

## 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**

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**Table of Contents**

<b>1. Introduction</b>	<b>1</b>
<b>2. Information and Results of the Site Survey</b>	<b>4</b>
2.1 Areas where the Site Survey was carried out	4
2.2 Beneficiary of the Project	5
2.2.1 Extension of 33 kV distribution line in Iganga, Bugiri and Busia District (Area-4)	5
2.2.2 Extension of 33 kV distribution line in Masaka and Rakai District (Area-2)	6
2.2.3 Extension of 33 kV distribution line in Bushenyi and Rukungiri District (Area-5)	7
2.3 Network Diagrams and Route Maps of the Project	8
2.3.1 Extension of 33 kV distribution line in Iganga, Bugiri and Busia District (Area-4)	8
2.3.2 Extension of 33 kV distribution line in Masaka and Rakai District (Area-2)	9
2.3.3 Extension of 33 kV distribution line in Bushenyi and Rukungiri District (Area-5)	10
2.4 Environmental and Social Considerations	11
2.4.1 Environmental and Social Aspects	11
2.4.2 Location of the 33kV Distribution Lines	11
2.4.3 Environmental Certificate (EC)	12
<b>3. Priority of the Requested Sites</b>	<b>13</b>
<b>4. Design Conditions and Technical Specifications</b>	<b>14</b>
4.1 Design Conditions	14
4.1.1 Climatic Conditions	14
4.1.2 Basic Electrical Design Conditions	14
4.1.3 Applicable Codes / Standards and Units	16
4.2 Basic Technical Specifications	16
<b>5. Data Collection of connecting situations in the Previous JICA's Project Area</b>	<b>19</b>
<b>6. Questionnaire for the Second Field Survey</b>	<b>19</b>
<b>7. List of Parties Concerned in the Recipient Country</b>	<b>20</b>

**ANNEX**

**PART 1:**

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

1. Socio-economic Data
2. Network Diagram
3. Route Map of Distribution Line

**PART 2**

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

1. Socio-economic Data
2. Network Diagram
3. Route Map of Distribution Line

**PART 3**

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

1. Socio-economic Data
2. Network Diagram
3. Route Map of Distribution Line

**PART 4 Pole Assembly Drawing for Distribution Line**

DWG No. T-01	Intermediate Pole (Line Angle 0 to 5 degrees)	TYPE A
DWG No. T-02	Light angle Pole (Line Angle 5 to 30 degrees)	TYPE B
DWG No. T-03	Heavy angle Pole (Line Angle 30 to 50 degrees)	TYPE C
DWG No. T-04	Heavy angle Pole (Line Angle 50 to 90 degrees)	TYPE D
DWG No. T-05	Section Pole	TYPE E
DWG No. T-06	Section Pole (VERTICAL)	TYPE F
DWG No. T-07	Terminal Pole	TYPE G
DWG No. T-08	Load Break Switch Pole	TYPE H
DWG No. T-09	T-off Pole	TYPE J
DWG No. T-10	Transformer Pole	TYPE K
DWG No. T-11	3 Member Pole	TYPE L
DWG No. T-12	Bulk Metering Unit Pole	TYPE M
DWG No. T-13	Connection Plan to the Existing Line (Extension Type)	TYPE N1
DWG No. T-14	Connection Plan to the Existing Line (Cross Type)	TYPE N2
DWG No. T-15	33kV Auto Reclose Pole	TYPE 3R

**PART 5 Questionnaire for the Second Field Survey**

**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 <sup>(1)</sup>	Contents of main components <sup>(2)</sup>	Project Features
1	Bale-Galina (Central) <sup>(3)</sup>	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-Bale line (JICA I) Length of line passing CFRs*: approx. 10km Recommendable for strengthening private participation in rural electrification Length of line passing CFRs*: approx. 8km
2	Bakira-Namirembe & Masaka-Nyabyajwe (Central)	B	Supply and installation of 33kV distribution Lines (approx. 93.9km) and distribution transformers (33kV/415-230V)	Power to Kiganda will be supplied from M'uzazi (Miyana)-Kiganda line, which is ongoing grant project by Norway. This reduces on number of connections and consequently project benefit. Length of line passing CFRs*: approx. 4.5km
3	Kiganda-Mubende (Central)	C	Supply and installation of 33kV distribution Lines (approx. 57.1km) and distribution transformers (33kV/415-230V)	Highly recommendable for electrification of new district headquarters (Namatyogo) and synergy with Interconnection of Electric Grids of Nile Equatorial Lakes Countries Project (NELSAP) Length of line passing CFRs*: approx. 1.5km
4	Iganga-Nakabugu & Mayuge-Lumino (Eastern) <sup>(4)</sup>	A	Supply and installation of 33kV distribution Lines (approx. 160.8km) 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
5	Kitagata-Kasana & Kitagata-Mukibirizi (Western) <sup>(5)</sup>	B	Supply and installation of 33kV distribution Lines (approx. 58.7km) and distribution transformers (33kV/415-230V)	Project scope has been reduced by various rural Electrification Projects funded by the Government of Uganda. The remaining project scope proposed to JICA

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	Matala 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	Bakira-Namirembe-Masaka-Nyabyajwe	80.9
2.2	Zzimwe	5.9
2.3	Nakayuga	3.3
2.4	Buwanga	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-Kasana-Kagati, Rwanja-Karisizo, Kitagata-Mukibirizi, Rowobugimbi-Kitagata	56.3
5.1	Kotoma	2.4
Subtotal		58.7

Note: Grey-colored component 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.

6	Homa-Mbarara-Kinyara (Western)	C	Supply and installation of 33kV distribution Lines (approx. 61.8km) and distribution transformers (33kV/415-230V)	is now limited to Kitagata-Kasana-Kagati with spur to Rukondo, Rwanja-Karisizo, Kitagata-Mukibirizi and Rowobugimbi-Kitagata. 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 Homa-Mbarara-Kinyara with spur to Kityamboggi and Kyabagya. Length of line passing CFRs*: approx. 7.5km
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- Notes:
- (1) Factors which are considered in explanation of priority ranking are: impact 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. 91.2km. However, project component of Kayunga-Busasa and associated costs is under implementation with financing from the Government of Uganda.
  - (4) The line originally requested was Iganga-Nakabugu. However, it has been changed to Iganga-Kaciro because the project to supply the District headquarters at Luza (Nakabugu) from Kaciro has been funded by the Government of Uganda.
  - (5) CFR stands for Central Forest Reserve managed by NFA. The proposed alignments including these passing CFRs are along the existing roads.
  - (6) The site survey was carried out on 10th April, 2011. The proposed alignments including these passing CFRs are along the existing roads.
  - (7) "Project Features" for Project Site 5 and Project Site 6 were added in Annex-4. Minutes of Discussion signed on 8th April, 2011, because one for Project Site 5 had been described in the column for Project Site 6. Accordingly, one for Project Site 6 were added in the column for Project Site 6 above.

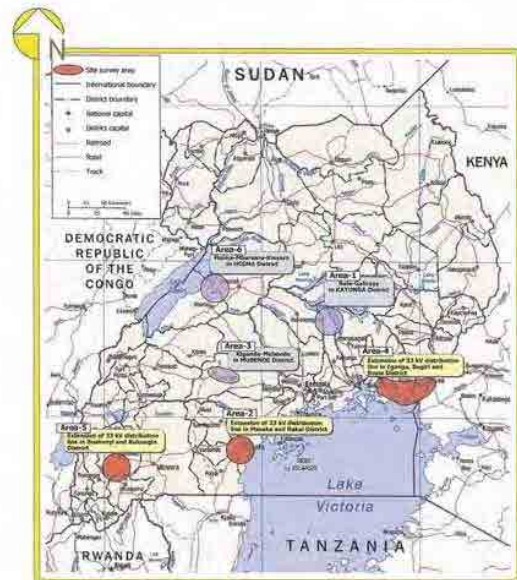


Figure 1 Areas where the Site Survey was carried out

2.2 Beneficiary of the Project

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

(i) 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 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, 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

- Polish 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, matoko, 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

6

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

- Polish 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

8

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

- Polish population covered by schools and health centers

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

### (5) Primary beneficiaries

#### 1) Potential Consumers

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

7

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 Matala 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 Kyambazi including a T-off line to Namirembe. The other is a distribution line from Ndeeba-Lwaggle to Kyotera (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.

9

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 Kyanbazzi: Approx. 36 km
- Line from Nankomá (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

- 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 Irindi 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

## 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	Bushenyi, 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 (pinyon) - 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, matooke, 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: matooke, coffee, cassava, beans - Livestock: cattle, goat, chicken - Trading: retailers - Approx. average monthly income: 50,000 - 100,000 (farming) UGX/household
Forest Reserve	- Irindi CFR (Bugiri): Approx. 500m on the route.	- Nabukongs CFR (Masaka): Approx. 500m on the route - Kinet 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*	<ul style="list-style-type: none"> <li>- Water flow in the wetlands should not be obstructed by poles</li> <li>- Embankment for pole installation in the wetlands should be shorter from roads</li> <li>- No erosion from the embankment.</li> <li>- Involvement of communities (local councils), district offices and sub-counties</li> <li>- Sensitization for workers and local peoples</li> <li>- Conserve cultural and valuable trees and re-plantation</li> <li>- Electricity is a step for improving livelihood leading to conserve environment</li> <li>- Prevent preservatives of poles being into the wetlands</li> </ul>		

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.

three CFRs and several permanent wetlands. One of them, Mujuzi 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	Area	Components
Priority A	Area-4	Extension of 33 kV distribution line in Mayuge, 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 taken into consideration.

Table 6 Areas where Site Survey was carried out

Area	Length (km)	Trading Center	Schools			Health Center				Household
			Primary	Secondary	tertiary	IV	III	B	I	
Area-4	136	27	141	17	2	3	1	3	1	695
Area-2	95	11	24	3	0	0	0	1	1	100
Area-5	86	3	2	0	0	0	0	0	0	21

Note: 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	Area	Components	* Length (km)
1st	Area-4	Extension of 33 kV distribution line in Iganga, Bugiri and Busia District	Approx. 130 km
2nd	Area-2	Extension of 33 kV distribution line in Masaka and Rakai District	Approx. 45 km
3rd	Area-5	Extension of 33 kV distribution line in Bushenyi and Kookungu District	Approx. 30 km

Note: \*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 Kookungu District)
Altitude	Less than 1,000m	Less than 1,000m	Less than 1,500m
Ambient Temperature	Maximum	35°C	33°C
	Minimum	15°C	12°C
	Mean	25°C	22°C
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 <sup>2</sup>	5 ton/m <sup>2</sup>	10 ton/m <sup>2</sup>

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

**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 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.

**Table 10 Basic technical specifications of major equipments**

Equipment	Specifications
<b>(1) Distribution Transformers</b>	
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
<b>(2) Load Break Switch</b>	
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)
<b>(3) Fused Cutout Switches</b>	
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
<b>(4) Lightning Arrester</b> 1) Applicable Standard 2) Type 3) Nominal System Voltage 4) Rated Voltage 5) Nominal Discharge Current 6) Protection Ratio 7) Accessories	IEC, JIS, JEC, JEM or Equivalent Outdoor, Zinc-oxide, Gapless Type 33 kV Minimum 30 kV (rms) 5 kA (8/20 μs) Minimum 1.2 Hot-dipped galvanized steel support with fixing material
<b>(5) Metering Unit</b> 1) Applicable Standard 2) Metering Unit  3) Electric Meter (Remarks: Electric Meter is to be provided two(2) (Main and Checking) 4) Control Cable 5) Outdoor Metering Kiosk 6) Terminal Blocks 7) Cable Ties	IEC or Equivalent 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 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, 3-Wire, 50 Hz, Voltage 110 V, Current/1 A, Class 0.2 Min. 2.5 mm <sup>2</sup> 7C cu, 10m Waterproof type, with pad-lock (spare key: 3pcs) 13 way 1 lot
<b>(6) Auto Recloser</b> 1) Applicable Standard 2) Type 3) Continuous Current Capacity 4) Rated Short-Time Current 5) Control Cubicle  6) Accessories:	IEC or Equivalent Pole mounting, gas insulated auto circuit recloser 630A 16 kA (1 sec.) 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. - 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
<b>(7) Conductor for 33kV Distribution Line</b> 1) Applicable standard 2) Type 3) Size 4) Length per a Drum	IEC or Equivalent All Aluminum Alloy Conductor (AAAC) 100 mm <sup>2</sup> 2,000 m

18

Equipment	Specifications
<b>(8) Wooden Pole with Pole Cap</b> 1) Wooden Pole • Material • Length • Diameter at top Min. 2) Pole Cap • Material • Accessories	Creosoted wooden pole 11 m / 12 m / 15 m 11 m (190-210mm) / 12m (210-235mm)  15m (220-245mm) 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.

