

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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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 ⁽¹⁾	Contents of main components ⁽²⁾	Project Features
1	Bale-Galina (Central) ⁽³⁾	C	Supply and installation of 33kV distribution Lines (approx. 44.1km) and distribution transformers (33kV/415-230V)	Need socio-economic justification for 44km extension of the existing Kayunga-Bale line (JICA I) Length of line passing CFRs*: approx. 10km Recommendable for strengthening private participation in rural electrification
2	Bakira-Namirembe & Masaka-Nyabiyajwe (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. 8km
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) ⁽⁴⁾	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) ⁽⁵⁾	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-Nyabiyajwe	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: impacts to rural economy and development, features of 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 Lunda (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 those passing CFRs are along the existing roads.
 - (6) The site survey was carried out on 10th April, 2011. The proposed alignments including those 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.

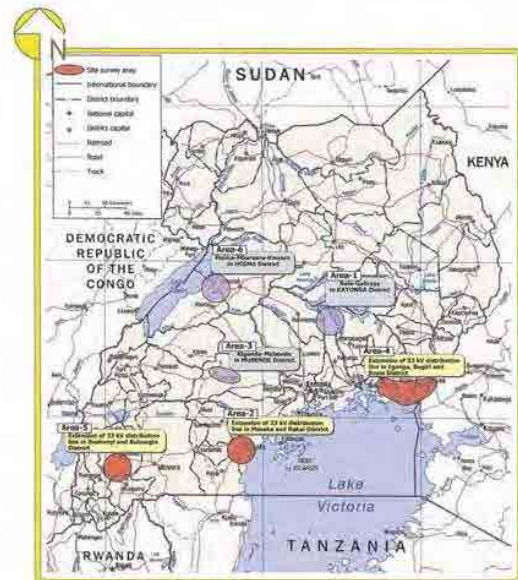


Figure 1 Areas where the Site Survey was carried out

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, matooke, 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

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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

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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 (matooke, coffee, cassava, beans), trading and they also have livestock (cattle, goat, chicken). The land use of Area-5 is dominated by ranch

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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.

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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 Rukungiri 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*	- 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. - Involvement of communities (local councils), district offices and sub-counties - Sensitization for workers and local peoples - Conserve cultural and valuable trees and re-plantation - Electricity is a step for improving livelihood leading to conserve environment - Prevent preservatives of poles being into the wetlands.		

Note: * EO (Environment Officer)

2.4.2 Location of the 33kV Distribution Lines

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

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 Iganga, Bugiri and Busia District
Priority B	Area-2	Extension of 33 kV distribution line in Masaka and Rakai District
Priority B	Area-5	Extension of 33 kV distribution line in Bushenyi and Rukungiri 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 ²	5 ton/m ²	10 ton/m ²

Source: UGANDA DISTRICTS Information Handbook (2007-2008)

4.1.2 Basic Electrical Design Conditions

(1) Electric System (Voltage and Wiring System)

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

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

Equipment	Specifications
(4) Lightning Arrester 1) Applicable Standard 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
(5) Metering Unit 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 ² 7C cu, 10m Waterproof type, with pad-lock (spare key: 3pcs) 13 way 1 lot
(6) Auto Recloser 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
(7) Conductor for 33kV Distribution Line 1) Applicable standard 2) Type 3) Size 4) Length per a Drum	IEC or Equivalent All Aluminum Alloy Conductor (AAAC) 100 mm ² 2,000 m

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Equipment	Specifications
(8) Wooden Pole with Pole Cap 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.

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7. List of Parties Concerned in the Recipient Country

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

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

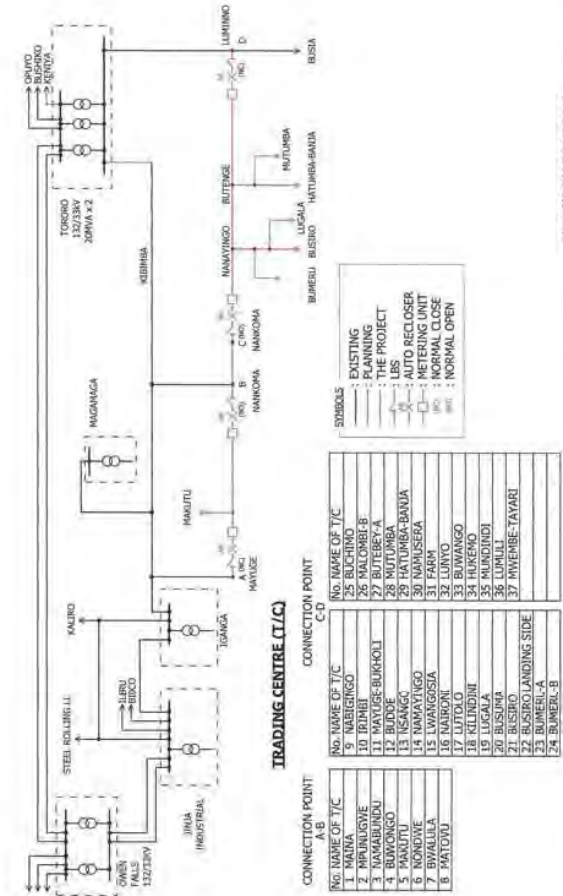
21



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

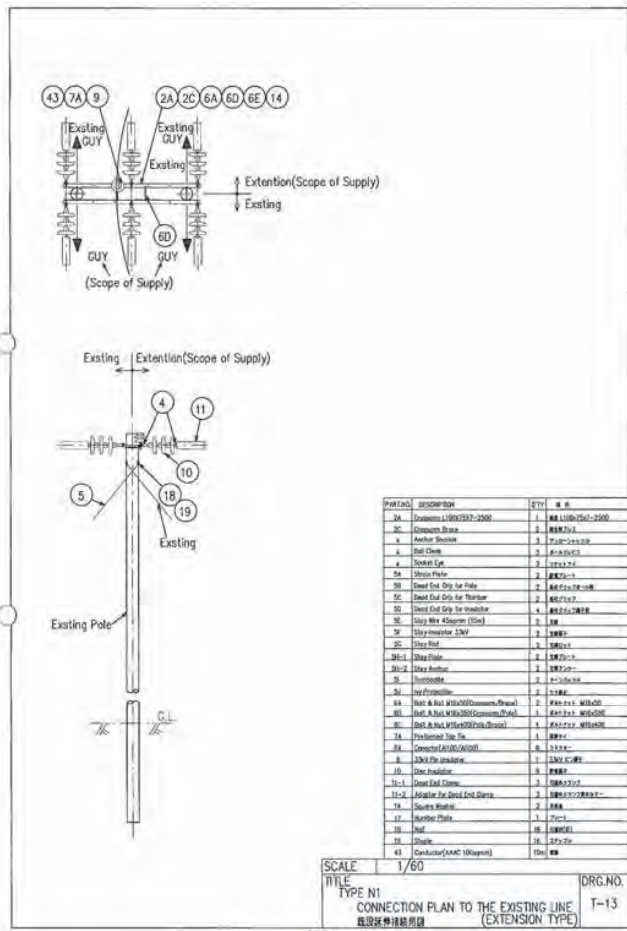
Trading Center	Parish	Sub-county	Schools			Health Center				Households	Remarks
			Primary	Secondary	Tertiary	IV	III	II	I		
25 Bichimo	Buchima	Muramba	2	1	0	0	0	0	0	0	48
26 Mutumba B	Muramba	Muramba	1	0	0	0	0	0	1	0	100
27 Rutabya A	Muramba	Muramba	1	0	0	0	0	0	0	0	40
28 Muramba	Muramba	Muramba	3	1	0	1	0	0	0	0	200
29 Hatumba-Banja	Buhle	Muramba	1	0	0	0	0	0	0	0	150
30 Nkasura	Buhle	Muramba	1	0	0	0	0	0	0	0	100
31 Pami	Sihe	Bibberha	1	0	0	0	0	0	1	0	200
32 Luryo	Buzibab	Luryo	2	1	0	0	1	0	1	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 Mundiidi	Mundiidi	Buaine	4	0	0	0	0	0	0	0	70
36 Lamal	Rakaka	Buaine	1	0	0	0	0	0	0	0	50
37 Mvembe-Iyari	Iyari	Buaine	1	0	0	0	0	0	0	0	50
Total			101	17	2	2	2	5	8	0	9095



