエンド懸垂金具
5E	Stay Wire 45sqmm (15m)	2	支線
5F	Stay Insulator 33kV	3	支線碍子
5G	Stay Rod	2	支線ロッド
5H-1	Stay Plate	2	支線プレート
5H-2	Stay Anchor	2	支線アンカー
5I	Turnbuckle	2	ターンバックル
5J	Ivy Protection	3	ツタ防止
6A	Bolt & Nut M16x50(Crossarm/Brace)	8	腕金ボルト M16x50
6D	Bolt & Nut M16x300(Crossarm/Pole)	6	腕金ボルト M16x300
6E	Bolt & Nut M16x400(Pole/Brace)	4	腕金ボルト M16x400
11-1	Dead End Clamp	3	引留クランプ
11-2	Adapter for Dead End Clamp	3	引留クランプ用ホルダー
14	Square Washer	16	角座金
17	Number Plate	1	プレート
18	Nail	24	釘 (50mm)
19	Staple	24	ステープル
21	Ground rod	2	接地棒
22	GI1 band	24	バンド
24	Ground Wire(4 Hexpom)	30m	接地線 (4 Hexpom)
25	Tr. Grounding Wire (VV38sqmm)	10m	変圧器接地線 (VV38sqmm)
27	PVC Protection Pipe L=4m	2	PVC保護パイプ L=4m
40-1	Danger Plate	1	危険標識
40-2	ODA Plate	1	ODAプレート
41	Nail (for Plate)	12	釘 (プレート用)
42	Anti Climbing Barbed Wire(1m)	2	鉄線巻上防止用鉄線(1m)
43	Conductor (AAAC 100sqmm)	10m	電線

SCALE 1/60

TITLE
TYPE J
T-OFF POLE
分岐柱

DRG.NO. T-09

A2-9



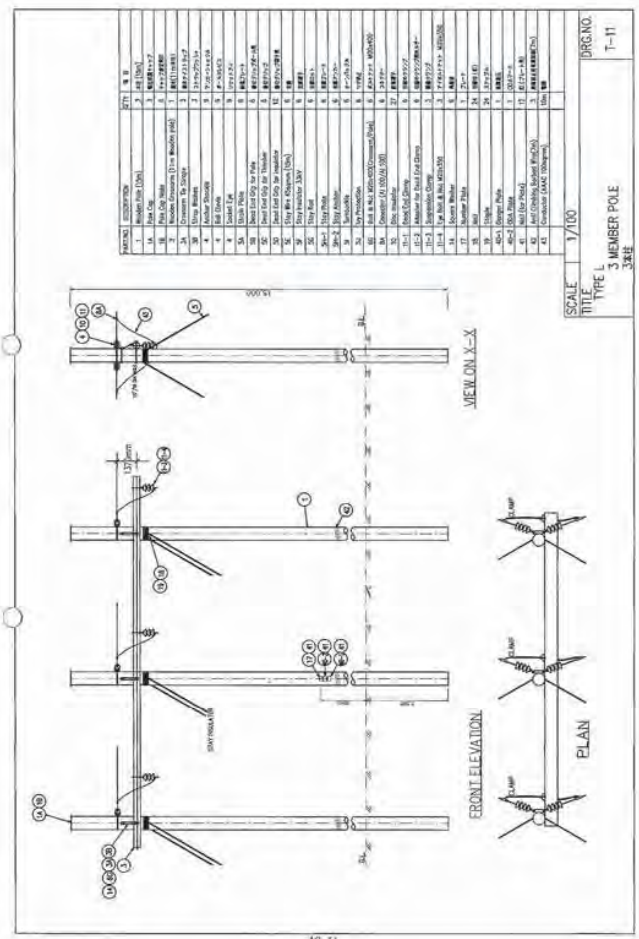
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (12m)	3	木柱 (12m)
1A	Pole Cap	3	電柱頭部キャップ
1B	Pole Cap Nails	6	キャップ釘使用数
2B	Crossarm for Pin Support and Fuse	3	ピンサポート,ヒューズ用腕金
2C	Crossarm Brace	16	腕金用アング
2F	Crossarm L100X100X10-2500	2	腕金 L100X100X10-2500
2H	Support for Bracket	6	ブラケットサポート
3A	Tr. Support(A) 75x75x3.2~3500	2	変圧器用サポート(A)
3B	Tr. Support(B) 75x75x3.2~1500	4	変圧器用サポート(B)
4	Anchor Shackle	2	アンカーシャックル
4	Bolt Clevis	3	ボールクレビス
4	Socket Eye	3	ソケットアイ
5A	Strain Plate	2	腕金プレート
5B	Dead End Grip for Pole	3	電柱デッドエンド金具
5C	Dead End Grip for Tribster	9	腕金デッドエンド
5D	Dead End Grip for Insulator	6	腕金デッドエンド懸垂金具
5E	Stay Wire 45sqmm (15m)	6	支線 (15m)
5F	Stay Insulator 33kV	6	支線碍子
5G	Stay Rod	6	支線ロッド
5H-1	Stay Plate	6	支線プレート
5H-2	Stay Anchor	6	支線アンカー
5I	Turnbuckle	9	ターンバックル
5J	Ivy Protection	9	ツタ防止
6A	Bolt & Nut M16x50(Crossarm/Brace)	4	腕金ボルト M16x50
6B	Bolt & Nut M16x150(Tr.Support/Brace)	12	腕金ボルト M16x150
6C	Bolt & Nut M16x200(Tr.Support A/B)	8	腕金ボルト M16x200
6D	Bolt & Nut M16x300(Crossarm/Pole)	6	腕金ボルト M16x300
6E	Bolt & Nut M16x400(Pole/Brace)	12	腕金ボルト M16x400
6H	Bolt & Nut M16x500(Tr. Support /Pole)	6	腕金ボルト M16x500
7A	Preformed Top Tie	3	引留線
8B	Connector (A100/A100)	6	コネクター
8C	Connector (D214/D114)	3	コネクター
8D	Connector (D238/D138)	2	コネクター
9	33kV Pin Insulator	3	33kV ピン碍子
10	Disc Insulator	9	懸垂碍子
11-1	Dead End Clamp	3	引留クランプ
11-2	Adapter for Dead End Clamp	3	引留クランプ用ホルダー
12	33kV Lightning Arrester	3	33kV 避雷器
13	33kV Fuse Cutout	3	33kV ヒューズカットアウト
14	Square Washer	16	角座金
17	Number Plate	1	プレート
18	Nail	24	釘 (50mm)
19	Staple	24	ステープル
21	Ground rod	2	接地棒
22	GI1 band	24	バンド
23	Drop Wire (AAAC 32sqmm)	30m	ドロップ線
24	Ground Wire(4 Hexpom)	30m	接地線 (4 Hexpom)
25	Tr. Grounding Wire (VV38sqmm)	10m	変圧器接地線 (VV38sqmm)
27	PVC Protection Pipe L=4m	2	PVC保護パイプ L=4m
40-1	Danger Plate	1	危険標識
40-2	ODA Plate	1	ODAプレート
41	Nail (for Plate)	12	釘 (プレート用)
43	Anti Climbing Barbed Wire(1m)	2	鉄線巻上防止用鉄線(1m)

SCALE 1/60

TITLE
TYPE K
TRANSFORMER POLE
変圧器柱 (鉄塩用)

DRG.NO. T-10

A2-10



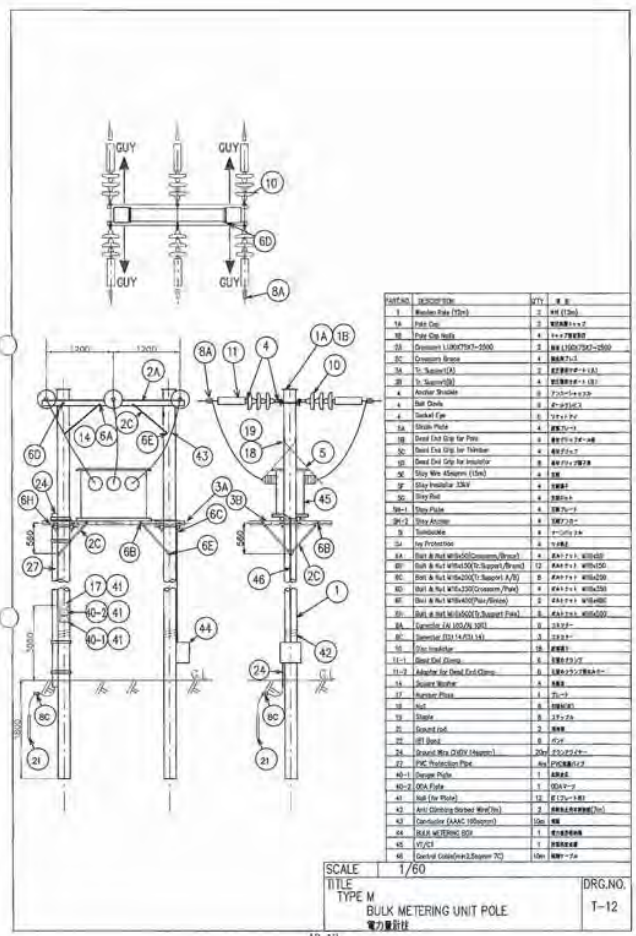
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (12m)	3	木柱 (12m)
1A	Pole Cap	3	電柱頭部キャップ
1B	Pole Cap Nails	6	キャップ釘使用数
2A	Crossarm L100X75X7-3500	1	腕金 L100X75X7-3500
2C	Crossarm Brace	4	腕金用アング
3A	Tr. Support(A)	2	変圧器用サポート(A)
3B	Tr. Support(B)	4	変圧器用サポート(B)
4	Anchor Shackle	2	アンカーシャックル
4	Bolt Clevis	3	ボールクレビス
4	Socket Eye	3	ソケットアイ
5A	Strain Plate	4	腕金プレート
5B	Dead End Grip for Pole	3	電柱デッドエンド金具
5C	Dead End Grip for Tribster	4	腕金デッドエンド
5D	Dead End Grip for Insulator	6	腕金デッドエンド懸垂金具
5E	Stay Wire 45sqmm (15m)	4	支線
5F	Stay Insulator 33kV	4	支線碍子
5G	Stay Rod	4	支線ロッド
5H-1	Stay Plate	4	支線プレート
5H-2	Stay Anchor	4	支線アンカー
5I	Turnbuckle	4	ターンバックル
5J	Ivy Protection	3	ツタ防止
6A	Bolt & Nut M16x50(Crossarm/Brace)	4	腕金ボルト M16x50
6B	Bolt & Nut M16x150(Tr.Support/Brace)	12	腕金ボルト M16x150
6C	Bolt & Nut M16x200(Tr.Support A/B)	8	腕金ボルト M16x200
6D	Bolt & Nut M16x300(Crossarm/Pole)	4	腕金ボルト M16x300
6E	Bolt & Nut M16x400(Pole/Brace)	2	腕金ボルト M16x400
6H	Bolt & Nut M16x500(Tr.Support Pole)	6	腕金ボルト M16x500
8A	Connector (AL 100/AL 100)	8	コネクター
8C	Connector (D214/D114)	3	コネクター
10	Disc Insulator	18	懸垂碍子
11-1	Dead End Clamp	6	引留クランプ
11-2	Adapter for Dead End Clamp	6	引留クランプ用ホルダー
14	Square Washer	4	角座金
17	Number Plate	1	プレート
18	Nut	8	防錆処理
19	Staple	8	ステープル
21	Ground rod	2	接地棒
22	GI1 Band	8	バンド
24	Ground Wire (7/2.6V (Hexpom)	20m	グランドワイヤー
27	PVC Protection Pipe	4m	PVC保護パイプ
40-1	Danger Plate	1	危険標識
40-2	ODA Plate	1	ODAプレート
41	Nail (for Plate)	12	釘 (プレート用)
43	Anti Climbing Barbed Wire(1m)	2	鉄線巻上防止用鉄線(1m)
43	Conductor (AAAC 100sqmm)	10m	電線
44	R.M.R. METERING BOX	1	電力量計収納箱
45	VT/CT	1	計器用変成器
46	Control Cable(4mx2.5sqmm 7C)	10m	制御ケーブル

SCALE 1/60

TITLE
TYPE L
3 MEMBER POLE
3本柱

DRG.NO. T-11

A2-11



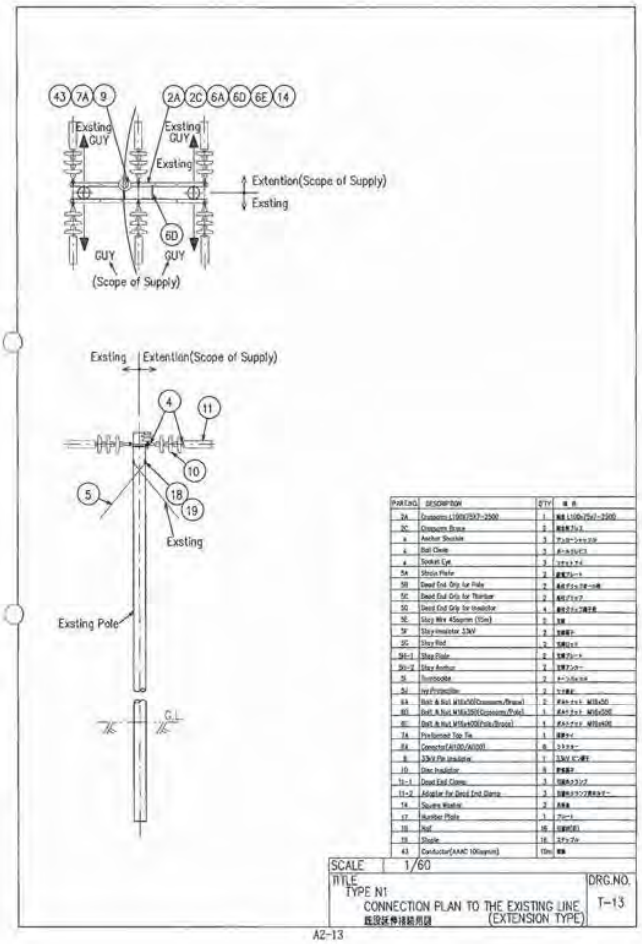
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (12m)	2	木柱 (12m)
1A	Pole Cap	2	電柱頭部キャップ
1B	Pole Cap Nails	4	キャップ釘使用数
2A	Crossarm L100X75X7-3500	2	腕金 L100X75X7-3500
2C	Crossarm Brace	4	腕金用アング
3A	Tr. Support(A)	2	変圧器用サポート(A)
3B	Tr. Support(B)	4	変圧器用サポート(B)
4	Anchor Shackle	2	アンカーシャックル
4	Bolt Clevis	2	ボールクレビス
4	Socket Eye	3	ソケットアイ
5A	Strain Plate	4	腕金プレート
5B	Dead End Grip for Pole	3	電柱デッドエンド金具
5C	Dead End Grip for Tribster	4	腕金デッドエンド
5D	Dead End Grip for Insulator	6	腕金デッドエンド懸垂金具
5E	Stay Wire 45sqmm (15m)	4	支線
5F	Stay Insulator 33kV	4	支線碍子
5G	Stay Rod	4	支線ロッド
5H-1	Stay Plate	4	支線プレート
5H-2	Stay Anchor	4	支線アンカー
5I	Turnbuckle	4	ターンバックル
5J	Ivy Protection	3	ツタ防止
6A	Bolt & Nut M16x50(Crossarm/Brace)	4	腕金ボルト M16x50
6B	Bolt & Nut M16x150(Tr.Support/Brace)	12	腕金ボルト M16x150
6C	Bolt & Nut M16x200(Tr.Support A/B)	8	腕金ボルト M16x200
6D	Bolt & Nut M16x300(Crossarm/Pole)	4	腕金ボルト M16x300
6E	Bolt & Nut M16x400(Pole/Brace)	2	腕金ボルト M16x400
6H	Bolt & Nut M16x500(Tr.Support Pole)	6	腕金ボルト M16x500
8A	Connector (AL 100/AL 100)	8	コネクター
8C	Connector (D214/D114)	3	コネクター
10	Disc Insulator	18	懸垂碍子
11-1	Dead End Clamp	6	引留クランプ
11-2	Adapter for Dead End Clamp	6	引留クランプ用ホルダー
14	Square Washer	4	角座金
17	Number Plate	1	プレート
18	Nut	8	防錆処理
19	Staple	8	ステープル
21	Ground rod	2	接地棒
22	GI1 Band	8	バンド
24	Ground Wire (7/2.6V (Hexpom)	20m	グランドワイヤー
27	PVC Protection Pipe	4m	PVC保護パイプ
40-1	Danger Plate	1	危険標識
40-2	ODA Plate	1	ODAプレート
41	Nail (for Plate)	12	釘 (プレート用)
43	Anti Climbing Barbed Wire(1m)	2	鉄線巻上防止用鉄線(1m)
43	Conductor (AAAC 100sqmm)	10m	電線
44	R.M.R. METERING BOX	1	電力量計収納箱
45	VT/CT	1	計器用変成器
46	Control Cable(4mx2.5sqmm 7C)	10m	制御ケーブル

SCALE 1/60

TITLE
TYPE M
BULK METERING UNIT POLE
電力量計柱

DRG.NO. T-12

A2-12



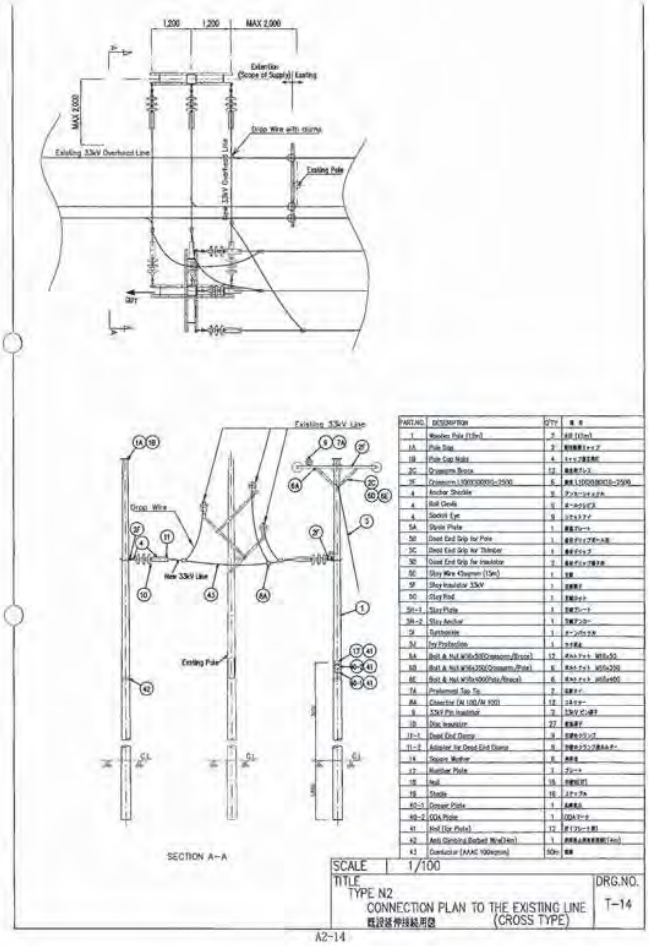
PART NO.	DESCRIPTION	QTY	備 考
2A	Crossarm L1900(75X7)-2500	1	鉄塔 L1100x75x7-2500
2C	Crossarm Brace	2	鉄塔用ブレス
A	Anchor Shackle	3	アンカーシャックル
C	Ball Clevis	3	ボールクレビス
E	Socket Eye	3	ソケットアイ
5A	Strain Plate	2	歪板プレート
5B	Dead End Grip for Pole	2	歪点グリップ(木柱用)
5C	Dead End Grip for Timber	2	歪点グリップ
5D	Dead End Grip for Insulator	4	歪点グリップ(碍子用)
5E	Stay Wire 4Sqmm (15m)	6	支線
5F	Stay-Insulator 33kV	2	支線碍子
5G	Stay Rod	2	支線ロッド
5H-1	Stay Plate	2	支線プレート
5H-2	Stay Anchor	2	支線アンカー
5I	Turnbuckle	2	ターンバックル
5J	Ivy Protection	2	ラッカ巻
6A	Bolt & Nut M16x100(Crossarm/Brace)	2	ボルトナット M16x100
6D	Bolt & Nut M16x250(Crossarm/Pole)	1	ボルトナット M16x250
6E	Bolt & Nut M16x300(Pole/Bracet)	1	ボルトナット M16x300
7A	Preformed Top Tie	1	保護テイ
9A	Connector(AI/St/AI100)	6	コネクター
9	33kV Pin Insulator	1	33kV ピン碍子
10	Disc Insulator	5	円盤碍子
11-1	Dead End Clamp	3	引留クランプ
11-2	Adapter for Dead End Clamp	3	引留クランプ用取合ナー
14	Square Washer	2	角座金
17	Number Plate	1	プレート
18	Nail	16	釘(鉄製)
19	Staple	16	コドマカ
43	Conductor(AAAC 100sqmm)	15m	導体

