

# Republic of Rwanda

## Ministry of Infrastructure

Urgent Electricity Rehabilitation Project (UERP)

Environmental Impact Assessment (EIA) Report  
for the Proposed Construction of a Substation in  
Birembo, Kinyinya Sector, Gasabo District,  
Kigali, Rwanda.



March, 2009.

# EXECUTIVE SUMMARY

## Introduction and Study Objectives

The Urgent Electricity Rehabilitation Project (UERP) being implemented by its partners including ELECTROGAZ Ministry of Infrastructure (MININFRA) and RURA through the UERP Project Coordinating Unit (PCU) plans to construct a substation in Birembo as part of its effort to ensure effective distribution of energy in Rwanda which remains one of the fundamental objectives of the UERP. For this reason in compliance in accordance with the operational policy and procedures of the World Bank and the regulation of Rwanda Environment Management Authority (REMA) an Environmental Impact Assessment (EIA) study report must be prepared to identify the potential adverse impacts of the projects. The Environmental Safeguards Advisor (EA) for the UERP has therefore prepared an EIA report in the fulfillment of these requirements.

The objectives of the study were to:

- Identifying both positive and negative impact of the project and the most appropriate interventions during construction, operation and decommissioning of the project based on the new proposed site.
- Undertake a baseline socioeconomic background of the project area and potential impact expected from project construction, implementation, operation and decommissioning,
- Develop an (Environmental Management Plan (EMP) to be implemented
- Develop an Environmental Monitoring Program during construction and operation and present plans to minimize, mitigate, or eliminate negative effects and impacts

This Project is classified under category B according to the World Bank Operational Procedure and therefore only requires the preparation of an EMP. However, Rwanda's Organic Law requires an EIA report and therefore this is an EIA report prepared to fulfill the Organic Law while at the same time, meet the bank's EMP requirements.

## Project Description

The UERP through ELECTROGAZ and its implementing agencies including RURA and MININFRA is seeking a contractor to install a substation in Birembo area which is in Kinyinya sector, Gasabo District in Kigali Province. The project is a response to the emergency power generation programme by the UERP/ELECTROGAZ under a World Bank loan following the acute energy crisis experienced by Rwanda.

Substations are essential for the smooth running of any electrical system. They are the point where high voltage electricity is reduced (or "stepped down") into lower voltage electricity suitable for distribution into commercial and residential areas. The proposed Birembo sub station will basically play the role if stepping down the high voltage electricity into low voltage and then to be distributed to the commercial and residential areas in Kigali. Specifically, ELECTROGAZ would like to expand the electricity network on the Eastern part of Kigali city and it is for this reason that the site in Birembo was selected.

Administratively the site for the proposed sub station is situated in the province of Kigali, in the District of Gasabo, Kinyinya sector in the Murama cell. The actual project site is approximately 3 kilometres from the Deutsche Welle broadcasting station along a dusty murram road interspersed with rural households.

The project will involve the construction of a new 110/15 kV - MW sub station at the site. The new Birembo substation will be in the final stage the main substation of the national grid and the main feeder substation for the Kigali distribution system. On the 220kV and 110kV level it will be an outdoor substation; the 15kV level will be of the indoor type.

The substation will be erected in three main stages:

### STAGE 1

This will involve the construction of a 110/15 kV substation with one 110 kV line bay, one 110/15kV transformer bay and one 110/70 kV autotransformer bay. The substation will be connected to the overhead line of Jabana – Gasogi. This is a new line that is planned for construction under the UERP Distribution component.

From this indoor substation two 15 (30) kV double circuit lines, length 7.5km, will go in the direction of Rubungo and Remera to connect the existing 15kV network of the surrounding areas north east of the town center (area of Kacyiru, Kibagabaga, Rubungo, Nyabisindu, Kimironko, Nyarutarama, etc.) –A separate EIA and ARAP is under preparation for the entire UERP distribution component that will include this line and all the other lines proposed in that component which will identify associated adverse impacts.

The distribution component EIA/ARAP report once finalised will be submitted to the bank and REMA for review and approval. The construction of the Jabana – Gasogi line and other lines in the distribution component of the UERP is expected to start in July 2009.

### STAGE 2

This will involve the extension of the Birembo substation by an additional 110kV line bay for the interconnection with Uganda and an additional transformer 110/15kV (TR2). The construction of this line is still under planning phase and no actual timing has been decided upon. Once a definite time frame is decided upon, an EIA and ARAP report will be prepared and submitted for approval to the bank and REMA.

### STAGE 3

This will involve the extension of the Birembo substation by a 220kV substation with one line bay and two 220/110 kV power transformer bays for the interconnection on the 220kV level with Tanzania. Also there will be a further extension of the 110kV substation by two bays for connecting the power transformers 220/110kV. The construction of this line is still under planning phase and no actual timing has been decided upon. Once a definite time frame is decided upon, an EIA and ARAP report will be prepared and submitted for approval to the bank and REMA.

**Note:** Only Stage 1 will be part of this contract, however areas and designs for future extensions (Stage 2 and Stage 3) will be availed by the contractor.

### Birembo Substation – Stage 1

The new substation will be constructed outside the town of Kigali in the north close to the tower 198 of the 110(70) kV overhead line from Jabana to Gasogi. The GPS coordinates of the tower 198 are:

**Table I.**

Zone	East	North
36M	180264	9788846

The substation will be looped in to the 110kV line coming from Jabana substation and continuing via Gasogi, Musha, and Rwamagana to Kabarondo as a 70kV line. In the final layout, the substation will be the main substation of the national grid and the main feeder substation for the Kigali distribution system.

The new substation shall be of a conventional open air type (AIS) for the 110 kV voltage level and of an indoor SF6 insulated switchgear type (GIS) for the 15 (30) kV level. Construction of this sub station is expected to begin in July 2009.

### **Proposed Activities**

The construction of the substation shall also include related engineering works, earthworks, and service utility buildings including an engine hall and control building.

### **Project Alternatives**

The study assessed potential project alternatives in terms of

- Project site Alternative,
- Alternative project with capacity to achieve the same goal,
- Process or material alternatives: Materials and process alternative
- No project alternative.

### **Positive Impacts**

The proposed substation will contribute immensely in the access and distribution of electricity to the households in the project area as well as increased supply of electricity to the residents of Kigali city. In effect, the beneficial impacts of the substation are mainly those associated with availability of electricity and include among others: Access to lighting for institutions and homesteads, increase in the growth of industrial and small and micro enterprises, improved security, and reduced reliance on fuel wood for different activities among others.

### **Adverse Impacts**

#### **Destruction of Vegetation and Crops**

The proposed project site for the construction of the substation plant is located in an area that is currently being utilized by the PAPs to cultivate crops including Avocado trees, Tomato, Orange trees, Mango trees, Grevillea, Pepper, Ficus Trees, Eucalyptus Trees, Euphorbia Trees, Flowers, Cassava, Euphorbia live fence, Maracuja, Cactus tree, Lemon trees, Papaya trees among others as well as a few scattered trees.

These crops and trees will inevitably have to be removed to pave way for the construction of the substation

#### **Land Acquisition**

The project will only acquire approximately 2.9 ha of the existing land area for which is currently under different uses and separately owned by four individuals one of the owners being a church.

There will also be compensation for land because the land in question is owned by 4 different households' individuals who use the targeted land for shelter, raising of livestock and cultivating crops.

#### **Noise Pollution**

There is expected to be noise impacts during the construction of the substation and this will mainly emanate from the activities and operations of heavy vehicles including trucks, excavators, tippers and tractors. Noise impacts from the machinery during the construction phase could be significant and hence adequate mitigation measures will be put in place to minimize the impact especially on workers.

However, noise impacts will primarily be insignificant during the operation stage of the project especially on residents because sub stations of this capacity generally do not emit noise of more than 39 decibels within the plant boundary. The particular equipment that will be procured under this contract has been designed to meet these requirements.

According to the standards of World Bank in relation to noise emission, when implementing projects in residential/institutional zones, then a maximum limit of 45-55 is allowed for day and night. Levels beyond this are considered adverse and not acceptable. The sub station will emit noise during operation from the transformers and this will not exceed 39 decibels within the plant boundary. However, for the substation workers, noise is inevitable within the plant area and noise mitigating measures to protect workers will be put in place as described in the mitigation section of this report.

Rwanda does not have noise pollution standards for comparison and hence in the absence of these standards, the World Bank standards will be used.

#### Soil Erosion

There is a likelihood of localized soil erosion during the civil works which entail compacting, earth excavations and moving works. However, these impacts will be largely localized to the project area and will only occur during the construction phase.

#### Waste and Waste oil pollution

Waste is also an output of the project that poses potential environmental problem in case of poor handling and disposal methods. Poor disposal of waste oil filters also has a potential of adversely affecting the environment through water and soil contamination.

#### Workers Health and Safety

Adverse impacts on the workers health and safety is likely to occur especially through workers interaction with the equipments and machines during construction and operation of the plant. Accidents are likely to occur during construction and operations when the equipments are in use, and further to this if workers are exposed to the noise of the equipments could lead to potential harm on health of the workers.

#### Traffic Congestion

During the construction phase, heavy moving vehicles in and out of the project site are likely to increase traffic along the Kinyinya-Deutsche Welle road and could cause congestion.

### **General Environmental Management Conditions and Measures**

Annex 6 of this report contains generalized environmental management conditions that the contractor will be obligated to fulfill. These are general conditions providing an overall guidance and conditions to ensure environmental safeguards. However, specific mitigation measures are also highlighted and are included in summary below with the detailed mitigation measures found in the EMP section.

### **Mitigation Measures**

#### Compensation for Land, Loss of Crops and Damage to Existing structures

The UERP/PCU will compensate for all the land, structures and crops that will be destroyed to pave way for the construction at the time of construction of the substation. This compensation will be calculated according to the Resettlement Framework Policy document and will include compensation for labor on any work undertaken in terms of digging, planting and weeding of the land prior to the establishment of a cut of date. A separate Abbreviated Resettlement Action Plan (ARAP) has been prepared and adequately

addresses issues in relation to compensation as required by the bank and Rwanda law on resettlement. This ARAP has been approved by REMA and the bank and disclosed locally and in the infoshop.