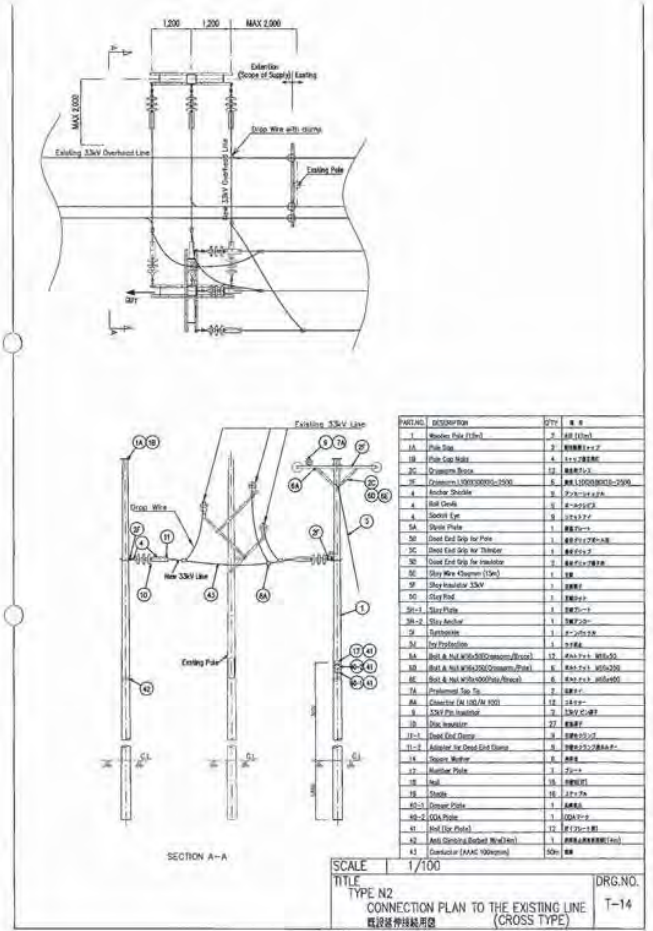
NETWORK DIAGRAM
AREA-4 (IGANGA, BUGIRI AND BUSIA DISTRICT)

PART 2

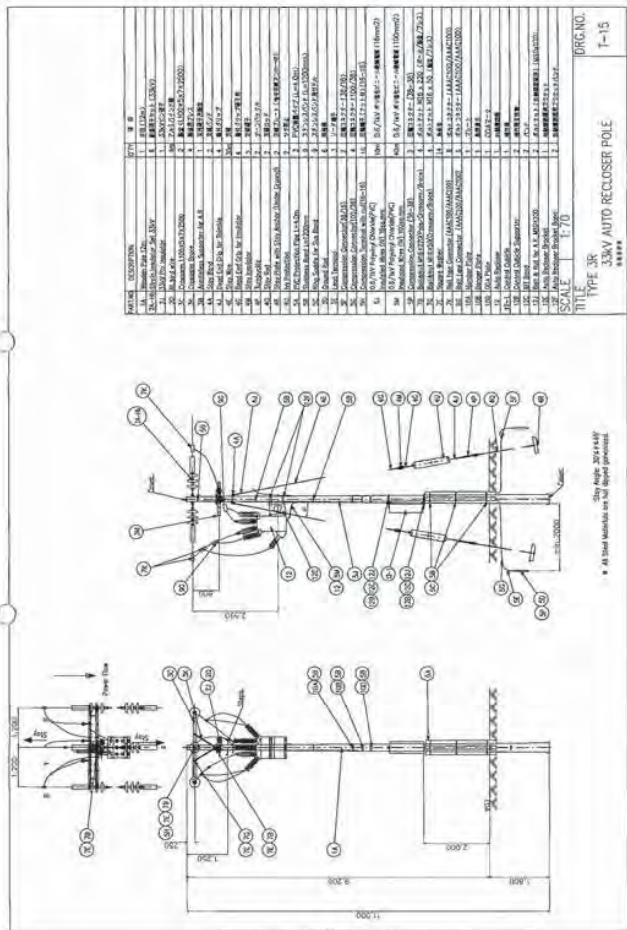
Extension of 33 kV distribution line in Masaka and Rakai District (Area-2)



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 ²]	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 ²]	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 ²]	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 ²]	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 ²]	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 ²]	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

**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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ANNEX

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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) 33/0.4/0.240 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	Type	Number of Outpatients		Number of Staffs		No. of Living population	% of Living population
				Day	Month	Health Center	Outreach		
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				
Total		342,900	1,012	2,390	51				

Source: JICA Study Team

Note: Each report of changing from first survey is below.
 *1 Musere: It is added, details see 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, Busiro Landing site and Lugala. Main products are Tilapia, Nile Perch, Mukene and Nkeje. 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
Total		342,900	1,012	2,390	51

Source: Compiled by JICA Study Team using the data below

Coverage population of Makuru, Musere, Mayuge, Buyinja, Luwero, Lutalo, Muramba, Linyo, and Linyo: (based on the development plan for the period 2010/2011) - 2013/2013

Coverage population of Musere and Mayuge: (based on the development plan for the period 2010/2011) - 2013/2013

Coverage population of Buyinja, Luwero, Lutalo, Muramba, Linyo: (based on the development plan for the period 2010/2011) - 2013/2013