SCALE 1/60

TITLE TYPE N1
CONNECTION PLAN TO THE EXISTING LINE (EXTENSION TYPE)
既設伏伸線結用図

DRG.NO. T-13

A2-13



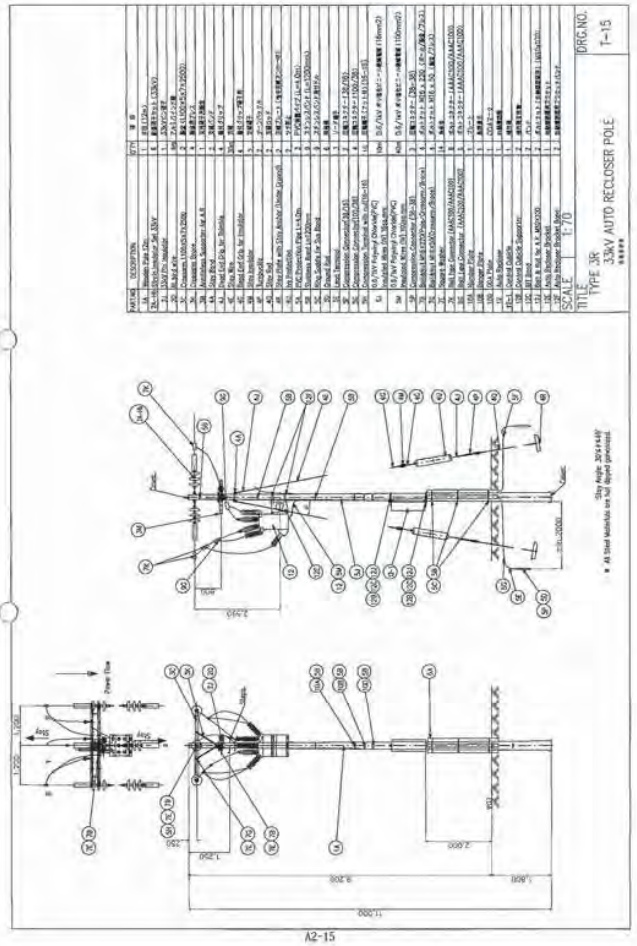
PART NO.	DESCRIPTION	QTY	備 考
1	Wooden Pole (15m)	7	木柱 (15m)
1A	Pole Step	3	昇柱用ボルトナット
1B	Pole Cap Nails	4	ヒゲ付釘(木柱用)
2C	Crossarm Brace	12	鉄塔用ブレス
2E	Crossarm L1900(100X10)-2500	6	鉄塔 L1100(100X10)-2500
A	Anchor Shackle	9	アンカーシャックル
C	Ball Clevis	9	ボールクレビス
E	Socket Eye	9	ソケットアイ
5A	Strain Plate	1	歪板プレート
5B	Dead End Grip for Pole	1	歪点グリップ(木柱用)
5C	Dead End Grip for Timber	1	歪点グリップ
5D	Dead End Grip for Insulator	2	歪点グリップ(碍子用)
5E	Stay Wire 4Sqmm (15m)	1	支線
5F	Stay-Insulator 33kV	1	支線碍子
5G	Stay Rod	1	支線ロッド
5H-1	Stay Plate	1	支線プレート
5H-2	Stay Anchor	1	支線アンカー
5I	Turnbuckle	1	ターンバックル
5J	Ivy Protection	1	ラッカ巻
6A	Bolt & Nut M16x300(Crossarm/Brace)	12	ボルトナット M16x300
6D	Bolt & Nut M16x250(Crossarm/Pole)	6	ボルトナット M16x250
6E	Bolt & Nut M16x400(Pole/Brace)	6	ボルトナット M16x400
7A	Preformed Top Tie	2	保護テイ
9A	Connector (Al 100/Al 100)	12	コネクター
9	33kV Pin Insulator	3	33kV ピン碍子
10	Disc Insulator	27	円盤碍子
11-1	Dead End Clamp	3	引留クランプ
11-2	Adapter for Dead End Clamp	3	引留クランプ用取合ナー
14	Square Washer	6	角座金
17	Number Plate	1	プレート
18	Nail	15	釘(鉄製)
19	Staple	15	コドマカ
43-1	Crosser Plate	1	鉄塔用
43-2	CCA Plate	1	CCAプレート
41	Rod (Dia Plate)	12	棒(プラレート用)
42	Anti Climbing Barbed Wire(24m)	1	鉄塔登攀防止用鉄線(24m)
43	Conductor (AAAC 100sqmm)	50m	導体

SCALE 1/100

TITLE TYPE N2
CONNECTION PLAN TO THE EXISTING LINE (CROSS TYPE)
既設伏伸線結用図

DRG.NO. T-14

A2-14



PART NO.	DESCRIPTION	QTY	備 考
1A	Wooden Pole (15m)	1	木柱 (15m)
1A-1	Pole Step (Use for Steel Pole 33kV)	6	昇柱用ボルトナット
2A	Crossarm L1900(75X7)-2500	1	鉄塔 L1100x75x7-2500
2B	33kV Pin Insulator	3	33kV ピン碍子
2C	Crossarm Brace	2	鉄塔用ブレス
2E	Crossarm L1900(100X10)-2500	2	鉄塔 L1100(100X10)-2500
3A	Crossarm Support	1	鉄塔用ブレス
3B	Insulator Support for 6.6	1	鉄塔用ブレス
3C	Crossarm L1900(75X7)-2500	1	鉄塔 L1100x75x7-2500
3D	Crossarm Support	1	鉄塔用ブレス
3E	Insulator Support for 6.6	1	鉄塔用ブレス
4A	Stay Rod	1	支線ロッド
A1	Pedd End Grip for Steel Pole	1	支線用引留クランプ
A2	Pedd End Grip for Timber	1	支線用引留クランプ
A3	Pedd End Grip for Insulator	1	支線用引留クランプ
A4	Stay Insulator	1	支線用碍子
A5	Stay Rod	1	支線ロッド
A6	Stay Plate with Stay Anchor Shackle (Upper)	1	支線用プレート(上部)
A7	Ivy Protection	1	ラッカ巻
A8	Stay Plate with Stay Anchor Shackle (Lower)	1	支線用プレート(下部)
A9	Stainless Band Lx1200mm	1.5	ステンレスバンド(Lx1200mm)
A10	Stay Saddle for Tee Bond	3	ステンレスバンド(Lx1200mm)
A11	Stay Insulator	1	支線用碍子
A12	Lock Washer	1	ロックワッシャ
A13	Compression Connector (38/38)	2	圧縮スリーブ(38/38)
A14	Compression Connector (100/38)	2	圧縮スリーブ(100/38)
A15	Compression Terminal with Bolt (No.16)	16	圧縮端子(ボルト付No.16)
5J	0.6/1kV Polyvinyl Chloride(PVC) Insulated Cable 3Cx150mm2	0.6m	0.6/1kV ポリビニル絶縁ケーブル 3C×150mm2
5M	0.6/1kV Polyvinyl Chloride(PVC) Insulated Cable 1Cx150mm2	15m	0.6/1kV ポリビニル絶縁ケーブル 1C×150mm2
6A	Bolt & Nut M16x100(Crossarm/Brace)	4	ボルトナット M16x100
6B	Bracket M16x50(Crossarm/Brace)	1	ブラケット M16x50
7A	Preformed Top Tie	1	保護テイ
7B	Preformed Line Guard	3	保護テイ
7C	Dead End Clamp for ACSR 150mm2	3	引留クランプ ACSR 150mm2
7D	Jumper Terminal for ACSR 150mm2	3	ジャンパー端子 ACSR 150mm2
7E	Jumper Connector for ACSR 150mm2	3	ジャンパー接続子 ACSR 150mm2
7F	Bolt & Nut M16x250(Crossarm/Pole)	1	ボルトナット M16x250
7G	Nut Type Expansion (AAAC150/AAAC150)	3	ナット型エキスパンション (AAAC150/AAAC150)
7H	Dead End Clamp for ACSR 150mm2	3	引留クランプ ACSR 150mm2
7I	Dead End Connector for ACSR 150mm2	3	引留接続子 ACSR 150mm2
7J	Jumper Connector for ACSR 150mm2	3	ジャンパー接続子 ACSR 150mm2
7K	Jumper Terminal for ACSR 150mm2	3	ジャンパー端子 ACSR 150mm2
7L	Jumper Wire	1	ジャンパー線
7M	Jumper Wire	1	ジャンパー線
7N	Jumper Wire	1	ジャンパー線
8A	Arm Clamp	1	CCAクランプ
8B	Arm Clamp	1	CCAクランプ
8C	Arm Clamp	1	CCAクランプ
8D	Arm Clamp	1	CCAクランプ
8E	Arm Clamp	1	CCAクランプ
8F	Arm Clamp	1	CCAクランプ
8G	Arm Clamp	1	CCAクランプ
8H	Arm Clamp	1	CCAクランプ
8I	Arm Clamp	1	CCAクランプ
8J	Arm Clamp	1	CCAクランプ
8K	Arm Clamp	1	CCAクランプ
8L	Arm Clamp	1	CCAクランプ
8M	Arm Clamp	1	CCAクランプ
8N	Arm Clamp	1	CCAクランプ
8O	Arm Clamp	1	CCAクランプ
8P	Arm Clamp	1	CCAクランプ
8Q	Arm Clamp	1	CCAクランプ
8R	Arm Clamp	1	CCAクランプ
8S	Arm Clamp	1	CCAクランプ
8T	Arm Clamp	1	CCAクランプ
8U	Arm Clamp	1	CCAクランプ
8V	Arm Clamp	1	CCAクランプ
8W	Arm Clamp	1	CCAクランプ
8X	Arm Clamp	1	CCAクランプ
8Y	Arm Clamp	1	CCAクランプ
8Z	Arm Clamp	1	CCAクランプ

SCALE 1/70

TITLE TYPE 3R
33kV AUTO RECLOSER POLE

DRG.NO. T-15

A2-15

PART 5

Questionnaire for the Second Field Survey

PREPARATORY SURVEY
ON
THE PROJECT FOR
RURAL ELECTRIFICATION PHASE III
IN
THE REPUBLIC OF UGANDA

QUESTIONNAIRE

for the Second Field Survey

April 2011

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

YACHIYO ENGINEERING CO., LTD.

1. Technical issues

1.1 Preparation of Network Diagrams related to the Project

Power source for some distribution lines currently under construction was not confirmed clearly. The Ugandan side shall prepare exact network diagrams for the existing distribution and transmission lines and ones under construction related to the Project. In the preparation of the network diagram, scope described in the network diagrams attached to this Field Report shall be referred.

1.2 Preparation of Route Maps of distribution and transmission lines related to the Project

It was confirmed in the site survey that actual location of some distribution lines was not in conformity with the information in the GIS data of REA. The Ugandan side shall prepare exact route maps of distribution and transmission lines for the existing ones and ones under construction related to the Project. The Ugandan side shall also specify voltage levels by color in the route maps for certain distinction. In the preparation of the route maps, scope described in the network diagrams and route maps attached to this Field Report shall be referred.

1.3 Preparation of Single Line Diagrams for 132/33kV Substations related to the Project including basic specifications of main transformers

For confirmation of protection system and capacity of the existing equipment, single line diagrams for 132/33 kV substations related to the Project including basic specifications of main transformers, i.e. capacity, vector group, percent impedance, installation year and etc., shall be prepared by the Ugandan side. The related 132/33 kV substations are as follows;

- 132/33 kV Substation in the Owen Falls Power Plant (Area-4)
- Tororo Substation (Area-4)
- Masaka West Substation (Area-2)
- Mbarara North Substation (Area-5)
- Nkenda Substation (Area-5)

1.4 Operational Data of each 33kV feeders in the 132/33kV Substations related to the Project

(1) Maximum Demand of the related 33 kV feeders

For confirmation of operational conditions of the existing equipment, maximum demand of all the 33 kV feeders in the 132/33 kV substations related to the Project for the recent four years shall be described in the following tables. Feeder number and feeder name shall be specified in the Table.

Table 1-1 Maximum demand of each 33 kV feeder in 132/33 kV Substation in the Owen Falls Power Plant (Area-4)

No.	Feeder Name	Rated	Recorded Data [A]			
		[A]	2007	2008	2009	2010

Table 1-2 Maximum demand of each 33 kV feeder in Tororo Substation

No.	Feeder Name	Rated	Recorded Data [A]			
		[A]	2007	2008	2009	2010

Table 1-3 Maximum demand of each 33 kV feeder in Masaka West Substation

No.	Feeder Name	Rated	Recorded Data [A]			
		[A]	2007	2008	2009	2010

Table 1-4 Maximum demand of each 33 kV feeder in Mbarara North Substation

No.	Feeder Name	Rated	Recorded Data [A]			
		[A]	2007	2008	2009	2010

Table 1-5 Maximum demand of each 33 kV feeder in Nkenda Substation

No.	Feeder Name	Rated	Recorded Data [A]			
		[A]	2007	2008	2009	2010

(2) Specifications and operational records of the existing conductors which the distribution lines of the Project will be connected to

For basic design of the Project, specifications and operational records of the existing conductors which the distribution lines of the Project will be connected to shall be described in the following tables.

Table 2-1 Specifications and operational records of the existing conductors which the distribution lines from Mayuge (Connection A) to Nankoma (Connection B) of the Project will be connected to

No.	Feeder Name	Size	Allowable Current	Maximum Current [A]			
		[mm^2]	[A]	2007	2008	2009	2010

Table 2-2 Specifications and operational records of the existing conductors which the distribution lines from Nankoma (Connection C) to Lumino (Connection D) of the Project will be connected to

No.	Feeder Name	Size	Allowable Current	Maximum Current [A]			
		[mm^2]	[A]	2007	2008	2009	2010

Table 2-3 Specifications and operational records of the existing conductors which the distribution lines from Nyendo (Connection A) to Kyambazi of the Project will be connected to

No.	Feeder Name	Size	Allowable Current	Maximum Current [A]			
		[mm^2]	[A]	2007	2008	2009	2010

Table 2-4 Specifications and operational records of the existing conductors which the distribution lines from Nankoma (Connection C) to Ndeeba-Lwaggle of the Project will be connected to

No.	Feeder Name	Size	Allowable Current	Maximum Current [A]			
		[mm^2]	[A]	2007	2008	2009	2010

Table 2-5 Specifications and operational records of the existing conductors which the distribution lines from Mayuge (Connection A) to Nankoma (Connection B) of the Project will be connected to

No.	Feeder Name	Size	Allowable Current	Maximum Current [A]			
		[mm^2]	[A]	2007	2008	2009	2010

Table 2-6 Specifications and operational records of the existing conductors which the distribution lines from Kitagata (Connection B) to Katagi of the Project will be connected to

No.	Feeder Name	Size	Allowable Current	Maximum Current [A]			
		[mm^2]	[A]	2007	2008	2009	2010

(3) Failure Records of 33kV feeders which the distribution lines of the Project will be connected to

For confirmation of operational conditions of the existing equipment, failure records of the 33 kV feeders which the distribution lines of the Project will be connected to for the recent four years shall be described in the following tables.

Table 3-1 Failure records of the 33 kV feeder which the distribution lines of the Project will be connected to in Iganga Substation

No.	Feeder Name	2007		2008		2009		2010	
		Times	Hours	Times	Hours	Times	Hours	Times	Hours

Table 3-2 Failure records of the 33 kV feeder which the distribution lines of the Project will be connected to in Tororo Substation

No.	Feeder Name	2007		2008		2009		2010	
		Times	Hours	Times	Hours	Times	Hours	Times	Hours

Table 3-3 Failure records of the 33 kV feeder which the distribution lines of the Project will be connected to in Masaka West Substation

No.	Feeder Name	2007		2008		2009		2010	
		Times	Hours	Times	Hours	Times	Hours	Times	Hours

Table 3-4 Failure records of the 33 kV feeder which the distribution lines of the Project will be connected to in Masaka Central Substation

No.	Feeder Name	2007		2008		2009		2010	
		Times	Hours	Times	Hours	Times	Hours	Times	Hours

Table 3-5 Failure records of the 33 kV feeder which the distribution lines of the Project will be connected to in Mbarara North Substation

No.	Feeder Name	2007		2008		2009		2010	
		Times	Hours	Times	Hours	Times	Hours	Times	Hours

Table 3-6 Failure records of the 33 kV feeder which the distribution lines of the Project will be connected to in Ishaka Substation

No.	Feeder Name	2007		2008		2009		2010	
		Times	Hours	Times	Hours	Times	Hours	Times	Hours

2. Data Collection of connecting situations in the Previous JICA's Project Area

The Ugandan side shall prepare data of the number of connected customers, customer category, and electricity consumption for the sites of the previous projects (JICA I and II) according to the Attachment of this questionnaire.