19

#### 7. List of Parties Concerned in the Recipient Country

Name	Employment Position
<b>Ministry of Energy and Mineral Development (MEMD)</b>	
Eng. Moses Murungezi	Advisor to Chairman (EMSWG)
Mr. Sajjabi J. Fredrick	Senior Energy Officer
Emmanuel Sande Nsuboga	Energy Officer (Electrical)
<b>Ministry of Finance, Planning and Economic Development (MFPED)</b>	
Ms. Jennifer Muwuliza	AG. Commissioner Aid Liaison Department
Mr. Mugagga Denis	Economist – Aid Liaison Department
Mr. Tomohito Kanaizuka	ODA Loan Advisor Aid Liaison Department
<b>Rural Electrification Agency (REA)</b>	
Mr. Benon Bena	Manager Investment Planning & Promotion
Mr. Philip E.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 Kayunga Mutibwa	Project Engineer Construction
Mr. James Gideon Litta	Wayleaves Officer
Mr. Daniel Mugaruna	Intern
<b>Uganda Electricity Transmission Company Ltd. (UETCL)</b>	
Mr. Erlasi Kiyenba	Managing Director/CEO
<b>Uganda Electricity Generation Company Ltd. (UEGCL)</b>	
Mr. Dan W Mayanja	Technical Manager
Mr. Kitayimwa Godfrey	Electrical Engineer
Mr. Kanzira Milton	Procurement Financial Specialist
Mr. Jimmy. C. Oconel	Mechanic Engineer / Consultant
Mr. Otim Moses	Environmental Specialist
<b>National Environment Management Authority (NEMA)</b>	
Mr. Francis Ogwal	Natural Resource Management Specialist (Biodiversity & Rangelands)
Mr. Alex Winyi Kiiza	Environmental Impact Assessment Officer

20

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

21



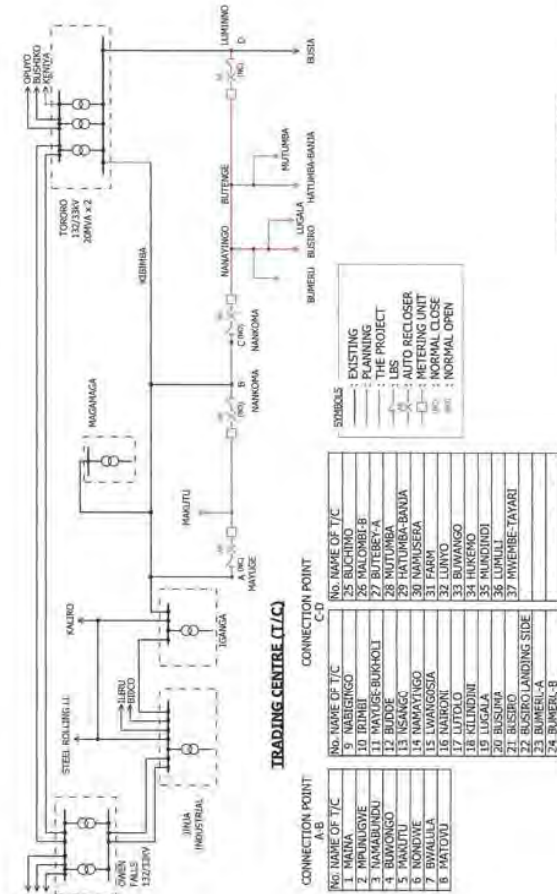




Route Map for Extension of 33 kV Distribution Line in Iganga, Bugiri and Busia District (Area-4)

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

Trading Center	Perish	Sub-County	Schools			Health Center				Households	Remarks	
			Primary	Secondary	Tertiary	IV	III	II	I			
25 Bichimo	Buchina	Muramba	2	1	0	0	0	0	0	0	48	
26 Mutamba B	Muramba	Muramba	1	0	0	0	0	0	0	0	100	
27 Butabya A	Muramba	Muramba	1	0	0	0	0	0	0	0	40	
28 Muramba	Muramba	Muramba	3	1	0	0	0	0	0	0	200	
29 Hatumba-Banja	Bukale	Muramba	1	0	0	0	0	0	0	0	150	
30 Ndasura	Bubale	Muramba	1	0	0	0	0	0	0	0	100	
31 Pann	Sirok	Biberiba	1	0	0	0	0	0	0	0	200	
32 Luryo	Buzibab	Luryo	2	1	0	0	0	0	0	0	260	
33 Bwanga	Luryo	Luryo	1	0	0	0	0	0	0	0	80	
34 Bakeno	Nabire	Luryo	3	0	0	0	0	0	0	0	150	
35 Mundidi	Mundidi	Burine	4	0	0	0	0	0	0	0	70	
36 Lamal	Rakata	Burine	1	0	0	0	0	0	0	0	50	
37 Mvembe-Iyari	Iyari	Burine	1	0	0	0	0	0	0	0	50	
<b>Total</b>			<b>101</b>	<b>17</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>5</b>	<b>8</b>	<b>0</b>	<b>9095</b>	



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

## PART 2

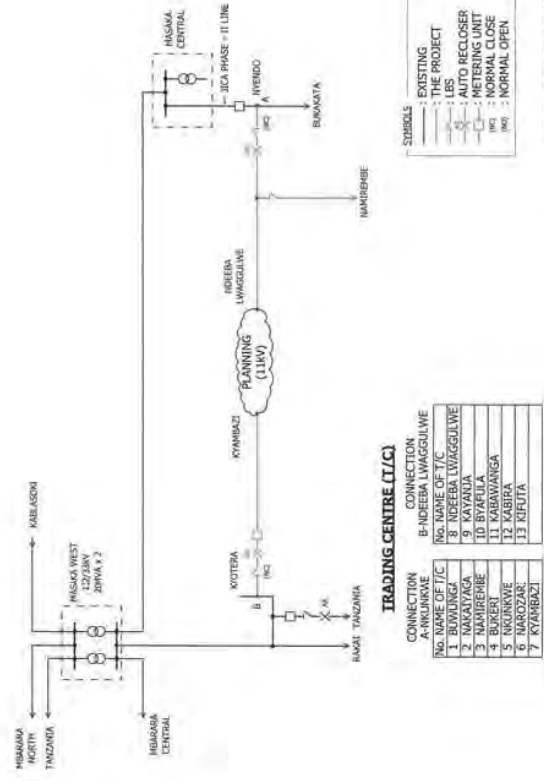
Extension of 33 kV distribution line in  
Masaka and Rakai District (Area-2)



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 Bwanga	Bwanga	Bwanga	3	0	0	0	0	0	1	120	
2 Nkomo	Nkomo	Bwanga	1	0	1	0	0	0	1	100	
3 Kyambizi	Kyambizi	Kyambizi	1	0	0	0	0	0	0	1000	
4 Bukuru	Kanywa	Bwanga	3	1	0	0	0	0	0	50	
5 Nkomo	Kanywa	Bwanga	3	0	0	0	0	0	0	100	
6 Nkomo	Bugere	Bwanga	1	1	1	0	0	0	0	10	
7 Kyambizi	Kyambizi	Kyambizi	2	0	0	0	0	0	0	80	
8 Ndeeba Lwaggulle	Kyambizi	Kyambizi	2	1	0	0	0	0	0	120	
9 Kyambizi	Kyambizi	Luwero	0	0	0	0	0	0	1	30	
10 Bwanga	Kanywa	Luwero	2	0	0	0	0	0	0	20	
11 Kabwanga	Bwanga	Kabwanga	2	0	0	0	0	0	0	100	
12 Kabwanga	Njala	Kabwanga	2	1	0	0	1	0	0	120	
13 Kifuta	Njala	Kabwanga	3	1	1	0	0	0	0	130	
<b>Total</b>			<b>25</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>1860</b>	



NETWORK DIAGRAM AREA-2 (MASAKA AND RAKAI DISTRICT)

### PART 3

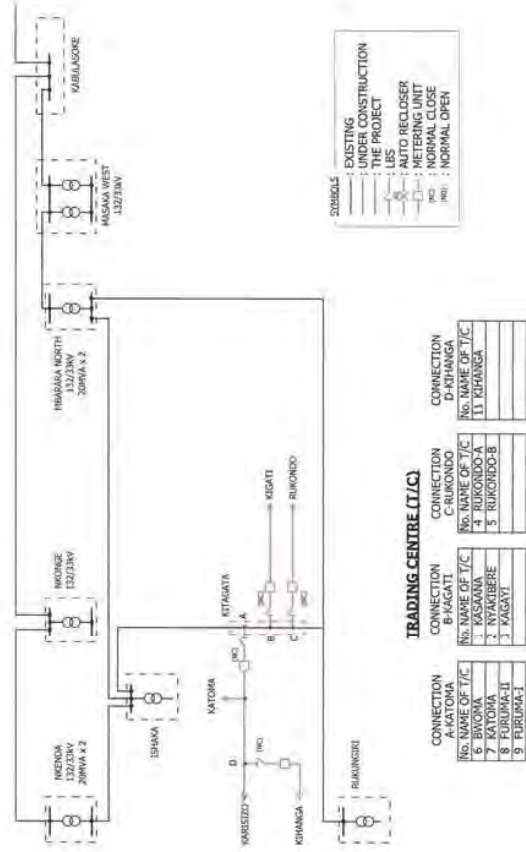
Extension of 33 kV distribution line in Bushenyi and Rukungin District (Area-5)