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, Muramba, Linyo, and Linyo, 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	436
Busia	12	7,073	144
Total	93	52,481	902

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

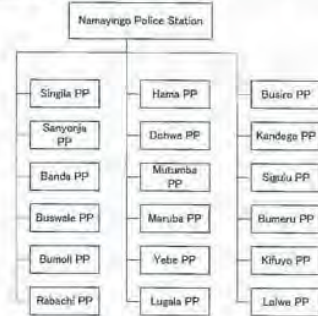
fuel engine are utilized for milling in areas not electrified, fuel cost and troubles in engine have burdened milling machine owners with. And these burdens are also troubling the living people. It is expected that release from these troubles by introduction of electric motor have caused such growth 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 (2009-2010) (Unit: %)

District	NOMIA		KAWONGA		IGANGA		BUGIRI		BUSAIRO		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	14	14	14
Small Office	0	11	0	17	0	18	0	0	0	0	17	17	17
Mil Machine	0	0	0	0	0	0	0	0	0	0	0	0	0
Health and Shop	139	810	2,118	2,105	429	1,772	299	405	2,218	4,149	11,039	2,271	20%
Total	179	830	2,118	2,224	429	1,772	299	405	2,218	4,597	14,628	2,271	15%
Total (excl. H&S)	179	830	2,118	2,224	429	1,772	299	405	2,218	4,597	14,628	2,271	15%

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	0	0	0	0	0	0	0	0%			
Mil Machine	0	0	0	0	0	0	0	0	0%			
Health and Shop	177	3,237	309	5,734	30	1,249	516	429	16,128	241	3,977	2%
Total	177	3,237	309	5,734	30	1,249	516	429	16,128	241	3,977	2%
Total (excl. H&S)	177	3,237	309	5,734	30	1,249	516	429	16,128	241	3,977	2%

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

Mill offices does not show (500) year

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

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

Source: JICA Study Team

2.3.2 Analysis of the Site Survey in the Previous Project Sites

In the project site, it is expected from the results of the socio-economic survey that the driving loads will be mainly composed of the demand of general households, shops and milling machines processing staple foods. Based on the results shown in Table 3, the period required for completion of connection in the previous project sites are respectively estimated by Least Squares Approximation and shown in Table 9. And increase rate of connection is also shown in Table 4, respectively.

The results are as follows:

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

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

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

Source: JICA Study Team

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

2.4 Power Demand Forecast in the Project Sites

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

Conditions for the demand forecast

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

Table 10 Demand Forecast for the Project

Trading Center	District	Year						Required Capacity	Total Capacity
		2011	2014	2015	2016	2017	2018		
1) Bwamba	Mbarara	1,483	2,841	5,110	7,704	12,281	15,201	22	22
2) Mbarara	Mbarara	8,277	10,842	13,813	16,259	19,214	22,169	601	100-213
3) Mbarara	Mbarara	1,025	2,156	4,711	8,411	12,514	18,102	30	23
4) Mbarara	Mbarara	1,491	3,651	4,811	6,211	11,311	13,822	29	23
5) Mbarara	Mbarara	4,881	9,741	14,601	20,211	25,111	30,011	94	100-213
6) Soroti	Soroti	9,941	19,181	28,321	38,011	47,811	57,611	94	100-213
7) Mbarara	Soroti	4,811	9,511	13,111	17,411	21,411	25,811	51	100-213
8) Mbarara	Soroti	2,521	5,121	7,611	10,311	13,411	16,911	21	21
9) Mbarara	Soroti	2,481	4,961	7,441	10,211	13,311	16,711	21	21
10) Mbarara	Soroti	8,901	1,781	2,671	3,561	4,451	5,341	13	23
11) Mbarara	Soroti	7,201	1,441	2,161	2,881	3,601	4,321	10	10-21
12) Mbarara	Mbarara	19,711	39,421	59,131	78,841	98,551	118,261	281	200-411
13) Mbarara	Mbarara	1,111	2,221	3,331	4,441	5,551	6,661	11	23
14) Mbarara	Mbarara	3,311	6,621	9,931	13,241	16,551	19,861	31	23
15) Mbarara	Mbarara	40,341	80,681	121,021	161,361	201,701	242,041	350	100-213 (100-213) (100-213)
16) Mbarara	Mbarara	1,971	3,941	5,911	7,881	9,851	11,821	21	23
17) Mbarara	Mbarara	6,341	1,268	1,901	2,531	3,161	3,791	13	23
18) Mbarara	Mbarara	2,441	4,881	7,321	9,761	12,201	14,641	32	23
19) Mbarara	Mbarara	8,611	1,721	2,581	3,441	4,301	5,161	11	23
20) Mbarara	Mbarara	3,781	7,561	11,341	15,121	18,901	22,681	32	23
21) Mbarara	Mbarara	1,791	3,581	5,371	7,161	8,951	10,741	16	23
22) Mbarara	Mbarara	1,741	3,481	5,161	6,841	8,521	10,201	16	23
23) Mbarara	Mbarara	2,291	4,581	6,871	9,161	11,451	13,741	20	23
24) Mbarara	Mbarara	2,541	5,081	7,621	10,161	12,701	15,241	21	23
25) Mbarara	Mbarara	1,291	2,581	3,871	5,161	6,451	7,741	16	23
26) Mbarara	Mbarara	1,811	3,621	5,431	7,241	9,051	10,861	21	23
27) Mbarara	Mbarara	2,881	5,761	8,641	11,521	14,401	17,281	21	23
28) Mbarara	Mbarara	3,541	7,081	10,621	14,161	17,701	21,241	21	23
29) Mbarara	Mbarara	1,711	3,421	5,131	6,841	8,551	10,261	15	23
30) Mbarara	Mbarara	5,831	1,166	1,749	2,331	2,914	3,497	13	23
31) Mbarara	Mbarara	1,221	2,441	3,661	4,881	6,101	7,321	14	23
32) Mbarara	Mbarara	1,241	2,481	3,721	4,961	6,201	7,441	14	23
33) Mbarara	Mbarara	3,331	6,661	10,001	13,331	16,661	20,001	31	23
34) Mbarara	Mbarara	2,581	5,161	7,741	10,321	12,901	15,481	21	23
35) Mbarara	Mbarara	2,551	5,101	7,651	10,201	12,751	15,301	21	23
36) Mbarara	Mbarara	2,551	5,101	7,651	10,201	12,751	15,301	21	23
37) Mbarara	Mbarara	6,251	1,251	1,876	2,501	3,126	3,751	13	23
38) Mbarara	Mbarara	8,701	1,741	2,611	3,481	4,351	5,221	13	23
Total		151,432	302,864	454,296	605,728	757,160	908,592		

Source: JICA Study Team

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

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

3. Design Conditions and Technical Specifications

3.1 Design Conditions

Design conditions applied to the Project are described as follows.