ATTACHMENT

JICA I

Estimated Power Demand in Project Site A1

Project Site A1 (Njeru-Kayunga-Bale)

TC Name	*Residential*	*Commercial*	*Schools*		*Health Center*		*Office*	*Small Factory*	*Energy (kWh)*	*Demand (KW)*
			Primary	*Secondary*	*Center*	*Clinic*				
Kanjuki										
Kyenima										
Wabwogo										
Kitimbwa										
Kayonza										
Nakyesa										
Kiwe										
Bale										
Bukeeka										
Nyize										
Wakisi										
Kikubamutwe										
Namiriya										
Lugasa										
Total	-	-	-	-	-	-	-	-	-	*0*

	Total in the Site		
	Energy (kWh)	Demand (KW)	Customer Number
Domestic			
Comertial			
Meddium Industry			
Large Industry			
EX-large Industry			
Total	0	0	0

Estimated Power Demand in Project Site A2

Project Site A2 (Buwenda(Jinja Area)-Kiyunga(Mbulamuti Area))

TC Name	*Residential*	*Commercial*	*Schools*		*Health Center*		*Office*	*Small Factory*	*Energy (kWh)*	*Demand (KW)*
			Primary	*Secondary*	*Center*	*Clinic*				
Buwenda										
Bujagali										
Ivunamba										
Namize										
Budondo S/C										
Budondo TC										
Buyala										
Kabowa										
Nakanyonyi										
Namagera										
Buragaya										
Lubani										
Budima										
Nankandulo										
Kiszi										
Namaganda										
Kiyunga										
Muwonge										
Namwenda										
Total	-	-	-	-	-	-	-	-	-	*0*

	Total in the Site		
	Energy (kWh)	Demand (KW)	Customer Number
Domestic			
Comertial			
Meddium Industry			
Large Industry			
EX-large Industry			
Total	0	0	0

ATTACHMENT

JICA II

Estimated Power Demand in Project Site A

Project Site A (Nabitende/Itanda Area in Iganga District)									
Parish	Residential	Water Pump	Schools		Health Center		Maize & rice mill	Energy (kWh)	Demand (KW)
			Primary	Secondary	Grade IV	Others			
Namungalwe									
Nabitende									
Naluko									
Ituba									
Bugono									
Itanda									
Kiwanyi									
Nawangaiza									
Total	-	-	-	-	-	-	-	-	*0*

	Total in the Site		
	Energy (kWh)	Demand (KW)	Customer Number
Domestic			
Comertial			
Meddium Industry			
Large Industry			
EX-large Industry			
Total	0	0	0

Estimated Power Demand in Project Site B

Project Site B (Wabigaro-Migera)										
TC Name	Residential	Commercial	Schools		Health Center		Office	Small Factory	Energy (kWh)	Demand (KW)
			Primary	Secondary	Center	Clinic				
Wabigalo										
Sasira										
Namasa										
Migera										
Total	-	-	-	-	-	-	-	-	-	*0*

Estimated Power Demand in Project Site C

Project Site C (Hoima-Munteme)										
TC Name	Residential	Commercial	Schools		Health Center		Office	Small Factory	Energy (kWh)	Demand (KW)
			Primary	Secondary	Center	Clinic				
Buawekera										
Buhimba										
Kikube										
Munteme										
Total	-	-	-	-	-	-	-	-	-	*0*

Estimated Power Demand in Project Site D

Project Site D (Bukakata Area in Masaka District)									
Parish	Residential	Water Pump	Schools		Health Center		Maize & rice mill	Energy (kWh)	Demand (KW)
			Primary	Secondary	Grade IV	Others			
Kayugi									
Nabusabu Camp									
Ssunga									
Kigo									
Bunaddu									
Katiko									
Lambu Landing site									
Bukakata									
Kachinga									
Total	-	-	-	-		-	-	-	0

	Total in the Site		
	Energy (kWh)	Demand (KW)	Customer Number
Domestic			
Comertial			
Meddium Industry			
Large Industry			
EX-large Industry			
Total	0	0	0

Estimated Power Demand in Project Site B

Project Site B (Kagadi/Munteme Area in Hoima and Kibale District)									
Parish	Residential	Water Pump	Schools		Health Center		Maize & rice mill	Energy (kWh)	Demand (KW)
			Primary	Secondary	Grade IV	Others			
Kigo									
Kabwoya									
Kitooke									
Kicanga									
Karama									
Pachwa 2									
Pachwa 1									
Mabsale									
Kitemuzi									
Kaitemba									
Mugalike									
Kyenzige									
Kiryane									
Total	-	-	-	-	-	-	-	-	0

	Total in the Site		
	Energy (kWh)	Demand (KW)	Customer Number
Domestic			
Comertial			
Meddium Industry			
Large Industry			
EX-large Industry			
Total	0	0	0

Estimated Power Demand in Project Site C

Project Site C (Bugeso/Iwemba Area in Bugiri District)									
Parish	Residential	Water Pump	Schools		Health Center		Maize & rice mill	Energy (kWh)	Demand (KW)
			Primary	Secondary	Grade IV	Others			
Bugeso									
Iwemba									
Buyala									
Nabirere									
Nambo									
Total	-	-	-	-	-	-	-	-	0

	Total in the Site		
	Energy (kWh)	Demand (KW)	Customer Number
Domestic			
Comertial			
Meddium Industry			
Large Industry			
EX-large Industry			
Total	0	0	0

PREPARATORY SURVEY
ON
THE PROJECT
FOR
RURAL ELECTRIFICATION PHASE III
IN
THE REPUBLIC OF UGANDA

THE SECOND FIELD SURVEY

FIELD REPORT

July 18th, 2011

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Table of Contents

ANNEX

Drawings

Contents of Drawings

1. Introduction

In order to build common understanding between the Ugandan side and the Second Preparatory Survey Team (hereinafter referred to as "the Team") for the Project for Rural Electrification Phase III in the Republic of Uganda (hereinafter referred to as "the Project") on the technical and engineering aspects, this Field Report has been prepared based on the results of the second field survey and discussions with the Ugandan side, i.e., Rural Electrification Agency (REA) and Ministry of Energy and Mineral Development (MEMD).

The Ugandan side and the Team agreed that the proposed distribution line traversing through parts of five districts; Mayuge, Iganga, Bugiri, Namayingo and Busia as the most prioritized site in the Minutes of Discussions (M/D) signed on 16th June, 2011. Main reasons for the prioritization are (1) electrification of beneficiaries in terms of the number of consumers which include trading centers, households, schools and health centers, (2) the importance of electrification of new district headquarters in Namayingo, and (3) project impacts including synergy with the Interconnection of Electric Grids of Nile Basin Initiative Countries Interconnection Project.

The main componetn of the Project is shown in Table 1. However, the final components of the Project will be decided by the Government of Japan.

Table 1 Summary of the Project

	Summary of the Project	
Procurement and Installation	Procurement and installation of the following equipment and materials for 33 kV distribution line:	
	(1) 33 kV Distribution Line (Total Length: Approx. 134.4 km)	
	➢ Trunk line from Mayuge Trading Centre (T/C) to Nankoma T/C through Mpungwe T/C	Approx. 21.5 km
	➢ Branch line from Mpungwe T/C to Makoma T/C	Approx. 10.2 km
	➢ Trunk line from Nankoma T/C to Lumino T/C through Namayingo T/C and [illegible] T/C	Approx. 37.5 km
	➢ Branch line from Namayingo T/C to Banda A T/C and Banda B T/C	Approx. 29.9 km
	➢ Branch line from Namayingo T/C to [illegible] Landing Site and Lugala	Approx. [illegible] km
	➢ Branch Line from [illegible] T/C to [illegible] T/C and [illegible] T/C	Approx. 10.5 km
	(2) 33/0.415-0.240 kV Distribution transformer (Total Number: 50 units)	
	➢ 200 kVA × 4 units, 100 kVA × 7 units, 50 kVA × 11 units, 25 kVA × 28 units	
	(3) Metering Unit 4 units	
	(4) Auto Re-closer 4 units	
	(5) Load Break Switch 14 units	
Procuremen	Spare parts and maintenance tools for 33 kV distribution line	
	(1) Emergency Spare Part	
	(2) Replacement Spare Parts	
	(3) Maintenance Tools	

Source: JICA Study Team

2. Project Site Information

2.1 Project Site Locations

The project site is located in Eastern Uganda. The project will involve the installation of approximately 135 km of 33 kV distribution line traversing through parts of five districts;, Mayuge, Iganga, Bugiri, Namayingo and Busia. The main component of the Project, includes electrification of Namayingo district Headquarter, major facilities such as Buyinja Health Center IV which is expected to be upgraded to a District Hospital in the near future, Nalwire Technical Institute offering eight vocational courses directly contributing to the improvement of vocational skills in the area, Namayingo Town Council, and four landing sites for example.

The project site location is shown as Figure 1.

Source: JICA Study Team

Figure.1 Project Site Location

2.2 Project Beneficiaries

(1) General Information of beneficiaries in the Project Site

A socio-economic survey was carried out and general information for the project area was established. General information obtained from the socio-economic survey is shown in Table 2; showing the, number of trading center, household school and health centers (from grade I to IV).

The results of the socio-economic survey are shown in Annex 4

- Total number of Trading Center (T/C): 38
  Based on site survey, Muterere T/C is requested to be included in the Project
- Total number of Households: 9,395 households
- Total number of schools: 108
- Total number of Health Center: 15
- 1 District Headquarter (HQ) and 1 District Police Station

(2) General households

- Total beneficiaries: 48,090 populations (9,395 households)
- Occupation of the consumers
  - Farming: Most of the potential consumers are farmers, whose main products are maize, cassava and coffee.
  - Milling machine owner: maize and cassava are main products in the project site. Diesel Engine is applied for grinding and processing these crops consumed as staple foods in the project area.
  - Fisheries: There are 4 landing sites in the project site, i.e., Bumeru A, Bumeru B, Busiro Landing site and Lugala. Main products are Tilapia, Nile Perch, Mukene and Nkejje. They are working without refrigeration due to a lack of electric power.
  - Retail trade: Each T/C has some retail shops selling foods, drinks and daily necessaries. Some of the shops are using kerosene refrigerators.
  - Fabrication: Especially in Namayingo, small welders and carpentries are working with generators as well as manual machines.

(3) Public Facilities

- Some important public facilities are included in the project.
  - Buyinja Health Center IV in Namayingo District
    (It is expected to be the District Hospital of Namayingo)
  - Nalwire technical school in Busia District
  - Namayingo District Headquarter in Namayingo District
  - Namayingo Police Office in Namayingo District

(a) **Health Center (H/C)**

- Total coverage populations: 461,600 population
  - Generally, one H/C IV shall be in each district, one H/C III shall be in each sub-county, so that coverage population is estimated by the population where the H/C covered.
- Number of outpatients:1012/ day
- Number of outreaches: 2590/ month
- Total number of staffs in charge: 51 people
- Installing lights is urgently needed for night delivery, inpatients, emergencies etc
- Steam sterilizers and refrigerators are most needed equipments when electrified.

Table 2 Beneficiaries in the Project

	Trading Center	Parish	Sub-county	District	Number of Schools: Primary	Secondary	Tertiary	Number of Health Centers: IV	III	II	I	Number of Households/ Shops	[illegible]	*3 Living population	*4 Number of Mill
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	*1 Muterere	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	Namayingo T.C.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
36	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
37	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: JICA Study Team

Note: Each respect of changing from first survey is below.

*1 Muterere: It is added, details are in main body.

*2 Luwangosia: Its H/C is changed from IV to III from the site survey.

*3 Living population: To specify the number of living populations only in the electrified area by the Project in consideration of coverage area of transformers installed, interview to LC1 chairpersons carried out in the first field survey.

*4 Number of Milling machines is estimated by the results of socio-economic survey

*5 Other marked cells: They are excluded or reduced the number from the site survey because they are located in out of T/C

Table 3 Major Beneficiaries of H/C III/IV in the Project

Name of Health Center	Grade	Coverage population	Outpatient /day	Outreach /month	Staff
Makuutu	III	27,300	75	320	3
Muterere	III	31,200	70	200	5
Mayuge	III	33,000	142	70	4
Buyinja	IV	221,700	450	460	17
Lwangosia	III	27,800	70	260	6
Lutolo	III	48,300	75	280	6
Mulumba	III	42,600	60	320	3
Lunyo	III	29,700	70	680	7
Total		*342,900	1,012	2,590	51

Source: Compiled by JICA Study Team using the data below

Coverage population of Makuutu: Mayuge three year development plan for the period 2010/2011 – 2012/2013

Coverage population of Muterere and Mayuge: Iganga three year development plan for the period 2010/2011 – 2012/2013

Coverage population of Buyinja, Lwangosia, Lutolo, Mulumba: Namayingo HQ

Coverage population of Lunyo: Busia District Abstract Busia 2010

Other information is primary information

Note: * Total coverage population is deducted number of population of Lwangosia, Lutolo and Mulumba, which are included the coverage population of Buyinja H/C IV

(b) **Schools**

- Total beneficiaries: 62,000 population
  - The number include students, teachers and boarders in Table 4 below.
- Some of the students staying far from the schools are staying in the boarding facilities when require electricity for night studying.

(a) **Primary school**

Table 4 Primary school beneficiaries by district

District	No. of schools	*No. of students	*No. of teachers
Mayuge	8	5,915	107
Iganga	6	4,119	69
Bugiri	26	13,950	246
Namayingo	41	22,424	336
Busia	12	7,073	144
Total	93	53,481	902

Source: Compiled by JICA Study Team using data below

UGANDA DISTRICTS Information Handbook (2007-2008)

Note: * Number of students and teachers are calculated as each district average of students' and teachers' number times number of schools

(b) Secondary school

Table 5 Secondary school beneficiaries by district

District	No. of schools	*No. of students	*No. of teachers
Mayugo	1	50	10
Iganga	2	789	38
Bugiri	3	1,929	39
Namayingo	7	3,927	114
Busia	0	0	0
Total	13	6,695	201

Source: JICA Study Team
Note: * Number of students and teachers are calculated as average of interview result by district times number of schools

(c) Higher Education

Table 6 Higher education beneficiaries by district

District	No. of schools	No. of students	No. of teachers
Mayuge	0	0	0
Iganga	0	0	0
Bugiri	0	0	0
Namayingo	*1	N/A	N/A
Busia	1	300	25
Total	1	300	25

Source: JICA Study Team
Note: * Namayingo has one college but it is temporary building and few students.

(c) Other Public Facilities

1.Namayingo District HQ

- Number of Staff: 138 people
- The HQ is in charge of supplying services to the residents of Namayingo District based on the organizational chart shown in Figure 2, below

Namayingo populations : 221,200

Correct as of July, 2011
Number of parenthesis is staff number of each department
Source: Namayingo District HQ

Figure 2 Organizational chart of Namaying District HQ

2.Namayingo Police Station

- Number of Staff: 30 police officers
- Installing lights in Police Station is urgently required for security.
  - Street lamps and lights in each households also can help to prevent crimes
    Number of crimes is approximately 70 cases/month in Namayingo District.
- Namayingo Police Station manages 18 outposts shown in Figure 3 and covers the whole Namayingo district.

Correct as of July, 2011
Notes: PP is Police Post
Source: Namayingo Police Station

Figure 3 Organization chart of outposts under Namayingo Police Station

2.3 Progress of Customer Connection in the Previous Project Sites

2.3.1 Results of the Site Survey in the Previous Project Sites (JICA I and JICA II)

To design the equipment and materials for the Project appropriately and also take some measures to improve progress of customer connection after commissioning of 33 kV distribution line of the Project, progress of customer connection in the previous project sites was studied in the second field survey. The results are shown in Table 7.

In the project site, milling machine owners are supplying grinding service of staple foods such as maize, cassava, rice and ground nuts to people living in each village. These people are paying milling charge (100 UGX / kg for maize) to the milling machine owners. Though milling machines driven by

diesel engine are utilized for milling in areas not electrified, fuel cost and troubles in engine have burdened milling machine owners with. And these burdens are also troubling the living people. It is expected that release from these troubles by introduction of electric motor have caused such growth in connection of milling machine owners in Table 7.

Table 7 also shows low connections of public facilities, i.e., health centers and schools. In the site survey, the Team visited some districts offices of the previous project sites. It is confirmed that acceleration program for connection of these facilities are currently carried out with budget of each district government in addition to ordinal budget from the Ministry of Health. It will contribute to accelerate connection of public facilities in the area of JICA I and JICA II.

Table 7 also shows that connection of general households and shops in JICA II site is stayed in 3 % in average after 2 years from commissioning. JICA II was divided into two phase of installation terms. Phase I (Masaka and Hoima) was completed in February, 2009, while Phase II (Iganga and Bugiri) was completed in December, 2009. Connection rate in Phase I site is 7 %, while one in Phase II site is 1%. They are implying that 6 %growth of connection in Phase II site is possible in the next 10 month and connection of households and shops is improving gradually in the JICA II sites.

Table 7 Progress of customer connection in the previous project site

JICA I, 2000~2001 Fiscal Year

District	HOIMA		KAYUNGA		JINJA		NAKASONGOLA						
Line	[illegible]		[illegible]		[illegible]		[illegible]		Total				
33kV D/L(km)	32		[illegible]		44		[illegible]		[illegible]		As per [illegible]		Progress of
Connection	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Connection
Health Center	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
School	[illegible]	11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]
Small Office	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14	[illegible]	[illegible]	21%
Mill Machines	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Petit and Shop	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Load(kW)	—	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	

JICA II, 2007~2008 Fiscal Year

District	MASAKA		HOIMA		IGANGA		BUGIRI						
Line	[illegible]		[illegible]		[illegible]		[illegible]		Total				
33kV D/L(km)	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		As per [illegible]		Progress of
Connection	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Connection
Health Center	[illegible]	[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21	[illegible]	[illegible]	[illegible]
School	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]	[illegible]	10%
Small Office	[illegible]	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	115	[illegible]	70	[illegible]
Mill Machines	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Petit and Shop	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Load(kW)	—	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	

Source: JICA Study Team
Note: All the data of JICA I is collected by Uganda Electricity Transmission Company Ltd from UMEME and Ferdsult as of 22nd May, 2011.
Data of Bugiri, JICA II is collected from Iganga Office as of 16th June, 2011.
The other data of JICA II are collected by Uganda Electricity Transmission Company Ltd from UMEME and Ferdsult as of 22nd May, 2011.

Completion of installation work of each previous project is as follows

- Rural Electrification (JICA I) had completed in 2000.
- Rural Electrification Phase II (JICA II) had completed in 2009.

Major findings obtained from the survey are as follows;

- Connection of general households and shops has reached 3% of the projection in Basic Design Study 2 years after from the commissioning of the Project (JICA II).
- Connection of general households and shops has reached 66% of the projection in Basic Design Study 11 years after from the commissioning of the Project (JICA I).
- Connection of mill machines has reached 28% of the projection in Basic Design Study 2 years after from the commissioning of the Project (JICA II).
- Connection of mill machines has reached 90% of the projection in Basic Design Study 11 years after from the commissioning of the Project (JICA I).

Progress of connection of public facilities such as health center and school, and

small offices does not show clear trend.

Table 8 Outline of the survey results of the customer connection growth in the previous project sites

After commissioning	2 years after	11 years after
General households and shops	3%	66%
Milling machines	28%	90%

Source: JICA Study Team

2.3.2 Analysis of the Site Survey in the Previous Project Sites

In the project site, it is expected from the results of our socio-economic survey that the driving loads will be mainly composed of the demand of general households, shops and milling machines processing staple foods. Based on the results shown in Table 8, the period required for completion of connection in the previous project sites are respectively estimated by Least Square Approximation and shown in Table 9. And increase rate of connection is also shown in Table 4, respectively.

The results are as follows;

- Connection of general households and shops will complete 16 years after from the commissioning of the Project
- Connection of milling machines will complete 10 years after from the commissioning of the Project

Table 9 Estimated terms required for completion of connection and increase rate of connection

After commissioning	Periods	Increase Rate of connection
General customer and shops	16 years	6.26 %/year
Milling machines	10 years	10.0 %/year

Source: JICA Study Team

Though public facilities such as health centers or schools are important as beneficiaries of the Project, their demand does not effect the total demand remarkably, as their respective number are not so large compared with one of general households and shops. Though number of milling Machines is not so large either, their respective demand are not small.