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

### Socio-economic Data in Area-5

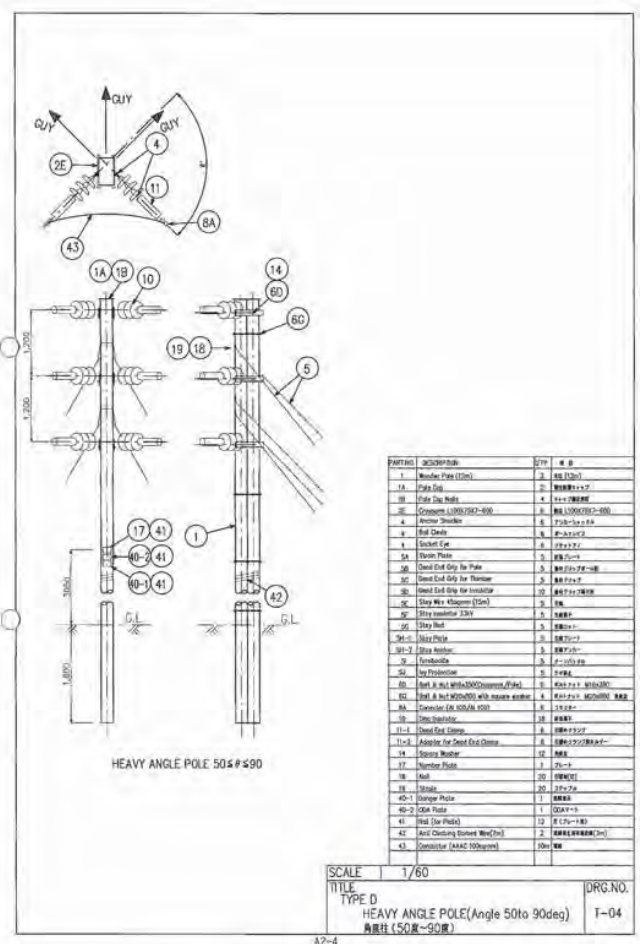
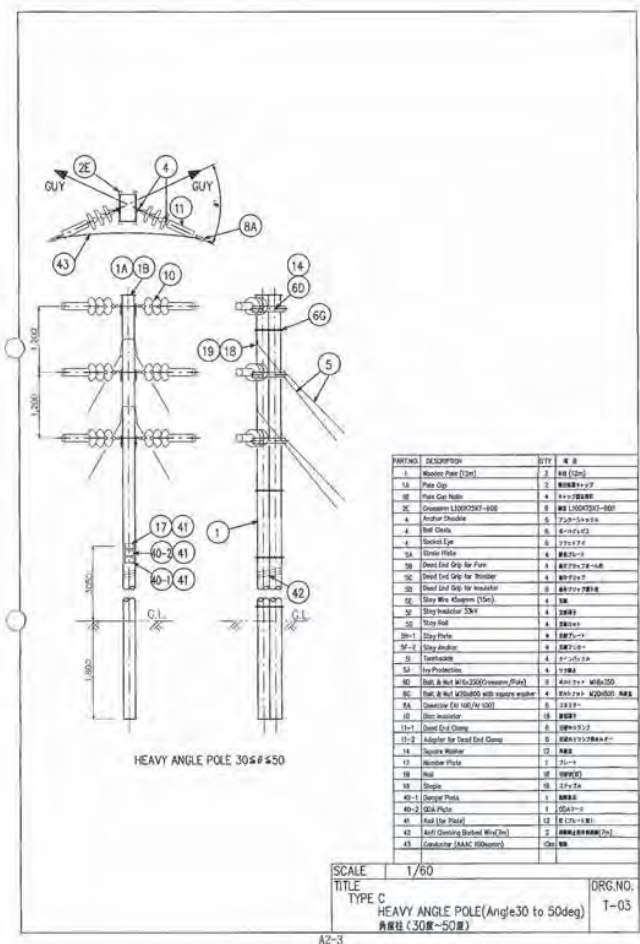
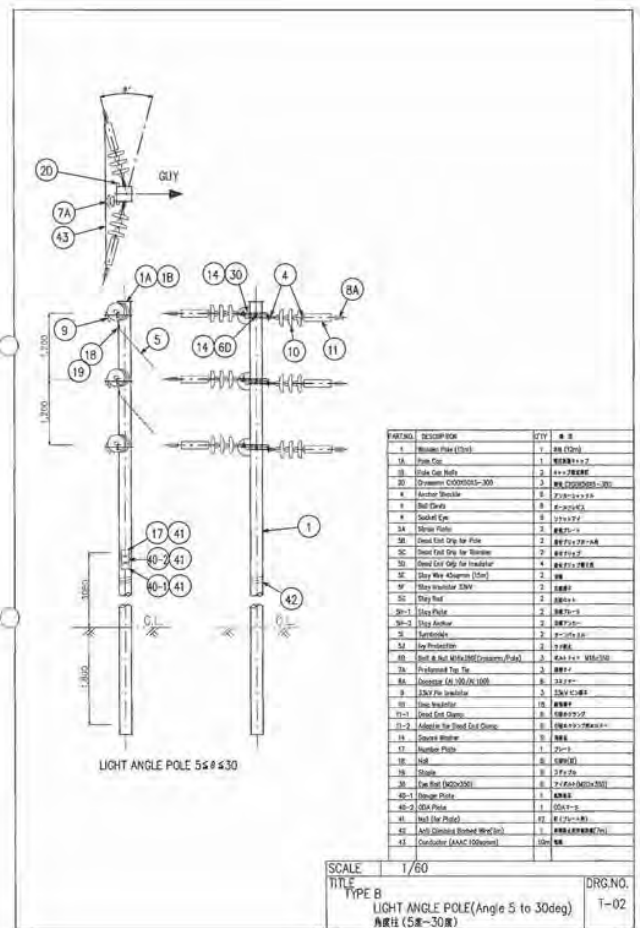
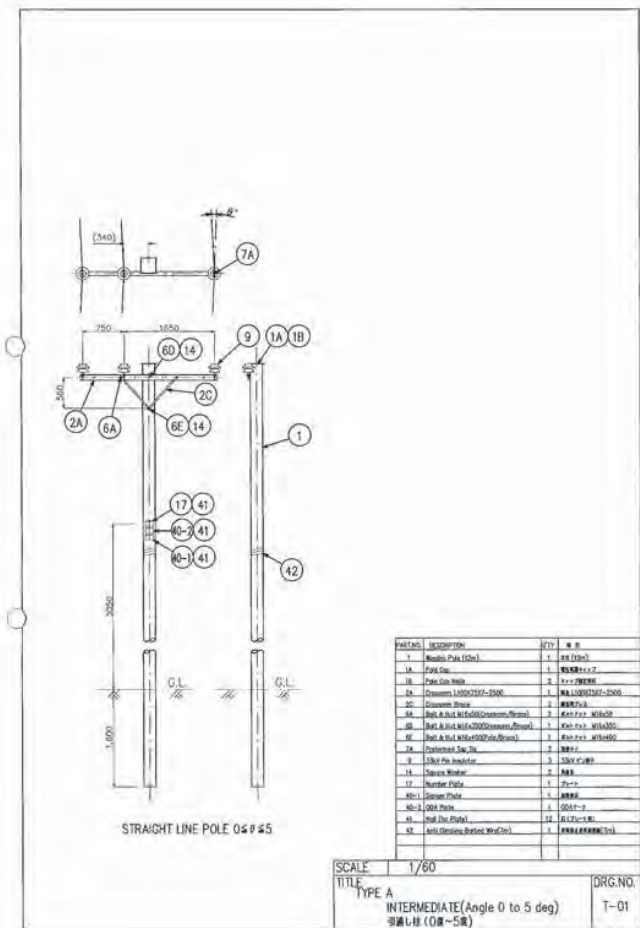
Trading Center	Parish	Sub-unity	Schools			Health Center				Households	Remarks
			Primary	Secondary	Tertiary	IV	III	II	I		
1 Kwasana	Kwasana West	Kibanga	3	2	1	0	1	0	0	300	
2 Nyakibere	Kwasana East	Kibanga	0	0	0	0	0	0	0	25	
3 Kagati	Kwasana East	Kibanga	4	0	0	0	0	0	0	150	
4 Rukondo A	Kibanga	Kibanga	4	1	0	0	0	0	0	200	
5 Rukondo B	Rukondo	Kibanga	2	1	0	0	0	0	0	20	
6 Bwama	Kyamukama	Kibanga	1	0	0	0	0	0	0	40	
7 Katima	Kyamukama	Kibanga	2	0	0	0	0	0	0	130	
8 Furuma II	Dukungiri	Muzira	2	0	0	0	0	0	0	20	
9 Furuma I	Dukungiri	Muzira	0	0	1	0	0	0	0	30	
10 Changa	Kibanga	Bubanga	2	0	0	0	0	1	0	80	
<b>Total</b>			<b>30</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>965</b>	



NETWORK DIAGRAM  
AREA-5 (BUSHENYI AND RUKUNGINI DISTRICT)

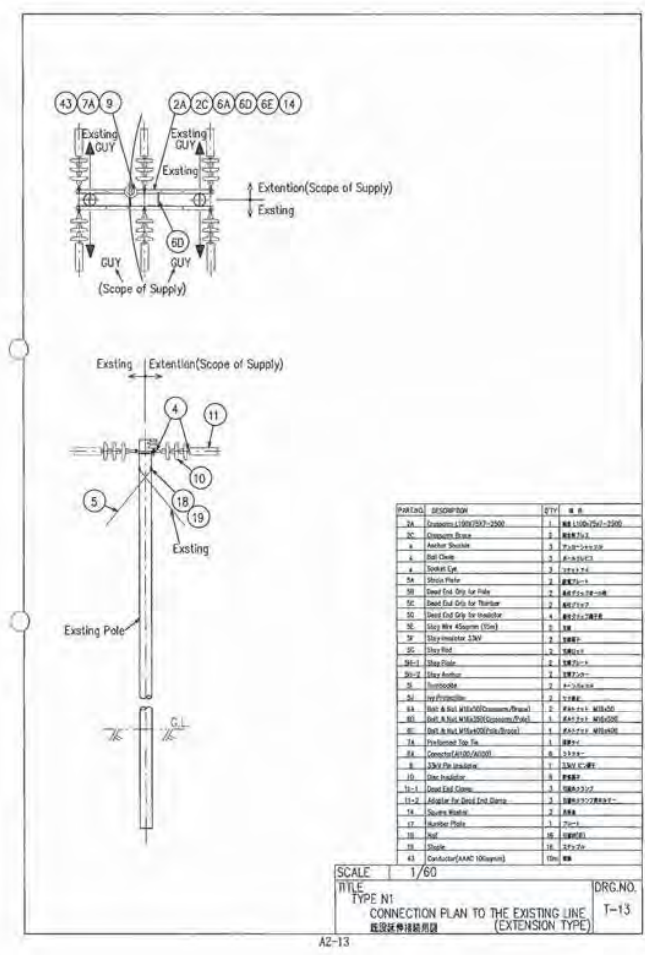
## PART 4

### Pole Assembly Drawing for Distribution Line

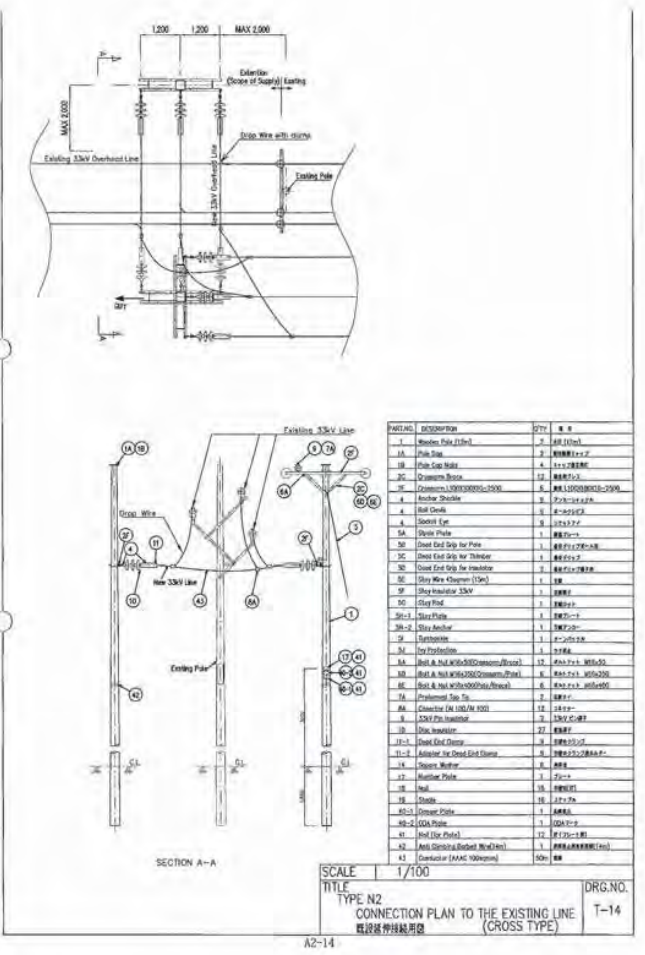




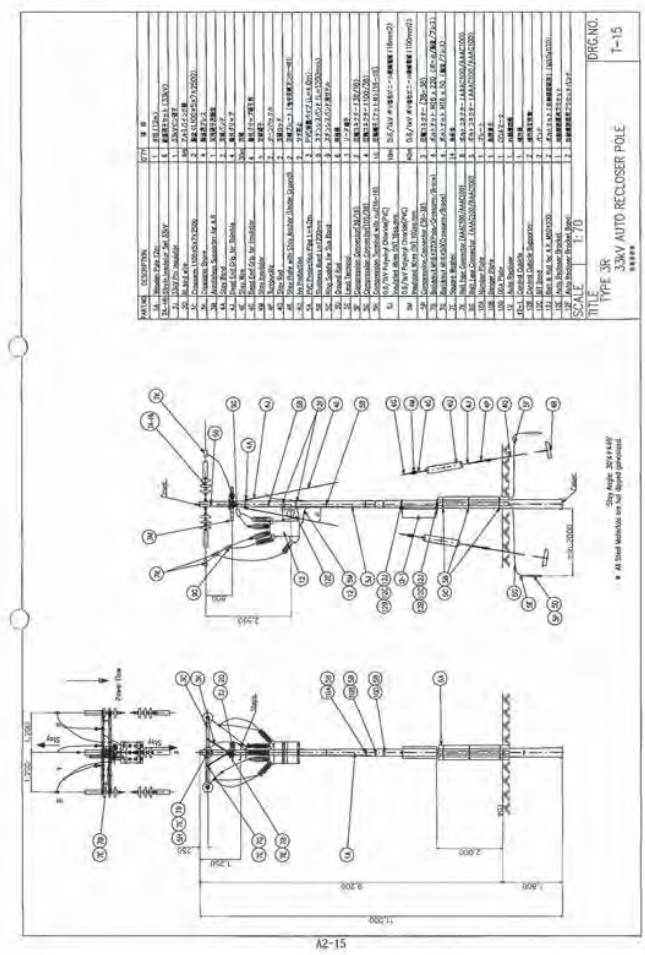




A2-13



A2-14



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 [A]	Recorded Data [A]			
			2007	2008	2009	2010

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

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

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

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

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

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

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

No.	Feeder Name	Rated [A]	Recorded Data [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 [mm <sup>2</sup> ]	Allowable Current [A]	Maximum Current [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 [mm <sup>2</sup> ]	Allowable Current [A]	Maximum Current [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 [mm <sup>2</sup> ]	Allowable Current [A]	Maximum Current [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 [mm <sup>2</sup> ]	Allowable Current [A]	Maximum Current [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 [mm <sup>2</sup> ]	Allowable Current [A]	Maximum Current [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 [mm <sup>2</sup> ]	Allowable Current [A]	Maximum Current [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.