3.1.1 Climatic Conditions

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

- Milling Machines: 15.0 %/year

➢ It was mentioned by RIA that the subsidy scheme will be introduced only for customers who will connect to the grid within some years after commissioning of 33 kV distribution line of the Project. The period to subsidize customers is assumed as 5 to 5 years in the demand forecast.

- Subsidy period: 4 years

➢ Increase rate of demand is assumed 1.65 %/year in consideration of the growth trend of minimum demand of Uganda for the past ten years and the recent 5 years.

- Increase rate of demand: 1.65 %/year

➢ Demand of each public facility is assumed as follows based on information obtained from the socio-economic survey carried out in the site survey. Number of public facilities are shown in Table 2. The loads of each consumer are estimated in Annex 3. Based on the site survey:

- Primary School: 1,400 W
- Secondary School and Tertiary School: 1,900 W
- Health Center IV: 25,000 W
- Health Center III and Health Center I: 1,600 W

➢ In general, it takes a few years to elapse before a rapid connection of milling machines to the grid, as procurement of motor (Approx. 10kW to 25kW) require some cost to their owners. It is assumed that the first boost will occur 2 to 4 years after from the commissioning of the Project based on data in the previous project site.

- The time of first boost of connection of milling machines: four years after from the commissioning.

Table 11 Climatic Conditions for the Equipment and Facilities Design

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

Source: ITC/ANR DISTRICTS Information Handbook (2007-2008)

3.1.2 Basic Electrical Design Conditions

(1) Electric System (Voltage and Wiring System)

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

Table 12 Summary of Electrical System

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

Source: JICA Study Team

(2) Other Electrical Systems

1) Color coding

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

2) Safety factor

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

- (a) Pole and Foundation: 2.0
- (b) Conductor and cross-arms: 2.5
- (c) Insulators: 2.0

3) Clearance of conductors

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

- (A) Minimum Clearance
- Phase to phase: 330 mm
 - Phase to ground: 380 mm
- (B) Minimum Height From Ground Level
- Road Crossing: 7.5 m
 - Roadside: 6.5 m

4) Span length of electrical pole

- 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.

- 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).

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

Source: JICA Study Team

3.3 Procurement and Installation Plan of Equipment and Materials

(1) Procurement Plan of Equipment and Materials

1) Quantity of Major Equipment and Materials

(a) Distribution Transformer

Table 14 Quantity and Capacity of Distribution Transformers

Trading Center	Quantities of Transformers (unit)				Total	Additional Transformer
	25 kVA	30 kVA	100 kVA	200 kVA		
1. Maita	1				1	
2. Mpungwe	1		1		2	25 kVA for secondary school
3. Nankoma	1		1		2	25 kVA for small town nearby
4. Bvahlia	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. Irtimbi	1				1	
11. Muterere	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	
15. Nankompe		2	1	2	5	* District capital of Nankompe
16. Lumyo			1		1	
17. Buswaga	2				2	25 kVA for Sub-zones headquarter
18. Hakeno		1			1	
19. Lumali	1				1	
20. Mwenbe-Fayari	1				1	
21. Mwenbidi	2				2	25 kVA for primary school
22. Lumwopia	1				1	
23. Nankobi	1				1	
24. Lutolo			1		1	
25. Kilimbi	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. Maitamba		1			1	
34. Busheva	1				1	
35. Mwenbidi-B	1				1	
36. Bushe	1				1	
37. Buswaga-A	1				1	
38. Buswaga-B	1				1	
Total	28	11	7	4	50	

Source: JICA Study Team

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

(b) Load Break Switch

Quantity and location of load break switch is as follows.

- Connection point at Lumino: 1 set
- Connection point at Nankoma: 2 sets
- Connection points at Mayuge: 2 sets
- Major branch point: 4 sets
- Intervals of 13 km: 5 sets

(c) Metering Unit

Quantity and location of metering unit is as follows.

- Connection point at Lumino: 1 set
- Connection point at Nankoma: 2 sets
- Connection points at Mayuge: 1 set

(d) Auto Recloser

Quantity and location of auto recloser is as follows.

- Connection point at Lumino: 1 set
- Connection point at Nankoma: 2 sets
- Connection points at Mayuge: 1 set

(e) Conductor

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

- Design length of conductor: 134.4km x 3 phase = 403.2km
- 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-stable, 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

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	3 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

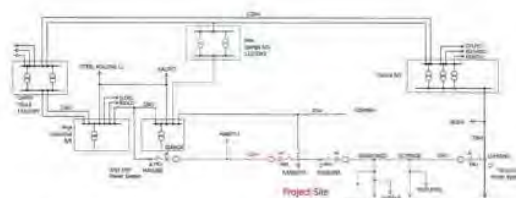
Types/Items	Qty	Description
(1) Digital-type multi meter	1 set	For general purpose
(2) LVP-m meter	1 set	For checking of metering unit
(3) Phase rotation meter	1 set	For general purpose
(4) Voltage detector	1 set	For 230V line
(5) Voltage detector	1 set	For low voltage
(6) Insulation resistance meter	1 set	For megger test, 10kV 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 mm² 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 mm² 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 mm² between Tororo and Busia: 50 mm² ACSR

(By the work, all the conductor between Tororo S/S and Busia will be 50 mm².)

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 mm² 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 mm² AAAC to 100 mm² 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.

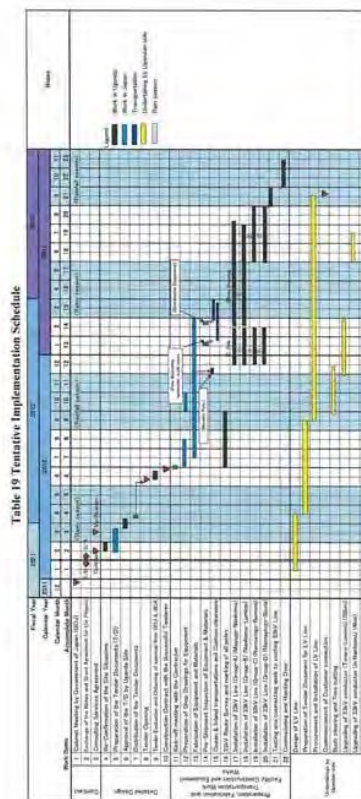


Table 19 Tentative Implementation Schedule

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, Kiguduru, Iganga
2) Mpingwe – Makutu	10.2	Mayuge	Makutu
3) Nankoma – Limimo	37.5	Bugiri	Nankoma, Dalaha, Muterere, Budhaya, Namayingo TC, Buzinga
4) Namayingo – Busera A	29.4	Namayingo	Lusya, Lumira
5) Namayingo – Lugala – Busera Landing Site	24.8	Namayingo	Namayingo TC, Buhimba
6) Hukema – Nwemile-Tayari – Mumbidi	10.5	Busia	Busia, Lutya
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.