2.4 Power Demand Forecast in the Project Sites

The conditions for the demand forecast are shown below and the results shown in Table 10

<u>**Conditions for the demand forecast**</u>

- Increased rate of customer connection in the project site is assumed as 1.5 times of the rate in the previous project sites in consideration of introduction of subsidy scheme for customer connection in the project site.
  - General households and shops: 9.39 %/year

  - Milling Machines: 15.0 %/year
- It was mentioned by REA that the subsidy scheme will be introduced only for customers who will connect to the grid within some years after commissioning of 33 kV distribution line of the Project. The period to subsidize customers is assumed as 3 to 5 years in the demand forecast.
  - Subsidy period: 4 years
- Increase rate of demand is assumed 1.65 %/year in consideration of the growth trend of national demand of Uganda for the past ten years and the recent 5 years.
  - Increase rate of demand: 1.65 %/year
- Demand of each public facility is assumed as follows based on information obtained from the socio-economic survey carried out in the site survey. Number of public facilities are shown in Table 2. The loads of each consumer are estimated in Annex 5. Based on the site survey,
  - Primary School: 1,400 W
  - Secondary School and Tertiary School: 1,900 W
  - Health Center IV: 25,000 W
  - Health Center III and Health Center II: 1,600 W
- In general, it takes a few years to elapse before a rapid connection of milling machines to the grid, as procurement of motor (Approx. 10kW to 25kW) require some cost to their owners. It is assumed that the first boost will occur 2 to 4 years after from the commissioning of the Project based on data in the previous project site.
  - The time of first boost of connection of milling machines: four years after from the commissioning

Table 10 Demand Forecast for the Project

	Trading Centre	District	2013 kW	2014 kW	2015 kW	2016 kW	2017 kW	2018 kW	Required Capacity kVA	Trans. Capacity kVA
1	[illegible]	Mayuge	1.49	2.41	5.15	7.94	12.88	15.01	22	25
2	[illegible]	Mayuge	6.37	18.82	25.85	34.76	59.43	68.20	101	100+25
3	[illegible]	Iganga	1.53	3.16	4.73	6.41	12.14	14.13	20	25
4	[illegible]	Iganga	1.49	3.03	4.61	6.23	11.90	13.82	20	25
5	[illegible]	Iganga	4.82	9.76	14.83	20.23	33.11	38.55	58	50+25
6	[illegible]	Bugiri	8.84	19.18	29.29	38.65	56.25	65.37	96	100+25
7	[illegible]	Bugiri	4.87	9.81	15.11	20.47	33.40	38.99	57	50+25
8	[illegible]	Bugiri	2.52	5.10	7.85	10.51	21.55	25.14	37	50
9	[illegible]	Bugiri	2.68	5.44	8.29	11.29	22.40	26.07	38	50
10	[illegible]	Bugiri	0.60	1.22	1.87	2.53	7.52	[illegible]	12	25
11	[illegible]	Bugiri	7.06	14.42	21.88	29.76	48.57	[illegible]	83	100+25
12	[illegible]	Bugiri	16.73	34.01	51.90	70.29	128.16	146.81	220	200+25
13	[illegible]	Bugiri	1.13	2.20	3.51	4.75	10.16	11.83	17	25
14	[illegible]	Namayingo	5.21	10.55	16.14	21.88	[illegible]	[illegible]	87	[illegible]
15	Namayingo	Namayingo	60.34	42.02	123.06	169.50	310.07	360.54	530	[illegible]
16	[illegible]	Namayingo	1.87	3.81	5.60	7.67	13.88	[illegible]	23	25
17	[illegible]	Namayingo	0.58	1.19	1.81	2.45	7.42	8.64	12	25
18	[illegible]	Namayingo	2.40	4.81	10.64	14.29	30.53	[illegible]	52	100
19	[illegible]	Namayingo	0.43	0.88	1.34	1.82	6.67	7.75	11	25
20	[illegible]	Namayingo	3.79	7.70	11.74	15.91	77.51	90.12	132	200
21	[illegible]	Namayingo	1.25	2.57	3.91	5.30	10.82	[illegible]	18	25
22	[illegible]	Namayingo	1.54	3.14	4.79	6.48	12.23	14.24	20	25
23	[illegible] Landing Site	Namayingo	2.09	4.25	6.48	8.76	19.47	22.66	33	50
24	[illegible]	Namayingo	2.54	5.17	7.88	10.69	21.74	[illegible]	37	50
25	[illegible]	Namayingo	1.28	2.57	3.91	5.30	10.87	12.60	18	25
26	[illegible]	Namayingo	1.82	3.72	5.67	7.69	18.18	21.17	31	50
27	[illegible]	Namayingo	2.89	[illegible]	9.25	12.54	23.85	27.80	41	50
28	[illegible] A	Namayingo	0.58	1.19	1.81	2.45	7.42	8.64	12	25
29	[illegible] B	Namayingo	1.28	2.60	3.97	5.38	10.92	12.71	18	25
30	[illegible]	Namayingo	0.89	1.82	2.77	3.76	8.88	10.45	15	25
31	[illegible] A	Namayingo	1.22	2.49	3.78	5.14	10.63	12.37	18	25
32	[illegible] B	Namayingo	1.26	2.31	3.81	5.30	10.82	12.60	18	25
33	[illegible]	Busia	3.35	6.82	10.40	14.59	[illegible]	[illegible]	51	100
34	[illegible]	Busia	3.56	7.24	11.04	14.97	22.34	26.03	38	25+25
35	[illegible]	Busia	2.09	4.25	6.48	8.79	19.47	22.66	33	50
36	[illegible]	Busia	3.82	7.76	11.83	16.03	23.80	27.70	40	25+25
37	[illegible]	Busia	0.70	1.42	2.16	2.93	7.89	9.30	13	25
38	[illegible]	Busia	0.70	1.42	2.16	2.93	7.89	9.30	13	25
	Total		151.42	307.92	[illegible]	[illegible]	[illegible]	[illegible]		

Source: JICA Study Team

Note: "Required capacity" is calculated in consideration of Power Factor 0.85 and Demand Factor 0.8

"Transformer capacity" is the minimum rated capacity to meet "Required Capacity".

3. Design Conditions and Technical Specifications

3.1 Design Conditions

Design conditions applied to the Project are described as follows.

3.1.1 Climatic Conditions

Natural conditions which need considerations for the equipment and facilities design are shown in Table 11.

Table 11 Climatic Conditions for the Equipment and Facilities Design

Item		The Project Area Mayuge, Iganga, Bugiri, Namayingo and Busia Districts
Altitude		Less than 1,200 m
Ambient Temperature	Maximum	35 ℃
	Minimum	15 ℃
	Mean	25 ℃
Maximum Humidity		85 %
Maximum Wind Velocity		30 m/sec
Rainfall		2,200 mm/year
Seismic Force		Horizontal 0.1 G

Source: UGANDA DISTRICTS Information Handbook (2007-2008)

3.1.2 Basic Electrical Design Conditions

(1) Electric System (Voltage and Wiring System)

Voltage, wiring, frequency and earthing system applied to the 33kV distribution line and distribution transformer LV side shall be the same as those of the existing facilities. The summary of the electrical system concerned with the Project is shown in Table 12.

Table 12 Summary of Electrical System

Nominal Voltage	33 kV	415-240 V
Maximum Voltage	36 kV	460 V
Wiring Method	3 phase, 3 wires	3 phase, 4 wires
Frequency	50 Hz	50 Hz
Earthing System	Effective Earth	Effective Earth
Short-circuit Current	Less than 25 kA (1 sec.) at 33 kV switchgear in substation	Less than 10 kA (1sec.) at distribution transformer LV side
Lightning Impulse Withstand Voltage (LIWV)	170 kV	–
Power Frequency Withstand Voltage	70 kV	–
Creepage distance	16 mm / kV	–
Overhead Grounding Wire	Not Required	–

Source: JICA Study Team

(2) Other Electrical Systems

1) Color coding

Applicable color coding shall be applied to IEC standard that is red, yellow, blue and black

2) Safety factor

The following safety factor shall be applied to design and installation works.

(a) Pole and foundation: 2.0

(b) Conductor and cross-arms: 2.5

(c) Insulators: 2.0

3) Clearance of conductors

The Clearance of 33kV overhead line shall be as follows.

(a) Minimum Clearance

a) Phase to phase: 400 mm

b) Phase to ground: 380 mm

(b) Minimum Height from Ground Level

a) Road Crossing: 7.5 m

b) Roadside: 6.5 m

4) Span length of electrical pole

a) Single pole and double poles: Maximum 100m

5) Location of section pole

Every 8 spans

6) Location of Load Break Switch

Load Break Switch shall be installed at connection point with existing 33kV distribution line, major branching point and at intervals of about 13km for inspection and maintenance of the 33kV distribution line.

7) Location of Auto Recloser

Auto Recloser shall be installed at connection point with existing 33kV distribution line.

8) Metering Unit

Metering Unit shall be installed at connection point with existing 33kV distribution line.

3.1.3 Applicable Codes / Standards and Units

(1) Applicable Codes/Standards

The following Japanese and International standards/codes shall be generally applied to the Project.

1) International Electrotechnical Commission (IEC)
2) British Standard (BS)
3) International Standardization Organization (ISO)
4) Japanese Industrial Standard (JIS)
5) Japanese Electrotechnical Commission (JEC)
6) The Standard of Japan Electrical Manufacturer's Association (JEM)
7) Japan Cable Maker's Association Standard (JCS)
8) Other Japanese and International Standards concerned

(2) Units

Unit of length, area, volume, mass (weight), etc. used in the Project (such as Design, Manufacturing, Installation, Testing and Reporting) shall be in accordance with the International System of Units (SI).

3.2 Basic Plans of Components

The basic plan of the components is shown in Table 13.

Table 13 Basic Plan of Components

	Basic plan of Components	
Procurement and Installation	Procurement and installation of the following equipment and materials for 33 kV distribution line	
	(1) 33 kV Distribution Line (Total Length: Approx. 134.4 km)	
	➢ Trunk line from Mayuge Trading Center (T/C) to Nankoma T/C through Mpungwe T/C	Approx. 21.5 km
	➢ Branch line from Mpungwe T/C to Makuny T/C	Approx. 10.2 km
	➢ Trunk line from Nankoma T/C to Lumino T/C through Namayingo T/C and Hakomo T/C	Approx. 37.5 km
	➢ Branch line from Namayingo T/C to Bunswa A T/C and Bunswa B T/C	Approx. 29.9 km
	➢ Branch line from Namayingo T/C to Busiro Landing Site and Ligala	Approx. 24.8 km
	➢ Branch Line from Hakomo T/C to Musijini T/C and Mwembe-Tayari T/C	Approx. 10.5 km
	(2) 33 / 0.415-0.240 kV Distribution transformer (Total Number: 50 units)	
	➢ 200 kVA = 4 units, 100 kVA = 7 units, 50 kVA = 11 units, 25 kVA = 28 units	
	(3) Metering Unit (Total: 4 units)	
	➢ Connection point at Mayuge: 1 unit	
	➢ Connection point at Nankoma: 2 units	
	➢ Connection point at Lumino: 1 unit	
	(4) Auto Re-closer (Total: 4 units)	
	➢ Connection point at Mayuge: 1 unit	
	➢ Connection point at Nankoma: 2 units	
	➢ Connection point at Lumino: 1 unit	
	(5) Load Break Switch (Total: 16 units)	
	➢ Connection point at Mayuge: 1 unit, Connection point at Nankoma: 2 units, Connection point at Lumino: 1 unit and Major branch point: 4 units and Intervals of 13 km: 8 units	
Procurement	Spare parts and maintenance tools for 33 kV distribution line	
	(1) Emergency Spare parts (1 lot)	
	➢ Lightning Arrester, Fused Cut-out Switch and Distribution Transformer	
	(2) Replacement Spare Parts (1 lot)	
	➢ Fuse element for cut-out switch and contacts for load break switch	
	(3) Maintenance Tools (1 lot)	
	➢ Digital-type multi meter, Clip-on meter, Phase rotation meter, etc.	

Source: JICA Study Team

3.3 Procurement and Installation Plan of Equipment and Materials

(1) Procurement Plan of Equipment and Materials

1) Quantity of Major Equipment and Materials

(a) Distribution Transformer

Table 14 Quantity and Capacity of Distribution Transformers

	Trading Center	Quantities of Transformers [unit]				Total	Additional Transformer
		25 kVA	50 kVA	100 kVA	200 kVA		
1	Maina	1				1	
2	Mpungwe	1		1		2	25 kVA for secondary school
3	Nandiwe	1		1		2	25 kVA for small town nearby
4	Bwahula	1	1			2	25 kVA for primary school
5	Matovu		1			1	
6	Namabundu	1				1	
7	Buwenge	1				1	
8	Makuny	1	1			2	25 kVA for schools
9	Nabigingo		1			1	
10	Irimbi	1				1	
11	Muterere	1		1		2	25 kVA for schools
12	Mayuge-Bukbuli	1			1	2	25 kVA for health center
13	Budde	1				1	
14	Nsango			1		1	
15	Namayingo		2	1	2	5	* District capital of Namayingo
16	Lunjo			1		1	
17	Buwanga	2				2	25 kVA for Sub-county headquarter
18	Hakomo		1			1	
19	Lumuli	1				1	
20	Mwembe-Tayari	1				1	
21	Mumbindi	2				2	25 kVA for primary school
22	Lwangosia	1				1	
23	Nairobi	1				1	
24	Lutolo			1		1	
25	Kilindini	1				1	
26	Lugala				1	1	
27	Bunswa	1				1	
28	Busiro	1				1	
29	Busiro Landing Site		1			1	
30	Farm		1			1	
31	Nabusera	1				1	
32	Hanumba-Banja		1			1	
33	Matumba		1			1	
34	Butehey-A	1				1	
35	Mulombi-B	1				1	
36	Buchimo	1				1	
37	Bumeru-A	1				1	
38	Bumeru-B	1				1	
	Total	28	11	7	4	50	

Source: JICA Study Team

Note: * The District capital of Namayingo District expands widely. Based on the demand forecast for the project, 5 transformers of total capacity of 600 kVA are located.

(b) Load Break Switch

Quantity and location of load break switch is as follows.

a) Connection point at Lumino: 1 set
b) Connection point at Nankoma: 2 sets
c) Connection points at Mayuge: 2 sets
d) Major branch point: 4 sets
e) Intervals of 13km: 5 sets

(c) Metering Unit

Quantity and location of metering unit is as follows.

a) Connection point at Lumino: 1 set
b) Connection point at Nankoma: 2 sets
c) Connection points at Mayuge: 1 set

(d) Auto Recloser

Quantity and location of auto recloser is as follows.

a) Connection point at Lumino: 1 set
b) Connection point at Nankoma: 2 sets
c) Connection points at Mayuge: 1 set

(e) Conductor

The procurement length of conductor for 33kV distribution lines is as follows.

a) Design length of conductors: 134.4km x 3 phase = 403.2km
b) Procurement length of conductor: 403.2 x 1.05 = 423km (1.05: margin)

(2) Specifications of Major Equipment and Materials

The specifications of major equipment and materials are shown in Table 15.

Table 15 Specifications of Major Equipment and Materials

Equipment	Specifications
(1) Distribution Transformers	
1) Applicable Standard	IEC, BS, JEC, JEM or Equivalent
2) Type	Oil immersed, ONAN, Hermetically-sealed, Outdoor, Pole-mount type
3) Nominal Voltage	33,000/433-250 V +5 %
4) Impedance Voltage	±2.5 %, +5.0 % (no voltage tap changer)
5) Tapping Voltage (%) on HV Side	
6) Phase	HV:3 phase , LV :3 phase,4-wire
7) Frequency	50 Hz
8) LIWV	170kV
9) Vector Symbol	Dyn11
10) Capacity	25, 50, 100, 200 kVA
11) Accessories	-Name Plate

Equipment	Specifications
	-Oil level indicator and oil temperature indicators
(2) Load Break Switch	
1) Applicable Standard	IEC, JIS, JEC, JEM or Equivalent
2) Type	Manual Operation
3) Rated Nominal Current	630 A
4) Rated Voltage	33 kV
5) Rated Frequency	50 Hz
6) LIWV	170 kV
7) Rated Breaking Capacity	630 A (at load current)
8) Rated Short-Time Current	16 kA (3 sec.)
9) Creepage Distance	min. 825 mm
10) Accessories	-Name Plate -Operation mechanism -Hot-dipped galvanized steel support with fixing material
(3) Fused Cutout Switches	
1) Applicable Standard	IEC, JIS, JEC, JEM or Equivalent
2) Type	Outdoor Type
3) Rated Current of Unit	100 A
4) Rated Voltage	33 kV
5) Rated Frequency	50 Hz
6) LIWV	170 kV
7) Rated Interrupting Current	8 kA
8) Fuse	5 A to 25 A (depending on the capacity of distribution transformer) to be operated by rod from the ground
9) Operation	-Operation rod(Length 5 m)
10) Accessories	-Hot-dipped galvanized steel support with fixing material
(4) Lightning Arrester	
1) Applicable Standard	IEC, JIS, JEC, JEM or Equivalent
2) Type	Outdoor, Zinc-oxide, Gapless Type
3) Nominal System Voltage	33 kV
4) Rated Voltage	Minimum 30 kV (rms)
5) Nominal Discharge Current	5 kA (8/20 μs)
6) Accessories	Hot-dipped galvanized steel support with fixing material
(5) Metering Unit	Consisting of CT/VT unit and bulk metering unit
1) Applicable Standard	IEC or Equivalent
2) CT/VT unit of MU	
3) Type	33 kV, Outdoor oil filled, Pole mounted
4) Rated Ampere	200 or 100 Amp., Short-time current: 13 kA (1sec.)
5) VT	33,000/110 V, 50 VA, Accuracy class: 0.2
6) CT	200-100-50/1 A, 10 VA, 2x/1, Accuracy class 0.2
7) SA	Surge arresters mounted
8) Electric meter of MU	2 units (Main and Checking)
9) Type	3-Wire, 50 Hz, Voltage 110 V, Current 1 A, Class 0.2
10) Function	kWhr & kvar Import/Export Measurement, kVAh Derivation (4 times of use 4 V line on pal relays, Load Profiling (450 days, 1 channel, 20 min.), 1-Phase
11) Control Cable	Min. 2.5 mm2, 7 cores, copper, 10 m
12) Outdoor Metering Kiosk	Waterproof type, with pad-lock (spare key: 3 pcs)
13) Terminal Blocks	13 way
14) Cable Ties	1 lot
(6) Auto Reclosers	
1) Applicable Standard	IEC or Equivalent
2) Type	Pole mounted, gas insulated auto circuit recloser
3) Continuous Current Capacity	630 A
4) Rated Short-Time Current	16 kA (1sec.)
5) Control Cubicle	Simple programming is provided from the control panel

Equipment	Specifications
6) Accessories	Closing and tripping is from high quality and long life batteries which charge capacitors. Control cubicle is stainless steel enclosure. - Voltage transformers (33 kV/110 V, Accuracy class 1.0, 50 VA) - Control cables - Fixing materials for electrical pole - Relay software - Technical and installation manual
(7) Conductor for 33kV Distribution Line	
1) Applicable Standard	IEC or Equivalent
2) Type	All Aluminum Alloy Conductor (AAAC)
3) Size	100 mm[2]
4) Length per a Drum	2,000 m
(8) Wooden Pole with Pole Cap	
1) Wooden Pole	
• Material	Creosoted wooden pole
• Shape	Round pole
• Length	11 m /12 m
• Diameter of pole (at top)	11 m pole: 190-210 mm 12m pole: 210-235 mm
2) Pole Cap	
• Material	Steel Plates/Iron Sheets
• Accessories	Nail (Q'ty 2 pcs/cap)
(9) Insulators	
1) Pin Insulator	
• Applicable standard	IEC or Equivalent
• Type	Solid core
• Material	Porcelain
• Color of porcelain	Brown
• Creepage distance	Min. 576mm
2) Disc Insulator	
• Applicable standard	IEC or Equivalent
• Type	Ball and socket
• Material	Porcelain
• Color of porcelain	Brown
• Diameter of insulator	254 mm
• Number of insulator per string	3 pieces
• Creepage distance	Min. 300 mm per one insulator

(3) Installation Plan of Equipment and Materials

The route of 33kV distribution lines and location of distribution transformers shall be designed in accordance with the following measures.

1) Technical Aspects

(a) 33kV distribution lines are designed along existing road and location of electrical pole is basically designed within road reserve.

(b) 100m span is applied for pole interval of 33 distribution line basically inconformity with the Ugandan standard.

(c) Distribution transformers are located in load center of each trading Center.

In case important public facilities are far away from the location of transformer (over 500m), can not supplied from the transformer and additional transformers are requested by REA based on the survey.

Trading Centers where additional transformer are located:

Mpunugwe, Nondwe, Buwalula, Makuutu, Muterere, Mayuge-Bukholi, Namayingo, Buwanga and Mundindi.

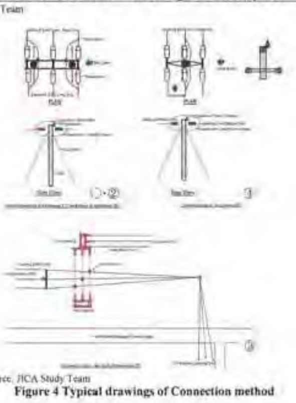
(d) Method of Connecting Existing and New Distribution Lines

New 33kV distribution lines shall be connected to the existing 33kV distribution lines and be extended to project sites. The connection method is shown in Table 16 and typical drawings are shown in Figure 4.

Table 16 Connection Method between New 33kV Distribution Lines and Existing Distribution Lines

Project Site	Connection Method	No.
Mayuge	New line shall be extended from the existing line at dead end pole in Mayuge.	①
Nankoma (West)	New line shall be extended from the existing line at dead end pole in Nankoma (West).	②
Nankoma (East)	New line shall be branched (T-off) from the existing line at dead end pole in Nankoma (East).	③
Lumino	New line shall be extended from the existing line at dead end pole in Lumino.	④

Source: JICA Study Team

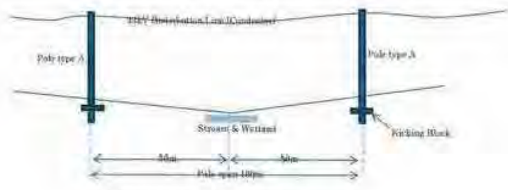


Source: JICA Study Team

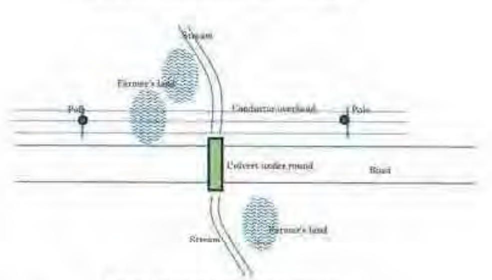
Figure 4 Typical drawings of Connection method

2) Environmental and Social Aspects

(a) Based on the site survey, we could find the mitigation measures of all cases of wetland as described Figure 5; Position of electrical poles are designed in 100m span as standards.