**Estimated Power Demand in Project Site A1**

TC Name	Residential		Commercial		Schools			Health Center		Office	Small Factory	Energy (kWh)	Demand (kV)
	Primary	Secondary	Primary	Secondary	Center	Clinic	Center	Clinic					
Kopiaki													
Kejema													
Wabwoga													
Kimbwa													
Kayanza													
Nakyasa													
Kiwe													
Bale													
Bukeika													
NYize													
Wakisi													
Kikubamubwe													
Namniya													
Lugasa													
Total													0

Total in the Site	Energy Demand (kWh)	Customer Number
Domestic		
Commercial		
Medium Industry		
Large Industry		
EX-Large Industry		
Total	0	0

**Estimated Power Demand in Project Site A2**

TC Name	Residential		Commercial		Schools			Health Center		Office	Small Factory	Energy (kWh)	Demand (kV)
	Primary	Secondary	Primary	Secondary	Center	Clinic	Center	Clinic					
Buwenda													
Bujagali													
Ivumbaba													
Namize													
Budondo S/C													
Budondo TC													
Suyela													
Kabowa													
Nakanyonyi													
Namagara													
Utagaya													
Umuhoza													
Nankandulo													
Kisozi													
Namaganda													
Kyuruga													
Mwanga													
Namwenda													
Total													0

Total in the Site	Energy Demand (kWh)	Customer Number
Domestic		
Commercial		
Medium Industry		
Large Industry		
EX-Large Industry		
Total	0	0

**ATTACHMENT  
JICA I**

## ATTACHMENT JICA II

Estimated Power Demand in Project Site B

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

Estimated Power Demand in Project Site C

TC Name	Project Site C (Hoima-Murtoime)											Demand (KW)
	Residential	Commercial	Schools		Health Center		Office	Small Factory	Energy (MWh)	Demand (KW)		
			Primary	Secondary	Center	Clinic						
Buwakera												
Buhimba												
Kikuba												
Murtoime												
<b>Total</b>												<b>0</b>

Estimated Power Demand in Project Site A

Parish	Project Site A (Nabitende/Itanda Area in Iganga District)												Demand (KW)
	Residential	Water Pump	Schools	Health Center			Mize & rice mill	Energy (MWh)	Demand (KW)				
				Primary	Secondary	Grade IV				Others			
Namungoive													
Nabitenda													
Naliuko													
Iluja													
Bugono													
Itanda													
Kwanyi													
Nawangaiza													
<b>Total</b>												<b>0</b>	

	Total in the Site	
	Energy Demand (MWh)	Customer Number
Domestic		
Commercial		
Manufacture Industry		
EX-Large Industry		
<b>Total</b>	<b>0</b>	<b>0</b>

Estimated Power Demand in Project Site D

Parish	Project Site D (Bukakata Area in Masaka District)						
	Residential	Water Pump	Schools		Health Center		Demand (KW)
			Primary	Secondary	Grade IV	Others	
Kavusi							
Nabwaku Camp							
Sounga							
Kipo							
Bunreddu							
Kaiko							
Lambi Landing site							
Bukakata							
Kachuga							
<b>Total</b>							<b>0</b>

	Total in the Site		
	Energy (KWH)	Demand (KW)	Customer Number
Domestic			
Commercial			
Medium Industry			
Large Industry			
EX-large Industry			
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>

Estimated Power Demand in Project Site B

Parish	Project Site B (Kagadi/Munteme Area in Hoima and Kibale District)						
	Residential	Water Pump	Schools		Health Center		Demand (KW)
			Primary	Secondary	Grade IV	Others	
Kipo							
Kiboyya							
Kicohe							
Kcanga							
Karama							
Pachwa 2							
Pachwa 1							
Mabale							
Kiemuzi							
Kaisamba							
Mugaliwe							
Kyenuge							
Kiryane							
<b>Total</b>							<b>0</b>

	Total in the Site		
	Energy (KWH)	Demand (KW)	Customer Number
Domestic			
Commercial			
Medium Industry			
Large Industry			
EX-large Industry			
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>

Estimated Power Demand in Project Site C

Parish	Project Site C (Bugeso/Wemba Area in Bugiri District)						
	Residential	Water Pump	Schools		Health Center		Demand (KW)
			Primary	Secondary	Grade IV	Others	
Bugeso							
Wemba							
Buyala							
Nabinere							
Nambo							
<b>Total</b>							<b>0</b>

	Total in the Site		
	Energy (KWH)	Demand (KW)	Customer Number
Domestic			
Commercial			
Medium Industry			
Large Industry			
EX-large Industry			
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>

**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**

<b>1. Introduction</b>	<b>1</b>
<b>2. Project Site Information</b>	<b>2</b>
2.1 Project Site Locations	2
2.2 Beneficiary of the Project	3
2.3 Progress of Customer Connection in the Previous Project Sites (JICA I and II)	7
2.4 Power Demand Forecast in the Project Sites	10
<b>3. Design Conditions and Technical Specifications</b>	<b>12</b>
3.1 Design Conditions	12
3.2 Basic Plans of Components	15
3.3 Procurement and Installation Plan of Equipment and Materials	16
3.4 Procurement Plan of Spare Parts and Maintenance Tools	22
3.5 Upgrading of the Existing Distribution Lines (from Busia to Nankoma, around Nankoma)	22
3.6 Tentative Implementation Schedule of the Project	24
<b>4. Environmental and Social Considerations</b>	<b>26</b>
4.1 Location of 33 kV Distribution Line	26
4.2 Points of Environment and Social Considerations	26
4.3 Site Survey	28
4.4 Environmental and Social Impacts and Mitigation Measures	31
4.5 Preparation of Project Brief (PB)	36
<b>5. Work Demarcations for Both Parties</b>	<b>36</b>

**ANNEX**

1. Members of the Team
2. List of Parties Concerned in the Recipient Country
3. Minutes of Discussion
4. Results of socio-economic survey
5. Estimation of loads of each consumer
6. Fact finding sheets  
Mayuge, Iganga, Busia, Namayingo and Bugiri districts

**Drawings**

1. Single Line Diagrams of the Project
2. Route Maps of the Project
3. Pole Assembly Drawings for Distribution Lines

**Contents of Drawings**

1. Single Line Diagram of the Project  
DWG No. UG3-E1: 33kV Distribution Network Diagram of the Project (Mayuge + Lumbwa)
2. Route Map of the Project  
DWG No. R-01  
DWG No. RD-01~RD-30  
Route Map of the Project  
Detail Route Map of the Project
3. Pole Assembly Drawings for Distribution Lines  
DWG No. T-01 Pole Type A Intermediate Pole (Line Angle: 0~5 degree)  
DWG No. T-02 Pole Type B Light Angle Pole (Line Angle: 5~30 degree)  
DWG No. T-03 Pole Type C Heavy Angle Pole (Line Angle: 30~50 degree)  
DWG No. T-04 Pole Type D Heavy Angle Pole (Line Angle: 50~90 degree)  
DWG No. T-05 Pole Type E Section Pole (Horizontal Arrangement)  
DWG No. T-07 Pole Type G Terminal Pole  
DWG No. T-08 Pole Type H Load Break Switch (LBS) Pole  
DWG No. T-09 Pole Type J T-off Pole (Branch)  
DWG No. T-10 Pole Type L Transformer Pole (Line end)  
DWG No. T-11 Pole Type K Transformer Pole (on Line)  
DWG No. T-12 Pole Type M Bulk Metering Unit Pole  
DWG No. T-13 Pole Type N Connection Plan to the existing line (extension type)  
DWG No. T-14 Pole Type O Sharp Angle Pole (Line Angle: 90~90 degree) (Horizontal)  
DWG No. T-15 Pole Type R Auto Re-closer Pole  
DWG No. T-16 Pole Type W Intermediate Pole (area to be flooded)

**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 component of the Project is shown in Table 1. However, the final component 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 Iwankoma T/C through Mayuge T/C Approx. 21.3 km
	➤ Branch line from Mayuge T/C to Makana T/C Approx. 10.2 km
	➤ Trunk Line from Nankoma T/C to Lumbwa T/C through Namayingo T/C and Iganga T/C Approx. 57.5 km
➤ Branch line from Namayingo T/C to Busia A T/C and Busia B T/C Approx. 29.9 km	
➤ Branch line from Namayingo T/C to Busia Landing Site and Iganga Approx. 14.8 km	
➤ Branch Line from Fikemp T/C to Mbulindi T/C and Mbulindi-Tuyant T/C Approx. 10.5 km	
(2) 33/0.4/15/0.240 kV Distribution transformer (Total Number: 90 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	
Procurement	Spare parts and maintenance tools for 33 kV distribution line
	(1) Emergency Spare Parts
	(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

(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: 2300 /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

Health Center	District	Sub-county	Township	Village	Number of Health Centers		Estimation of Health Centers		Number of Households	Population	% Living population
					III	IV	III	IV			
Makuru	III				1	1	1	1	27,300	75	320
Musere	III				1	1	1	1	31,200	70	300
Mayuge	III				1	1	1	1	33,000	142	70
Buyinja	IV				1	1	1	1	221,700	450	460
Luwero	III				1	1	1	1	22,800	70	200
Lutalo	III				1	1	1	1	48,200	75	380
Muramba	III				1	1	1	1	42,600	60	320
Linyo	III				1	1	1	1	29,700	70	680
<b>Total</b>					<b>8</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>342,900</b>	<b>1,012</b>	<b>2,390</b>

Source: JICA Study Team

Note: Each report of changing from first survey is below.  
 \*1 Musere: It is added, details are in main body.  
 \*2 Luwero: Its H/C is changed from IV to III from the site survey.  
 \*3 Living population: To specify the number of living population only in the electrified area by the Project in consideration of coverage area of transformers installed, interview in 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 LC.

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 1 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, Mitterere 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, Buseru Landing site and Lugala. Main products are Tilapia, Nile Perch, Mukene and Nkejo. 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 necessities. Some of the shops are using kerosene refrigerators.
  - Fabrication: Especially in Namayingo, small welders and carpenters 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

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

Name of Health Center	Grade	Coverage population	Outpatient /day	Outreach /month	Staff
Makuru	III	27,300	75	320	3
Musere	III	31,200	70	300	5
Mayuge	III	33,000	142	70	4
Buyinja	IV	221,700	450	460	17
Luwero	III	22,800	70	200	6
Lutalo	III	48,200	75	380	6
Muramba	III	42,600	60	320	3
Linyo	III	29,700	70	680	7
<b>Total</b>		<b>342,900</b>	<b>1,012</b>	<b>2,390</b>	<b>21</b>

Source: Compiled by JICA Study Team using the data below  
 Coverage population of Makuru, Musere, Mayuge: their plan development plan for the period 2010/2011 - 2013/2013  
 Coverage population of Buyinja and Linyo: (adopt their own development plan for the period 2010/2011 - 2013/2013)  
 Coverage population of Luwero, Lutalo, Muramba, Namayingo: HQ  
 Coverage population of Linyo: Busia District Annual Report 2010  
 Other information at primary information  
 Note: \* Total coverage population is estimated by population of Luwero, Lutalo and Muramba, 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	5,013	107
Iganga	6	4,119	89
Bugiri	26	13,950	246
Namayingo	41	22,424	746
Busia	12	7,073	144
<b>Total</b>	<b>93</b>	<b>52,481</b>	<b>992</b>

Source: Compiled by JICA Study Team using data below  
 UGANDA'S DISTRICTS Information Handbook (2007-2008)  
 Note: \* Number of students and teachers are calculated as same 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
Mayuge	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 if 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 University of Health and Allied Sciences

(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 population: 331,799



Current as of July, 2011  
 \*Number of parentheses is staff number of each department  
 Source: Namayingo District HQ

Figure 2 Organizational chart of Namayingo District HQ

fuel 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 Hulina) 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.

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.