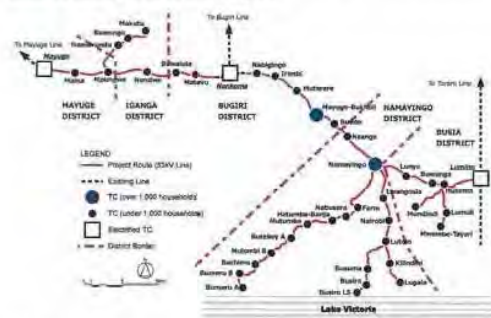


Figure 8 Survey Area with Trading Centers

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 in 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, albulis, pigonmites, 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 Kungula) 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 Kungula 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
(1) Positive Impacts		
1) Before/During Construction Phase		
(Social Environment)		
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, foods and beverages
2) Operation Phase		
(Social Environment)		
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"> • Kiosk with refrigerator • Welding, Carpentry, Sawmill • Video theater, salon • Reproducing to cash fish
2	Improvement of living environments	The electrification can improve the living environment like, <ul style="list-style-type: none"> • Reduce risk of fire and health damage from kerosene lamp • Facilitate access in social information and entertainment with TV, radio, electrical device • Facilitate charging mobile phone and communication • Improve home safety and awareness on sanitation with lighting • Provide a longer time of homework for children at night
3	Improvement of social services (school, health center, water supply)	Better and more reliable public services will be provided by the health centers and schools for people in a wider area. In areas where the local peoples hardly can access to domestic water supplied by bore 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"> • Enable them emergency care in the night • Enable them to introduce electrical medical equipments • Improved cold storage condition for medicine and vaccine can improve medical care services including immunization In the schools, students and teachers can obtain academic progress by <ul style="list-style-type: none"> • Introducing lighting equipment, PC, laboratory, practical equipment, etc • Extending time of night learning
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
(2) Negative Impacts		
1) Before/During Construction Phase		

- 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-Milfela 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
(Social Environment)		
1	Obstruction of residential buildings	At Namayingo branch point of the Project Route, there is an area where the space is too narrow to pass the Project Route along the road. The 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.
(Natural Environment)		
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 large trees, plantations could deteriorate the vegetation and landscape along the Route although they are avoided as much as possible.
(Accidents)		
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.
(3) Operation Phase		
(Accidents)		
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 raised.
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
1) Before/During Construction Phase			
1	Obstruction of buildings and other infrastructure	<ul style="list-style-type: none"> To avoid the obstructions on buildings, the Project Route will be designed to connect to the other branch line of Nanyalyaga - Lupaia Prinka Route at Nanyalyaga. At Farm TC, the Project Route will be designed past behind the buildings. 	REA, Consultant
2	Loss of crops and trees on the Project Route	<ul style="list-style-type: none"> REA will conduct community meetings, survey, explain to the local people, make agreements, evaluate the subjects with district compensation rates and compensate the owners. 	REA
3	Construction workers trespassing on the land	<ul style="list-style-type: none"> Contractor will instruct the construction workers about proper manner in the sites and to learn the local traditions. 	Contractor
4	Obstruction of cultural sites (shrines)	<ul style="list-style-type: none"> The cultural site will not be impacted with the Project Route will be designed passing the opposite side of the road. 	REA, Consultant
5	Obstruction of the schools especially the playgrounds	<ul style="list-style-type: none"> The Project Route will be designed passing the opposite side of the road where schools are located. 	REA, Consultant
6	Expansion of HIV/AIDS	<ul style="list-style-type: none"> Contractors will sensitize workers and communities with cooperation of respective health centers. 	Contractor, Health Centers
7	Obstruction of wetlands	<ul style="list-style-type: none"> The Project Route will be designed to avoid water pools and soft ground. The poles will be installed at approximately 100m span to avoid the box culverts and stream. 	REA, Consultant
		<ul style="list-style-type: none"> In case the poles are installed in the wetlands, the poles' location will be away from the box culverts to avoid obstruction of the flow of water. Clearance of the vegetation and excavation will be limited in the area where the electricity poles will be installed. 	Supervision Consultant, Contractor
8	Loss of trees in tribal CFR	<ul style="list-style-type: none"> The Project Route will be designed to pass the north side to avoid more massive historical plantations. The poles will be installed at approximately 100m span to minimize the numbers of poles in the site. 	REA, Consultant
		<ul style="list-style-type: none"> REA will cooperate NTA, the forested persons and sacre farmers for the tribal trees, crops and animals' evaluation in other areas. 	REA
9	Loss of vegetation and landscape	<ul style="list-style-type: none"> The Project Route will be designed to avoid tall/large trees or massive trees along the road as much as possible. 	REA, Consultant
		<ul style="list-style-type: none"> The trees felled by necessity will be compensated by REA as same as loss of crops and trees. Re-plantation program will be conducted to provide communities with seeds, tree seedlings for replanting. 	REA, Community

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. 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.	Understandings	To be covered by		Remarks	Item No. on MOU	
		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 effluent to 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"> Personal Protective wear will be provided for all the workers during construction according to the labor laws of Uganda and ensure good and safe working conditions in accordance with contractor's construction manuals which are required in the contract. 	Supervising Consultant, Contractor
2) Operation Phase			
11	Accidents in households	<ul style="list-style-type: none"> REA will sensitize the local people to educate about electricity and instruction how to use safely. 	REA, District/ Sub-county offices
12	Accidents on the facilities	<ul style="list-style-type: none"> Operator is obligated to maintain the facilities complying with their maintenance regulation. 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. 	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.	Understandings	To be covered by	Remarks	Item No. on MOU
		Japan	Uganda	
1	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"/>		
5	(4) Exemption or payment of value-added tax (VAT) on locally procured items		<input type="checkbox"/>	6
	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	
7	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	7
8	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	8
9	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	9
10	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	10
11	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	11
12	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	12
13	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	13
14	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	14
15	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	15
16	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	16
17	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	17
18	Procedures necessary to obtain the following permits for the Japanese Consulate and Contractor: <ul style="list-style-type: none"> Permits required for installation works Permits to access restricted areas 		<input type="checkbox"/>	18

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 Equipments	<input type="checkbox"/>		
25	Assessing capacity for personnel in the Project sites	<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 coordination to ensure feasibility 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. Fradrick Senior Energy Officer
Ms. Agni Caroline Senior Petroleum Officer/ Environment
Ms. Mary Mwegeza 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 Bamanya 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. Wamsia 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

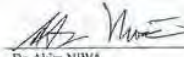
Minutes of Discussions on the Preparatory Survey on the Project for Rural Electrification Phase III in the Republic of Uganda (Second Field Survey)

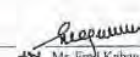
In response to the request from the Government of the Republic of Uganda (hereinafter referred to as "Uganda"), the Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with the Government of Japan, decided to conduct a Preparatory Survey (hereinafter referred to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