Typical section at stream/wetland crossing



Typical Plan at stream/wetland crossing

Source: JICA Study Team

Figure 5 Typical Arrangement around Wetland/Stream

(b) 33kV distribution lines routes are designed to avoid play-grounds in schools, cultural sites (shrines) and valuable trees, where possible.

(c) In case of crossing seasonal flood plains, position of electrical pole is designed in maximum 100m span. Type of electrical pole is intermediate double poles (Type W) is applied.

3.4 Procurement Plan of Spare Parts and Maintenance Tools

The spare parts and maintenance tools for the Project are shown in Table 17 and Table 18.

Table 17 Spare Parts List

Equipment	Q'ty	Description
(1) Emergency Spare Part		
1) Lightning Arrester	3 pcs	33kV, 5kA, single phase
2) Fused Cut-out switch	3 pcs	33kV, single phase
3) Distribution Transformer	1 set of each type	25, 50, 100, 200kVA
(2) Replacement Spare Parts		
1) Fuse element for cut-out switch	3 pcs of each type	-
2) Contacts for load break switch	3 pcs	

Source: JICA Study Team

Table 18 Maintenance Tool List

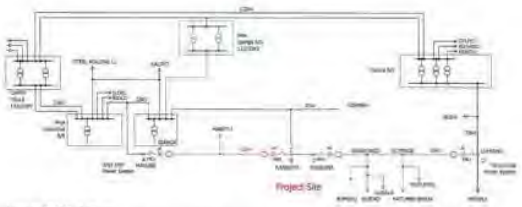
Equipment	Q'ty	Description
(1) Digital-type multi-meter	1 set	For general purpose
(2) Clip-on meter	1 set	For checking of metering unit
(3) Phase rotation meter	1 set	For general purpose
(4) Voltage detector	1 set	For 33kV line
(5) Voltage detector	1 set	For low voltage
(6) Insulation resistance meter	1 set	For megger test, 33kV line
(7) Insulation resistance tester	1 set	For megger test, low voltage
(8) Earth resistance tester	1 set	For general purpose
(9) Operation rod	1 set	For fused cut-out switch

Source: JICA Study Team

3.5 Upgrading of the Existing Distribution Lines (from Busia to Lumino, around Nankoma)

For stable and qualitative power supply to the project site, the capacity of power equipment in the back bone supply level of the project site was established through a site survey and discussions with REA, UMEME and Uganda Electricity Transmission Company Limited (UETCL). The power system around the project site is shown in Figure.6.

- 33 kV distribution line of the Project will be connected to the existing distribution line from Jinja Industrial Substation to Iganga S/S in the Jinja side of the Project site.
- 33 kV distribution line of the Project will also be connected to the existing distribution line from Tororo S/S to Majanji through Busia and Lumino in the Lumino site.



Source: JICA Study Team

Figure.6 Project System around the project site

- Currently, the power system infrastructure from Jinja Industrial S/S to Iganga S/S is almost loaded at full capacity due to huge power consumption of big factories such as the steel rolling mills in the Iganga area.
  - Conductor type: 150 mm^2 AAAC
  - Normal Load of Line 15 MVA / Capacity of Power line 17 MVA
- It was confirmed through discussion with UETCL that they plan to install and commission a new Iganga S/S (132 / 33 kV, Capacity 80 MVA) in 2015 between Owen Falls S/S and Iganga S/S. Therefore, it is projected that the power source to the project site from the Jinja side will be relieved from over-load a few years after commissioning the Project.
- Currently, specifications of the existing 33 kV distribution line from Tororo S/S to Busia are partly 25 mm^2 AAAC or ACSR. It was confirmed through discussion with UMEME that the rehabilitation and urgent upgrading work for the line will be carried out starting in this year, 2011 in consideration of development of Busia.
  - Rehabilitation work of supporting structures for the line: 220 poles
  - Upgrading work of conductor size at the parts where the size of conductor is 25 mm^2 between Tororo and Busia: 50 mm^2 ACSR
    (By the work, all the conductor between Tororo S/S and Busia will be 50 mm^2.)

The extension work of the distribution line shall be in conformity with the current conditions of the existing distribution system. In consideration of urgency of the Project, the Project is targeting five years after from the time of the Preparatory Survey, i.e. 2016. Above mentioned upgrading work will contribute to keep the voltage drop within 10 % at the load center (Nankoma T/C) of the project site until the target year based on the demand forecast for the Project shown in Table 10.

- The Ugandan side also plans to upgrade 33 kV distribution line from Tororo S/S to Majanji to 100 mm^2 AAAC in conformity with development of Busia and Lumino within a few years. The upgrading work will contribute to stable and qualitative power supply to the project site from viewpoint of medium term as well as construction of New Iganga S/S, in case that the Project is commissioned.
- The above mentioned upgrading work is planned to include upgrading of the existing 33 kV distribution line around Nankoma T/C, which is between Point B and C in Fig.6, from 25 mm^2 AAAC to 100 mm^2 AAAC.

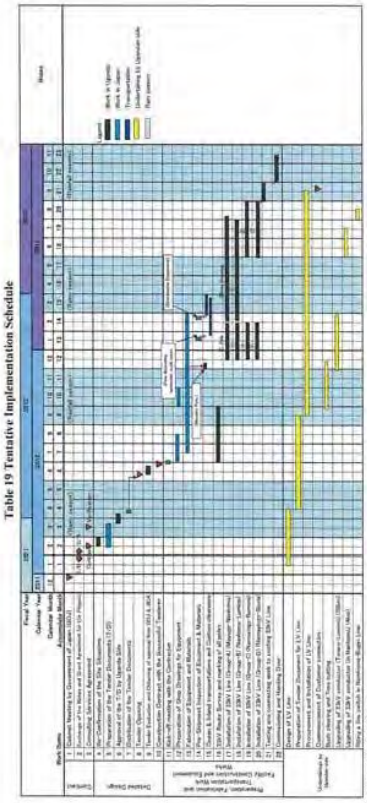
The Team recommends the Ugandan side to include installation work of transformer for the pumping station to supply water to Nankoma T/C which was confirmed in the site survey between Matovu T/C and Nankoma T/C. It is desirable 33 kV distribution line of the Project can be utilized effectively by installation of the transformer for the pumping station.

3.6 Tentative Implementation Schedule of the Project

Tentative implementation schedule is shown as Table 19. In case that the Project is decided by the Japanese Government, the Project will proceed as bellows in case of the earliest scenario, as shown as Table 19. Installation work of the Project starts in December, 2012.

- The Exchange of Notes between the Ugandan and Japanese Government will be signed in January, 2012.
- The Tender Opening will be held in June, 2012.
- Installation work of the Project will start in December, 2012.
- Commissioning of the Project will be in November, 2013.
- Design and preparation of tender for installation of low voltage distribution line borne by the Ugandan side shall be commenced immediately after the Exchange of Note.
  In conformity with the time of commissioning of the Project, the Ugandan side procure and install low voltage line in timely manner to escape stagnation of progress of customer connection.

Table 19 Tentative Implementation Schedule



Source: JICA Study Team
Note:

4. Environmental and Social Considerations

4.1 Location of 33 kV Distribution Line

The proposed Project Route passes through five districts at about 134.4 kilometers. Table 20 summarizes the sensations of proposed Project Route, those approximate lengths and respective local administrations and Figure 7 shows the proposed Project Site.

Table 20 Proposed Project Route with Local Administrations

Project Route	(km)	District	Sub-county
1) Mayuge – Nankoma	21.5	Mayuge	Mayuge TC, Bukatube, Mpungwe, Kigandaro
		Iganga	Makuutu
2) Mpungwe– Makuutu	10.2	Mayuge	Mpungwe
		Iganga	Makuutu
3) Nankoma – Lumino	37.5	Bugiri	Nankoma, Buliaba, Mutorere, Budhaya)
		Namayingo	Namayingo TC, Buyinja
		Busia	Lunyo, Lumino
4) Namayingo – Bumeru A	29.9	Namayingo	Namayingo TC, Bukomba
5) Namayingo – Lugala – Busitsi Landing Site	24.8	Namayingo	Namayingo TC, Bukomba, Bunda
6) Hukomo – Mwembe-Tayari – Mundindi	10.5	Busia	Lunyo
Total	134.4		

Source: JICA Study Team

Source: JICA Study Team

Figure 7 Proposed Project Site

4.2 Points of Environment and Social Considerations

The following sections summarize the results of 1st field survey of the Project Route. The following points are derived from those results for the works of environmental survey in 2nd field survey.

1) Socio-economic activities can be affected on the Project routes

2) Land use and structures can be affected on the Project routes

3) Nature areas can be affected on the Project routes (CFR, wetlands, rivers, vegetation especially roadside valuable trees)

4) Local people's involvement

4.2.1 Points of Environment and Social Aspects

The results of 1st field survey shows that most lands along the Project routes of Area-4 are cultivated already and many trade centers (TCs) are located on. The Project Site has totally gently undulating hills in topography and the requested route passes a Central Forest Reserve (CFR) named Irimbi CFR which is used for industrial and commercial plantation on rocky hill in the short length at approximately 1km. In the inland of Project Site, there are seasonal wetlands that the local people have been cultivating and few wetlands. Respective District Environment Officers say that the local wetlands have common aspects in the country. Table 21 summarizes the environmental and social aspects of Project Site from the 1st site survey and interviews to district environment officers and local representatives (Local Council Chairmen).

Table 21 Environmental and Social Aspects in the Areas

Area	Description
District	Mayuge, Iganga, Bugiri, Namayingo, Busia
Topography	- Gently hilly site - Lake shore site
Land Use	- Settlements (trading centers) - Cultivated lands, Cattle grazing land - Woodlot (forestry)
Socio-economy	- Farming: cassava, maize, ground nut, beans, rice, millet, sugarcane - Fishing: tilapia, nile perch - Livestock: cattle, goat, chicken - Approx. average monthly income: 50,000 – 100,000 (farming), 150,000 – 200,000 (fishing), up to 950,000 (trading) UGX/household
Forest Reserve	- Irimbi CFR (Bugiri District): Approx. 1km on the Project Route
Wetland	- Common wetlands in vegetation - There are few permanent wetlands - Most wetlands are seasonal ones - Local people have been cultivating the wetlands

Source: JICA Study Team

4.2.2 Focal Points for the Environmental and Social Considerations from the District Officers

In the 1st field survey, the Team visited district environment officers and forest officers, and obtained their suggestions on the specific points for the environmental and social considerations of Area-4 as follows.

- Electricity is a step for improving livelihood leading to conserve environment
- Water flow in the wetlands should not be obstructed by poles
- Embankment for pole installation in the wetlands should be shorten from roads
- No erosion from the embankment
- Prevent preservatives of poles being into the wetlands
- Involvement of communities (local councils), district offices and sub-counties
- Sensitization for workers and local peoples (to prevent risks of extension of diseases/HIV or to respect local cultures)
- Conserve cultural and valuable trees or re-plantation

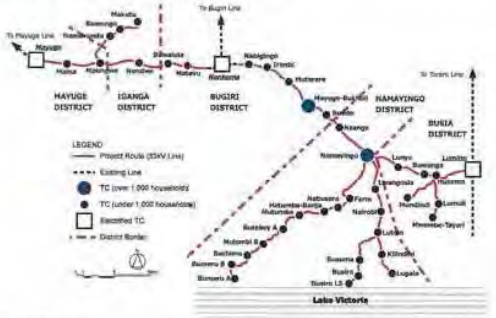
Key Findings:

- Adverse impacts on wetlands should be prevented or minimized.
- Involvement of local peoples is necessary.
- Valuable trees should be conserved.

4.3 Site Survey

4.3.1 Survey Area

Based on the points of environment and social considerations through the 1st field survey, the Team and REA with the respective District Environment Officers conducted the 2nd site survey covering the following Project Site shown in Figure 8.



Source: JICA Study Team

Figure 8 Survey Area with Trading Centers

4.3.2 Fact Findings with District Environment Officers

The Team and REA will avoid or minimize development projects' adverse impacts on the environment and local communities. Based on the policy, both of them conducted the site survey involving the District Environment Officers to identify the focal points of environmental and social impacts to reflect them on the route design.

Through the site survey, the Team, REA and the District Environment Officers found and concluded the following points should be considered most in the Project Site, which are described in the Fact Sheets attached to ANNEX 6.

- Wetlands (permanent and seasonal)
- Forest (Irimbi CFR)
- Cultural Site (shrine)
- Overclouded building area at Namayingo branch point

(1) Wetlands

The Team, REA and respective District Environment Officers observed wetlands (seasonal and permanent), seasonal streams, flood plains, water valley tanks along the Project Route. They are highly modified for cultivation mainly with maize and rice except the water valley tanks. The other crops, sugarcane, cassava, matoke (banana), were observed in the wetlands. Cattle grazing are also typical activities in the wetlands. Small water pools around box culverts were observed at the lowest points in them with the common wetland vegetations mainly of reeds, sedges, alfalfa, pinagamites, elephant grass, acacia, and thorny bushes. In the south area of the Project Site, along the Project Routes up to the lake shore, the water valley tanks are main domestic water sources as there are few bore halls.

- Wetlands: Seasonal (23 places), Permanent (5 places)
- Seasonal streams: 5 places
- Protected spring: 1 place
- Water valley tanks: 2 places
- Seasonal water pool: 1 place
- Seasonal flood plain: 1 place

(2) Forest (Irimbi) CFR)

Irimbi CFR managed by NFA is located at 250 meters from Irimbi TC. Main function of the Irimbi CFR is categorized in industrial and commercial forest plantations. The area is located on rocky Irimbi hill and it protects soil from erosion for the surrounding villages. The CFR also supplies fuel woods to Bugiri, Iganga and the surrounding trading centers. There are three licensed persons in four parts of land along the road. The plantations at the south side are more than the north side along the road. Types of plantations

- North side aspects: Young Grevillea and Pine trees at about 1 meter tall are planted

sparsely. Another type of plantation is Burtydaria trees which is also planted few. Most land is mixed with maize cultivation encroached by local peoples. Burtydaria trees about 5 years grown (about 6m tall) are planted sparsely. A cultural site (Kazimba Kungira) is located on the road.

- South side aspects: Grevillea, Pine trees and Burtydaria trees about 5 years grown (about 6m tall) are planted in one licensed area. These trees can be used for timbers. A part of land is used mixed with vegetable and maize cultivation encroached by local peoples. Few trees are planted at half part of land along the road. Most land is cultivated with maize.

(3) Cultural Site (shrine)

There are two shrines were identified along the Project Route. Baisemera is located on the north side of the road at the border of Iganga District and Mayuge District, which is taken care by Nalugodha (a cultural leader). There are several rocks surrounded by trees. The other shrine, called Kazimba Kungira is located on the northern side of the road in Irimbi CFR. The site is surrounded by tall trees.

(4) Overclouded building area at Namayingo branch point

Residential buildings are established close to the carriageway at the start of the preliminary Project Route branch to Bumeru A TC at Namayingo TC. The preliminary Project Route will affect the residential buildings along the road at about 400 meters. The space is too narrow to pass the Project Route along the road.

4.3.3 Other Subjects to be Considered

In addition to the fact findings, the Team and REA have concluded that the subjects to be considered as much as possible for the Route design as follows:

- Buildings and Structures should not be affected
- Loss of crops will be minimized
- School especially playground will be avoided
- Tall/large trees or massive trees will be avoided or those losses will be minimized.

4.3.4 Findings from Environment Officers

The followings are findings for the Project Route from interviews to the District Environment Officers of five districts.

- Important ecosystems: wetlands, Irimbi CFR, plantations
- Environment issues: deforestation, wetland degradation,
- Likely positive impacts: lighting, value added agricultural production, welding, products processed materials, boost of economic activities, growth of trading centers, reduce use of fire wood (deforestation)

- Likely negative impacts: loss of crops and trees, stream flow interruption, destruction of property, people's health
- Mitigation measures: compensation, re-plantation, minimum excavation
- Specific land use: mostly cultivated land with maize, cassava, millet, potato, settlements (shops), schools, plantation along the road
- Threatened species: nothing special, local trees (Mvule-Milicia Excelsa)

4.3.5 Findings from Local Representatives

It is also important to involve local representatives in the process of the Project. The Team and REA visited 43 local representatives including sub-county headquarters and local representatives (LC chairmen and mayors of TCs) to explain the Project, collect information and ask corporation. The results are summarized as follows.

- Specific land use, ecosystems (forests, wetlands, etc.), trees, graveyards, structures, to be considered along the Project Route: Nothing special, some grave yards but not clear
- Positive impacts: Milling (Maize, Rice, Coffee), Charging phone and battery, Sawmill, Refrigerator for cool drink, Welding (workshop), Carpentry, Salon, Industrialization (processing factory), Video theater, Health center, School, Reduce use of fire wood (deforestation)
- Negative impacts and fears: Loss of crops, mango trees, Construction workers encroach on land, Accidents (lack of knowledge), Accidents on the facilities (poles and wires), Expensive electricity charge/connection cost,
- Mitigation measures for the impacts: compensation, sensitization
- Others: Peoples are aware of road reserve (need sensitization); Peoples can allow the Project Route pass in front of/behind buildings; Peoples are waiting power long time

4.4 Environmental and Social Impacts and Mitigation Measures

4.4.1 Anticipated Environmental and Social Impacts

Anticipated environmental and social impacts are summarized as shown in Table 22 incorporating the findings of the site survey and interviews with various stakeholders. Most lands are dominated by farmlands even in both seasonal/permanent wetlands and farmland/residence mixed lands along the Project Route. Total 38 TCs include residential/commercial area of larger TC and settlement of smaller TC. The focal points of environmental and social impacts found with the District Environment Officers are already mitigated and reflected on the route design as well as the other subjects mentioned in section 4.3. In this context, the installation of 33 kV distribution lines can minimally affect the natural environment. Loss of crops and trees is the most negative impacts on the cultivated lands along the Project Route, however, will be compensated by REA.

Meanwhile, the power supply to un-electrified households will possibly provide new means of

livelihood and extend night-time learning for children at home. At health centers and schools, their public services will be more accessible and reliable for people in a wider area.