### **Noise Abatement Measures**

- All equipments and machinery installed must be tested to verify if they are compliant with the World Bank acceptable standards of noise as contained in the World Bank Pollution Prevention and Abatement Handbook (PPAH) 1998. The tested noise levels should be recorded as baseline and used for future monitoring.
- Noise emitting equipment should comply with the applicable Rwanda and World Bank noise standards and should be properly maintained. The World Bank environmental regulations allow a maximum 70dB noise level in industrial zones and 45 dB(day), and 55 dB (night) for residential areas. The project site is a rural residential zone and hence the standards of the bank for residential areas must be met. The sub station will emit noise during operation mainly from the transformers and this will not exceed 39 decibels within the plant boundary. This is because the transformers have been designed internationally to emit no more than 39 decibels within the plant boundary.
- All workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the Directorate of Occupation Health and Safety of the Ministry of Health but not limited to facilities to protect against noise impacts, ear muffs, safety helmets, boots, dust masks, gloves, overall, goggles, hearing protection etc.

### **Soil Erosion Mitigation Measures**

- The final site grade should include an adequate drainage channel which should facilitate drainage to avoid flooding and pooling. A site drainage plan should be developed to protect against erosion. Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.
- Installation of drainage ditches is necessary. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.
- Borrow pit areas (if any) should avoid other non site areas; borrow areas should be reworked to blend into the surroundings. Re-vegetation should be performed using local plants. All slopes and working surfaces should be returned to a stable condition.
- Topsoil on the final site would be graded and re-planted as appropriate.

### **Dust Emission Mitigation Measure(s)**

- Fugitive emissions from roads and site work to be eliminated or minimized by applying water on a need to need basis to dirt roads, unpaved surfaces and exposed construction areas during the dry season.
- The dirt roads and exposed construction areas should be moisturised during the dry season to prevent or minimise the fugitive dust emissions.

### **Workers Health and Safety Mitigation Measure(s)**

- All workers entering the construction site must be equipped with PPE including ear muffs, factory boots, overalls, gloves, dust masks, among others. The PPE should be those that meet the international standards of PPE.

- Personal protection gear must be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures. Training given to the employees should be backed by regular on- site training in safety measures.
- 'Restricted ENTRY' signs should be installed to keep away unqualified workers from access to restricted areas.
- Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.
- The contractor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.
- The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the construction.
- A perimeter fence should be constructed all around the project site to keep away unauthorised persons from the site.

#### **Fire Suppression Measure(s)**

The construction site must contain fire fighting equipments of recommended standards and in key strategic points all over the site. Fire pumps, hydrants, sprinkler/water spray systems, hose houses, dry chemical systems, carbon dioxide systems, detection/alarm systems and portable fire extinguishers are all specified in the tender documents as necessary in the plant. All these fire suppression equipments are required in a plant and must all be present at key strategic points. The contractor is expected to provide all these equipment for fire suppression as stipulated in the tender documents.

A fire evacuation plan should be developed by Contractor and ELECTROGAZ and must be posted in various points of the construction site including procedures to follow when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly.

#### **Solid waste pollution and littering**

- ELECTROGAZ and the contractor should develop a solid waste disposal plan which includes the provision of receptacles at strategic points within the construction site, recycling programmes for recyclable wastes, separation of wastes.
- ELECTROGAZ and contractor should engage a refuse handling company to remove the wastes from the site to the recommended waste management site.
- Warning signs against littering and dumping within the construction site should be erected by the contractor.

## **Accidents at the work place from operating of machineries and equipment by workers**

- Personal protection gear will be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures.
- Training given to the employees should be backed by regular on- site training in safety measures
- Restricted ENTRY signs should be installed to keep away unqualified workers from access to restricted areas.
- Machines and equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.
- The contactor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.
- The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the operation.

## **Monitoring Plan**

The EMP proposes parameters to be monitored during preparation, operation and decommissioning of the plant.

## **Conclusion and Recommendations**

On the basis of the EIA study of the Birembo substation, the following conclusions have been drawn by the UERP/PCU Safeguards Advisor:

- An annual environmental audit should be conducted to review the compliance to the proposed Environmental Management Plan.
- The project in the short term is environmentally feasible with the implementation of the mitigation measures prescribed in the EMP. The benefit of the project outweighs the costs of the project and being an emergency stop gap measure to save the country from long term outages, the environmental implications can be mitigated against the costs of the project on environment.
- The contractor's tender documents have elaborately spelt out the mitigation requirements against environmental degradation during construction and installation and thus serve as a good basis for developing the EMP.

## **Recommendations**

- An Environmental Audit (EA) should be conducted annually to review compliance to the proposed Environmental Management Plan. According the EIA regulations of REMA, an annual environmental audit must be conducted at the end of every year once the diesel plant begins operating. The audit will be conducted by registered REMA consultants or the environmental safeguards advisor as required by the Organic Law on environmental protection.



- The goal of this EA is to establish and ascertain the extent to which the project achieved compliance with the environmental mitigation measures and requirements that were specified in the approved EIA report and make recommendations for correcting any problematic or non-compliant activities.
- It is expected as required by the REMA EIA regulations that the cost of the environmental audit will be paid for by the client in this case ELECTROGAZ who will engage competent registered consultants.

#### **REMA Approval**

This EIA and ARAP report has been submitted to Rwanda Environment Management Authority for approval and required approval and go ahead to proceed with the project with conditions have been accorded by REMA upon review of the report. These conditions for approval are included in the annex 10 section of this report.

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## 2.0 INTRODUCTION

Energy is crucial to Rwanda's economic growth. In Rwanda, electricity is the second most important source of commercial energy for the formal sector after petroleum fuels. Commercial and industrial establishments as well as institutions and households in the country use electricity.

Rwanda remains among the lowest per capita electricity and petroleum products consumption countries in the world. Only about 65,000 (6-8percent) of households have access to grid supplied power, almost entirely in the main urban areas. Diesel remains the primary fuel for self-generation in rural areas, and also for back up in urban areas during the current crisis, and kerosene for lighting for the vast majority.

Grid extension has been extremely limited, and economically justified only to meet rural industrial loads and emerging population clusters.

Rwanda's post conflict genocide economic recovery is under threat from severe power supply shortages. A combination of strong demand growth with unexpectedly low water levels in its hydro power sourced lakes further exacerbated by high technical losses and unreliability of ELECTROGAZ dilapidated network, have led to extensive and lengthy power cuts.

Despite re-commissioning of an old diesel power plant, load shedding has increased to about 25% of peak demand with serious adverse consequences. Supply shortages have raised the cost of doing business, in particular for short export enterprises, and weakened the prospect of attracting new investments. Power supply shortages have also worsened water supply problems in the main urban areas, leaving ELECTROGAZ to switch to diesel water pumping and adding to its financial woes.

Rwanda already imports 60% of its electricity needs, mostly from SNEL and Sinelac plants in the Democratic Republic of Congo, and there is a little scope to increase this further. In the near term before any new hydro or gas based power can be brought on line, Rwanda will have to increasingly rely on higher costs diesel power (about 150USc/kWh compared to 2003 average bulk supply cost of around 5USc/kwh).

Urbanization and industrial growth, combined with limited access to electricity and high cost of petroleum products have led to an even more rapid growth in urban charcoal demand. Severe deforestation during conflict, in part by internally displaced persons and returning refugees has been further compounded by the large scale demands for charcoal making, construction materials, and agro industrial, institutional and commercial customers.

By the end of 2004 Rwanda has faced year energy crisis that has never happened before. The Government Rwanda of (GoR) ELECTROGAZ through has managed to mitigate the crisis by putting in places Diesel Power Plantations with additional capacity of about 12.5 MWS. The effort to get rid of the deficit has continued. As part of the strategy of the Government of Rwanda to arrest the energy crisis in the country, the GoR has asked the World Bank for support of its Urgent Electricity Rehabilitation Project (UERP). The overall development objectives of the proposed project are to: (i) Alleviate the power shortages: and (ii) enhance the capabilities of energy sector institutions.

The UERP project is intended to further mitigate the power crisis in Rwanda and to help to restore good utility practice and its facilities. The project is being coordinated by the Project Coordination Unit (PCU)

housed in ELECTROGAZ and which works under the overall responsibility of a Steering Committee chaired by the Ministry of Infrastructure. This study was commissioned by UERP/PCU to assess the environmental effects of the proposed substation.

## 2.0 STUDY SCOPE AND METHODOLOGY

The scope of the study was determined by the influence of the potential impacts and stakeholders input. The terms of reference also helped in shaping the scope as well as the methodology to be applied in assessing the impacts.

The study was undertaken in the Birembo area and its environs. Administratively the site for the proposed sub station is situated in the province of Kigali City, in the District of Gasabo, Kinyinya sector in the Murama. The actual project site is approximately 3 kms from the Deutsche Welle broadcasting station along a dusty murrum road interspersed with rural households.

### 2.1 Study Scope

A rapid scoping study was undertaken at the beginning of the study. This exercise helped the EIA to define the spatial and contextual scope of the study.

The scoping process helped the EIA identify the issues that were likely to be of priority importance during the study and eliminates those that were of little concern. The rapid scoping exercise also enabled the consultants identify the stakeholders and public concerns.

Scoping exercise also helped in introducing the project to stakeholders and involving them in determining the scope and focus of the EIA study.

### 2.2 Methodology

#### Baseline Assessment

Baseline data was first collected from secondary data however the EA discovered that not much data has been collected in the area. The EA went to the field to collect primary data.

Data collected included information on; physical environment: geology; topography; soils; climate and meteorology; ambient air quality; surface and ground water hydrology; existing sources of air emissions; existing water pollution discharges; and receiving water quality, biological environment: flora; fauna; rare or endangered species; sensitive habitats, including significant natural sites etc.; species of commercial importance; species with potential to become nuisances, vectors or dangerous and socio-cultural environment: population, land use; planned development activities; community structure; employment; distribution of income, goods and services; recreation; public health and safety; cultural aspects/properties; aspirations and attitudes.

#### Project Alternatives

The EA analysed the various project alternatives available to achieve this project's objectives but with the least adverse environmental impacts. The alternatives were identified and evaluated determining impacts and cost implications of each alternative.

### **Public Consultation**

During the scoping process, a stakeholder mapping exercise was undertaken to identify Interested and Affected Parties (I&AP) to the project. The mapping exercise was conducted simultaneously with the scoping exercise. The exercise identified all the stakeholders in the area.