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

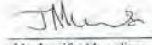
The Team held discussions with the officials of authorities concerned of the Government of Uganda (hereinafter referred to as "the Ugandan side"), and conducted a series of field surveys. In the course of the discussions, both the Ugandan side and the Team (hereinafter referred to as "Both parties")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

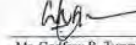
Kampala, June 16, 2011


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


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

3. Responsible and Implementing Organizations

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

4. Components of the Project

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

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

5. Japan's Grant Aid Scheme

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

6. Environmental and Social Considerations

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

- (2) Both parties confirmed that a project brief document was required for the Project to obtain approval from the National Environment Management Authority (NEMA). The project brief document would duly include IEE level study and mitigation measures for the selected section of distribution line. The project brief document for the Project will be prepared and submitted to the NEMA by the end of August, 2011. An approval is to be expected by the end of October, 2011.
- (3) Both parties agreed followings in relation to environment and social considerations:
 - (a) REA assigned an environment officer during the 2nd Field Survey to coordinate the environmental activities, survey for environmental impacts and mitigation measures, and compile baseline data for preparation of the project brief
 - (b) REA will conduct stakeholder meetings (SHM) on July 13 and 14 (tentative) at Namayingo and Mayuge district headquarters respectively, inviting district officials and community leaders from the Project areas. The proposed agenda of SHM will include:
 - (i) Explanation of government policy and plan in rural electrification,
 - (ii) Presentation of project features,
 - (iii) Presentation of the route map of 33kV distribution line, location map of transformers and load centers,
 - (iv) Characteristics of project impacts and mitigation measures at sites, and
 - (v) Enhance awareness in community.Records and findings of the SHM will be incorporated in the Project Brief.
 - (c) JICA is to monitor the progress of environmental activities in terms of the overall project schedule and review and advise on the outcomes in order to ensure conformity with JICA Environmental and Social Consideration Guidelines.
- (4) The Ugandan side agreed to secure lands necessary for implementation of the Project.
- (5) The Ugandan side agreed to secure funding for and execution of the above environmental matters in a schedule as required for smooth execution of the Project.

7. Technical Considerations

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

8. Schedule of the Survey

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

9. Other Relevant Issues

(1) Status of the Survey

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

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

(2) Stable and reliable electricity supply 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 2nd Field Survey. The team will review and evaluate technical and economic viability of the proposal for the further consideration of Japanese government.

(3) Confirmation of information/data submission

In the 1st field survey, MEMD/REA agreed on the following measures to minimize the constraints on realization of the electrification 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 2nd Field Survey of the Project
- To realize timely implementation of low voltage connection to the communities for the Project by making necessary arrangements including measures for avoiding a delay in the procurement procedures by initiating the contract as soon as the Outline Design completed.

(4) Counterpart Personnel

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

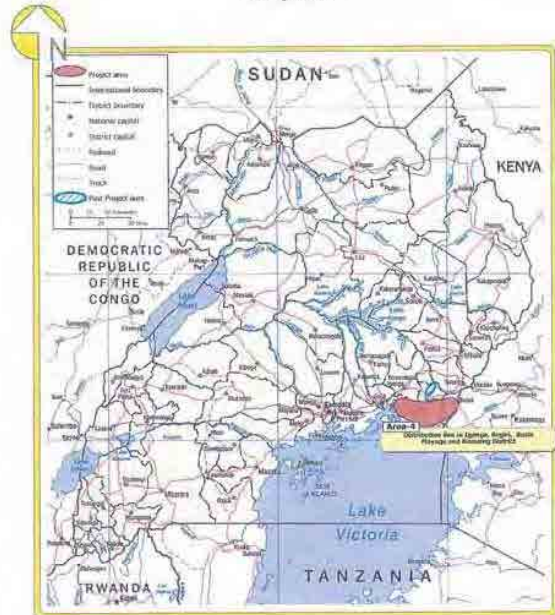
(5) Questionnaires

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

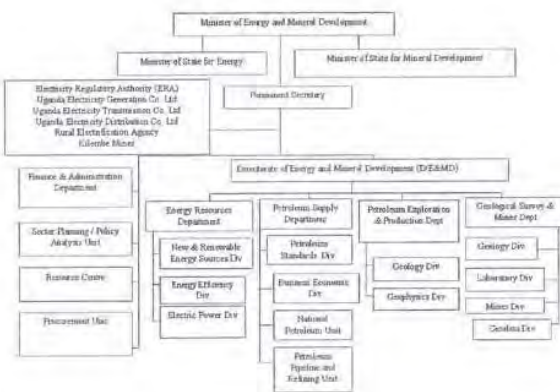
(End)

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

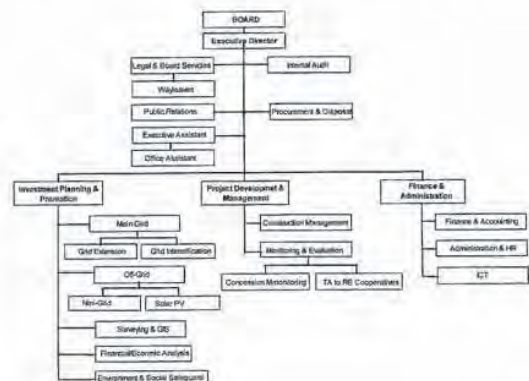
The Project Site



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

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

1. Grant Aid Procedures

The Japanese Grant Aid is conducted as follows-

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

2. Preparatory Survey

(1) Contents of the Survey

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

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

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

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

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

(2) Selection of Consultants

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

(3) Result of the Survey

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

3. Japan's Grant Aid Scheme

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

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be 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. However, the prime contractors, namely, contracting and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

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

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

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

(6) "Proper Use"

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

(7) "Export and Re-export"

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

(8) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

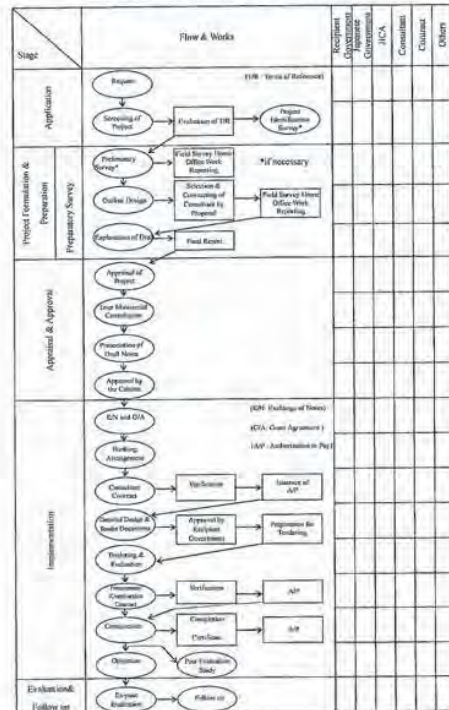
(9) Authorization to Pay (A/P)