Table 22 Anticipated Impacts

No.	Likely Impacts	Descriptions
(1) Positive Impacts		
1) Before/During Construction Phase		
[Social Environment]		
1	Create job opportunities as construction workers	• As the construction work will be mostly manually conducted, the worker's demand (especially unskilled) can provide a temporary boost for local employment
2	Facilitate business opportunities for local service sector	• Local services sector can provide the construction workers accommodation, foods and beverages
2) Operation Phase		
[Social Environment]		
1	Create opportunities to establish new businesses (micro enterprises) to improve income sources for the local peoples	The power supply to households will create the scope of developing new livelihoods using electricity as, • Kiosk with refrigerator • Welding, Carpentry, Sawmill • Video theater, salon • Ice producing to cool fish
2	Improvement of living environment	The electrification can improve the living environment like, • Reduce risk of fire and health damage from kerosene lamp • Facilitate access to social information and entertainment with TV, radio, electrical device • Facilitate charging mobile phone and communication • Improve home safety and awareness on sanitation with lighting • Provide a longer time of homework for children at night
3	Improvement of social services (school, health center, water supply)	Better and more reliable public services will be provided by the health centers and schools for people in a wider area. In areas where the local peoples hardly can access to domestic water supplied by bore hall or spring, electrification could induce a water pumping system in those areas. In the health centers, the following impacts can contribute for the health maintenance of local peoples: • Enable them emergency care in the night • Enable them to introduce electrical medical equipment • Improved cold storage condition for medicine and vaccine can improve medical care services including immunization In the schools, students and boarders can obtain academic progress by • Introducing lighting equipment, PC, laboratory, practical equipment, and • Extending time of night learning
4	Improvement of agricultural industry	The most likely development to improve agricultural industry is electrification of grinding mills especially for maize and rice. The electric grinding mills can produce better quality flour and more quantity with lower cost, and those ones can be sold with better prices. Additionally, availability of power can promote investment to establish agricultural processing factories.
5	Improvement of social safety	Lighting in households, installation of street lamps and lighting at police stations can contribute to prevent crimes like thief and violence in the darkness. Moreover, the lighting can moderate mental fear to the darkness.
(2) Negative Impacts		
1) Before/During Construction Phase		

No.	Likely Impacts	Descriptions
[Social Environment]		
1	Obstruction of residential buildings	At Namayingo branch point of the Project Route, there is an area where the space is too narrow to pass the Project Route along the road. The other narrow space is seen along the Namayingo-Bumeru route at 'Funk' trading centre. The Project Route could affect the residential buildings in the areas.
2	Loss of crops and trees on the Project Route	Most lands along the Project Route are cultivated even in wetlands. The tall/large trees, plantations were also observed along the Route. Those crops and trees on the Project Route will be removed for the installing the poles and cables.
3	Construction workers encroaching on the land	External construction workers can induce fears of the local peoples. They would behave with bad manners, not respect local culture and traditions, or could harm the peoples' properties.
4	Obstruction of cultural sites (shrines)	There are two shrines were identified along the Project Route. The distribution line can pass in front of the shrines.
5	Obstruction of schools especially playground	Primary and secondary schools are located along the Project Route. The installation works and installed poles can hinder the student's activities on the playgrounds.
6	Expansion of HIV/AIDS	The external construction workers could induce illicit sexual relationships with local women and it would enlarge a risk to expand HIV/AIDS.
[Natural Environment]		
6	Obstruction of water flow in wetlands	The Project Route passes along wetlands (seasonal and permanent), seasonal streams, flood plains, water valley tanks. Small water pools around box culverts were observed on the road with pioneer wetland vegetations. If the poles are installed in front of the box culverts, water flows can be obstructed.
7	Loss of trees in Irimbi CFR	The Project Route is designed along the road passing through Irimbi CFR at about 1 kilometer. The planted trees can be felled to install the distribution line.
8	Loss of vegetation and landscape	The loss of tall/large trees, plantations could deteriorate the vegetation and landscape along the Route although they are avoided as much as possible.
[Accident]		
9	Accidents of construction workers and local residents	Although a contractor will use few heavy machinery, the manual nature of the work means that there is the opportunity for accidents involving workers to occur. The works to install poles and wires can induce the accidents on the local peoples.
2) Operation Phase		
[Accident]		
10	Accidents in households	Due to lack of knowledge of electricity, the consumers can have accidents like electric shock in their homes. The results of interviews to the local people's representatives, LC/III chairmen, sub-county officials, also tell the same fears.
11	Accidents on the facilities	Although rare, the overhead cables may be cut and damaged due to an accident or disaster. The other possible accidents on the facilities are theft, vandalism or burns in the field.

Source: JICA Study Team

4.4.2 Proposed Mitigation Measures

As the environmental items which may experience negative impacts of the Project based on the evaluation results, their common mitigation measures are proposed as shown in Table 23.

Table 23 Proposed Mitigation Measures

No.	Possible Negative Impacts	Mitigation Measures	Organization
1)	Before/During Construction Phase		
1	Obstruction of buildings and other infrastructure	• To avoid the affections on buildings, the Project Route will be designed to connect to the other branch line of Namayingo – Lugala Project Route at Namayingo • At Ferri TC, the Project Route will be designed pass behind the buildings	REA, Consultant
2	Loss of crops and trees on the Project Route	• REA will conduct community meetings, survey, explain to the local peoples, make agreements, evaluate the subjects with district compensation rates and compensate the owners	REA
3	Construction workers misbehaving on the land	• Contractor will sensitize the construction workers about proper manner in the sites and to learn the local traditions	Contractor
4	Obstruction of cultural sites (shrines)	• The cultural site will not be tampered with; the Project Route will be designed passing the opposite side of the road	REA, Consultant
5	Obstruction of the schools especially the playgrounds	• The Project Route will be designed passing the opposite side of the road where schools are located	REA, Consultant
6	Expansion of HIV/AIDS	• Contractors will sensitize workers and communities with cooperation of respective health centers	Contractor, Health Centers
7	Obstruction of wetlands	• The Project Route will be designed to avoid water pools and soft ground • The poles will be installed at approximately 100m span to avoid the box culverts and stream	REA, Consultant
		• In case the poles are installed in the wetlands, the poles' location will be away from the box culverts to avoid obstruction of the flow of water • Clearance of the vegetation and excavation will be limited to the area where the electricity poles will be installed	Supervising Consultant, Contractor
8	Loss of trees in Irimbi CFR	• The Project Route will be designed to pass the north side to avoid more massive licensed plantations • The poles will be installed at approximately 100m span to minimize the numbers of poles in the site	REA, Consultant
		• REA will compensate NFA, the licensed persons and other farmers for the felled trees, crops and encourage replanting in other areas	REA
9	Loss of vegetation and landscape	• The Project Route will be designed to avoid tall/large trees or massive trees along the road as much as possible	REA, Consultant
		• The trees felled by necessity will be compensated by REA as same as loss of crops and trees • Re-plantation program will be conducted to provide communities with seeds, tree seedlings for replanting	REA, Community

No.	Possible Negative Impacts	Mitigation Measures	Organization
10	Accidents of construction workers and local residents	• Personal Protective wear will be provided for all the workers during construction according to the labor laws of Uganda and ensure good and safe working conditions in accordance with contractor's construction manuals which are required in the contract	Supervising Consultant, Contractor
2)	Operation Phase		
11	Accidents in households	• REA will sensitize the local peoples to educate about electricity and instruction how to use safely	REA, District/ Sub-county offices
12	Accidents on the facilities	• Operator is obligated to maintain the facilities complying with their maintenance regulation • Community development Officers will also sensitize the local people on the importance of maintaining the facilities, need protect them from theft, vandalism or burns in the field	Operator, Community (LCI/III, Sub-county)

4.4.3 Procedure of Compensation

On that basis, the road reserves of selected routes should be cleared according to road classification of national and district levels, if REA will use the road reserves for the Project. Even in case that REA will not use the road reserve, distances to be kept from them should be cleared.

Meanwhile, REA's policies and procedures how to secure the routes of 33kV distribution lines should be confirmed. REA will take the following steps for compensation on the routes. However, the survey will be started just before construction according to the REA's prior projects. Therefore, it is recommended that the first step of the process, the community meeting with related LCI Chairmen, will be conducted immediately after E/N and agreement are done. Besides, the local peoples will also be involved in the early meeting.

- ➢ Community meeting with LCI Chairmen
- ➢ Survey and Explanation to persons whose properties are affected
- ➢ Agreement with the wayleaves consent form
- ➢ Evaluation of properties on the routes with the wayleaves assessment form
- ➢ Preparation of evaluation report
- ➢ Submission of the evaluation report to a Chief Government Valuer in Ministry of Land
- ➢ Assessment and authorization by a Chief Government Valuer
- ➢ Explanation of evaluation results to the affected owners and payment

4.5 Preparation of Project Brief (PB)

REA shall obtain an Environmental Certificate (EC) from NEMA to implement the Project. As the first step, REA shall submit NEMA a Project Brief which describes the outline of the project, likely impacts caused by the Project and the mitigation measures. NEMA will determine whether or not the Project is exempted from an EIA based on the Project Brief. To prepare the PB, an environment expert who belongs to MEMD joined the site survey. She will finalize the PB and submit NEMA it in the end of August.

5. Work Demarcations for Both Parties

In the implementation of the Grant Aid Project, Japanese side and Ugandan side is required to undertake such necessary measures as shown in Table 24.

Table 24 Work Demarcations for Both Countries

No	Undertakings	To be covered by Japan	To be covered by Uganda	Remarks	Item No. on M/D
*1	(1) Securing of lands of the Project sites (routes of 33kV distribution lines)		○		1
	(2) Land leveling and preparation, bush clearing and removal of obstacles in the Project sites		○		
*2	To construct the following facilities			Not Applicable (Building installation work does not include.)	2
	(1) The building	○			
	(2) The gates and fences in and around the site		○		
	(3) The parking lot	○			
	(4) The road within the site	○			
	(5) The road outside the site		○		
*3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the [site(s)]			Not Applicable (Building installation work does not include.)	3
	(1) Electricity				
	a. The distributing power line to the site		○		
	b. The drop wiring and internal wiring within the site	○			
	c. The main circuit breaker and transformer	○			
	(2) Water Supply				
	a. The city water distribution main to the site		○		
	b. The supply system within the site (receiving and elevated tanks)	○			
	(3) Drainage				
	a. The city drainage main (for storm sewer and others to the site)		○		
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	○			
	(4) Gas Supply				
	a. The city gas main to the site		○		
	b. The gas supply system within the site	○			
	(5) Telephone System				

No	Undertakings	To be covered by Japan	To be covered by Uganda	Remarks	Item No. on M/D
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		○		
	b. The MDF and the extension after the frame/panel	○			
	(6) Furniture and Equipment				
	a. General furniture		○		
	b. Project equipment	○			
*4	Transportation of the Equipment, customs procedures and tax procedures				4 and 5
	(1) Marine/ air transportation to a port of disembarkation	○			
	(2) Procedures for tax exemption and customs clearance at the port of disembarkation		○		
	(3) Internal transportation from a port of disembarkation to the Project sites	○		Delivery point: Storage Yard at Nankoma	
	(4) Exemption or payment of value-added tax (VAT) on locally procured items		○		
*5	Procedures necessary to obtain the following permits for the Japanese Consultant and Contractor: - Permits required for installation works - Permits to access restricted areas		○	The permits shall be obtained before project implementation.	6
*6	Proper operation and maintenance of facilities and the Equipment after the Project		○	Including bush clearing and removal of obstacles along 33kV distribution lines	7
*7	To bear all the expenses, other than those covered by Grant, necessary for the implementation of the project.		○		8
*8	Payment of the following fees based on the Banking Arrangement:				9
	(1) A/P advising commission		○	Approx. 10,000 Japanese Yen	
	(2) Payment commission		○	0.1% of the grant aid amount	
*9	Giving due environmental and social considerations in the implementation of the Project.		○		10
10	Securing of land of temporary material storage yard with fence and gate		○	To be utilized Storage Yard at Nankoma	
11	Securing parking space during installation period		○	To be secured, beside the road during the installation work	
12	Site offices	○		For the Japanese Consultant and Contractor	
13	Proper storage and safety management of the Equipment at temporary material storage yard	○			
14	Securing of working space along routes of 33kV distribution lines and traffic control		○	When necessary	
15	Relocation of existing overhead/underground cables or pipes of power, telephone, water supply/drainage, etc. and obtaining necessary permissions		○	When necessary	
16	Obtaining permissions on road crossing during 33kV distribution line work		○	When necessary	
17	Providing of disposal site of soil and discharged water caused by the installation work		○		
18	Manufacturing and procurement of the Equipment	○		"The Equipment" is defined as the equipment and materials to be provided by the Japanese side under the Project.	

No.	Undertakings	To be covered by		Remarks	Item No. in M/D
		Japan	Uganda		
19	Installation of the Equipment, adjust and testing	○		The Ugandan side is required to lend test equipment and tools to be provided on the Project to the Japanese Contractor during installation.	
20	Temporary shut down during installation		○		
21	Installation of a load break switch onto the existing pole at the connection point of 33kV distribution line in Nakawa		○		
22	Final connection to the existing 33kV distribution lines		○	At Mayuge, Namwera and Lumino connection point	
23	Provision of materials for the above mentioned final connection	○			
24	Provision of trainings for initial operation and maintenance of the Equipment	○			
25	Assuring security for personnel in the Project sites		○	On request	
26	Managing any dispute from consumers regarding temporary shut down for installation work including compensation for consumers		○	If necessary	
27	Public notice of scheduled shut down and implementation of the project during the implementation stage		○		
28	Design, procurement and installation of small hint of low voltage distribution lines and connection to consumers (household and public facilities) in the Project sites		○	The Ugandan side is required to implement the work in parallel with 33kV distribution line work done by Japanese side	
29	Safety		○	The Ugandan side is required to implement the work in parallel with 33kV distribution line work done by Japanese side	

Source: JICA Study Team

Note: * is described in the "Annex 7 of Minutes of Discussion" signed between the Ugandan and Japanese side.

ANNEX

1. Member of the Team

1 Member of the Team

Name	Assignment	Organization
Akira NIWA	Team Leader	Japan International Corporation Agency
Yoshikazu WADA	Planning and Management	Japan International Corporation Agency
Masatsugu KOMIYA	Chief Consultant / Power Supply Planning	Yachiyo Engineering Co., Ltd.
Kazunari NOGAMI	Deputy Chief Consultant/ Distribution Equipment Planning	Yachiyo Engineering Co., Ltd.
Masayuki TAMAI	Distribution System Planning	Yachiyo Engineering Co., Ltd.
Takeshi OMURA	Social and Environmental Considerations	Yachiyo Engineering Co., Ltd.
Atsuhito URUNO	Procurement and Installation Plan/ Cost Estimation	Yachiyo Engineering Co., Ltd.
Ayumi KOYAMA	Coordinator/ Assistance for Distribution System Planning	Yachiyo Engineering Co., Ltd.

2. List of Parties Concerned in the Recipient Country

2. List of Parties Concerned in the Recipient Country

Name	Employment Position
Ministry of Finance, Planning and Economic Development (MoFPED)	
Mr. Lawrence K Kiiza	Director Economic Affairs
Mr. Muhumuza NTACYO Juvenil	Senior Economist/ Finance Officer Aid Liason Department
Ministry of Energy and Mineral Development (MEMD)	
Ms. Irene Nafiina Muloni	Minister of Energy and Minerals
Mr. Simon D' Janga,	Minister of State for Energy
Mr. Ssegawa Ronald Gyagenda	Undersecretary
Eng. Henry Bidasala-Igaga,	Assistant Commissioner (Electric Power)
Eng. Moses Murengezi	Advisor to Chairman (BMSWG)
Mr. Sam Barasa	Personal Assistant to Minister
Mr. James Bunambe Isingoma,	Acting Commissioner Energy Resources Department
Mr. Sajjabi J. Fredrick	Senior Energy Officer
Ms. Agnti Caroline	Senior Petroleum Officer/ Environment
Ms. Mary Mwogeza,	Civil Engineer
Mr. Nabagereka Bridget	Electrical Engineer
Mr. Emmanuel Sande Ssalinga	Energy Officer (Electrical)
Rural Electrification Agency (REA)	
Mr. Godfrey R. Turyahikayo	Executive Director
Ms. Wesike K. Godfrey	Manager Project Monitoring & Evaluation
Mr. Muguwa Andrew	Principal Planning Engineer
Mr. Philip E.P.Gguyi	Senior Planning Engineer
Mr. Thomas Amaku	Senior Project Engineer
Ms. Joan Kayanga Mutibwa	Project Engineer Construction
Mr. Daniel Mugarura	Intern
Uganda Electricity Transmission Company Ltd. (UETCL)	
Mr. Eriasi Kiyenba	CEO
Mr. Gerald Muganga	Manager, Planning and Investments
Mr. Andrew Geno Omalia	Technical Officer, Projects
Mr. Ziria Tibalwa	Principal Planning Engineer
Ms. Stephen Kyeganwa	Senior Planning Engineer
Uganda Electricity Distribution Company Ltd. (UEDCL)	
Mr. Laura Ramanya	Project Manager
Mayuge District	
Mr. Omar Bongo Dantoor,	District Chairman, Mayuge District
Mr. Kabakubya Samual	Assistant Chief Administration Officer
Mr. Lubanga	District Natural Resource Officer
Mr. Alan Thomas	District Environment Officer
Iganga District	
Ms. Epodot Pauline Opio	Principal Assistant Secretary
Mr. Wamala Jotham	Assistant Chief Administrative Officer
Mr. Samanya Abdul	District Forest Officer
Mr. Dhikusooka Joseph	District Agricultural Officer
Mr. Batuuka Samuel	District Community Officer
Mr. Kayemba Jomin Fred	District Planner
Mr. Kagere Reinhard	Project Support Officer CAIIP
Mr. Ncluswu Mwamud	Chairperson Nondwe Town Board
Mr. Muhikirwa Sulayi	Councilor of Nondwe
Bugiri District	
Ms. Margaret Mwanamoiza	Resident District Commissioner
Mr. Luke L.L. Lukuda	Chief Administrative Officer
Ms. Bonadet Kauma	Environmental Officer
Mr. Kyemdira Maudraudy	District Planner
Mr. Nga Abebi	Water pump Operator
Mr. Bogere Muzammu	Water pump Operator
Namayingo District	
Mr. Richard Mugolo	Chief Administrative Officer
Mr. Kaleeba Peter	Assistant Chief Administrative Officer
Mr. Mayedo Ebwoni	Accountant
Mr. Kaawo Kawere Naay	District Educational Officer
Mr. Bwamiki Michael	District Health Educator
Mr. Kaleeba Peter	District Health Inspector
Busia District	
Mr. Semeza Yusuf	Chief Administrative Officer
Mr. Adeya Vincent	Deputy Chief Administrative Officer
Mr. Wabwire Patric	District Planner
Ms. Tsopista Namajia	Municipality Environmental Officer
Mr. Omiogo Matota Julius	Chief of Busime sub-county
Mr. Ondworo James	Accountant of Busime sub-county
Ms. Kisakye Mourveen	Intern
Umeme Limited	
Mr. Charles Chapman	Managing Director
Mr. Sam Zimbe	General Manager Corporate & Regulatory Affairs
Mr. Robert Kisubi	Support Service Manager
Mr. Zach Human	Network Manager Planning & Loss Reduction
Mr. Isaac Serwadda	Project Manager
Mr. Robert Mubiru	Area Manager Eastern
Mr. Fred Wandira	Power Transformer Maintenance Manager
Mr. Charles Magombe	Switchgear Maintenance Manager
Ms. Patricia Ocan	Planning & Design Manager
Embassy of Japan in Uganda	
Kazuo Minagawa	Ambassador Extraordinary and Plenipotentiary
Eri Ogawa	Third Secretary
Shugo Shinohara	Coordinator for Economic Cooperation
JICA Uganda Office	
Mr. Tetsuo Seki	Chief Representative
Ms. Akiko Nanami	Representative
Ms. Masae Iijima	Project Formulation Advisor

3. Minutes of Discussion

Minutes of Discussions
on the Preparatory Survey on the Project for
Rural Electrification Phase III in the Republic of Uganda
(Second Field Survey)

In response to the request from the Government of the Republic of Uganda (hereinafter referred to as "Uganda"), the Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with the Government of Japan, decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Rural Electrification Phase III (hereinafter referred to as "the Project").

JICA dispatched the 2nd Field Survey Team (hereinafter referred to as "the Team") to Uganda, headed by Dr. Akira NIWA, Senior Advisor, Department of Human Resources for International Cooperation, JICA. The Team is scheduled to stay in Uganda from June 10 to July 21, 2011.

The Team held discussions with the officials of authorities concerned of the Government of Uganda (hereinafter referred to as "the Ugandan side"), and conducted a series of field surveys. In the course of the discussions, both the Ugandan side and the Team (hereinafter referred to as "Both parties") have confirmed the main items described in the sheets attached hereto.

Kampala, June 16, 2011

Dr. Akira NIWA
Leader,
Preparatory Survey Team,
Japan International Cooperation Agency
(JICA)

Mr. Fred Kabugambe-Kaliisa
Permanent Secretary,
Ministry of Energy and Mineral Development
(MEMD)
/ Chairman of Rural Electrification Board

Witness:

Ms. Jennifer Muwaliza
Ag. Commissioner,
Aid Liaison Department,
Ministry of Finance Planning and
Economic Development (MoFPED)

Mr. Godfrey R. Turyahikayo
Executive Director,
Rural Electrification Agency (REA),
Ministry of Energy and Mineral Development
(MEMD)

ATTACHMENT

1. Objective of the Project

The objective of the Project is to extend the distribution system for reliable and stable supply of electricity to the rural communities within the Project sites.