After identifying the relevant stakeholders, a cleaning exercise was undertaken to do away with those who would not be impacted both positively and adversely.

The stakeholders' consultation also helped in highlighting the serious socio-economic and environmental concerns and impacts that could arise from the project and was instrumental in helping to come up with feasible mitigation measures.

### **Impact Prediction and Evaluation**

Various methods and techniques were applied in impact identification, prediction and evaluation. The EA identified and analysed potential impacts linking these with specific project activities and phase. First the task was to consider both positive and negative impacts of the project. While considering the impacts, the study examined them in light of their characteristics i.e. nature (positive or negative), extent (spatial), occurrence (one-off, intermitted or constant), magnitude, whether reversible or irreversible, direct or indirect, probability of occurrence and significance with and without mitigation.

# 3.0 PROJECT AREA DESCRIPTION AND BASELINE DATA

This chapter gives background information of the project area as a whole then narrows down to project specific site in terms of its location, administrative set-up, climate, settlement patterns, and the major environment attributes, which will play a crucial role in the identification and development of the project.

This section begins with the relevant information pertinent to this project in terms of Gasabo District and then in the next section the report focuses on the specific background information of Kinyinya sector, Murama cell and project site.

## Geographical Location (Gasabo District)

Gasabo District is one of three districts of Kigali City and form one of 30 such entities that in Rwanda after the administrative reform of February 2006. With 15 sectors, 73 cells and 501 villages (imidugudu), it follows from the merger of the former districts of Gasabo, Kacyiru, Gisozi, Kabuga (3 six sectors namely Gasogi, and Ndera Rusororo) Kanombe (Masoro sector) , Buliza (Cyunga sectors, Jabana, Kabuye and Ngiryi) Gasabo (Bumbogo sectors, Gasabo, Gacaca I & II, Gikomero, Gishaka, Jurwe Karama, Kayanga, Nduba, Sha, Shango, and Rubungo Rutunga).

It is located northeast of the City of Kigali, the Rwandan capital. It is bounded on the south by the district Kicukiro; to the north by the district and Rulindo Gicumbi; to the east by the districts of Rwamagana and west by the district Nyarugenge. It has an area of 429.2066 km <sup>2</sup>, and currently has 410 485 inhabitants.

Due to this configuration, the District is a duality between rural and urban areas. The rural area accounts for more than 90% of the District, with a population representing 66%, which involves more effort in the field of urbanization and land use.

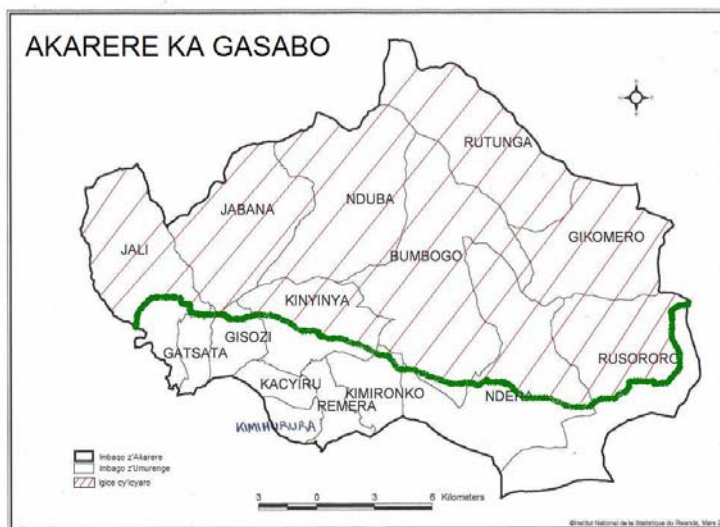


Figure 1. New Administrative Map of Gasabo District



## Relief

The terrain of Gasabo district is dominated by mountains of altitude (1800 m), especially in rural areas. Gasabo District is also surrounded by watersheds and valleys. The District has small rivers in the valleys of areas with high hills. The only river worth mentioning in name is the Nyabugogo River which has its source in Lake Muhazi and drains into the river Nyabarongo after crossing wetland valley approximately 50 kilometres long and 1000 m wide.

In addition, the usual method of sanitation in the city of Kigali promotes the infiltration of sewage that enrich groundwater creating small springs scattered here and there in the valleys.

## Flora and fauna

Natural vegetation is almost non-existent in Gasabo District. It was gradually replaced by artificial vegetation whose presence is the dominant eucalyptus tree species. However, some wild plants are found in the marshes and in small corners of uncultivated land. Depressions are occupied by natural vegetation composed of *Typha fringed* of papyrus and *Cyperus latifolius*.

In the hills, the natural vegetation there is especially herbs like *hyparenia spp* (imikenke) and *eragrostis* (inshinge). There are also various shrubs and savanna trees and the most dominant types are *Albizia gummifera* (imisebeya) *mimosacées*, including *Acacia abyssinica* (iminyinya).

As for wildlife, Gasabo district is characterized by a diversity of species of birds and small wild animals familiar to the type of vegetation in the District as well as fish species compatible with the aquatic environment of Lake Muhazi (tilapia, barbus, Clarias galiepunus, common carp, haprochromis).

## Climatic zones

Gasabo District has four seasons: two rainy seasons and two dry seasons alternately distributed as follows:

- A short dry season: December, January, February
- A great rainy season: March, April, May
- A long dry season: June, July, August, September
- A small rainy season: October, November

The four seasons are the common features of climate in the country. The seasons are irregular and hence the boundary cannot be correctly predicted. The rainy season may extend into the dry season and vice versa. The average temperature is 22 ° C and a rainfall between 900 and 1150 mm of annually is experienced.

## Demographics

**Table 2: Population of Gasabo District by sector**

Number of sector	Population 2007	Area (Km2)	Density (Km <sup>2</sup> ) 2007
Bumbogo	21289	60,0727	354
Gatsata	33515	6,0156	5571
Gikomero	16872	34,8095	485
Gisozi	18452	8,4834	2175
Jabana	27734	36,4359	761
Jali	26509	37,4999	707
Kacyiru	23648	5,8119	4069
Kimihurura	35741	4,8758	7330
Kimironko	44918	11,4356	3928

Kinyinya	39649	24,5943	1612
Ndera	23387	50,1650	466
Nduba	17983	46,7201	385
Remera	26925	7,0307	3830
Rusororo	30412	52,4736	580
Rutunga	23451	42,7826	548
Total	410485	429,2066	957

Source; District Development Plan Gasabo

The Sectors of Gatsata, Kimirunko, Kimihurura and Kacyiru have a higher density compared to other sectors are those in both urban and predominantly spontaneous neighbourhood.

Furthermore, data from the census and the Integrated Household Survey of the District show that the population is predominantly young Gasabo with a proportion of persons under 45 years is about 80% of this result that it is the younger who migrate to urban areas.

## Economic Activities

### Agriculture

Agricultural activity is developed in the 8 rural areas of Gasabo. However with the expansion of the City there will be more and more loss in agricultural space. The land is relatively fertile and crops such as tomatoes, soybeans, sunflower, corn, coffee and vegetables have a comparative advantage for various reasons, including improved techniques for the production of tomato popularized by SORWATOM; proximity to the City of Kigali, which offers opportunities for vegetables; the proximity to factories washing coffee in Ndera.

The priority crops are cassava, beans, sorghum and bananas. In small wetlands, there are vegetables such as cabbage, onions, tomatoes, eggplants and other legumes. The promotion of modern agriculture is not yet widespread in all sectors; only the introduction of radical terraces to prevent erosion is in progress. People's participation in this activity is estimated at 75%.

In the "Urban", there are small agricultural activities like growing vegetables carried by individuals in some portions of the wetlands. However, there are some marshes where you can organize and modernize agriculture with a few adjustments.

### Energy

The main sources of energy used for cooking are: electricity gas, oil, firewood, charcoal and agricultural residues. Charcoal is the energy source most used in cooking in urban areas. This use is among the direct causes of environmental degradation in the country in general and the District of Gasabo in particular urging or forcing peasants to engage in disorderly exploitation of forests.

For lighting, energy sources are used ELECTROGAZ electricity, solar panels, generators, lamp oil, lanterns, candles and wood.

Kerosene is the most used by households as a source of lighting. Other energy sources such as biogas, peat can be initiated and operated centres or correctional schools are almost unknown in the District. Solar energy and generators are used by high-income households when downloading current ELECTROGAZ.

### Housing and Settlement

The housing in the District of Gasabo is characterized by four different types: the well-developed urban area, urban areas in settlements, villages (imidugudu) in rural areas and houses scattered in rural areas.

**Table 3. Housing Type**

Housing Type	Areas		Total
	Urban	Rural	
Imidugudu (New Villages)	7%	8%	7%
Old villages (insisiro)	2%		1%
Dispersed Households	28%	89%	48%
Formal Settlements	7%	1%	5%
Informal Settlement	56%	1%	38%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Source: EICV 2006

### Murama Cell Background Information

#### Administration

Administratively Murama cell is one of the 4 cells that form Kinyinya sector. The others are Gacuriro, Gacharu and Kagugu cells. The project site is located in Murama cell.

#### Population

According to the last census report of Rwanda, Murama cell in Kinyinya sector has a population of 3,327 people.

#### Socio-Economic Activities

Murama cell is primarily driven by subsistence crop production and livestock husbandry as the main economic activities. Crops grown for subsistence include maize, beans, cassava, carrots, cabbages etc. Exotic dairy cattle are kept under zero grazing and milk production is a key economic activity in this cell.

Small scale trading is also an economic activity in this area as illustrated by the kiosks, shops, bars and restaurants about 4km from the project site. This is the main trading centre in Murama center.

#### Health/Education

There is one health center in this cell and this is the Kinyinya Health Center located approximately 4kms from the project site. There is only 1 primary and 1 secondary school in this cell and these are 10kms away from the site.