Current as of July, 2011  
 Note: 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

Table 7 Progress of customer connection in the previous project site

JICA I (2004-2010) (Unit: %)

District	NOMIA		KAWONGA		IGANGA		BUGIRI		MASAKA		Total	As per 100%	Progress of Connection
	Actual	Design	Actual	Design	Actual	Design	Actual	Design	Actual	Design			
Health Center	0	10	0	14	0	20	0	0	0	0	0	0	0
Small Office	0	11	0	17	0	18	0	0	0	0	0	0	0
Mill Machine	16	1	17	24	0	16	23	0	20	16	16	16	16
Health and Shop	139	810	2,118	2,105	429	1,772	299	402	2,218	4,149	1,019	2,271	46
Total	175	842	2,241	2,224	429	1,807	419	412	2,218	4,597	1,428	2,681	46
Total (excl. MS)	139	732	1,828	1,688	429	1,408	419	412	2,218	3,779	1,019	2,176	46

JICA II (2009-2010) (Unit: %)

District	MUSIGA		IGANGA		BUGIRI		Total	As per 100%	Progress of Connection
	Actual	Design	Actual	Design	Actual	Design			
Health Center	0	0	0	0	0	0	0	0	0
Small Office	0	17	0	14	0	0	0	0	0
Mill Machine	0	1	12	14	0	0	12	15	12
Health and Shop	117	5,227	309	5,734	30	1,249	456	4,810	3,117
Total	117	5,244	319	5,848	30	1,249	486	4,829	3,117
Total (excl. MS)	117	4,827	319	5,429	30	1,249	486	4,407	3,117

Source: JICA Study Team  
 Note: All the data of JICA I is collected by Uganda Electricity Transmission Company Ltd from UMEME and FREDUK 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 FREDUK as of 22nd May, 2011.

Completion of installation work of each previous project is as follows:

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



- (A) Minimum Clearance
- a) Phase to phase: 330 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)
	<ul style="list-style-type: none"> <li>&gt; Trunk line from Mayuge T/O to T/O at Nankoma T/C through Mpungwe T/C: Approx. 21.5 km</li> <li>&gt; Branch line from Mpungwe T/C to Mayuge T/O: Approx. 10.2 km</li> <li>&gt; Trunk line from Nankoma T/C to Lumino T/C and Nankoma T/C and Hakeno T/C: Approx. 27.5 km</li> <li>&gt; Branch line from Nankoma T/C to Hakeno A T/C and Hakeno B T/C: Approx. 39.9 km</li> <li>&gt; Branch line from Nankoma T/C to Busiro Landing Site and Lugala: Approx. 24.9 km</li> <li>&gt; Branch Line from Fakeno T/C to Mayuge T/C and Mwanembe-Tovori T/C: Approx. 10.5 km</li> </ul>
	(2) 33 (0.415-0.240 kV) Distribution Transformer (Total Number: 56 units)
	<ul style="list-style-type: none"> <li>&gt; 250 kVA = 4 units, 100 kVA = 7 units, 50 kVA = 11 units, 25 kVA = 28 units</li> </ul>
(3) Metering Unit (Total: 4 units)	
Procurement	<ul style="list-style-type: none"> <li>&gt; Connection point at Mayuge: 1 unit</li> <li>&gt; Connection point at Nankoma: 2 units</li> <li>&gt; Connection point at Lumino: 1 unit</li> </ul>
	(4) Auto Reclosers (Total: 4 units)
	<ul style="list-style-type: none"> <li>&gt; Connection point at Mayuge: 1 unit</li> <li>&gt; Connection point at Nankoma: 2 units</li> <li>&gt; Connection point at Lumino: 1 unit</li> </ul>
	(5) Load Break Switch (Total: 4 units)
	<ul style="list-style-type: none"> <li>&gt; 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: 5 units</li> </ul>
	Space parts and maintenance tools for 33 kV distribution line
	(1) Emergency Spare parts (1 lot)
	<ul style="list-style-type: none"> <li>&gt; Lightning Arrester, Fused Cut-out Switch and Distribution Transformer</li> </ul>
	(2) Replacement Spare Parts (1 lot)
	<ul style="list-style-type: none"> <li>&gt; Fuse elements for cut-out switch and contacts for load break switch</li> </ul>
(3) Maintenance Tools (1 lot)	
<ul style="list-style-type: none"> <li>&gt; Digital-type multi meter, Clip-on meter, Phase rotation meter, etc.</li> </ul>	

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		
1. Maina	1			1	
2. Mpungwe	1		1	2	25 kVA for secondary school
3. Nankoma	1		1	2	25 kVA for small town nearby
4. Bwahida	1	1		2	25 kVA for primary school
5. Malova	1			1	
6. Nankomoda	1			1	
7. Buswaga	1			1	
8. Makimo	1	1		2	25 kVA for schools
9. Nankompe	1	1		2	
10. Irindi	1			1	
11. Mwanere	1		1	2	25 kVA for schools
12. Mayuge-Bukheli	1		1	2	25 kVA for health center
13. Bushe	1			1	
14. Nankoma		1	1	2	
15. Nankompe		2	1	3	* District capital of Nankompe
16. Lumino			1	1	
17. Buswaga	2			2	25 kVA for Sub-county headquarter
18. Hakeno	1	1		2	
19. Lumino	1			1	
20. Mwanembe-Fayari	1			1	
21. Mwanembe	2			2	25 kVA for primary school
22. Lwampoa	1			1	
23. Nankoma	1			1	
24. Lutolo		1		1	
25. Kilindi	1			1	
26. Lugala			1	1	
27. Buswaga	1			1	
28. Busiro	1			1	
29. Busiro Landing site	1			1	
30. Farm	1			1	
31. Nankoma	1			1	
32. Hakeno-Banja	1			1	
33. Matamba	1	1		2	
34. Busheva	1			1	
35. Mwanembe-B	1			1	
36. Busheva	1			1	
37. Buswaga-A	1			1	
38. Buswaga-B	1			1	
Total	28	11	7	46	

Source: JICA Study Team

Note: \* The District capital of Nankompe District expands widely. Based on the demand forecast for the project, 3 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 13 km: 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 conductor: 134.4km x 3 phase = 403.2km
- b) Procurement length of conductor: 403.2 x 1.05 = 423.36km (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 Transformer	
1) Applicable Standard	IEC, JIS, JFC, JEM or Equivalent
2) Type	Y0/Δ ungrounded, ONAN, Thermally-steady, Outdoor, Pole-mount type
3) Nominal Voltage	33,000/415/250 V
4) Impedance Voltage	±2.5%, ±5.0% (no voltage tap changer)
5) Tapping Voltage (%) on HV Side	
6) Phase	11V:3 phase, LV:3 phase, 4-wire
7) Frequency	50 Hz
8) LRVV	170kV
9) Vector Symbol	Dyn11
10) Capacity	25, 50, 100, 200 kVA
11) Accessories	-Same Plate



Equipment	Specifications
(2) Local Break Switch	-20 level indicator and/or emergency indicator
(3) Fused Circuit Switches	-20 level indicator and/or emergency indicator
(4) Lightning Arresier	-20 level indicator and/or emergency indicator
(5) Metering Unit	-20 level indicator and/or emergency indicator
(6) Area Recloser	-20 level indicator and/or emergency indicator

Equipment	Specifications
9) Accessories	Climbing and tying is from high quality and long life barometer which change capacities. Control cables in stainless steel sheathings. - Voltage transformers (0.5 kV/110 V, Accuracy class 1.0, 50 VA) - Ground cables - Fixing materials for electrical pole - Relay software - Technical and installation manual
(7) Conductor for 33kV Distribution Line	IEC or Equivalent All Aluminum Alloy Conductor (AAAC) 100 mm <sup>2</sup> 2,600 m
(8) Wooden Pole with Pole Cap	Crossed wooden pole Round pole: 1) m: 12 m 1) m pole: 190-210 mm 1.2m pole: 210-235 mm Diameter of pole (at top) Pole Cap Material: Steel Plate/Alum Sheet Min (0.75 x 2.50x1.25) Accessories
(9) Insulators	Pin Insulator Applicable standard: IEC or Equivalent Type: Saddle type Material: Porcelain Color of porcelain: Brown Min. 57mm Creepage distance: Min. 37mm Disc Insulator Applicable standard: IEC or Equivalent Type: Half 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 disc 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

- 33kV distribution lines are designed along existing road and location of electrical pole is basically designed within road reserve.
- 100m span is applied for pole interval of 33 distribution line basically in conformity with the Ugandan standard.
- Distribution transformers are located in land center of each trading Center.

19

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: Mpungwe, Nondwe, Bwahaha, Makuutu, Muterece, Manye-Bukholi, Namayingo, Bwanga and Mundindi.

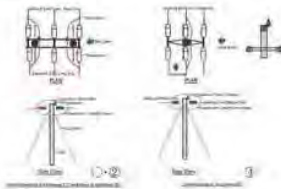
#### (d) Method of Connecting Existing and New Distribution Lines

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
Manye	New line shall be extended from the existing line at dead end pole in Manye.	(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

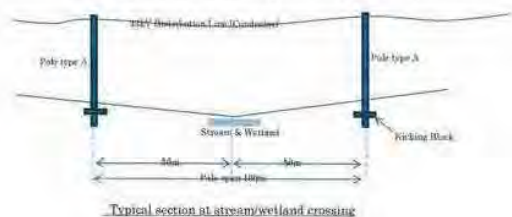


Source: JICA Study Team

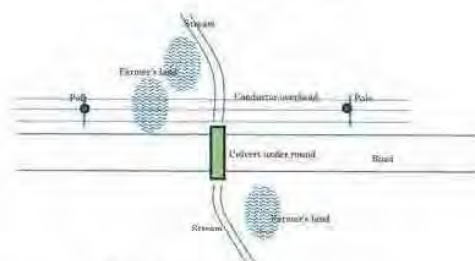
Figure 4 Typical drawings of Connection method

#### 2) Environmental and Social Aspects

- 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

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

21

### 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	Qty	Description
(1) Emergency Spare Part		
1) Lighting fixture	3 pcs	330V, 1kA, single phase
2) Fused Cut-out switch	7 pcs	33kV, center phase
3) Distribution Transformer	1 set of each type	25, 50, 100, 200kVA
(2) Maintenance Spare Part		
1) Fuse chamber for cut-out switch	3 nos of each type	-
2) Contacts for fault break switch	3 pcs	-

Source: JICA Study Team

Table 18 Maintenance Tool List

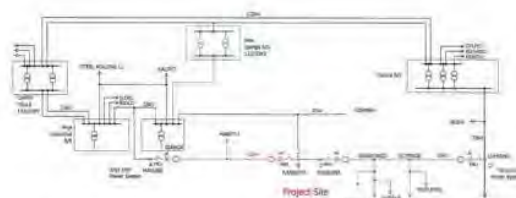
Types/Items	Qty	Description
(1) Digital-type multi meter	1 set	For general purpose
(2) LVP-m meter	1 set	For checking of metering unit
(3) Phase rotation meter	1 set	For general purpose
(4) Voltage detector	1 set	For 23kV line
(5) Voltage detector	1 set	For low voltage
(6) Insulation resistance meter	1 set	For megger test, 23kV line
(7) Insulation resistance meter	1 set	For megger test, low voltage
(8) Earth resistance tester	1 set	For general purpose
(9) Operation tool	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 backbone supply level of the project site was established through a site survey and discussions with RGA, 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<sup>2</sup> 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<sup>2</sup> 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<sup>2</sup> between Tororo and Busia: 50 mm<sup>2</sup> ACSR

(By the work, all the conductor between Tororo S/S and Busia will be 50 mm<sup>2</sup>.)

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<sup>2</sup> AAAC to conform 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<sup>2</sup> AAAC to 100 mm<sup>2</sup> 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 Malovu 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 follows 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.

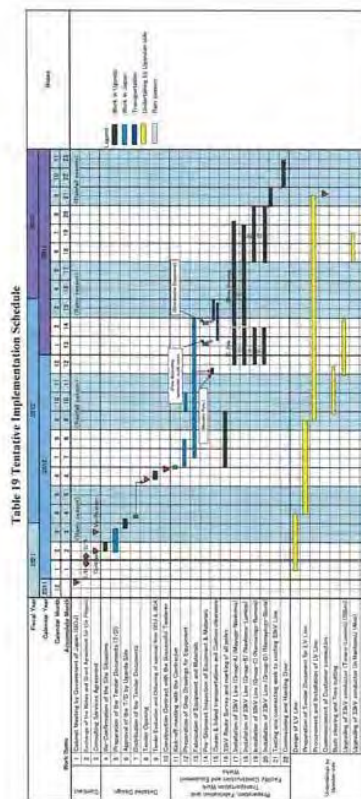


Table 19 Tentative Implementation Schedule

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 sections of proposed Project Route, those approximate lengths and respective local administrations and Figure 7 shows the proposed Project Site.