2. The Project Site

The Ugandan side and the Team confirmed prioritization among six candidate project sites in the 1st Field Survey and agreed that the Area-4 as the most prioritized site in consideration of previous project scale. Main reasons for the prioritization are (1)electrification beneficiaries in terms of the number of consumers which include trading centers, households, schools and health centers, (2)an importance of electrification of new district headquarters in Namayingo, and (3)project impacts including synergy with the Interconnection of Electric Grids of Nile Equatorial Lakes Countries Project. Both parties reconfirmed needs and urgency of rural community electrification and agreed to take necessary action by conveying strong recommendation to decision makers for the smooth and timely implementation of the Project to both governments. The Project Sites are shown in Annex-1.

3. Responsible and Implementing Organizations

(1) The responsible organization for the Project is the Ministry of Energy and Mineral Development (MEMD).
(2) The implementing agency is the Rural Electrification Agency (REA).
(3) The organization charts of MEMD and REA are shown in Annex-2 and Annex-3, respectively.

4. Components of the Project

JICA explained the result of analysis on the 1st Survey to Ugandan side and also explained following main components of the Area-4, the highest prioritized project site. The detailed contents of the components are described in Annex-4.

(1) Supply and installation of 33kV distribution lines in Mayuge-Lumino
(2) Installation of distribution transformers (33kV/415-230V)

5. Japan's Grant Aid Scheme

(1) The Ugandan side has understood the Japan's Grant Aid Scheme explained by the Team as described in Annex-5 and Annex-6.
(2) The Ugandan side will take necessary measures, as described in Annex-7, for smooth implementation of the Project as prerequisites for the Japan's Grant Aid to be implemented.

6. Environmental and Social Considerations

(1) The Ugandan side agreed to comply with the JICA Guidelines for Environmental and Social Considerations (April 2004) (hereinafter referred to as "JICA Guidelines") as well as Ugandan laws and regulations, and to prepare Environmental Checklist and Monitoring Form which are designated by JICA Guidelines for an outline design.

(2) Both parties confirmed that a project brief document was required for the Project to obtain approval from the National Environment Management Authority (NEMA). The project brief document would duly include IEE level study and mitigation measures for the selected section of distribution line. The project brief document for the Project will be prepared and submitted to the NEMA by the end of August, 2011. An approval is to be expected by the end of October, 2011.
(3) Both parties agreed followings in relation to environment and social considerations
  (a) REA assigned an environment officer during the 2nd Field Survey to coordinate the environmental activities, survey for environmental impacts and mitigation measures, and compile baseline data for preparation of the project brief
  (b) REA will conduct stakeholder meetings (SHM) on July 13 and 14 (tentative) at Namayingo and Mayuge district headquarters respectively, inviting district officials and community leaders from the Project areas. The proposed agenda of SHM will include;
    (i) Explanation of government policy and plan in rural electrification,
    (ii) Presentation of project features,
    (iii) Presentation of the route map of 33kV distribution line, location map of transformers and load centers,
    (iv) Characteristics of project impacts and mitigation measures at sites, and
    (v) Enhance awareness in community.

  Records and findings of the SHM will be incorporated in the Project Brief.
  (c) JICA is to monitor the progress of environmental activities in terms of the overall project schedule and review and advise on the outcomes in order to ensure conformity with JICA Environmental and Social Consideration Guidelines.
(4) The Ugandan side agreed to secure lands necessary for implementation of the Project.
(5) The Ugandan side agreed to secure funding for and execution of the above environmental matters in a schedule as required for smooth execution of the Project.

7. Technical Considerations

The Ugandan side will formulate the technical notes together with the Team during the 2nd Field Survey. The technical notes aims at clarifying works to be done by the Ugandan side for smooth implementation of the Project especially data and document collection for further analysis in the outline design and environmental and social consideration activities.

8. Schedule of the Survey

The Team will continue the Survey in Uganda until July 21, 2011. Based on the results of the Survey, JICA plans to send a mission to explain the Draft Final Report in October, 2011.

9. Other Relevant Issues

(1) Status of the Survey

The Team explained that the purpose of the Survey is to collect necessary information and data for 1) the evaluation of the relevance, appropriateness and urgency of the Project, 2) the identification of the priorities of the components of the Project, and 3) the identification of the

issues to be cleared for implementation of the Project. Therefore the project site for the Survey and components confirmed by both parties may not necessarily be approved by the Government of Japan.

(2) Stable and reliable electricity supply to the Project Site

Both parties have discussed and confirmed necessity for further analysis in the related transmission line and distribution lines for stable and reliable electricity supply in the Project site. In order to realize power supply stability in the region, both parties agreed that the Ugandan side will submit an additional proposal by the end of the 2nd Field Survey. The team will review and evaluate technical and economic viability of the proposal for the further consideration of Japanese government.

(3) Confirmation of information/ data submission

In the 1st field survey, MEMD/REA agreed on the following measures to minimize the constraints on realization of the electrification benefit of rural communities in the Project sites.

- Revision of policy, which was specifically the Rural Electrification Strategy and Plan (RESP)
- Social and economic data in the Area-4 were to be confirmed during the 2nd Field Survey of the Project
- To realize timely implementation of low voltage connection to the communities for the Project by making necessary arrangements including measures for avoiding a delay in the procurement procedures by initiating the contract as soon as the Outline Design completed

(4) Counterpart Personnel

The Team requested the Ugandan side that necessary number of counterpart personnel shall be assigned to the Team and necessary arrangements with related organizations shall be made during the Survey in Uganda. The Ugandan side agreed to support the Team based on the request.

(5) Questionnaires

The Team requested the Ugandan side that the answers to the questionnaires which the Team had already submitted to the Ugandan side shall be given to the Team by July 19, 2011

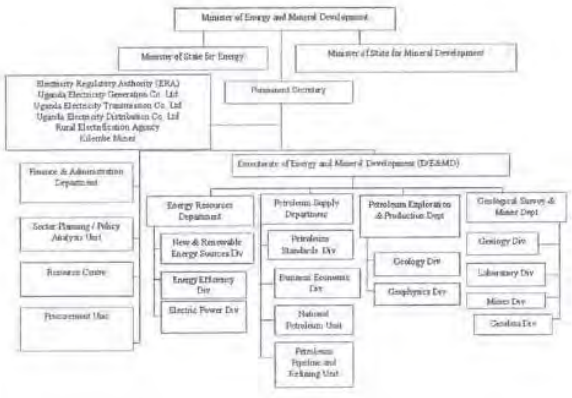
(End)

Annex-1	The Project Site
Annex-2	Organization charts of MEMD
Annex-3	Organization charts of REA
Annex-4	Components of the Project confirmed by the Ugandan side and the Japanese side
Annex-5	Japan's Grant Aid
Annex-6	Flow Chart of Japan's Grant Aid Procedures
Annex-7	Major Undertakings to be taken by Each Government

Annex-1

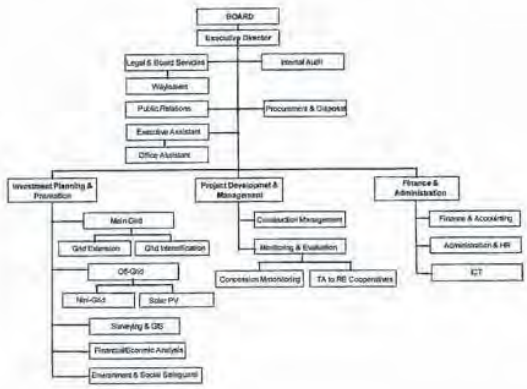
The Project Site

Annex-2

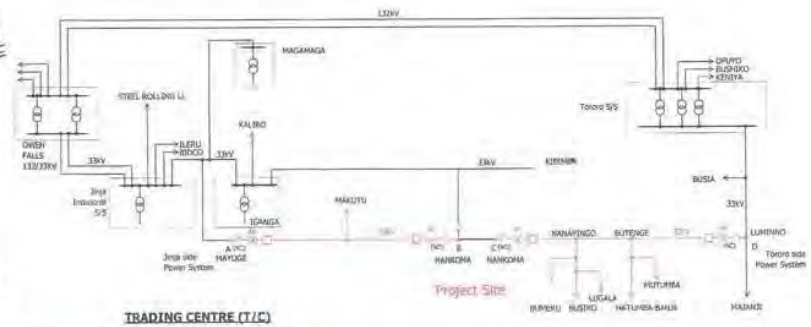


Organization charts of MEMD

Annex-3



Organization charts of REA



TRADING CENTRE (T/C)

CONNECTION POINT A-B

No.	NAME OF T/C
1	MAINA
2	MPUNUGWE
3	NAMABUNDU
4	BUWONGO
5	MAKUTU
6	NOKOWE
7	BWALULA
8	MATOVU

CONNECTION POINT C-D

No.	NAME OF T/C
9	NABIGINGO
10	IRIMBI
11	MAYUGE-BUKHOLI
12	BUDDE
13	NSANGO
14	NAMAYINGO
15	LWANGOSIA
16	NAIRONI
17	LUTOLO
18	KILINDINI
19	LUGALA
20	BUGUMA
21	BUSIRO
22	BUSIRO LANDING SIDE
23	BUMERU-A
24	BUMERU-B
25	BUCHIRO
26	MALOMBI-B
27	BUTEBEY-A
28	MUTUMBA
29	NATUMBA-BANJA
30	NAMUSERA
31	FARM
32	LUNYO
33	BUWANGO
34	NAKEMO
35	MUNDINDI
36	LUMULI
37	MWEMBE-TAYARI

SYMBOLS

——: EXISTING

——: THE PROJECT

——: LBS

——: AUTO RECLOSER

——: METERING UNIT

——: NORMAL CLOSE

——: NORMAL OPEN

NETWORK DIAGRAM

AREA-4 (IGANGA, BUGIRI AND BUSIA DISTRICT)

	Trading Center	Parish	Sub-county	Schools			Health Center				Households	Remarks
				Primary	Secondary	Tertiary	IV	III	II	I		
19	Lugala	Lugala	Banda	3	0	0	0	0	1	0	300	
20	Bussuna	Buchumba	Banda	1	0	0	0	0	0	0	100	
21	Busizo	Bujuwanga	Banda	2	0	0	0	0	1	0	100	
22	Busizo Landing Site	Bujuwanga	Banda	3	0	0	0	0	0	0	150	
23	Bumeru A	Buchimo	Mutumba	5	0	0	0	0	0	0	50	
24	Bumeru B	Buchimo	Mutumba	1	0	0	0	0	0	0	100	
25	Buchimo	Buchimo	Mutumba	2	1	0	0	0	0	0	40	
26	Malombi B	Muwenu	Mutumba	1	0	0	0	0	1	0	100	
27	Butebey A	Muvema	Mutumba	1	0	0	0	0	0	0	40	
28	Mutumba	Mutumba	Mutumba	3	1	0	0	1	0	0	200	
29	Natumba-Banja	Bulule	Mutumba	1	0	0	0	0	0	0	150	
30	Nabusera	Bulule	Mutumba	1	0	0	0	0	0	0	100	
31	Farm	Sinde	Buhemba	1	0	0	0	0	1	0	200	
32	Lunyo	Busiabua	Lunyo	2	1	0	0	1	0	0	260	
33	Buwanga	Nalwire	Lunyo	1	0	1	0	0	0	0	60	
34	Nakemo	Nalwire	Lunyo	3	0	0	0	0	0	0	150	
35	Mundindi	Mundindi	Busiime	4	0	0	0	0	1	0	70	
36	Lumuli	Rukaka	Busiime	1	0	0	0	0	0	0	50	
37	Mwembe-Tayari	Busime	Busime	1	0	0	0	0	0	0	50	
	Total			101	17	2	2	5	8	0	9095	

Annex-4

Components of the Project confirmed by the Ugandan side and the Japanese side

Project Site	Area(Region)	Priority Ranking[1]	Contents of main components[2]	Project Features
4	Mayuge-Lumino (Eastern)[6]	8	- Supply and installation of 33kV distribution Lines (approx. 130km) and distribution transformers (33kV/415-230V)	Highly recommendable for electrification of new district headquarters (Namayingo) and synergy with EPSA. Length of line passing CFRs*: approx. 1.5km.

Notes:

(1) Factors which are considered in evaluation of priority ranking are: impacts to rural economy and development, features of benefits in electrification, access to electricity in the underserved area and environment.

(2) Content of main components is based on the results of the previous survey and additional information provided by REA. Modification in the quantities and additional new items/equipments will be determined based on the site survey.

(3) *CFR stands for Central Forest Reserve managed by NFA. The proposed alignments including those passing CFRs are along the existing roads.

Table Outline of the project site

Areas	Length [km]	Trading Center	Schools			Health Center				Households
			Primary	Secondary	Tertiary	IV	III	II	I	
Extension of 33 kV distribution lines (Iganga, Bugiri and Busia District (Area-4)	130	37	101	17	2	2	5	8	0	9095

[Remarks] The details are shown below.

Rural Electrification Phase III Socio-economic Data in Area-4

	Trading Center	Parish	Sub-county	Schools			Health Center				Households	Remarks
				Primary	Secondary	Tertiary	IV	III	II	I		
1	Maina	Maina	Mpungwe	3	0	0	0	0	1	0	100	
2	Mpungwe	Mijji	Mpungwe	5	1	0	0	0	0	0	450	
3	Namabundu	Kasozi	Makuto	3	0	0	0	0	0	0	100	
4	Buwongo	Makoto	Makuto	1	0	0	0	0	0	0	120	
5	Makutu	Makitu	Makuto	2	2	0	0	1	0	0	150	
6	Nandwa	Kasasi	Makuto	1	0	0	0	0	0	0	200	
7	Hwahula	Itegero	Nankoma	2	1	0	0	0	0	0	200	
8	Matovu	Matovu	Nankoma	2	0	0	0	0	0	0	200	
9	Nabigingo	Nasigingo	Bulidha	2	0	0	0	0	1	0	200	
10	Irimbi	Kitumba	Mutorere	2	0	0	0	0	0	0	30	
11	Mayuge-Bukholi	Mayuge	Budaya	5	0	0	0	1	0	0	1200	
12	Budde	Busweiya	Budaya	0	0	0	0	0	0	0	100	
13	Nsango	Kiñeyo	Buyinja	7	1	0	0	0	1	0	350	
14	Namayingo	Namayingo	Namayingo T.C.	23	7	1	1	0	0	0	3000	
15	Lwangosia	Lwangosia	Buyinja	4	1	0	1	2	0	0	90	
16	Nairobi	Buweya	Bunla	1	0	0	0	0	0	0	40	
17	Lumlo	Lutolo	Bunla	1	1	0	0	1	0	0	260	
18	Kilindini	Lutolo	Bunla	2	0	0	0	0	0	0	35	

Annex-5

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on the law and the decision of the Government of Japan (hereinafter referred to as "the GOJ"), JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is conducted as follows:

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary

to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals"

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-7.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

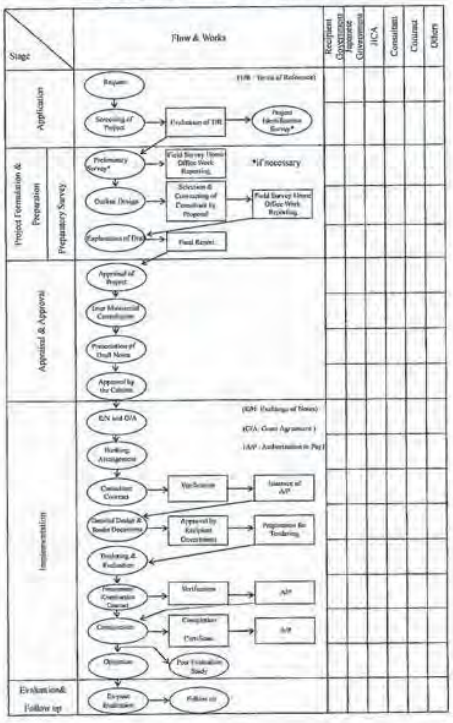
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Environmental and Social Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and the JICA Guidelines for Environmental and Social Considerations (April 2004).

Annex-6

Flow Chart of Japan's Grant Aid Procedures



Annex-7

MajorUndertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure [a lot] /[lots] of land necessary for the implementation of the Project and to clear the [site]/[sites];		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the site		●
	3) The parking lot	●	
	4) The road within the site	●	
	5) The road outside the site		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the [site]/[sites]		
	1)Electricity		
	a. The distributing power line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services [be exempted] / [be borne by the Authority without using the Grant]		●
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To ensure that [the Facilities and the products]/[the Facilities]/ [the products] be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●

4. Results of socio-economic survey

4-1. General Consumers (farmers)

Village		Makutu	Nabigingo	Mayuge-bukhali	Mutenere-East	Lunyo
Occupation		Farmer	Farmer	Farmer	Farmer and livestock	Farmer and drug store
Member of family		10	10	7	10	16
Income	UGX/month	200,000	30,000	50,000	83,000	300,000
Income source		cash crops : maize,coffee bean	cash crops : maize,coffee bean	cash crops : maize, ground nut, coffee bean,bean	cash crops : maize	cash crops : ground nut
		food crops : cassava,matoke	food crops : bean	food crops : bean	food crops : bean	food crops : cassava
Others		Non	Non	Non	livestock : 8 goats, 10 ducks	drug shop
Number of employee		Non	Non	Non	Non	10(14ppl/year)
Income of employee		Non	Non	Non	Non	2,500/day/ppl
Energy consumption/household						
Lighting						
Equipments		1 kerosene lump	2 kerosene lumps, 3 tadoba	4 kerosene lumps, 1 tadoba	2 kerosene lumps	5 kerosene lumps, 1 battery lump
*Cost	UGX/month	42,000	42000	41,000	34,000	57,200
Cooking						
Equipments		woods	woods	woods,charcoal	woods	woods
*Cost	UGX/month	60,000	collect themselves	10,000	collect themselves	collect themselves
Amusement						
Equipments		4 pairs of dry cell	4 pairs of dry cell	radio	radio	radio
*Cost	UGX/month	4,800	4,800	14,400	2,400	3,600
Others						
Equipments		Non	Non	Non	Non	solar panel with battery
*Cost	UGX/month	Non	Non	Non	Non	Non
Total Energy Cost		106,800	46,800	65,400	36,400	60,800
Prospect after electrified		・install lights ・use milling machine ・use fridge and open drinkings shop	・install lights ・use milling machine ・open theater ・use fridge and open drinkings shop	・install lights ・use milling machine	・install lights ・install lights for security (livestock)	・install lights ・use milling machine ・use refregirator for house

※Price of fuel
kerosene : UGX2,800/L
diesel : UGX3,200/L
gasoline : UGX3,800/L
dry cell : UGX1,200/Pair
charcoal : UGX1500/Sac
gas : UGX 200,000/Cylinder

Village		Mayuge-Bukindi	Nondwe	Izimbi	Mayuge-Bukindi
Occupation		Farmer and cloth shop	Farmer	Farmer	Farmer
Number of family		12	10	13	6
Income	UGX/month	311,250	116,667	23,333	80,000
Income Source		cash crops: cotton, coffee	cash crops: coffee	cash and food crops: maize	cash and food crops: maize, cassava
		food crops: cassava, sorghum	food crops: maize		
Others		both tomato, maize, beans, ground nut	Non	Non	Non
Number of employees		5 (farming 4, cloth shop 1)	Non	Non	Non
Salaries of employees		0,000 farming, 45000 cloth shop	Non	Non	Non
Energy consumption (household)					
Lighting					
Equipments		1 kerosene lamps, 4 tadobas	2 tadobas	1 tadobas	2 tadobas
*Cost	UGX/month	56,000	11,200	25,200	[illegible]
Cooking					
Equipments		wood	wood	wood	wood
*Cost	UGX/month	30,000	collect themselves	10000	15,000
Amusement					
Equipments		radio	1 radio	1 radio	1 radio
*Cost	UGX/month	1,200	4,800	[illegible]	1,200
Others					
Equipments		borehole maintenance fee	Non	Non	Non
*Cost	UGX/month	500	Non	Non	Non
Total Energy Cost		[illegible]	16,000	[illegible]	[illegible]
Prospect after electrified		*install lights *use fridge and open drinkings shop *use radio and TV	*install lights *use refrigerator, iron for house *start poultry farming	*install lights *use milling machine	*install lights *use TV, radio, cooker and ironing