Photo of Kinyinya Health Center

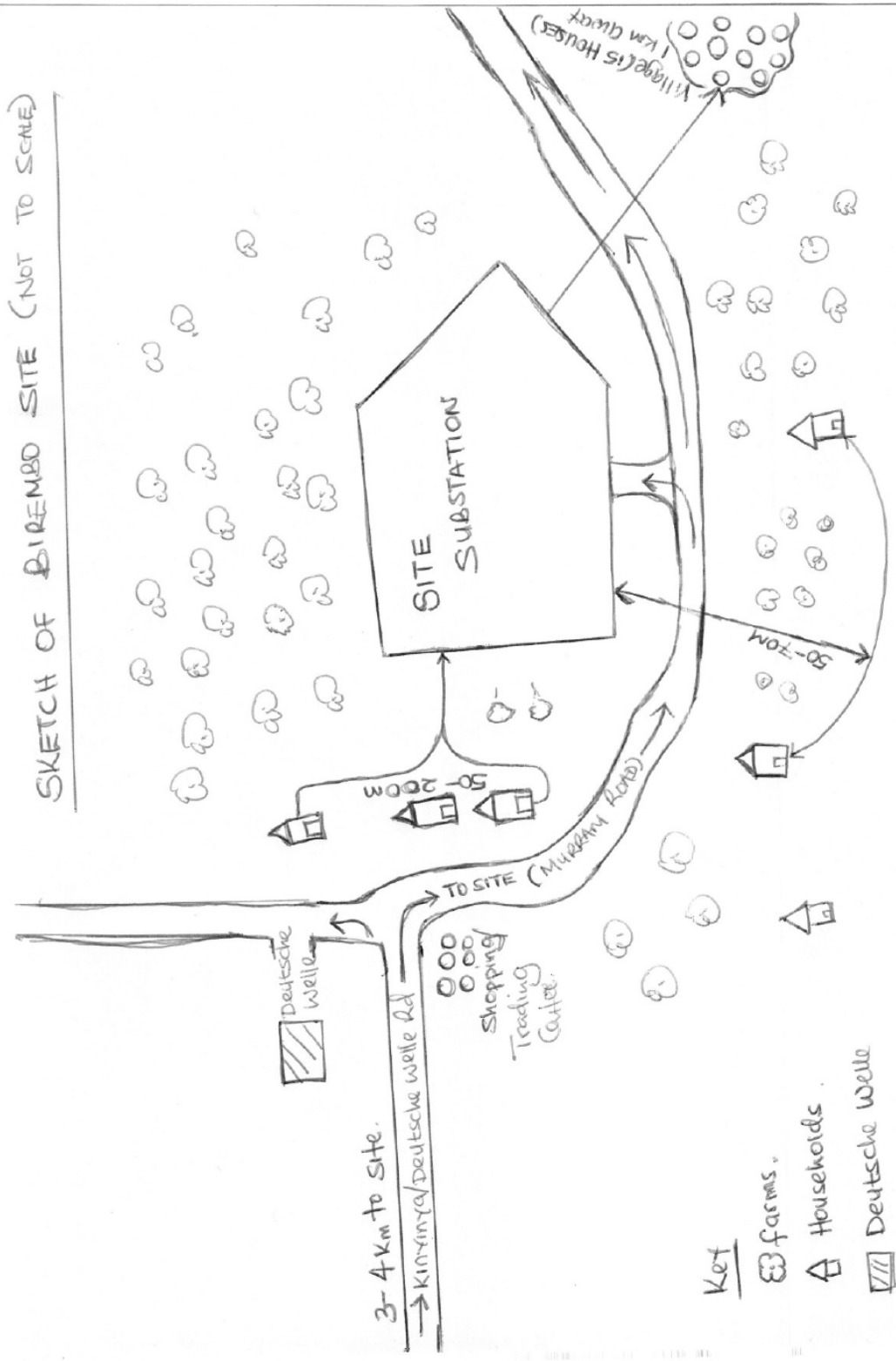
## **Specific Site Description**

### **3.1 Physical Environment**

#### **3.1.1 Location**

Administratively the site for the proposed sub station is situated in the province of Kigali City, in the District of Gasabo, Kinyinya sector in the Murama cell. The actual project site is close to the Deutsche Welle broadcasting station along a dusty murram road interspersed with rural villages and households.

SKETCH OF BIREMBO SITE (NOT TO SCALE)



- Key
- ☁ farms.
  - △ Households
  - ▨ Deutsche Welle

## 3.2 Biological Environment

### 3.2.1 Physical

The chosen site is a zone constituting of limno - clay soil of contribution following soil erosion. There is no natural vegetation anymore in the project site which is now transformed entirely into agricultural production and livestock keeping.



Photo showing soil type in the proposed project site.

### 3.2.2 Flora

The project site is primarily an agricultural area with the existing vegetation comprising of normal subsistence crops grown in Rwanda including, The project area is present with a variety of crops that is cultivated by the PAPs including Avocado trees, Tomato, Orange trees, Mango trees, Grevillea, Pepper, Ficus Trees, Eucalyptus Trees, Euphorbia Trees, Flowers, Cassava, Euphorbia live fence, Maracuja, Cactus tree, Lemon trees and Papaya trees. These crops and trees will inevitably have to be removed to pave way for the construction of the substation among others.



Photo of plant crops present in the project site.

### 3.2.3 Fauna

There are no species of importance within and around the site. However, the PAPs in the site also keep livestock under zero grazing as shown in the photo below of a cow pen.



Photo of a cow pen used for zero grazing by one of the land owners.

### 3.2.4 Sensitive Ecosystem

There are no sensitive ecosystems worth mentioning or recognising in the project area or site that would be adversely impacted by the proposed project.

## 3.3 Socio-Economic Environment

### 3.3.1 Population and Demography

The project area is not densely populated and scattered interspersed rural homesteads are observable as one move along the murrumbidgee road to the project site. Within a radius of 500 metres on the project site there are 4 households/structures that have already been earmarked for resettlement under the ARAP. At a radius of 1km there are 15 houses with an estimated population of 60 people and are not likely to be adversely affected by the proposed project mainly due to the distance especially in relation to noise impacts.

### 3.3.2 Socio Economic Profile

The project area is an area where the local communities practice subsistence agriculture and to some extent minimal livestock husbandry. As mentioned above, the immediate project site that will be acquired for the construction of this plant has visible signs and evidence of subsistence farming at a small scale mainly at the household level.

### 3.3.3 Land Uses

The major land uses in the immediate project area are mainly small scale agricultural activities like cultivation of food crops like maize, bananas, yams, cassava among others. The area is also primarily rural residential with 4 rural households and a church mainly made from mud walled grass thatched houses within the project site intended for acquisition and will be resettled. There are 5 other residential houses within a distance of 100 metres from the project site. These houses will not be destroyed or affected by the project especially in relation to noise impacts. About 3 kilometres away is the Deutsche Welle radio transmitting station. 4 kilometres from the site, is the Kinyinya Health Centre, the office of the Executive manager in Muramba, and a small trading centre with kiosks and bars.



Photo of houses in the project area showing brick walled house and mud walled house.

The land in question is partly owned by 4 individuals who use the land for several purposes including shelter, cultivation of crops, rearing livestock through zero grazing, and as a church respectively.



**Photo of an existing Seventh Day Adventist Church in the project site.**

### **3.3.4 Infrastructure**

#### **Roads, Electricity and Communication**

There is an existing electricity transmission line that passes across the project site. The road network in the project area is generally loose surface road and could be difficult to access during the rainy season. However, there is a tarmac road which is the main Kigali-Kinyinya-Deutsche Welle road which is busy and is the main route connecting the sector with Kigali city centre. Deutsche Welle a German broadcasting company has its main station a few kilometres from the proposed project site and telecommunication masts can be observed at a distance.



**Photo of existing transmission line in the project site and the Kinyinya-Deutsche Welle Tarmac road.**



# 4.0 PROJECT ALTERNATIVES

This chapter describe and examine the various alternatives available for the project. Alternatives examined during the study included site alternatives in project location particularly with regards to location based impacts and land use conflicts was assessed, and finally a No Project alternative was also assessed to determine the impact of this No Project Scenario.

The choice of an appropriate site for locating a new substation was guided by the following issues presented by ELCTROGAZ/UERP as the criteria:

- Location;- The site should not be sited close to a highly dense residential areas in order to minimise impacts and costs related to resettlement.
- The site should have adequate access in terms of road network to facilitate transport of construction material and equipment and also allow for emergency intervention during operations
- The project site should not increase the overall cost of the project
- The site should have adequate space for future extension
- Specifically for ELECTROGAZ, the priority was to construct a substation on the Eastern part of Kigali City so as to expand the network on this side which is limited and requires expansion.

## 4.1 Alternative Site(s)

In assessing alternative site to determine potential, the above points were used to come up with the preferred choice of site.

### Gikondo site

This site already houses the 110kV substation of Gikondo and is situated in the center of Kigali city in a densely populated area and is the important most substations, serving the biggest load in Kigali and the country. For this reason it does not become a very appropriate site for locating the proposed substation because it is first and foremost already overloaded. Secondly, it is not in the Eastern Part of Kigali city and locating the plant would mean extension of long lines and voltage drops to the Eastern part of Kigali which would mean addition costs related to construction of distribution network and compensation. Hence this site was rejected.

### Gasogi site.

The Gasogi site houses the Gasogi Substation in the Eastern part of Kigali City. However, this site is located in a ridge making it unsuitable for locating the new substation, mainly because of the challenges that will be experienced in the transportation of bulk goods and equipment due to access related problems. Because of the ridges, the project will be required to create access roads to the site for use during transportation of construction equipment and this will increase the overall project cost. This site also lacks adequate space for future expansion. Therefore this site was also rejected even though it lies along the Eastern part of Kigali city.

### Mt Kigali Substation

The Mt Kigali Substation is located at the South of the city of Kigali and is right inside and within a town housing development area thus making it unsuitable in terms of location for any future extension for that matter. This is because it will require a lot of compensation when undertaking the resettlement which will increase the project cost. This substation is also located towards the Southern part of Kigali and hence does not meet ELECTROGAZ's criteria of intending to increase the electricity distribution network in the Eastern part of the city. Therefore this site was also rejected because of the stated reasons.

### Jabana Substation

The Jabana site houses the Jabana Substation and is situated in the West of Kigali along the Byumba Road with the incoming line from the Mukungwa Ntaruka and Hydropower stations, and was established in 1960 and rehabilitated in the mid 80s. The 70 kV line to the East Rwanda has its origin at this substation. This substation is not located in the Eastern part of the city hence the rejection.