Project Route	(km)	District	Sub-county
1) Mayuge – Nankoma	21.5	Mayuge	Mayuge TC, Bukamba, Mpingwe, Kigululu, Iganga
2) Mpingwe – Makutu	10.2	Mayuge	Makutu
3) Nankoma – Limimo	37.5	Bugiri	Nankoma, Dalaha, Muterere, Bwafaya
		Namayingo	Namayingo TC, Buzinga
		Busia	Lusya, Lumira
4) Namayingo – Bwera A	29.4	Namayingo	Namayingo TC, Bwera
5) Namayingo – Lugala – Bwera Landing Site	24.8	Namayingo	Namayingo TC, Bwera, Banda
6) Hukema – Nwemle-Tayari – Mumbidi	10.5	Busia	Lusya
Total	134.4		



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

- 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 shorter from roads
- No erosion from the embankment
- Prevent preservatives of poles being into the wetlands
- Involvement of communities (local councils), district officers 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.

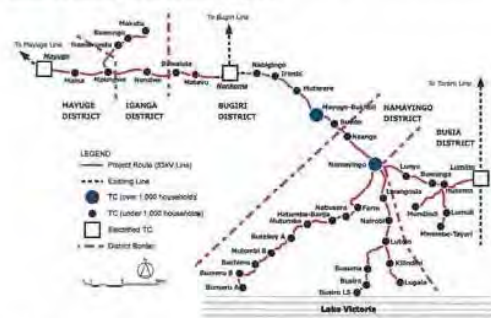


Figure 8 Survey Area with Trading Centers

Source: JICA Study Team

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 850,000 (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.

4.2.3 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)
- Overcrowded building area at Namayingo trading 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, rootok (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 vegetation mainly of reeds, sedges, alfalfa, pigonamites, 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 holes.

- Wetlands: Seasonal (23 places), Permanent (5 places)
- Seasonal streams: 5 places
- Proposed 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 Greywelles and Pine trees at about 1 meter tall as planned

apartely. 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 5m tall) are planted apartely. A cultural site (Kazimba Kungwa) is located on the road.

- South side aspects: Cerevilia, Pine trees and Burtydaria trees about 5 years grown (about 5m tall) are planted in one fenced 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. Basimena 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 Kungwa is located on the northern side of the road in Irindi CFR. The site is surrounded by tall trees.

### (4) Overcrowded building area at Namayingo branch point

Residential buildings are established close to the carriageway at the turn of the preliminary Project Route branch to Bumeo A IC at Namayingo TC. The preliminary Project Route will affect the residential buildings along the road at about 400 metres. 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 mango trees or massive trees will be avoided or those lower 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, Irindi CFR, plantations
- Environment issues: deforestation, wetland degradation,
- Likely positive impacts: lighting, value added agricultural production, welding, produce processed materials, boost of economic activities, growth of trading centers, reduce use of fire wood (deforestation)

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	Description
<b>(1) Positive Impacts</b>		
<b>1) Before/During Construction Phase</b>		
<b>(Social Environment)</b>		
1	Create job opportunities at 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 service sector can provide the construction workers accommodation, food and beverages
<b>2) Operation Phase</b>		
<b>(Social Environment)</b>		
1	Create opportunities to establish new businesses (micro enterprises) to improve income sources for the local people	The power supply to households will create the scope of developing new livelihoods using electricity as, <ul style="list-style-type: none"> <li>• Kiosk with refrigerator</li> <li>• Welding, Carpentry, Sawmill</li> <li>• Video theater, salon</li> <li>• Reproducing to cash fish</li> </ul>
2	Improvement of living environments	The electrification can improve the living environment like, <ul style="list-style-type: none"> <li>• Reduce risk of fire and health damage from kerosene lamp</li> <li>• Facilitate access in social information and entertainment with TV, radio, electrical device</li> <li>• Facilitate charging mobile phone and communication</li> <li>• Improve home safety and awareness on sanitation with lighting</li> <li>• Provide a longer time of homework for children at night</li> </ul>
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 hole 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 <ul style="list-style-type: none"> <li>• Enable them emergency care in the night</li> <li>• Enable them to introduce electrical medical equipment</li> <li>• Improved cold storage condition for medicine and vaccine can improve medical care services including immunization</li> </ul> In the schools, students and teachers can obtain academic program by <ul style="list-style-type: none"> <li>• Introducing lighting equipment, PC, laboratory, practical equipment, etc</li> <li>• Extending time of night learning</li> </ul>
4	Improvement of agricultural industry	The most likely development is improve agricultural industry in 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 public stations can contribute to prevent crimes like theft and violence in the darkness. Moreover, the lighting can moderate mental fear to the darkness
<b>(2) Negative Impacts</b>		
<b>1) Before/During Construction Phase</b>		

- 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, mullet, potato, settlements (shops), schools, plantation along the road
- Threatened species: nothing special, local trees (Mwale-Mitfela Escelja)

#### 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) chairman and mayors of TCs) to explain the Project, collect information and ask cooperation. 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 residential 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/rainforest 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 line 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

No.	Likely Impacts	Description
<b>(Social Environment)</b>		
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 wider narrow space is seen along the Namayingo-Bumeo route at 'T-junction' (trading center). The Project Route could affect the residential buildings in the area.
2	Loss of crops and trees of the Project Route	Most lands along the Project Route are cultivated even in wetlands. The tall mango trees, plantations were also observed along the Route. These crops and trees on the Project Route will be removed for the installation of the poles and cables.
3	Construction workers encroaching on the land	External construction workers use indoor tents of the local peoples. They might behave with bad manners, not respect local culture and traditions, or could harm the people's properties.
4	Obstruction of cultural sites (shrines)	There are two shrines were identified along the Project Route. The distribution line site 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 students' activities on the playground.
6	Exposure 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.
<b>(Natural Environment)</b>		
8	Obstruction of water flow in wetlands	The Project Route passes along wetlands (seasonal and permanent), seasonal streams, flood plains, water valley lands. Small water pools around the wetlands were observed on the road with some wetland vegetation. If the poles are installed in front of the box culverts, water flows can be obstructed.
7	Loss of trees in Irindi CFR	The Project Route is designed along the road passing through Irindi CFR at about 1 kilometer. The planned trees can be felled to install the distribution line.
8	Loss of vegetation and landscape	The loss of tall mango trees, plantations could deteriorate the vegetation and landscape along the Route although they are avoided as much as possible.
<b>(Accidents)</b>		
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 one opportunity for accidents involving workers to occur. The works to install poles and wires can induce the accidents on the local peoples.
<b>(3) Operation Phase</b>		
<b>(Accidents)</b>		
10	Accidents in households	Due to lack of knowledge of electricity, the consumers can have accidents like electric shock in their homes. The levels of awareness to the local people's representatives, LCHM children, sub-county officials, also will be same level.
11	Accidents on the facilities	Although rare, the overhead wires may be cut and damaged due to an accident or disaster. The other possible accidents on the facilities are theft, vandalism or burn in the field.

Source: ICA 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 33.

**Table 23 Proposed Mitigation Measures**

No.	Possible Negative Impacts	Mitigation Measures	Organization
<b>1) Before/During Construction Phase:</b>			
1	Obstruction of buildings and other infrastructure	<ul style="list-style-type: none"> <li>To avoid the obstructions on buildings, the Project Route will be designed to connect to the other branch line of Nanyalyango - Lwanga Private Route at Nanyalyango.</li> <li>At Firm TC, the Project Route will be designed past behind the buildings.</li> </ul>	REA, Consultant
2	Loss of crops and trees on the Project Route	<ul style="list-style-type: none"> <li>REA will conduct community meetings, survey, explain to the local people, make agreements, evaluate the subjects with district compensation rates and compensate the owners.</li> </ul>	REA
3	Construction workers trespassing on the land	<ul style="list-style-type: none"> <li>Contractor will instruct the construction workers about proper manner in the sites and to learn the local traditions.</li> </ul>	Contractor
4	Obstruction of cultural sites (shrines)	<ul style="list-style-type: none"> <li>The cultural site will not be impacted with the Project Route will be designed passing the opposite side of the road.</li> </ul>	REA, Consultant
5	Obstruction of the schools especially site playgrounds	<ul style="list-style-type: none"> <li>The Project Route will be designed passing the opposite side of the road where schools are located.</li> </ul>	REA, Consultant
6	Expansion of HIV/AIDS	<ul style="list-style-type: none"> <li>Contractors will sensitize workers and communities with cooperation of respective health centers.</li> </ul>	Contractor, Health Centers
7	Obstruction of wetlands	<ul style="list-style-type: none"> <li>The Project Route will be designed to avoid water pools and soft ground.</li> <li>The poles will be installed at approximately 100m span to avoid the box culverts and stream.</li> </ul>	REA, Consultant
		<ul style="list-style-type: none"> <li>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.</li> <li>Clearance of the vegetation and excavation will be limited in the area where the electricity poles will be installed.</li> </ul>	Supervision Consultant, Contractor
8	Loss of trees in tribal CFR	<ul style="list-style-type: none"> <li>The Project Route will be designed to pass the north side to avoid more massive historical plantations.</li> <li>The poles will be installed at approximately 100m span to minimize the numbers of poles in the site.</li> </ul>	REA, Consultant
		<ul style="list-style-type: none"> <li>REA will cooperate NTA, the forested persons and sacre farmers for the tribal trees, crops and animals available in other areas.</li> </ul>	REA
9	Loss of vegetation and landscape	<ul style="list-style-type: none"> <li>The Project Route will be designed to avoid tall/large trees or massive trees along the road as much as possible.</li> </ul>	REA, Consultant
		<ul style="list-style-type: none"> <li>The trees felled by necessity will be compensated by REA as same as loss of crops and trees.</li> <li>Re-plantation program will be conducted to provide communities with seeds, tree seedlings for replanting.</li> </ul>	REA, Community

#### 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. s/he 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.	Under takings	To be covered by		Remarks	Item No. on MIP	
		Japan	Uganda			
1	(1) Reclaiming lands of the Project site (points of 33kV distribution lines)		<input type="checkbox"/>		1	
	(2) Land leveling and preparation, bush clearing and removal of obstacles in the Project site		<input type="checkbox"/>			
2	To construct the following facilities	Not Applicable (Existing amenities work does not include)		3		
	(1) The building	<input type="checkbox"/>				
	(2) The gates and fences in and around the site	<input type="checkbox"/>	<input type="checkbox"/>			
	(3) The parking lot	<input type="checkbox"/>	<input type="checkbox"/>			
	(4) The road within the site	<input type="checkbox"/>	<input type="checkbox"/>			
	(5) The road outside the site	<input type="checkbox"/>	<input type="checkbox"/>			
	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 land/land	Not Applicable (Existing installation work does not include)		3	
		(1) Electricity				
		a. The distributing power line in the site				<input type="checkbox"/>
		b. The drop wiring and internal wiring within the site	<input type="checkbox"/>			
c. The main control transformer and transformer		<input type="checkbox"/>				
(2) Water Supply						
a. The city water distribution main to the site		<input type="checkbox"/>	<input type="checkbox"/>			
b. The supply system within the site (reservoir and elevated tanks)		<input type="checkbox"/>				
(3) Drainage						
a. The city drainage main (for storm sewer and collect in the site)		<input type="checkbox"/>	<input type="checkbox"/>			
b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	<input type="checkbox"/>					
(4) Gas Supply						
a. The city gas main to the site		<input type="checkbox"/>				
b. The gas supply system within the site	<input type="checkbox"/>					
(5) Telephone System						

No.	Possible Negative Impacts	Mitigation Measures	Organization
10	Accidents of construction workers and local residents	<ul style="list-style-type: none"> <li>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.</li> </ul>	Supervising Consultant, Contractor
<b>2) Operation Phase</b>			
11	Accidents in households	<ul style="list-style-type: none"> <li>REA will sensitize the local people to educate about electricity and instruction how to use safely.</li> </ul>	REA, District/ Sub-county offices
12	Accidents on the facilities	<ul style="list-style-type: none"> <li>Operator is obligated to maintain the facilities complying with their maintenance regulation.</li> <li>Community development Officer will also sensitize the local people on the importance of maintaining the facilities, need protect them from theft, vandalism or burns in the field.</li> </ul>	Operator, Community (LCI/II, 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