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

(10) Environmental and Social Considerations

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

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 land (sites).		•
2	To construct the following facilities		
	1) The building	•	•
	2) The gates and fences in and around the site	•	•
	3) The parking lot	•	•
	4) The road within the site	•	•
	5) The road outside the site	•	•
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site (sites).		
	1) Electricity		
	a. The distributing power line to the site		•
	b. The drop wiring and internal wiring within the site	•	•
	c. The main circuit breaker and transformer	•	•
	2) Water Supply		
	a. The city water distribution main to the site		•
	b. The supply system within the site (receiving and 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 products		
	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	Value	Unit	Remarks
1. Rice	10000	1000000	kg	
2. Wheat	10000	1000000	kg	
3. Soybean	10000	1000000	kg	
4. Corn	10000	1000000	kg	
5. Other crops	10000	1000000	kg	
6. Livestock	10000	1000000	kg	
7. Poultry	10000	1000000	kg	
8. Fish	10000	1000000	kg	
9. Other products	10000	1000000	kg	
10. Total	100000	10000000	kg	

Source: Survey of the
 Ministry of Agriculture, Forestry and Fisheries
 Survey of the
 Ministry of Agriculture, Forestry and Fisheries
 Survey of the
 Ministry of Agriculture, Forestry and Fisheries

Class	Item	Quantity	Unit Price	Total Value	Notes	Market			
Meat	Beef	1000	1.50	1500.00	1000 lbs	Meat			
	Pork	500	1.20	600.00	500 lbs	Meat			
	Chicken	2000	0.80	1600.00	2000 lbs	Meat			
	Lamb	1000	1.80	1800.00	1000 lbs	Meat			
	Veal	500	1.40	700.00	500 lbs	Meat			
	Other	1000	1.00	1000.00	1000 lbs	Meat			
	Dairy	Milk	10000	0.15	1500.00	10000 gal	Dairy		
		Cheese	500	1.00	500.00	500 lbs	Dairy		
		Butter	1000	0.80	800.00	1000 lbs	Dairy		
		Yogurt	2000	0.40	800.00	2000 gal	Dairy		
		Ice cream	1000	0.60	600.00	1000 gal	Dairy		
		Other	1000	0.50	500.00	1000 lbs	Dairy		
		Eggs	Eggs	10000	0.10	1000.00	10000 doz	Eggs	
			Other	1000	0.50	500.00	1000 doz	Eggs	
			Grains	Wheat	10000	0.20	2000.00	10000 bu	Grains
Barley				5000	0.15	750.00	5000 bu	Grains	
Oats				5000	0.12	600.00	5000 bu	Grains	
Rice				1000	0.80	800.00	1000 bu	Grains	
Other				1000	0.50	500.00	1000 bu	Grains	
Fruits & Veggies				Apples	10000	0.10	1000.00	10000 bu	Fruits
				Oranges	5000	0.15	750.00	5000 bu	Fruits
	Bananas			10000	0.08	800.00	10000 bu	Fruits	
	Carrots			10000	0.05	500.00	10000 bu	Veggies	
	Spinach			5000	0.10	500.00	5000 bu	Veggies	
	Other			10000	0.05	500.00	10000 bu	Fruits	

Notes: 1. All prices are in US dollars. 2. Quantities are in standard units. 3. Market values are based on current market prices. 4. Total value is the sum of all items.

4-2. General Consumers (non farmers)

Class	Item	Quantity	Unit Price	Total Value	Notes	Market			
Meat	Beef	1000	1.50	1500.00	1000 lbs	Meat			
	Pork	500	1.20	600.00	500 lbs	Meat			
	Chicken	2000	0.80	1600.00	2000 lbs	Meat			
	Lamb	1000	1.80	1800.00	1000 lbs	Meat			
	Veal	500	1.40	700.00	500 lbs	Meat			
	Other	1000	1.00	1000.00	1000 lbs	Meat			
	Dairy	Milk	10000	0.15	1500.00	10000 gal	Dairy		
		Cheese	500	1.00	500.00	500 lbs	Dairy		
		Butter	1000	0.80	800.00	1000 lbs	Dairy		
		Yogurt	2000	0.40	800.00	2000 gal	Dairy		
		Ice cream	1000	0.60	600.00	1000 gal	Dairy		
		Other	1000	0.50	500.00	1000 lbs	Dairy		
		Eggs	Eggs	10000	0.10	1000.00	10000 doz	Eggs	
			Other	1000	0.50	500.00	1000 doz	Eggs	
			Grains	Wheat	10000	0.20	2000.00	10000 bu	Grains
Barley				5000	0.15	750.00	5000 bu	Grains	
Oats				5000	0.12	600.00	5000 bu	Grains	
Rice				1000	0.80	800.00	1000 bu	Grains	
Other				1000	0.50	500.00	1000 bu	Grains	
Fruits & Veggies				Apples	10000	0.10	1000.00	10000 bu	Fruits
				Oranges	5000	0.15	750.00	5000 bu	Fruits
	Bananas			10000	0.08	800.00	10000 bu	Fruits	
	Carrots			10000	0.05	500.00	10000 bu	Veggies	
	Spinach			5000	0.10	500.00	5000 bu	Veggies	
	Other			10000	0.05	500.00	10000 bu	Fruits	

Notes: 1. All prices are in US dollars. 2. Quantities are in standard units. 3. Market values are based on current market prices. 4. Total value is the sum of all items.

Class	Item	Quantity	Unit Price	Total Value	Notes	Market			
Meat	Beef	1000	1.50	1500.00	1000 lbs	Meat			
	Pork	500	1.20	600.00	500 lbs	Meat			
	Chicken	2000	0.80	1600.00	2000 lbs	Meat			
	Lamb	1000	1.80	1800.00	1000 lbs	Meat			
	Veal	500	1.40	700.00	500 lbs	Meat			
	Other	1000	1.00	1000.00	1000 lbs	Meat			
	Dairy	Milk	10000	0.15	1500.00	10000 gal	Dairy		
		Cheese	500	1.00	500.00	500 lbs	Dairy		
		Butter	1000	0.80	800.00	1000 lbs	Dairy		
		Yogurt	2000	0.40	800.00	2000 gal	Dairy		
		Ice cream	1000	0.60	600.00	1000 gal	Dairy		
		Other	1000	0.50	500.00	1000 lbs	Dairy		
		Eggs	Eggs	10000	0.10	1000.00	10000 doz	Eggs	
			Other	1000	0.50	500.00	1000 doz	Eggs	
			Grains	Wheat	10000	0.20	2000.00	10000 bu	Grains
Barley				5000	0.15	750.00	5000 bu	Grains	
Oats				5000	0.12	600.00	5000 bu	Grains	
Rice				1000	0.80	800.00	1000 bu	Grains	
Other				1000	0.50	500.00	1000 bu	Grains	
Fruits & Veggies				Apples	10000	0.10	1000.00	10000 bu	Fruits
				Oranges	5000	0.15	750.00	5000 bu	Fruits
	Bananas			10000	0.08	800.00	10000 bu	Fruits	
	Carrots			10000	0.05	500.00	10000 bu	Veggies	
	Spinach			5000	0.10	500.00	5000 bu	Veggies	
	Other			10000	0.05	500.00	10000 bu	Fruits	

Notes: 1. All prices are in US dollars. 2. Quantities are in standard units. 3. Market values are based on current market prices. 4. Total value is the sum of all items.