### Birembo Site (Preferred Location)

Due to the above reason, the Birembo site in comparison to the other sites presents the most appropriate site for locating the substation because, the proposed site is not densely populated; it is easily accessible using the Kigali-Kinyinya-Deutsche Welle tarmac road, and is located in the Eastern part of the city.

## **4.6 No Project Alternatives**

A No Project alternative would primarily mean that the status quo will be maintained and in a sense the environmental impacts (adverse) will not occur. However the positive benefits will be forgone in terms of providing more access to electricity to the populace of Kigali which would have in turn spurred and contributed to economic growth.

# 5.0 LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK

The chapter of the study reviews the relevant legal and institutional arrangements that would hinder or guide the development of the project in line with the national and international laws. Rwanda being a signatory to various international conventions and laws, it's important that national projects are in line with these laws and as such some of the relevant international conventions are reviewed in this chapter.

## 5.1 Organic Law on Environment Protection and Management

The law sets out the general legal framework for environment protection and management in Rwanda. It also constitutes environment as a one of the priority concerns of the Government of Rwanda. Under the fundamental principle on national environmental protection policy develops national strategies, plans and programs, aiming at ensuring the conservation and use of sustainable environmental resources.

The law gives right to every natural or legal person in Rwanda to live in a healthy and balanced environment. They also have the obligation to contribute individually or collectively to safeguard country's natural, historical and socio-cultural heritage.

The framework of the law on the protection and management of natural resources centres on avoiding and reducing the disastrous consequences on environment. It measures result from an environmental evaluation of policies, programs and projects, aimed at preventing the consequences of such activities.

The principle of sustainability of environment and equity among generation emphasizes human beings at the core of sustainable development. They therefore, have a right to a healthy and productive life in harmony with nature. They must so as to equitably meet the needs of the present and future generation.

The protection and management of environment is currently registered in the environmental organic law that has been published in the official Rwanda newspaper in May 1st 2005.

MINITERE which is the ministry responsible for the environment under the article 65 puts the in place Rwanda Environment Management Authority (REMA) which is the institution now charged with the responsibility of ensuring environmental protection by demanding for EIA studies to be undertaken before projects are executed.

The present organic law has the following objectives:

- To protect human and natural environment;
- To establish fundamental principles of management and protection of environment against all forms of degradation so as to develop natural resources and to fight all kinds of pollutions and nuisances;
- To improve the living conditions of the population while preserving ecosystems and available resources;
- To ensure sustainable environment and resources as well as rational and sustainable use of resources, taking into account the equality between the present and future generations;
- To guarantee to all Rwandans an economically viable, ecologically rational and socially acceptable development;

- To establish the precaution principle in order to reduce the negative effects on Environment and ensure the rehabilitation of degraded areas.

Chapter IV of the Organic Law Article 65 clearly calls for the need to subject projects to mandatory Environmental Impact Assessment.

Article 3: States that every person has the duty to protect safeguard and promote environment. The State shall protect, conserve and manage the environment.

Article 65: Further specifies that every project shall be subjected to environmental impact assessment prior to its commencement. It shall be the same for programs, plans and policies likely to affect the environment. Specific details of projects referred to in this Article shall be spelt out by the order of the Minister in charge of environment.

**Article 66:**

The Environmental Impact Assessment (EIA) shall include at least the following:

- A brief description of the project and its variants.
- Analysis of direct and indirect foreseeable consequences on the environment.
- Analysis of the initial state of the environment.
- Measures envisaged reducing, preventing or compensating for the consequences.
- Reasons for the choice.
- A summary of requisitions from clause 1 to 5 of this article;
- A definition of the evaluation and monitoring methods used regularly and environmental indicators before (initial state), during and after implementation of the project or, as the case may be, at the final evaluation stage of the project;
- A financial evaluation of measures recommended preventing, reducing or compensating for the negative effects of the project on the environment and measures for regular monitoring and control of relevant environmental indicators.

**Article 67:**

States that the analysis and approval of environmental impact assessments is done by the Rwanda Environmental Protection Authority or any other person given a written authorisation. The project promoter shall pay a levy which shall be assessed from the amount invested or to be invested, excluding the amount of operating cost. The assessment of this levy shall be fixed by law establishing the National Fund for the Environment. The impact study shall be done at the expense and under the responsibility of the promoter.

The Organic Law also puts in place the National Fund of the Environment in Rwanda (FONERWA). The composition, the working and the assignments of these institutions will be determined by particular laws.

The article 66 of the Organic Law on the environment specifies that it has created, to the level of the Provinces, of the City of Kigali, of the Districts, the Cities, the Sectors and the Cells, Committees responsible for the conservation and the protection of the environment. The composition, the working and the assignments of these committees will be determined by Decree of the prime minister.

Title IV of Article 67 of the Organic Law requires that the execution of Policies, Plans and Projects must be subject to mandatory EIA studies to identify the potential adverse impacts they could have on the environment.

Further to this through the Ministerial Decree, a list of all the project that must be subjected to mandatory EIA has been put in place under article 68 of the Organic Law. Article 30 further stipulates that works of public or private construction as roads, dams etc must be subjected to EIA studies.

Article 69 of the Organic Law further specifies that the EIA studies undertaken must be submitted to REMA for approval and the studies must be undertaken at the proponent's expense.

### **The Environmental Impact Assessment Regulations, 2007**

REMA has now developed the EIA regulations which provide a guideline and requirements for EIA in Rwanda. According to these new regulations Sub Article 1 makes it mandatory for all the projects listed under schedule I to be subjected to a full scale EIA. The Sub Article further states that :

Sub Article 1) No environmental authorization shall be granted by the Authority for any project in Schedule I to these Regulations if no environmental impact assessment has been submitted to the Authority in accordance with the provisions of these Regulations.

Sub Article 2) states Any project listed under Impact Level III of Schedule I to these Regulations shall require a full environmental impact assessment by the preparation of an environmental impact report, unless the Authority refuses permission. The construction of a substation is in this category and thus must be subjected to full scale EIA.

### **Public Hearing Process**

Article 47: The Authority shall on receipt of the developer's environmental impact report, arrange for a public hearing to take place within twenty (20) working days from the first day of public notification, at which relevant Lead Agencies, local governments, civil societies and concerned members of the public may comment on the environmental impact report and express views on impact of the proposed development. The Authority shall cover all costs incidental to the public hearing.

Article 48: All projects classified under Impact Level III shall be subjected to a public hearing prior to the decision-making process.

## **5.2 Energy Policy**

The national policy goal is to meet the energy challenges and needs of the Rwandan population for economic and social development in an environmentally sound and sustainable manner.

Since 1994, the energy sector as well as the overall economy has gone through structural modifications, where the role of the Government has changed, markets have been liberalised and private sector initiatives encouraged. Hence, the energy policy document has to take into account structural changes in the economy and political transformations at national and international levels.

The national policy objective for the development of the energy sector is to provide an input in the development process by establishing an efficient energy production, procurement, transportation, distribution, and end-user systems in an environmentally sound manner.

The Energy Policy, therefore, focuses on market mechanisms and means to reach the objective, and achieve an efficient energy sector with a balance between national and commercial interests.

An interactive and participatory process between Government, other stakeholders and relevant groups has been necessary as part of the formulation process in order to incorporate views of market actors and energy consumers to address the complex nature of the sector.

Specifically, the energy policy takes into consideration the need to:

- (a) Have affordable and reliable energy supplies country wide;
- (b) Reform the market for energy services and establishes an adequate institutional framework, which facilitates investment, expansion of services, efficient pricing mechanisms and other financial incentives;
- (c) Enhance the development and utilisation of indigenous and renewable energy sources and technologies,
- (d) Adequately take into account environmental considerations for all energy activities,
- (e) Increase energy efficiency and conservation in all sectors; and
- (f) Increase energy education and build gender-balanced capacity in energy planning, implementation and monitoring.

Domestic energy demand has grown rapidly due to population growth and the increase in economic activities especially during the last ten years

The vision of the energy sector is to effectively contribute to the growth of the national economy and thereby improve the standard of living for the entire nation in a sustainable and environmentally sound manner. The mission of the energy sector is to create conditions for the provision of safe, reliable, efficient, cost-effective and environmentally appropriate energy services to all sectors on a sustainable basis. By fulfilling its vision and mission, the energy sector will contribute to social economic development, and in the long-term framework, poverty reduction.

The national energy policy objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The national energy policy, therefore, aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner.

#### **Short and medium term policy priority actions**

The priority for Rwanda is to implement projects now, to overcome the current electricity crisis, to prevent the next electricity crisis, to tackle proactively the wood crisis, to begin to provide greater access to modern energy and to reduce reliance on petroleum products due to the oil price crisis. Without implementation further capacity building and studies will have no value.

Our management and institutional capacity has to continue to progress if these projects are to be delivered effectively and efficiently. This will require further external support and guidance.

Several policy actions will be implemented in order to achieve the broad and specific objectives of this energy policy. Strategic financial interventions required to move forward the policy priority actions are indicated alongside the proposed actions.

#### **Priority policy actions**

1. Meet the crisis of blackouts caused by delayed investment and drought
2. Provide economic power by developing the use of Lake Kivu methane, and by bringing on line more hydro power.
3. Enhance overall electrical infrastructure to meet demand growth and supply quality needs – generation, transmission and major distribution construction and rehabilitation.
4. Deliver a programme of rural electrification on the basis of enhanced distribution networks, micro hydro, and solar power.

5. Implement a wood and charcoal efficiency and substitution strategy to counter the deforestation crisis.
6. Continue steady progress to a viable electricity and gas sector, consistent with meeting social needs.
7. Commence utilisation of Kivu gas for other than power generation.
8. Determine options for response to oil prices and petroleum products costs, and their impact on the economy. Reduce reliance on petroleum products.

### 5.3 Land Policy

Apart from a few scattered land regulations, most of which date back to the colonial period, Rwanda has never had a proper land policy nor has it ever had a land law, a situation that enhances the existing duality between the very restrictive written law and the widely practised customary law, giving rise to insecurity, instability and precariousness of land tenure.

The Rwandan Government, therefore, found it compelling and necessary to establish a national land policy that would guarantee a safe and stable form of land tenure, and bring about a rational and planned use of land while ensuring sound land management and an efficient land administration.