No.	Under takings	To be covered by	Remarks	Item No. on MIP	
		Japan	Uganda		
	a. The telephone trunk line to the main distribution frame/pole (MDF) of the building		<input type="checkbox"/>		
	b. The MDF and the extension after the termination	<input type="checkbox"/>			
	(6) Furniture and Equipment				
	a. General furniture		<input type="checkbox"/>		
	b. Project equipment	<input type="checkbox"/>			
4	Transportation of the Equipment, customs procedures and tax procedures			4 and 5	
	(1) Air/road air transportation to a port of disembarkation	<input type="checkbox"/>			
	(2) Procedures for tax exemption and customs clearance at the port of disembarkation		<input type="checkbox"/>		
	(3) Internal transportation from a port of disembarkation to the Project site	<input type="checkbox"/>			
	(4) Exemption or payment of value-added tax (VAT) on locally procured items	<input type="checkbox"/>	<input type="checkbox"/>		
5	Procedures necessary to obtain the following permits for the Japanese Consultant and Contractor: <ul style="list-style-type: none"> <li>Permits required for installation works</li> <li>Permits to access restricted areas</li> </ul>		<input type="checkbox"/>	The permits shall be obtained before project implementation.	6
6	Proper operation and maintenance of facilities and the equipment after the Project		<input type="checkbox"/>	including bush clearing and removal of obstacles along 33kV utilization lines.	7
7	To bear all the expenses, other than those covered by Grant, necessary for the implementation of the project.		<input type="checkbox"/>		8
8	Payment of the following fees based on the Banking Arrangement: <ul style="list-style-type: none"> <li>(1) A/P soliciting commission</li> <li>(2) Payment commission</li> </ul>		<input type="checkbox"/>	Approx. 10,000 Japanese Yen.	9
			<input type="checkbox"/>	0.1% of the grant aid amount	
9	Giving due environmental and social considerations in the implementation of the Project.		<input type="checkbox"/>		10
10	Securing of land of temporary material storage yard with fence and gate		<input type="checkbox"/>	To be utilized Storage Yard at Nankwasa	
11	Securing parking space during installation period		<input type="checkbox"/>	To be secured, beside the road during the installation work.	
12	Site offices	<input type="checkbox"/>		For the Japanese Consultant and Contractor	
13	Proper storage and safety management of the equipment in temporary material storage yard	<input type="checkbox"/>			
14	Securing of working space along routes of 33kV distribution lines and traffic control		<input type="checkbox"/>	When necessary	
15	Relocation of existing overhead/underground cables or pipes of power, telephone, water supply/sewerage, etc. and cleaning necessary perturbations.		<input type="checkbox"/>	When necessary	
16	Obtaining permission on road crossing during 33kV distribution line work		<input type="checkbox"/>	When necessary	
17	Prevention of disposal site of soil and discharged water caused by the installation work.		<input type="checkbox"/>		
18	Manufacturing and procurement of the Equipment	<input type="checkbox"/>		"The Equipment" is defined as the equipment and materials to be provided by the Japanese side under the Project.	

No.	Understandings	To be covered by Japan / Uganda	Remarks	Item No. in S4/D
19	Installation of the Equipment, adjust and setting	<input type="checkbox"/>	The Ugandan side is required to install equipment and tools to be provided on the Project to the Japanese Contractor during installation.	
20	Temporary shut down during installation	<input type="checkbox"/>		
21	Installation of a final back-sweep onto the existing pole at the connection point of 33kV distribution line in Nakomati	<input type="checkbox"/>		
22	Final connection to the existing 33kV distribution lines	<input type="checkbox"/>	At Mayuge, Nankomo and Lemeta connection points	
23	Provision of materials for the above mentioned final connection	<input type="checkbox"/>		
24	Provision of training for initial operation and maintenance of the Equipment	<input type="checkbox"/>		
25	Assessing capacity for personnel in the Project site	<input type="checkbox"/>	On request	
26	Managing any dispute from contractors regarding temporary shut down for installation work including compensation for contractors	<input type="checkbox"/>	If necessary	
27	Public notice of scheduled shut down and implementation of the project during the implementation stage	<input type="checkbox"/>		
28	Design, procurement and installation of trunk line of low voltage distribution lines and cooperation to construct transformer and public facilities in the Project sites	<input type="checkbox"/>	The Ugandan side is required to implement the work in parallel with 33kV distribution line work done by Japanese side.	
29	Safety	<input type="checkbox"/>	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 Grantee's to the "Access Test 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 Cooperation Agency
Yoshikazu WADA	Planning and Management	Japan International Cooperation Agency
Masatsugu KOMIYA	Chief Consultant / Power Supply Planning	Yachiyo Engineering Co., Ltd.
Kazumori 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. Kiles Director Economic Affairs  
Mr. Muhumusa NYALUYO Javeru Senior Economist/ Finance Officer: Aid (Lesse) Department

### Ministry of Energy and Mineral Development (MEMD)

Ms. Irene Nalwira Mutebi Minister of Energy and Minerals  
Mr. Simon D'Janga, Minister of State for Energy  
Mr. Ssegawa Ronald Gyagenda Undersecretary  
Eng. Henry Bidassa-Igaga Assistant Commissioner (Electric Power)  
Eng. Moses Murengeri Advisor to Chairman (EMSWG)  
Mr. Sam Barasa Personal Assistant to Minister  
Mr. James Bwanabe Isingoma, Acting Commissioner Energy Resources Department  
Mr. Sigiabi A. Frederick Senior Energy Officer  
Ms. Agni Caroline Senior Petroleum Officer/ Environment  
Ms. Mary Mwegisha Civil Engineer  
Mr. Nabagereka Ibrahim Electrical Engineer  
Mr. Emmanuel Sante Nsubuga Energy Officer (Electrical)

### Rural Electrification Agency (REA)

Mr. Godfrey R. Turyahabwe Executive Director  
Mr. Wexiku K. Godfrey Manager Project Monitoring & Evaluation  
Mr. Mugwera Andrew Principal Planning Engineer  
Mr. Philip E.P. Ggoyi Senior Planning Engineer  
Mr. Thomas Amuku Senior Project Engineer  
Ms. Joan Kayunga Mutibwa Project Engineer Construction  
Mr. Daniel Muganza Intern

### Uganda Electricity Transmission Company Ltd. (UETCL)

Mr. Eriasi Kiyenba CEO  
Mr. Gerald Muganga Manager, Planning and Investments  
Mr. Andrew Geno Omalla Technical Officer, Projects  
Mr. Ziria Titalwa Principal Planning Engineer  
Ms. Stephen Kyeganya Senior Planning Engineer

### Uganda Electricity Distribution Company Ltd. (UEDCL)

Mr. Lazo Bwanya Project Manager

#### Mayuge District

Mr. Omar Bwaga Dantoor District Chairman, Mayuge District  
Mr. Kabakabya Samuel Assistant Chief Administrative Officer  
Mr. Lubanga District Natural Resources Officer  
Mr. Alan Thomas District Environment Officer

#### Iganga District

Ms. Epondot Pauline Orio Principal Assistant Secretary  
Mr. Wamala Jotham Assistant Chief Administrative Officer  
Mr. Samanya Abdul District Forest Officer  
Mr. Dhikusooka Joseph District Agricultural Officer  
Mr. Batwaka Samuel District Community Officer  
Mr. Kayemba Jonan Fred District Planner  
Mr. Kagere Reinhard Project Support Officer CAIP  
Mr. Nelson Mwanindu Chairman Nondwe Town Board  
Mr. Mulikwa Sulayi Councilor of Nondwe

#### Bugiri District

Ms. Margaret Mwanamaliza Resident District Commissioner  
Mr. Luke L.L. Lukusa Chief Administrative Officer  
Ms. Eriandot Kiyama Environmental Officer  
Mr. Kyemba Mwandirady District Planner  
Mr. Nga Abeli Water pump Operator  
Mr. Bogere Mwanamwa Water pump Operator

#### Namayingo District

Mr. Richard Mugolo Chief Administrative Officer  
Mr. Kaleeba Peter Assistant Chief Administrative Officer  
Mr. Mayedo Ekwoni Accountant  
Mr. Kaawo Kawere Naay District Educational Officer  
Mr. Bwamiki Michael District Health Educator  
Mr. Kaleeba Peter District Health Inspector

#### Busia District

Mr. Sentema Yusuf Chief Administrative Officer  
Mr. Adeya Vincent Deputy Chief Administrative Officer  
Mr. Wabwire Patrio District Planner  
Ms. Teopista Namajja Municipality Environmental Officer  
Mr. Orongo Matota Julius Chief of Busime sub-county  
Mr. Ondworo James Accountant of Busime sub-county  
Ms. Kinye Murewan 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 Muhiru 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 Shimodani Coordinator for Economic Cooperation

#### JICA Uganda Office

Mr. Teisui Saki Chief Representative  
Ms. Akiko Nanami Representative  
Ms. Masae Iijima Project Formulation Advisor

### 3. Minutes of Discussion

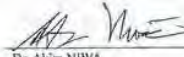
### Minutes of Discussions on the Preparatory Survey on the Project for Rural Electrification Phase III in the Republic of Uganda (Second Field Survey)

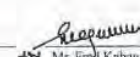
In response to the request from the Government of the Republic of Uganda (hereinafter referred to as "Uganda"), the Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with the Government of Japan, decided to conduct a Preparatory Survey (hereinafter referred to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

JICA dispatched the 2<sup>nd</sup> 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.

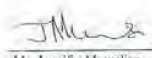
The Team held discussions with the officials of authorities concerned of the Government of Uganda (hereinafter referred to as "the Ugandan side"), and conducted a series of field surveys. In the course of the discussions, both the Ugandan side and the Team (hereinafter referred to as "Both parties") 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-Kalisa  
Permanent Secretary,  
Ministry of Energy and Mineral Development  
(MEMD)  
/ Chairman of Rural Electrification Board

Witness:

  
Ms. Jennifer Muwuliza  
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 1<sup>st</sup> 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 1<sup>st</sup> 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 2<sup>nd</sup> 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 2<sup>nd</sup> 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 in 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 2<sup>nd</sup> 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 1<sup>st</sup> field survey, MEMD/REA agreed on the following measures to minimize the constraints on realization of the electrification benefits 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 2<sup>nd</sup> 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.

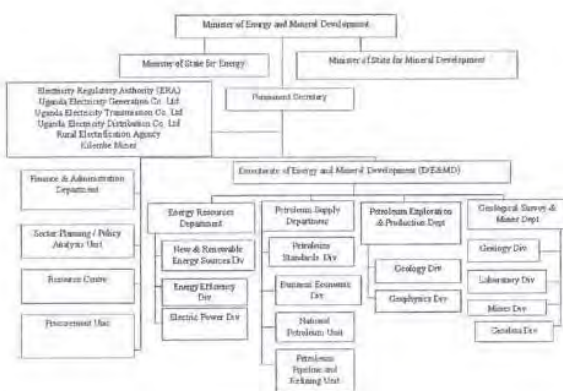
(End)

- 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

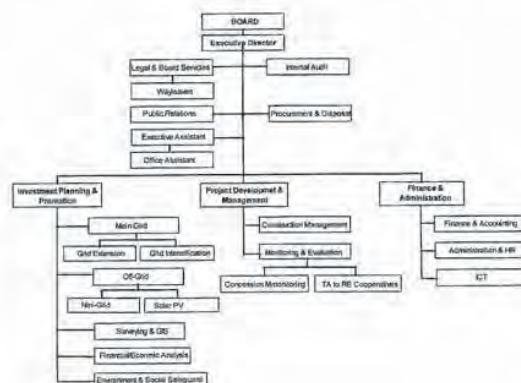
The Project Site



Annex-2



Organization charts of MEMD



Organization charts of REA



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...

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.

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.

(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 signed between the GOJ and the Government of the recipient country to make a pledge 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 or 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.

(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.

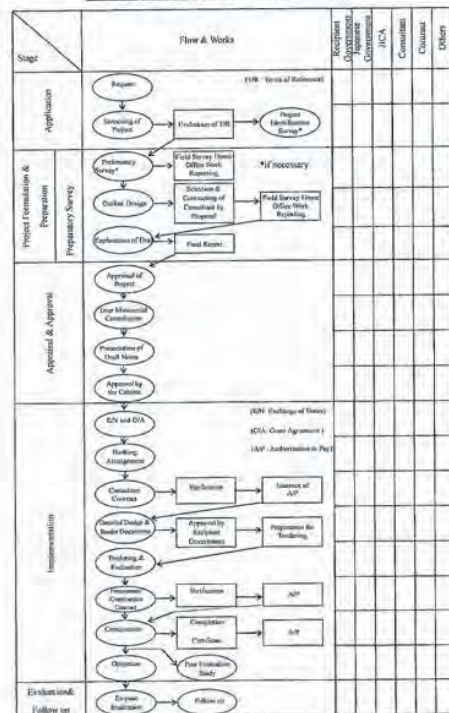
(9) Authorization to Pay (A/P)

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).