4-3. Health Centers

Code	Material	Quantity	Unit	Remarks
0001
0002
0003
0004
0005
0006
0007
0008
0009
0010
0011
0012
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0014
0015
0016
0017
0018
0019
0020

Notes: 1. UIC 1000001
 2. UIC 1000002
 3. UIC 1000003
 4. UIC 1000004
 5. UIC 1000005

Code	Material	Quantity	Unit	Remarks
0021
0022
0023
0024
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0080
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0090
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0096
0097
0098
0099
0100

Notes: 1. UIC 1000001
 2. UIC 1000002
 3. UIC 1000003
 4. UIC 1000004
 5. UIC 1000005

Code	Material	Quantity	Unit	Remarks
0101
0102
0103
0104
0105
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0115
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0123
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0199
0200

Notes: 1. UIC 1000001
 2. UIC 1000002
 3. UIC 1000003
 4. UIC 1000004
 5. UIC 1000005

Name	Neosoma primary school	Stuart secondary and primary school	Stuart primary school	Stuart primary school	Stuart primary school
Neosoma					
Stuart					
Primary					
Secondary					
Kindergarten					
Other					
Comments					

Phone: 011 007 8093/L
 Fax: 011 007 8093/L
 Email: 011 007 8093/L
 Web: 011 007 8093/L
 Address: 011 007 8093/L
 City: 011 007 8093/L

Name	Primary school	Primary school	Primary school	Primary school	Primary school
Primary					
Secondary					
Kindergarten					
Other					
Comments					

Phone: 011 007 8093/L
 Fax: 011 007 8093/L
 Email: 011 007 8093/L
 Web: 011 007 8093/L
 Address: 011 007 8093/L
 City: 011 007 8093/L

Name	Maia primary school	St. Lawrence primary school	St. Lawrence primary school
Maia			
St. Lawrence			
Primary			
Secondary			
Kindergarten			
Other			
Comments			

Phone: 011 007 8093/L
 Fax: 011 007 8093/L
 Email: 011 007 8093/L
 Web: 011 007 8093/L
 Address: 011 007 8093/L
 City: 011 007 8093/L

4-4. Schools

Name	Halyure technical institute
Village	Mahalinga
Grade	3 years
Courses	<ul style="list-style-type: none"> •biological and concrete products •electrical installation •plumbing •painting decoration •motor vehicle technology •welding (6 months course)
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
Equipments	solid panel with battery
#Cost	USD 7 month
#Lamp	4 incandescent lamps
#Desk	100 desk
#Chair	100 chair
Equipments	None
Use	None
#Cost	USD 7 month
Project after identified	use computer, scanner, printer and photocopier machine
Price of fuel	None
Microsoma	USD 2,800 / L
disposal	USD 3,800 / L
dry cell	USD 1,200 / Pair
charger	USD 1,800 / Set
gas	USD 300,000 / Cylinder

Price of fuel
Microsoma USD 2,800 / L
disposal USD 3,800 / L
dry cell USD 1,200 / Pair
charger USD 1,800 / Set
gas USD 300,000 / Cylinder

4-5. Other public facilities

Name	Mwandani secondary school	Makindu secondary school	Makindu (Uchumi secondary school)	Makindu secondary school	Dunde secondary school
Village	Mwandani	Makindu	Makindu	Makindu	Neminyaga school
Number of coverage village	7	8	14	12	11
Number of students	507	142	247	243	720
Number of teachers	10	10	10	10	25
Number of class rooms	3	3	10	13	13
Number of boarding rooms	4	4	7	4	4
Number of staff rooms	4	4	4	4	4
Equipments	None	None	None	None	None
#Cost	USD 7 month	None	None	None	None
Project after identified	use computer, scanner, printer and photocopier machine	use computer, scanner, printer and photocopier machine	use computer, scanner, printer and photocopier machine	use computer, scanner, printer and photocopier machine	use computer, scanner, printer and photocopier machine
Price of fuel	None	None	None	None	None
Microsoma	USD 2,800 / L	None	None	None	None
disposal	USD 3,800 / L	None	None	None	None
dry cell	USD 1,200 / Pair	None	None	None	None
charger	USD 1,800 / Set	None	None	None	None
gas	USD 300,000 / Cylinder	None	None	None	None

Price of fuel
Microsoma USD 2,800 / L
disposal USD 3,800 / L
dry cell USD 1,200 / Pair
charger USD 1,800 / Set
gas USD 300,000 / Cylinder

Name	St. John's secondary school	Banda secondary school	Kiluya secondary school
Village	Uwanga	Banda west	Kiluya
Number of coverage village	13	15	5
Number of students	450	350	100
Number of teachers	14	13	11
Number of class rooms	5	5	5
Number of boarding rooms	4	4	4
Number of staff rooms	4	4	4
Equipments	None	None	None
#Cost	USD 7 month	None	None
Project after identified	use computer, scanner, printer and photocopier machine	use computer, scanner, printer and photocopier machine	use computer, scanner, printer and photocopier machine
Price of fuel	None	None	None
Microsoma	USD 2,800 / L	None	None
disposal	USD 3,800 / L	None	None
dry cell	USD 1,200 / Pair	None	None
charger	USD 1,800 / Set	None	None
gas	USD 300,000 / Cylinder	None	None

Price of fuel
Microsoma USD 2,800 / L
disposal USD 3,800 / L
dry cell USD 1,200 / Pair
charger USD 1,800 / Set
gas USD 300,000 / Cylinder

5. Estimation of loads of each consumer

Village	Namayingo	Namayingo
Institutions	District HQ	Police Station
Number of staffs	188	7
Power generator	25	16
Equipments	generators/chargers with H/V IV	Solar panel with battery
•Cost	Non	Non
Light Equipments	UDX/mth	8 lights for security
•Cost	UDX/mth	Non
Others	Non	2 laptops Logic
Equipments	Non	42,000
•Cost	Non	Non
Used Equipments	1 UDX/mth	Non
Prospect after electrified	18 computers, 8 printers	radio communication, typewriter
Others	Small lights, steady use of computers and printers and refrigerator	Steady use of radio equipments

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	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	
						1416	
						1500	
Tertiary School	Desktop Computer	90W	17 set	1 Class room	0.8	384	
	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	
	Cardiograph	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	
	Cardiograph	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	
	Cardiograph	60W	1 set	1 Room	0.8	48	
						480	
						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