The following are the main obstacles that hinder the efficient management of land in Rwanda, necessitating the establishment of a national land policy that would guide the essential land reforms:

- Strong pressure on the already spatially limited land resources by a rapidly growing population;
- Domination of the agricultural sector which lacks any specialization in terms of human resources and equipment, and lack of alternative concrete and realistic options that would reduce the pressure on land resource;
- A land tenure system dominated by customary law which favours land fragmentation, a practice which reduces further the size of the family farms which are already below the threshold of the average surface area that is economically viable;
  - A considerable number of landless persons who have to be resettled at all costs;
  - Scattered farming plots that are difficult to manage due to the scattered mode of human settlement;
  - Lack of a reliable land registration system that would guarantee the security of land tenure;
  - Weak and inadequate existing methods of land-use planning and land improvement (outline of land potential, land use and land development; reliable methods of soil and water conservation);
  - Disorderly and fraudulent land transactions, necessitating the establishment of regulations that would enable the authorities to give to the land a recognised market value which brings considerable profit to the Government Treasury;
  - Unplanned use of marshlands which, in spite of their good agricultural soil, cannot be wholly recovered for agricultural purposes, in view of the following factors:
    - Abundance of water which is necessary as a useful water reservoir;
    - The soil make-up, which does not lend itself easily to the current cultivation methods;
    - The biotic environment and biodiversity which should be protected at all costs;
    - The obvious poor coordination among various institutions which use with land to support their activities;

Currently, the land tenure system in Rwanda operates in a dual legal system: On one hand, there is:

- The customary law, which governs almost all the rural land and promotes the excessive parcelling out of plots through the successive father-to-son inheritance system. And on the other, there is
- The written law, which mostly governs land in urban districts and some rural lands managed by churches and other natural and legal persons. This law confers several land tenure rights to individuals such as land tenancy, long term lease and title deeds (particularly in towns).

On the whole, Rwanda's land tenure system requires comprehensive reforms, from the elaboration of a national land policy to the establishment of a land law and land code, which will guide the judicious use and management of the land resource for the economy to be able to take off in such a way that our country is freed from the grips of poverty.

In the perspective of the harmonious and sustainable development, the overall objective of the national land policy of Rwanda is to establish a land tenure system that guarantees tenure security for all Rwandans and give guidance to the necessary land reforms with a view to good management and rational use of national land resources.

#### Specific Objectives

- To put in place mechanisms which guarantee land tenure security to land users for the promotion of investments in land.
- To promote good allocation of land in order to enhance rational use of land resources according to their capacity.
- To avoid the splitting up of plots and promote their consolidation in order to bring about economically viable production.
- To establish mechanisms which facilitate giving land its productive value in order to promote the country's socio-economic development.
- To focus land management towards more viable and sustainable production by choosing reliable and time-tested methods of land development.
- To develop actions that protects land resources from the various effects of land degradation.
- To establish institutional land administration arrangements that enable land to have value in the market economy.
- To promote research and continuous education of the public in all aspects of duties and obligations with regard to land tenure, land management and land transactions.
- To establish order and discipline in the allocation of land and land transactions in order to control and/or curb pressure on land, inappropriate development, land speculation and land trafficking.
- To promote the involvement and sensitization of the public at all levels in order to infuse land use practices that are favourable to environmental protection and good land management.
- To promote conservation and sustainable use of wetlands.

Land tenure may be considered as a set of modes or procedures of land acquisition and ownership. It is, in other words, a combination of rules that define the modes of access, use and control of land and its renewable natural resources. It is therefore a relationship between men or social groups and land or its underlying resources.

Land tenure has a multidisciplinary dimension that includes social, technical, economical, institutional, legal and political aspects. Debates on land issues must deal with various aspects of the environment, including the vision of space and nature, forms of land ownership, the role of the government, etc.



In Rwanda, there are currently two modes of land acquisition, namely acquisition according to customary law or conceptions, and acquisition according to the rules of the written law.

According to custom, land ownership is held by whoever occupies the land first. This rule has always been respected in our society. However, in modern times, land acquisition by occupation has become obsolete since all vacant land belongs to the State. Likewise, the provisions of the decree-law No. 09/76 of 4<sup>th</sup> March 1976, article 1, stipulate that '*all land not held under the written law and affected or not by customary law or land occupation belongs to the State*'.

Customarily, land rights are passed on from father to son through inheritance. Girls are excluded from inheritance of the family land from the father. Concerning inheritance rights of widows, the custom merely gives them the right to use the land that belonged to their deceased husbands.

In its original customary conception, land was owned collectively. Any disposal of land was therefore inconceivable, since such land was considered as family property that belonged to the ancestors, as well as to present and future generations.

With the introduction of the subdivision of land into individual plots due to successive inheritance procedures, each family owner of a plot of land was considered as the real owner of the plot, having the right to dispose of it as it wishes. However, Article 2 of the decree-law No. 09/76 of 4<sup>th</sup> March 1976, stipulates that nobody may sell off his land rights except with the written authorization of the Minister of Lands upon the recommendation of the Municipal Council where the land is located.

In actual fact, ownership through prescription originates from the written law since traditionally, title deeds were unheard of. Rwandans consider that once a right has been acquired or recognized, even customarily, it is indefeasible. This is why the many existing landless people, not having received any new land, continue to feel cheated and left out because they have no right over the land which they owned customarily over 30 years ago, since the law has fixed the time limit of acquisition by prescription to 10 years.

#### Method of acquisition through written law

- Tenancy contracts of plots for building purposes for a 3-year period in urban areas.
- Long lease contracts of land for agricultural purposes for a period of 15 years or more in rural areas.
- Free assignment contracts in both rural and urban areas to natural or legal persons for social activities with real impact on the welfare of the people.
- Sale contracts and title deeds for plots that are built in urban areas. This is a system of land tenure by urban residents who first lease plots with the contractual obligation of developing them. The Ministry of Lands delivers the title deeds after confirming that the plots have been developed.
- Right of access: mode of land acquisition which is common for public institutions.

Apart from the above-mentioned different modes of land acquisition and land ownership, there is the case of the landless people who live in rural areas and who must live from farming. These are mostly the refugees of 1959 who were forced into exile for political reasons and left their land behind. These same refugees have now returned to their country and find themselves landless. They cannot claim back their previously owned land which has been occupied by other Rwandans who remained in the country, because the Arusha Peace Accords fixed the time limit for acquisition by prescription to 10 years.

## 5.4. International Legislations

Rwanda is a signatory to a number of conventions on sustainable development and is a member of various bilateral and multilateral organizations. Some of the relevant development partners in this project are the World Bank and a number of United Nations agencies.

### 5.4.1 World Bank Environment and Social Safeguards Policy

World Bank Operational Policies (OP) and Bank Procedures (BP) Environmental Assessment - BP4.01 and OP 4.01 (January 1999) all of which require environmental assessment of projects proposed for World Bank financing to help ensure that they are environmentally sound and sustainable.

Environmental Assessment is one of the 10 safeguard policies of the World Bank. The World Bank Environment and Social Safeguard Policy aims at improving decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01. The World Bank system assigns a project to one of three project categories, as defined below:

#### Category "A" Projects

An EIA is always required for projects that are in this category. Impacts are expected to be 'adverse, sensitive, irreversible and diverse with attributes such as pollutant discharges large enough to cause degradation of air, water, or soil; large-scale physical disturbance of the site or surroundings; extraction, consumption or conversion of substantial amounts of forests and other natural resources; measurable modification of hydrological cycles; use of hazardous materials in more than incidental quantities; and involuntary displacement of people and other significant social disturbances.

#### Category "B" Projects

The construction of this sub station falls under *Category B* of the World Bank Operational. A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects.

These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A Environmental Assessment.

Like Category A Environmental Assessment, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

#### Category "C" Projects

No EIA or other analysis is required. Category C projects result in negligible or minimal direct disturbance of the physical environment. Typical projects include education, family planning, health, and human resource development.

## 6.0 PROJECT DESCRIPTION

The Urgent Electricity Rehabilitation Project (UERP) through the Project Coordinating Unit (PCU) has identified a site where it wants to install a substation for electricity transmission by ELECTROGAZ of Rwanda.

Substations are essential for the smooth running of any electrical system. They are the point where high voltage electricity is reduced (or “stepped down”) into lower voltage electricity suitable for distribution into commercial and residential areas. The proposed Birembo sub station will basically play the role of stepping down the high voltage electricity into low voltage and then to be distributed to the commercial and residential areas in Kigali.

Administratively the site for the proposed sub station is situated in the province of Kigali City, in the District of Gasabo, Kinyinya sector in the Murama cell. The actual project site is close to the Deutsche Welle broadcasting station along a dusty murram road interspersed with rural villages and households.

The project will involve the construction of a new 110/15 kV - MW sub station at the Birembo site. The new Birembo substation will be in the final stage the main substation of the national grid and the main feeder substation for the Kigali distribution system. On the 220kV and 110kV level it will be an outdoor substation; the 15kV level will be of the indoor type.

The substation will be erected in three main stages:

### STAGE 1

This will involve the construction of a 110/15 kV substation with one 110 kV line bay, one 110/15kV transformer bay and one 110/70 kV autotransformer bay. The substation will be connected to the overhead line of Jabana – Gasogi. This is a new line that is planned for construction under the UERP Distribution component.

From this indoor substation two 15 (30) kV double circuit lines, length 7.5km, will go in the direction of Rubungo and Remera to connect the existing 15kV network of the surrounding areas north east of the town center (area of Kacyiru, Kibagabaga, Rubungo, Nyabisindu, Kimironko, Nyarutarama, etc.) –A separate EIA and ARAP is under preparation for the entire UERP distribution component that will include this line and all the other lines proposed in that component which will identify associated adverse impacts.

The distribution component EIA/ARAP report once finalised will be submitted to the bank and REMA for review and approval. The construction of the Jabana – Gasogi line and other lines in the distribution component of the UERP is expected to start in July 2009.

### STAGE 2

This will involve the extension of the Birembo substation by an additional 110kV line bay for the interconnection with Uganda and an additional transformer 110/15kV (TR2). The construction of this line is still under planning phase and no actual timing has been decided upon. Once a definite time frame is decided upon, an EIA and ARAP report will be prepared and submitted for approval to the bank and REMA.