Flow Chart of Japan's Grant Aid Procedures



Major Undertakings to be taken by Each Government

No.	Name	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 (lot/ lots);		•
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 (lot/ lots)		
	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 elevational tanks)	•	•
	3) Drainage		
	a. The city drainage main (for storm sewer and sewers 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 (MDF) of the building	•	•
	b. The MDF and the extension after the frame/pant	•	•
	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 financial repatriation of the proceeds		
	1) Market (A) 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 (if so provided) (to be borne by the Authority) within the Grant)		•
6	To succeed Japanese nationals whose services may be required in connection with the supply of the products and the services and 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 "Articles") (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)

Item	Quantity	Unit Price	Value	Remarks
1. Rice	10000	1000	10000000	
2. Wheat	5000	2000	10000000	
3. Soybean	3000	3000	9000000	
4. Corn	2000	4000	8000000	
5. Other crops	1000	5000	5000000	
6. Livestock	1000	10000	10000000	
7. Fishery	1000	10000	10000000	
8. Poultry	1000	10000	10000000	
9. Aquaculture	1000	10000	10000000	
10. Other	1000	10000	10000000	
11. Total				

Prepared by the Ministry of Agriculture, Forestry and Fisheries, Japan  
 Date: 1982.10.20  
 Scale: 1:10000  
 Sheet No. 10000

Class	Item	Quantity	Unit Price	Total	Notes	Market (Market)
Consumption	Meat	1000	1.50	1500		
	Vegetables	500	2.00	1000		
	Fruit	300	3.00	900		
	Dairy	200	2.50	500		
	Grains	100	1.00	100		
	Oil	50	4.00	200		
	Sugar	30	3.00	90		
	Spices	20	2.00	40		
	Alcohol	10	1.00	10		
	Other	5	0.50	2.50		
Production	Meat	1000	1.50	1500		
	Vegetables	500	2.00	1000		
	Fruit	300	3.00	900		
	Dairy	200	2.50	500		
	Grains	100	1.00	100		
	Oil	50	4.00	200		
	Sugar	30	3.00	90		
	Spices	20	2.00	40		
	Alcohol	10	1.00	10		
	Other	5	0.50	2.50		

Notes: Market prices are based on current market rates. Production values are estimated based on current yields and prices. All values are in USD.

## 4-2. General Consumers (non farmers)

Class	Item	Quantity	Unit Price	Total	Notes	Market (Market)
Consumption	Meat	1000	1.50	1500		
	Vegetables	500	2.00	1000		
	Fruit	300	3.00	900		
	Dairy	200	2.50	500		
	Grains	100	1.00	100		
	Oil	50	4.00	200		
	Sugar	30	3.00	90		
	Spices	20	2.00	40		
	Alcohol	10	1.00	10		
	Other	5	0.50	2.50		
Production	Meat	1000	1.50	1500		
	Vegetables	500	2.00	1000		
	Fruit	300	3.00	900		
	Dairy	200	2.50	500		
	Grains	100	1.00	100		
	Oil	50	4.00	200		
	Sugar	30	3.00	90		
	Spices	20	2.00	40		
	Alcohol	10	1.00	10		
	Other	5	0.50	2.50		

Notes: Market prices are based on current market rates. Production values are estimated based on current yields and prices. All values are in USD.

Class	Item	Quantity	Unit Price	Total	Notes	Market (Market)
Consumption	Meat	1000	1.50	1500		
	Vegetables	500	2.00	1000		
	Fruit	300	3.00	900		
	Dairy	200	2.50	500		
	Grains	100	1.00	100		
	Oil	50	4.00	200		
	Sugar	30	3.00	90		
	Spices	20	2.00	40		
	Alcohol	10	1.00	10		
	Other	5	0.50	2.50		
Production	Meat	1000	1.50	1500		
	Vegetables	500	2.00	1000		
	Fruit	300	3.00	900		
	Dairy	200	2.50	500		
	Grains	100	1.00	100		
	Oil	50	4.00	200		
	Sugar	30	3.00	90		
	Spices	20	2.00	40		
	Alcohol	10	1.00	10		
	Other	5	0.50	2.50		

Notes: Market prices are based on current market rates. Production values are estimated based on current yields and prices. All values are in USD.





Name	Halyure technical institute
Village	Mahalinga
Grade	3 years
Courses	<ul style="list-style-type: none"> <li>• block work and concrete products</li> <li>• electrical installation</li> <li>• plumbing</li> <li>• painting decoration</li> <li>• motor vehicle technology</li> <li>• salon (3 months course)</li> </ul>
Number of coverage village	Whole village
Number of students	200
Number of teachers	25
Number of class rooms	4
Number of boarding rooms	2
Number of staff rooms	2
Number of toilets	15
Equipments	Solar panel with battery
#Cost	USD 7 month
#Energy	4 kwh
#Solar	4 kwh/season lamp
#Diesel	100 kwh
Use	Non
Equipments	Non
Project after identified	Non
Price of fuel	Non
Microsima LUCX2,800/L	Non
disseal LUCX3,800/L	Non
dry cell LUCX1,200/Pwr	Non
charcell LUCX1,800/5sec	Non
gas LUCX 300/000/Cylinder	Non

Project after identified  
 Price of fuel  
 Microsima LUCX2,800/L  
 disseal LUCX3,800/L  
 dry cell LUCX1,200/Pwr  
 charcell LUCX1,800/5sec  
 gas LUCX 300/000/Cylinder

Name	Mwanapan secondary school
Village	Mwanapan
Number of coverage village	7
Number of students	507
Number of teachers	10
Number of class rooms	3
Number of boarding rooms	4
Number of staff rooms	4
Number of toilets	10
Equipments	Non
#Cost	USD 7 month
Project after identified	Non
Price of fuel	Non
Microsima LUCX2,800/L	Non
disseal LUCX3,800/L	Non
dry cell LUCX1,200/Pwr	Non
charcell LUCX1,800/5sec	Non
gas LUCX 300/000/Cylinder	Non

Project after identified  
 Price of fuel  
 Microsima LUCX2,800/L  
 disseal LUCX3,800/L  
 dry cell LUCX1,200/Pwr  
 charcell LUCX1,800/5sec  
 gas LUCX 300/000/Cylinder

#### 4-5. Other public facilities

Name	St. John's secondary school
Village	Uwanga
Number of coverage village	13
Number of students	450
Number of teachers	14
Number of class rooms	5
Number of boarding rooms	5
Number of staff rooms	4
Number of toilets	14
Equipments	Non
#Cost	USD 7 month
Project after identified	Non
Price of fuel	Non
Microsima LUCX2,800/L	Non
disseal LUCX3,800/L	Non
dry cell LUCX1,200/Pwr	Non
charcell LUCX1,800/5sec	Non
gas LUCX 300/000/Cylinder	Non

Project after identified  
 Price of fuel  
 Microsima LUCX2,800/L  
 disseal LUCX3,800/L  
 dry cell LUCX1,200/Pwr  
 charcell LUCX1,800/5sec  
 gas LUCX 300/000/Cylinder

Name	Makindu secondary school
Village	Makindu
Number of coverage village	14
Number of students	847
Number of teachers	19
Number of class rooms	7
Number of boarding rooms	4
Number of staff rooms	4
Number of toilets	14
Equipments	Non
#Cost	USD 7 month
Project after identified	Non
Price of fuel	Non
Microsima LUCX2,800/L	Non
disseal LUCX3,800/L	Non
dry cell LUCX1,200/Pwr	Non
charcell LUCX1,800/5sec	Non
gas LUCX 300/000/Cylinder	Non

Project after identified  
 Price of fuel  
 Microsima LUCX2,800/L  
 disseal LUCX3,800/L  
 dry cell LUCX1,200/Pwr  
 charcell LUCX1,800/5sec  
 gas LUCX 300/000/Cylinder



## 5. Estimation of loads of each consumer

Village	Namayingo	Namayingo	Namayingo
Institutions	District HQ		Police Station
Number of staffs	188	25	7
Power generator			16
Equipments	generators/chargers with H/V IV		Solar panel with battery
Cost	Non		Non
Light Equipments	UDX/mth		2 lamps/area lamps
Cost	UDX/mth		42,000
Others	Non		Non
Equipments	Non		Non
Use	Non		Non
Cost	1 UGX/mth		Non
Errected equipments	18 computers, 8 printers		radio communication typewriter
Prospect after electrified	small lights, steady use of computers and printers and refrigerator		Steady use of radio equipments.
Others			{Crimes solutions} robbers, thefts, child abuses etc. {Number of Crimes} 70/month {Much expectations of lights for security.

Price of fuel  
kerosene UGX2,800/L  
diesel UGX3,200/L  
gasoline UGX3,800/L  
dry cell UGX1,200/Pac  
charcoal UGX1,500/Sac  
gas UGX 200,000/Cylinder

	Equipment	Power Consumption	Number of Equipment	Number of rooms	Usage Factor	Power Consumption	
Primary School	Desktop Computer	90W	2 set	1 Class room	0.8	144	
	Printer	30W	1 set	1 Class room	0.8	24	
	Photocopying Machine	500W	1 set	1 Class room	0.8	400	
	Fluorescent Lamp	20W	4 set	10 Class room	0.8	640	
	TV	100W	1 set	1 Class room	0.8	80	
	Fluorescent Lamp	20W	4 set	1 Boarding room	0.8	64	
						1362	
						1400	
Secondary School	Desktop Computer	90W	12 set	1 Class room	0.8	364	
	Printer	30W	1 set	1 Class room	0.8	24	
	Photocopying Machine	500W	1 set	1 Class room	0.8	400	
	Fluorescent Lamp	20W	4 set	6 Class room	0.8	384	
	TV	100W	1 set	1 Class room	0.8	80	
	Fluorescent Lamp	20W	4 set	1 Boarding room	0.8	64	
						1416	
						1500	
Tertiary School	Desktop Computer	90W	17 set	1 Class room	0.8	364	
	Printer	30W	1 set	1 Class room	0.8	24	
	Photocopying Machine	500W	1 set	1 Class room	0.8	400	
	Fluorescent Lamp	20W	4 set	8 Class room	0.8	384	
	TV	100W	1 set	1 Class room	0.8	80	
	Fluorescent Lamp	20W	4 set	1 Boarding room	0.8	64	
						1816	
						1952	
Health Center IV	Desktop Computer	90W	4 set	1 Room	0.8	288	
	Printer	30W	4 set	1 Room	0.8	96	
	Photocopying Machine	500W	1 set	1 Class room	0.8	400	
	Fluorescent Lamp	20W	4 set	10 Room	0.8	640	
	Refrigerator	90W	1 set	4 Room	0.8	288	
	Endoscope Unit	700W	1 set	1 Room	0.8	560	
	Ultrasonic Scanner	1000W	2 set	2 Room	1.8	3600	
	Bedside Monitor	80W	2 set	1 Room	0.8	128	
	Gadograph	60W	1 set	1 Room	0.8	48	
	Evacuator	60W	2 set	1 Room	0.8	96	
	Sterilizer	600W	4 set	1 Room	0.8	1920	
							16384
							25000
Health Center III	Desktop Computer	90W	1 set	1 Room	0.8	72	
	Printer	30W	1 set	1 Room	0.8	24	
	Fluorescent Lamp	20W	4 set	4 Room	0.8	288	
	Refrigerator	90W	1 set	1 Room	0.8	72	
	Bedside Monitor	80W	1 set	1 Room	0.8	64	
	Gadograph	60W	1 set	1 Room	0.8	48	
	Evacuator	60W	1 set	1 Room	0.8	48	
	Sterilizer	600W	1 set	1 Room	0.8	480	
						1084	
						1000	
Health Center II	Desktop Computer	90W	1 set	1 Room	0.8	72	
	Printer	30W	1 set	1 Room	0.8	24	
	Fluorescent Lamp	20W	4 set	4 Room	0.8	288	
	Refrigerator	90W	1 set	1 Room	0.8	72	
	Bedside Monitor	80W	1 set	1 Room	0.8	64	
	Gadograph	60W	1 set	1 Room	0.8	48	
	Evacuator	60W	1 set	1 Room	0.8	48	
						496	
						1084	
						1000	
Households / Shops	Fluorescent Lamp	13W	1 set	2 Room	0.8	20.8	
	TV	100W	1 set	1 Room	0.8	80	
	Refrigerator	90W	1 set	1 Room	0.8	72	
						172.8	
						172	

## 6. Fact finding sheets

Mayuge, Iganga, Busia, Namayingo and Bugiri districts