*Price of fuel
kerosene: UGX2,300/L
diesel: UGX2,200/L
gasoline: UGX2,600/L
dry cell: UGX1,200/Pair
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

4-2. General Consumers (non farmers)

Village		Mayuge Bukholi	Namayingo Nsiri	Namayingo Nsiri
Occupation		Maize, cassava, rice milling machine owner	Welding shop owner	Welding workshop owner
Number of family		12	11	8
Income	UGX/month	6,250,000	240,000	1,227,000
Number of employee		6	1	3
Income of employee		150,000	80,000	150,000
Energy consumption(working)				
Power generation				
Equipments		Non	generator	generator
*Cost	UGX/month	Non	38,400	684,000
Lighting				
Equipments		Non	Non	Non
*Cost	UGX/month	Non	Non	Non
Others				
Equipments		diesel engine	Non	Non
Use		grinding maize, cassava, rice	Non	Non
*Cost	UGX/month	2,880,000	Non	Non
Energy consumption(household)				
Lighting				
Equipments		solar panel with battery, car battery	3 Kerosen lamps	generator
*Cost	UGX/month	Non	42,000	108,000
Cooking				
Equipments		wood	wood	charcoal and water
*Cost	UGX/month	Non	Non	105,000
Communication				
Equipments		Non	2 radios	2 radios (by generator)
*Cost	UGX/month	Non	7,400	Non
Total Energy Cost		2,880,000	87,800	1,017,000
Prospect after electrified		・purchase motor for electricity ・change gas to electricity of fridge	・install lights ・purchase TV, refrigerator ・welding equipments shall be electrified and make bigger workshop	・purchase motor for electricity ・welding equipments shall be electrified

*Price of fuel
kerosene: UGX2,800/L
diesel: UGX3,200/L
gasoline: UGX3,600/L
dry cell: UGX1,200/Pair
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

4-3. Health Centers

Village		Namayingo	Makutu	Mayuge Bukholi	Mutumba?
Grade		IV	III	III	III
Type of medical services		・outpatient ・antenental ・delivery ・treatment(only antenental) ・immunization ・outreach ・dentistry ・ophthalmology ・psychiatric ・surgery	・outpatient ・antenental ・delivery ・immunization ・outreach ・HIV/AIDS counselling ・blood test	・outpatient ・antenental ・delivery ・immunization ・outreach ・family planning	・outpatient ・antenental ・delivery ・immunization ・outreach ・health education
Number of coverage villages		Whole Namayingo	27	6	9
Doctor		Yes	Non	Non	Yes (once/week)
Number of staff		17	3	4	5
Number of outpatients	people/day	450	70	142	70
Number of beds		25	10	3	8
Operation theatre		Yes	Non	Non	Non
Existed equipments		・microscope ・blood pressure ・sterilizer ・gas refrigerator ・other basic equipments	・microscope ・blood pressure scale ・weight scale ・sterilizer ・fetus scope ・gas refrigerator	・weight scale ・sterilizer ・simple kit for surgeries ・gas refrigerator	・blood pressure scale ・weight scale ・sterilizer ・clinical thermometer ・fetus scope ・delivery kit ・gas refrigerator
Power generation					
Equipments		generator, solar panel with battery	solar panel with battery	Non	Non
*Cost	UGX/month	1,440,000	Non	Non	Non
Lighting					
Equipments		1 torch	1 kerosene lamp	2 kerosene lamps	1 kerosene lamp
*Cost	UGX/month	12,700	22400	168,000	168,000
Others					
Equipments		gas refrigerator	gas refrigerator, sterilizer	gas refrigerator, sterilizer	gas refrigerator, sterilizer
Use		keeping vaccine cool	keeping vaccine cool, sterilize equipments	keeping vaccine cool, sterilize equipments	keeping vaccine cool, sterilize equipments
*Cost	UGX/month	600,000	490,000	327,000	300,000
Prospect after electrified		・install lights ・use steam sterilizer ・dental chair ・x-ray ・centrifuge ・endoscope ・super tonic scale ・computers for registration	・install lights ・night treatment	・use sterilizer ・use refrigerator ・expand of outpatient ・operate surgeries	・install lights ・use steam sterilizer ・use refrigerator

*Price of fuel
kerosene: UGX2,800/L
diesel: UGX3,200/L
gasoline: UGX3,600/L
dry cell: UGX1,200/Pair
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

Village		Lumanzune	Lutolo	Lunya	Mutumba
Grade		III	III	III	III
Type of medical services		・outpatient ・antenental ・delivery ・inpatient ・immunization ・outreach ・prevention education	・outpatient ・antenental ・delivery ・inpatient(only antenental) ・immunization ・outreach	・outpatient ・antenental ・delivery ・inpatient ・immunization ・outreach ・health education	・outpatient ・antenental ・delivery ・immunization ・outreach ・HIV/AIDS test and counselling ・health education ・prevention education
Number of coverage villages		7	4	80	24
Doctor		Non	Non	Non	Non
Number of staff		9	6	7	3
Number of outpatients	people/day	70	75	70	60
Number of beds		6	3	7	Non
Operation theatre		Non	Non	Non	Non
Existed equipments		・microscope ・stethoscope ・blood pressure ・sterilizer ・HIV and TB check kit ・delivery kit ・fetus scope	・microscope ・weight scale ・blood pressure ・sterilizer ・refrigerator(out of order)	・microscope ・blood pressure ・sterilizer ・clinical thermometer ・fetus scope ・delivery kit ・gas refrigerator	・microscope ・blood pressure ・sterilizer ・fetus scope ・delivery kit ・gas refrigerator ・weight scale
Power generation					
Equipments		generator, solar panel with battery	2 solar panel with battery (one is out of order)	solar panel with battery	solar panel with battery
*Cost	UGX/month	672,000	Non	Non	Non
Lighting					
Equipments		1 kerosene lamp	1 kerosene lamp	2 kerosene lamps (support solar)	Non(patient should bring light)
*Cost	UGX/month	84,000	7,000	28,000	Non
Others					
Equipments		sterilizer	sterilizer	gas refrigerator, sterilizer	gas refrigerator, sterilizer
Use		sterilize equipments	sterilize equipments	keeping vaccine cool, sterilize equipments	keeping vaccine cool, sterilize equipments
*Cost	UGX/month	252,000	15,000	228,000	456,000
Prospect after electrified		・install lights ・use steam sterilizer ・use refrigerator ・use water warmer	・install lights ・use steam sterilizer ・use refrigerator ・operate blood tests	・install lights ・use steam sterilizer ・use refrigerator ・operate blood tests ・use incubator	・install lights ・use steam sterilizer

*Price of fuel
kerosene: UGX2,800/L
diesel: UGX3,200/L
gasoline: UGX3,600/L
dry cell: UGX1,200/Pair
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

Village		Busiro	Mundudi	Maina	Nabitanga
Grade		II	II	II	II
Type of medical services		・outpatient ・antenatal ・delivery ・inpatient ・immunization ・outreach ・health education	・outpatient ・antenatal ・delivery ・immunization ・outreach ・family planning	・outpatient ・antenatal ・immunization ・outreach ・health education ・prevention education ・family planning	・outpatient ・antenatal ・inpatient ・immunization ・outreach ・HIV/AIDS counseling
Number of coverage villages		14	12	6	5
Doctor		Yes	Non	Yes (once/week)	Yes (Only outreach)
Number of staff		7	2	4	3
Number of outpatients	people/day	34	50	30	30
Number of beds		10	2	7	3
Operation theatre		Non	Yes (small)	Non	Non
Existed equipments		・microscope ・blood pressure ・sterilizer ・clinical thermometer ・fetus scope ・delivery kit ・gas refrigerator	・weight scale ・sterilizer ・simple dressing kit ・delivery kit ・fetus scope	・blood pressure ・clinical thermometer ・fetus scope ・weight scale	・stethoscope ・blood pressure ・sterilizer ・weight scale
Power generation					
Equipments		solar panel with battery	Non	Non	Non
*Cost	UGX/month	Non	Non	Non	Non
Lighting					
Equipments		1 kerosene lamp	1 kerosene lamp	1 kerosene lamp (only emergency at night)	2 kerosene lamps
*Cost	UGX/month	42,000	30,000	1,400	42,000
Others					
Equipments		2 gas refrigerator, sterilizer	sterilizer	Non	sterilizer
Use		keeping vaccine cool, sterilize equipments	sterilize equipments	Non	sterilize equipments
*Cost	UGX/month	660,000	8,400	Non	3,750
Prospect after electrified		・install lights ・use refrigerator ・use scan machine ・use incubator ・use centrifuge	・install lights ・use refrigerator ・use refrigerator	・install lights ・use steam sterilizer ・use refrigerator ・accept outpatient at night	・install lights ・use steam sterilizer ・use refrigerator ・operate blood tests

*Price of fuel
kerosene: UGX2,800/L
diesel: UGX3,200/L
gasoline: UGX3,800/L
dry cell: UGX1,200/Pair
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

4-4. Schools

Name		Mpungwe primary school	Talent nursery and primary school	Busiro church of God primary school	Mutumba primary school	Bululu primary school
Village		Mpungwe	Namayingo south	Busiro	Mutumbu	Bukale
Grade		P1-P7	P1-P7	P1-P7	P1-P7	P1-P7
Number of coverage village		8	8	3	7	6
Number of students		750	1,200	1,088	970	1,470
Number of boarders		50	140	Non	Non	Non
Number of teachers		18	26	14	7	17
Number of class rooms		18	11	5	8	8
Number of boarding rooms		4	2	Non	Non	Non
Morning or Night preps		Yes	Yes	Yes	Non	Yes
Power generation						
Equipments		Non	solar panel with battery 300W	Non	Non	Non
*Cost	UGX/month	Non	Non	Non	Non	Non
Lighting						
Equipments		kerosene lamps	light	Non	Non	2 kerosene lamps
*Cost	UGX/month	300,000	Non	Non	Non	22,400
Prospect after electrified		・install lights ・use computer, printer and photocopy machine	・install lights ・use computer and video machine	・install lights ・use computer, printer and photocopy machine ・open morning and night prep ・open computer class	・install lights ・use computer, printer and photocopy machine ・start class using TV	・install lights ・use computer, printer and photocopy machine ・start class using TV ・start boarding school

*Price of fuel
kerosene: UGX2,800/L
diesel: UGX3,200/L
gasoline: UGX3,600/L
dry cell: UGX1,200/Pair
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

Name		Maina primary school	Kifuyo primary school	St. Lawrence primary school
Village		Maina	Nsango	Mutanere
Grade		P1-P7	P1-P7	P1-P7
Number of coverage village		5	5	10
Number of students		785	1,103	1,348
Number of boarders		138	Non	Non
Number of teachers		13	15	10
Number of class rooms		6	10	11
Number of boarding rooms		2	Non	Non
Morning or Night preps		Yes	Yes	Yes
Power generation				
Equipments		car battery	Non	Non
*Cost	UGX/month	8,000	Non	Non
Lighting				
Equipments		2 kerosene lamps	Non	Non
*Cost	UGX/month	129,000	Non	Non
Prospect after electrified		・install lights ・use computer, printer and photocopy machine ・start class using TV	・install lights ・use computer, printer and photocopy machine ・start class using TV ・use broadcasting equipments	・install lights ・use computer, printer and photocopy machine ・use cooker in home economic class ・start boarding school

*Price of fuel
kerosene: UGX2,800/L
diesel: UGX3,200/L
gasoline: UGX3,800/L
dry cell: UGX1,200/Pair
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

Name		Nalvere technical institute
Village		Makima
Grade		2 years
Course		•carpentory and joinery •block brick and concrete products •electrical installation •plumbing •painting decoration •tayloring •motor vehicle technology •salon (3 months course)
Number of coverage village		Whole Uganda
Number of students		200
Number of boarders		200
Number of teachers		25
Number of class rooms		4
Number of boarding rooms		3
Morning or Night preps		Yes
Power generation		
Equipments		solal panel with battery
*Cost	UGX/month	Non
Lighting		
Equipments		4 kerosene lumps
*Cost	UGX/month	168,000
Others		
Equipments		Non
Use		Non
*Cost	UGX/month	Non
Prospect after electrified		•use computer, scanner, printer and photocopy machine •use electrified equipments need in each class

*Price of fuel
kerosene : UGX2,800/L
diesel : UGX3,200/L
gasoline : UGX3,600/L
dry cell : UGX1,200/Pair
charcoal : UGX1500/Sac
gas : UGX 200,000/Cylinder

Name		Mpungwe secondary school	Makulu secondary school	Makulu hillside secondary school	Mutemre secondary school	Dede secondary school
Village		Mpungwe	Makulu	Makulu	Mutemre	Namayingo south
Number of coverage village		7	9	14	12	11
Number of students		50	142	647	643	1,200
Number of boarders		Non	Non	150	Non	224
Number of teachers		10	18	19	13	28
Number of class rooms		3	6	7	4	13
Number of boarding rooms		Non		4	Non	4
Morning or Night preps		Non	Non	Yes	Non	Yes
Power generation						
Equipments		Non	Non	solar panel with battery	solar panel with battery	solar panel with battery
*Cost	UGX/month	Non	Non	Non	Non	Non
Lighting						
Equipments		Non	Non	Non	Non	5 kerosene lumps
*Cost	UGX/month	Non	Non	Non	Non	135,000
Prospect after electrified		•use computer, printer and photocopy machine •start boarding school	•use computer, printer and photocopy machine •built laboratory •open night prep.	•use computer •expand morning and night prep.	•use computer and projector •open night prep.	•install light •use computer, printer and photocopy machine •use TV •built laboratory •start class using TV

*Price of fuel
kerosene : UGX2,800/L
diesel : UGX3,200/L
gasoline : UGX3,600/L
dry cell : UGX1,200/Pair
charcoal : UGX1500/Sac
gas : UGX 200,000/Cylinder

4-5. Other public facilities

Name		St. philip secondary school	Banda secondary school	Kituye secondary school
Village		Lwangasia	Buwoya west	Ntungo
Number of coverage village		12	16	5
Number of students		400	534	110
Number of boarders		Non	Non	Non
Number of teachers		14	15	11
Number of class rooms		5	5	4
Number of boarding rooms		Non	Non	Non
Morning or Night preps		Yes	Yes	Yes
Power generation				
Equipments		Non	Non	Non
*Cost	UGX/month	Non	Non	Non
Lighting				
Equipments		Non	Non	2 kerosene lumps
*Cost	UGX/month	Non	Non	84,000
Prospect after electrified		•install light •use computer, printer and photocopy machine •use TV •start computer class •open morning and night prep. •start class using TV	•install light •use computer, printer and photocopy machine •use TV •start computer class •open morning and night prep. •start class using TV	•install light •use computer, printer and photocopy machine •built laboratory •start computer class

*Price of fuel
kerosene : UGX2,800/L
diesel : UGX3,200/L
gasoline : UGX3,600/L
dry cell : UGX1,200/Pair
charcoal : UGX1500/Sac
gas : UGX 200,000/Cylinder

Village	Namayingo	Namayingo
Institutions	District HQ	Police Station
Number of staffs	188	7
Number of rooms	23	16
Power generator		
Equipments	generator(share with H/C IV)	solar panel with battery
*Cost	UGX /mth Non	Non
Lighting		
Equipments	8 lights for security	2 kerosene lamps
*Cost	UGX /mth Non	42,000
Others		
Equipments	Non	Non
Use	Non	Non
*Cost	UGX /mth Non	Non
Existed equipments	18 computers, 8 printers	radio communication, typewriter
Prospect after electrified	Install lights; steady use of computers and printers and refrigerator	Steady use of radio equipments
Others		[Crimes situations] robbers, thefts, child abuses etc. [Number of Crimes] 10/month Much expectations of lights for security

*Price of fuel
kerosene: UGX2,800/L
diesel : UGX3,200/L
gasoline: UGX3,900/L
dry cell: UGX1,200/Pac
charcoal: UGX1500/Sac
gas: UGX 200,000/Cylinder

5. Estimation of loads of each consumer

	Equipment	Power Consumption	Number of Equipment	Number of rooms	Usage Factor	Power Consumption
Primary School	Desktop Computer	90 W	2 set	1 Class room	0.8	144
	Printer	30 W	1 set	1 Class room	0.8	24
	Photocopying Machine	500 W	1 set	1 Class room	0.8	400
	Flourscent Lump	20 W	4 set	10 Class room	0.8	640
	TV	100 W	1 set	1 Class room	0.8	80
	Flourscent Lump	20 W	4 set	1 Boarding room	0.8	64
						1352
						1400
Secondary School	Desktop Computer	90 W	12 set	1 Class room	0.8	864
	Printer	30 W	1 set	1 Class room	0.8	24
	Photocopying Machine	500 W	1 set	1 Class room	0.8	400
	Flourscent Lump	20 W	4 set	6 Class room	0.8	384
	TV	100 W	1 set	1 Class room	0.8	80
	Flourscent Lump	20 W	4 set	1 Boarding room	0.8	64
						1816
						1900
Teciary School	Desktop Computer	90 W	12 set	1 Class room	0.8	864
	Printer	30 W	1 set	1 Class room	0.8	24
	Photocopying Machine	500 W	1 set	1 Class room	0.8	400
	Flourscent Lump	20 W	4 set	6 Class room	0.8	384
	TV	100 W	1 set	1 Class room	0.8	80
	Flourscent Lump	20 W	4 set	1 Boarding room	0.8	64
						1816
						1900
Health Center IV	Desktop Computer	90 W	4 set	1 Room	0.8	288
	Printer	30 W	4 set	1 Room	0.8	96
	Photocopying Machine	500 W	1 set	1 Class room	0.8	400
	Flourscent Lump	20 W	4 set	10 Room	0.8	640
	Refrigerator	90 W	1 set	4 Room	0.8	288
	Endoscope Unit	700 W	1 set	1 Room	0.8	560
	Ultrasoscope	700 W	1 set	1 Room	0.8	560
	Mobile X-ray Unit	700 W	1 set	1 Room	0.8	560
	Ultrasound Scanner	1500 W	2 set	2 Room	1.8	10800
	Bedside Monitor	80 W	2 set	1 Room	0.8	128
	Cadiograph	60 W	1 set	1 Room	0.8	48
	Evacuator	60 W	2 set	1 Room	0.8	96
	Sterilizer	600 W	4 set	1 Room	0.8	1920
						16384
						25000
Health Center III	Desktop Computer	90 W	1 set	1 Room	0.8	
	Printer	30 W	1 set	1 Room	0.8	24
	Flourscent Lump	20 W	4 set	4 Room	0.8	256
	Refrigerator	90 W	1 set	1 Room	0.8	72
	Bedside Monitor	80 W	1 set	1 Room	0.8	64
	Cadiograph	60 W	1 set	1 Room	0.8	48
	Evacuator	60 W	1 set	1 Room	0.8	48
	Sterilizer	600 W	1 set	1 Room	0.8	480
						992
						1500
Health Center II	Desktop Computer	90 W	1 set	1 Room	0.8	72
	Printer	30 W	1 set	1 Room	0.8	24
	Flourscent Lump	20 W	4 set	4 Room	0.8	256
	Refrigerator	90 W	1 set	1 Room	0.8	72
	Bedside Monitor	80 W	1 set	1 Room	0.8	64
	Cadiograph	60 W	1 set	1 Room	0.8	48
	Evacuator	60 W	1 set	1 Room	0.8	48
	Sterilizer	600 W	1 set	1 Room	0.8	480
						1064
						1100
Households / Shops	Flourscent Lump	13 W	1 set	2 Room	0.8	20.8
	TV	100 W	1 set	1 Room	0.8	80
	Refrigerator	90 W	1 set	1 Room	0.8	72
						172.8
						174

6. Fact finding sheets

Mayuge, Iganga, Busia, Namayingo and Bugiri districts