### STAGE 3

This will involve the extension of the Birembo substation by a 220kV substation with one line bay and two 220/110 kV power transformer bays for the interconnection on the 220kV level with Tanzania. Also there will be a further extension of the 110kV substation by two bays for connecting the power transformers

220/110kV. The construction of this line is still under planning phase and no actual timing has been decided upon. Once a definite time frame is decided upon, an EIA and ARAP report will be prepared and submitted for approval to the bank and REMA.

**Note:** Only Stage 1 will be part of this contract, however areas and designs for future extensions (Stage 2 and Stage 3) will be availed by the contractor.

### **Birembo Substation – Stage 1**

The new substation will be constructed on a settled and farmed area outside the town of Kigali in the north close to the tower 198 of the 110(70) kV overhead line from Jabana to Gasogi. The GPS coordinates of the tower 198 are:

**Table 4.**

Zone	East	North
36M	180264	9788846

The substation will be looped in to the 110kV line coming from Jabana substation and continuing via Gasogi, Musha, and Rwamagana to Kabarondo as a 70kV line. In the final layout, the substation will be the main substation of the national grid and the main feeder substation for the Kigali distribution system. The conductor of the 110kV line is ACSR 138/22, the shield wire S35.

The new substation shall be of a conventional open air type (AIS) for the 110 kV voltage level and of an indoor SF6 insulated switchgear type (GIS) for the 15 (30) kV level.

### **Proposed Activities**

The project activities will fall under site preparation, installation of equipments and operation/generation. The project specific activities will include the following;

Activities expected to occur during the planning and design phase of the project include;

- Identification of project site including feasibility studies
- Acquisition of land for construction of the substation and its ancillary structures
- Valuation and Compensation of PAPs for loss of land, structures and crops

During the construction phase of the project the following activities will be undertaken namely;

- Site clearing
- Excavation related works
- Construction works including erection of towers and building of the staff quarters and housing unit

At the operation phase of the project activities to occur are mainly controlling operating of the substation

### **Design and Planning Phase**

During the design phase of this project, the expected activities some of which have already occurred include:

#### **Site Selection**

Identification of a proper site for the construction of the substation remains one of the fundamental activities that will have to be undertaken before the construction works begin. This has already been undertaken and the Birembo site has been identified as a suitable site for the sub station.

## **Land Acquisition /Compensation**

The land in question must be acquired for purposes of construction and for this reason; the (PAPs) who will lose their land will have to be compensated as required by the World Bank and Government of Rwanda. Compensation for land will be based on the current land rate values. An Abbreviated Resettlement Action Plan (ARAP) has been prepared, approved by the bank and already disclosed in the infoshop.

Annex 11 of this report shows the quantities of crops and trees that will be destroyed to pave way for the project.

## **Construction Phase**

The works shall include the following activities:

- preparation of site
- detailed planning of the civil works
- detailed planning of the electrical equipment
- execution of civil works
- installation of electrical equipment and connection to the MV and LV lines
- installation of small power distribution
- testing and commissioning

## **Excavation of land during civil works**

Civil works including stripping of the land, excavation and installation of equipment is largely expected to occur. However this is expected to occur only after the PAPs have been duly compensated and resettled with approval from World Bank, local authorities and REMA.

The plot (approx. 120 x 240 m) of the new 110 kV substation is outside Kigali, in the north of the town and accessible by a good road. The buildings to be constructed shall contain all auxiliaries. The civil works comprises the following buildings but not limited to the following:

- site installations
- electrical switchgear rooms
- transformer bays
- electrical auxiliary rooms (such as AC/DC supply, battery, control, relay and telecommunication rooms, etc.), offices and utilities
- surrounding pavements and gravelling of all areas inside the plot limits/adjacent roads
- boundary fence and entrance gates
- safety fence
- plumbing and sanitary works, including cold and hot water supply systems, ground and overhead tanks, sewer and drainage systems and connections
- small power and lighting installation including outdoor substation illumination and security lighting system
- ventilation systems
- cable laying between the station buildings and within the station area(s) as necessary for the subject work,
- earthing grid laying as necessary and connection to the existing earthing grid as well as enlarging of existing earthing grid,
- piping for water, sewage and rain water,

### **Site Clearing and Stripping**

The construction work shall involve the clearing of areas required for permanent works. All such areas shall be kept free from subsequent growth of vegetation and all other areas that may be required for his temporary arrangements or for any other purposes for the execution of the works.

### **Excavation and Foundation**

Ground excavations to the lengths and widths and exact depths as indicated on the tender drawings for the construction of the works will be undertaken. In cases where the bearing capacity of the subsoil under foundations or roads is insufficient, the excavation shall be continued to such greater depth as may be necessary. All excavation will be carried out mechanically, but the final shaping and trimming of the sub grade below foundations, etc. shall be done by hand.

### **Backfilling**

The substation plot shall be cleaned and levelled, excavated and surplus material shall be used to as back fill. Back-filling and compaction shall be performed with approved material (imported materials like stones, soil will be from the government approved site in Nyacyonga), unpaved areas shall be topped with not less than 10 cm thick gravel 32-51) mm to reach the station's footpath/kerbstone level. This is to result in a completely finished, homogenous station of attractive appearance.

### **Plot Infrastructure**

The of work/supply shall comprise site survey, site mobilisation and installation, soil investigation, temporary access roads, demolishing of existing structures, shifting relocation or protection of existing services and other preparatory works as required.

The substation plot shall be surrounded by a drainage ditch with suitable outlets to the next natural stream. The substation level shall be 300 mm above the surrounding area. Furthermore, the entire station plot shall have a boundary fence plus suitable lighting system covering the substation area.

The station plot shall be accessible through entrances with four (4) adequately sized double leaf steel entrance gates including (1) separate single entrance door. All road constructions shall be provided and properly connected to the next existing approaching or bypassing service road.

### **Substation Building with Auxiliary Rooms**

The Contractor will design the substation building according to the technical data sheet and his equipment to be installed. Room for the medium voltage switchgear shall be provided having space for the number of feeders specified as well as space for additional feeders as per single line diagram and marked as future. The channels for control and power cables shall be built completely separated.

The substation building will have the following rooms:

- four (4) office rooms;
- one (1) meeting room;
- one (1) switchboard room;
- one (1) AC, DC distribution boards, battery charger
- control and command room;
- one (1) battery room;
- one (1) store room;
- one (1) supply transformer room;
- one (1) combined interior bathroom and toilet room;

- One (1) exterior toilets room;
- one (1) telecommunication room;
- one (1) workshop room;

### **Substation double living house**

It is foreseen to build two double living houses at Birembo substation for use by the ELECTROGAZ staff during operation of the substation. The double living house will be built outside the safety fence area but within the plot of substation. Each flat of the double living house will have the following rooms:

- three (3) bed rooms;
- one (1) living room;
- one (1) kitchen room;
- two (2) store rooms;
- one (1) combined interior bathroom and toilet room;
- one (1) exterior toilets room;

### **Operation Phase**

During operation phase the expected activities include, operation and maintenance of the transformers, circuit breakers, circuit switches and capacitors that will have been installed during the construction phase. Sub Station buildings will also be constructed to some of the equipment described above, as well as other instruments and devices that ensure the efficient functioning of the system.

## **6.1 Project Technology Description**

### **Installation of the sub station**

This will involve the construction of a 110 kV substation will be of the open air type with a double tubular busbar system, inline layout. Under the present project, only three busbar sections for one busbar need to be erected. However, the necessary gantries shall be erected for a double busbar system.

The stage 1 is equipped with the following feeders:

- One (1)110kV line bay to Jabana substation
- One (1) transformer bay for transformer 110/15 kV
- One (1) transformer bay for transformer 110/70 kV
- One (1)110 (70) kV line bay to Gasogi

The future 110 kV substation extensions shall be indicated on all drawings and single line diagrams as future installations and the detailed planning must take into account the foreseen future extensions.

The design shall be such as to leave space for the future feeders as well as for installation of the second busbar without relocation of any equipment. The future bays and the 110 kV installations shall be included in the design and marked as "Future".

### **15 (30)kV Switchgear**

- The 15 kV substation will be of the indoor type, composed of the following cubicles:
- two (2) incoming transformer feeders for transformer 110/15 kV
- one (1) bus coupler
- three (3) overhead line feeders
- one (1) equipped spare feeder for overhead line
- one (1) station supply feeder

The 15 (30) kV switchgear room shall be designed such as to have space for at least 2 additional feeders for each busbar side (total 4 additional feeders). All necessary cut outs in the floor slab of the switchgear room shall be provided.

There will also be construction of a transformer bay, cable overhead feeder, transformer incoming feeder, station supply feeder and line bay to Jabana among others.

## **6.2 Plant Design**

### **Details of 110kV Equipment**

#### **Busbar Arrangement**

- The busbar shall be made of Al tubes 120mm of diameter, wall thickness 10mm; an aluminium damp cable of 329 mm<sup>2</sup> shall be inside. The spacing between 2 busbar supports shall be about 11 m. The busbar shall be complete with expansion joints, clamps, etc. Rated short circuit current 1s shall be 31.5kA, rated current shall be 2,500A,
- Flexible connections to switchgear, other equipment shall be made by All Aluminium Conductor (AAC), conductor size 593 mm<sup>2</sup>.
- Rigid conductors interconnecting switchgear and other equipment by aluminium tube of external diameter 80 mm and internal diameter of 70 mm complete with expansion joints where appropriate.
- Shield wire type Aluminium Conductor Steel Reinforced (ACSR), denomination 7/5 AWG, nominal cross section 117.4 mm<sup>2</sup> complete with all necessary hardware.

#### **110/15kV Transformer Bay**

- one (1) power transformer 110/15kV, 20MVA
- one (1) busbar disconnector, outdoor, 3-pole, rotary type or horizontal centre-break, 1,250 A, manually gang-operated and motor drive
- three (3) current transformers, outdoor, 120-240/1/1/1 A
- one (1) circuit-breaker, 3-pole, 1,250A, 31.5 kA rated short time withstand current (3s), with motor drive 110 V DC

#### **110kV Line Bay Jabana**

- one dead end tower and foundation, line insulators and all necessary accessories
- one (1) busbar disconnector, outdoor, 3-pole, rotary type or horizontal centre-break, 1,250 A, manually gang-operated and motor drive
- three (3) current transformers, outdoor, 100-200/1/1/1 A, tapping on secondary side
- one (1) circuit-breaker, 3-pole, 1,250A, 31.5 kA rated short time withstand current (3s), with motor drive 110 V DC
- terminal cubicle for all low voltage cable (command, control and protection)
- overhead line gantry
- dismantling of the existing suspension tower
- temporary connexion of the still 70 kV line coming from Jabana to the line going to Gasogi at Birembo site for the whole duration of the erection works in Birembo concerning the new substation.

#### **110/70kV 10MVA Auto-Transformer Bay**

- one 110/70 kV, 15MVA (30 Tons) Auto-Transformer to be shifted from Jabana substation, commissioning tests as for a new one



### 110kV side

- one (1) busbar disconnecter, outdoor, 3-pole, rotary type or horizontal centre-break, 1250 A, manually gang-operated and motor drive
- one (1) circuit-breaker, 3-pole, 1250A, 31.5 kA rated short time withstand current (3s), with motor drive 110 V DC
- three (3) current transformers, outdoor, 50-100/1/1/1 A
- three (3) lightning arresters, outdoor, 110 kV, 20 kA discharge current, with discharge counters
- post insulators, outdoor,
- terminal cubicle for all low voltage cable (command, control and protection)

### 70kV side

The transformer bay shall include a 70kV part connecting the autotransformer to the overhead line 70kV.

- three (3) lightning arresters, outdoor, 70 kV, 20 kA discharge current, with discharge counters
- three (3) current transformers 110(70)kV, outdoor, 100-200/1/1/1 A
- one (1) circuit-breaker, 3-pole, 1250A, 31.5 kA rated short time withstand current (3s), with motor drive 110 V DC

The transformer foundation shall be designed for a 110/15kV, 20MVA power transformer as foreseen in the other transformer bay. The Technical Data for 70kV Equipment will be the same as for 110kV Equipment except the lightning arresters and the voltage transformers

### Details of 15 (30) kV Equipment

15 kV indoor arrangements with a double busbar system with the following data:

- Rated Current Busbar 2,500 A
- Rated Short Circuit Withstand Current common for all equipment 25 kA (3 sec)

### Transformer Feeder Incoming

- two (2) three pole three position switch 1,600 A
- one (1) three pole circuit breaker 1,600 A, 25kA
- three (3) current transformers 400- 800/1/1/1 A
- three (3) plug-in surge arresters, 10 kA, discharge class 3

### Cable / Overhead Line Feeder

- two (2) three pole three position switch 1,250 A
- one (1) three pole circuit breaker 1,250 A, 25kA
- three (3) current transformers 200-400/1/1/1 A
- cable compartment for plug-in SF6/ cable sealing ends for three single core cables

### Station Supply Feeder

- two (2) three pole three position switch 1,250 A
- one (1) three pole circuit breaker 1,250 A, 25kA
- three (3) current transformers 5-10/1/1/1 A
- cable compartment for plug-in SF6/ cable sealing ends for three single core cables
- low voltage compartment with control and protection equipment as specified

### Bus Coupler

- two (2) three pole three position switch 1,600 A

- one (1) three pole circuit breaker 1,600 A, 25kA
- three (3) current transformers 1,200/1/1/1 A

### **Control, Supervision and Protection Control and Protection Panels**

One set of four (4) combined control and protection panel for 110 kV bays, complete with:

- micro-processor controlled Bay Control Unit (BCU) as per specification section 6.2
- key-lockable selector switch for control positions LOCAL-OFF-REMOTE (may be included in BCU)

These control and protection panels shall house all relevant equipment as specified.

### **Voltage Regulation Panels**

One (1) transformer tap-changer and voltage control cubicle for the new 110/15 kV transformer. The cubicle shall be arranged such as to incorporate the tap changer control unit for the second transformer and the related transformer parallel operation module.

Above voltage regulation panels shall be equipped with the following equipment for each transformer:

- one automatic numerically controlled voltage regulator
- one numerically controlled parallel operation control unit, if not included in the voltage regulator
- control selector switch (positions: AUTO-MANUAL-REMOTE)
- tap-change control switch for 2 push-buttons for operation of the tap changer for RAISE/LOWER
- one digital tap position indicator
- one voltmeter with spread scale and with selector switch 0-R-Y-B

## **6.3 Project In Puts, Outputs and Wastes Generated**

The aim of the project is to step down electricity from the HV lines to MV and then distribute to the households and institutions in Kigali. However in the process the principle of input-output applies. The input of the project as mentioned earlier include, transformer oil and water for use by the staff in the substation. The output will be the stepping down of the electricity for consumption by the residents of Kigali.

It is estimated that 16,000 litres of transformer oil will be required for the transformers to begin operation and this will be topped up whenever the concentration is low.

Water use in the plant by the staff will be from the ELECTROGAZ pump station in Mazira. 10 staff members are expected to reside in the staff quarters and will use approximately 500 litres of water on a daily basis.

### **Wastes Generated**

The main wastes from the process include; during construction the waste generated will mainly be construction debris including paper, scrap metals, pieces of rods, packaging material etc. All these will be disposed by the contractor in an acceptable site(s) in Kigali city or recycled for instance the scrap metal.

At the operation phase the wastes below will be generated namely;

1. Waste water from general cleaning and washing of the plant, domestic use within the plant constitutes the other only set of liquid wastes that will be generated during the operation phase of the plant. The waste water will be channelled into the existing storm water drain and sewage line.

2. General solid waste materials from the staff quarters and the plant for example domestic household wastes, papers, etc will be generated and disposed through the collection by waste providers to the dumping site in Kigali.

## **6.5 Project Operations and Management**

As described in chapter one of this report, UERP/PCU through ELECTROGAZ will contract a company to install generators for the purposes of producing electricity to be connected to the existing grid. Upon commission of the plant, the contracted firm will hand over the plant and its operations back to ELECTROGAZ.

# 7.0 BIREMBO SUB STATION - ENVIRONMENTAL IMPACTS

This chapter address the potential adverse impacts of the construction and installation of the Birembo substation. In this report, environmental impacts are defined in totality to mean, socio-economic, cultural, physical as well as biological. The chapter is structured into two parts one describing positive impacts of the development and the second part addressing the adverse impacts of the project on the environment.

The project being a national development agenda in the energy sector has immense benefits that could save the country losses in terms of power rationing and frequent outages. However poor planning of the project could also affect the environment that supports millions of Rwandese through the project potential hazards that the project could pose to the public, pollution of water resources and atmospheric resources.

## 7.1 Positive Impacts

Positive impacts of these project are various and diverse in nature. They range from employment opportunities, to wealth creation, industrialization, improvement in service delivery to technology transfer and capacity building.

### 7.1.1 Socio-economic Benefits

The impacts of the project on socioeconomic development of the people in the area include additional electricity for the region, provision of conditions for rational and effective use of natural resources in the country, creation of new jobs for related services and direct workers, and acceleration of the investment process in the region.

#### **Employment Opportunities**

On employment the project expects to employ local casual and skilled labor on-site. Approximately 200 workers will be employed over a period of 18 months which is the projected construction phase. UERP has no control over who will be employed by the contractor but will advise the contractor to consider using workers from the project area and women. This is exclusive of indirectly employed people who will provide support and related services including those trading in foodstuff for the workers on site and construction personnel during the site preparation phase of the project.

#### **Electricity**

The substation will ensure increased access to electricity to the residents of Kigali city and it environs which will be good for economic development and other benefits associated with the availability of electricity.

### 7.1.2 Environmental Benefits

The existence of Birembo substation and the eventual distribution of electricity to the local communities and population will ease the pressure on the use of fuel wood that is rampant in the city and in effect would help to conserve the fragile and diminishing forest cover of the country by providing an alternative source of energy.

## **7.2 Adverse Impacts**

Adverse impacts of the Birembo Substation are those unintended effects of the project that have negative impacts to sustainable development and the environment.

### **7.2.1 Impacts on Physical Environment**

#### **Land Acquisition/Compensation**

In order to construct the substation, land will definitely have to be identified (suitable site) and thereafter acquired.

#### **Size of Land expected to be Acquired**

The project will only acquire approximately 2.9 ha of the existing land area for which is currently under different uses and separately owned by four individuals one of the owners being a church.

#### **Land Use Type**

The land to be acquired is being utilized in different ways that vary in nature and include:

- Settlement/Shelter
- Livestock Keeping
- Crop Growing
- Church/Worship premise by the Seventh Day Adventist

In terms of compensation, the construction activities will lead to the acquisition of land, destruction of crops and vegetation found in the proposed site including:

- Avocado trees
- Tomato
- Orange trees
- Mango trees
- Grevillea
- Pepper
- Ficus Trees
- Eucalyptus Trees
- Euphorbia Trees
- Flowers
- Cassava
- Euphorbia live fence
- Maracuja
- Cactus tree
- Lemon trees
- Papaya trees

#### **Mitigation**

There will be compensation for the land to be acquired as well as the crops that will be destroyed to pave way for construction in accordance with the already prepared and approved ARAP.

#### **Fugitive Dust**

Fugitive dust may be emitted from construction works and stock piles of materials including machinery as well as from truck traffic. This could cause health related impacts to the communities around and workers in the project site.

The diesel power construction machinery and vehicles will also have other air quality impacts.

### **Mitigation**

- The dirt roads and exposed construction areas should be moisturised during the dry season to prevent or minimise the fugitive dust emissions.
- Installation of speed bumps and speed limit signs to reduce speed of construction equipments capacity to blow dust
- Proper location of material stockpiles, especially sand and soil downwind from the commercial, residential and other establishments will be required; Frequent wetting of the stockpile and working area; screening of or providing wind breaks for stockpiles;
- Diesel powered construction equipment and vehicles should be well maintained to minimise tailpipe emissions; Covering of trucks; and proper selection of equipment and control of speed limits in construction area.
- Workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry.

### **Soil Erosion**

During the construction phase, activities involving preparation, stripping, grading, soil removal, backfilling, compacting, disposal of surplus and excavation of the earth surface to pave way for the installation of the thermal power plant will lead to fugitive dust emission and accelerate soil erosion and run off.

Another impact of the project on soil and geology will be compaction, soil erosion and increased runoff. The compaction will prevent infiltration of surface water to the ground. This impact will only occur on site where compaction will be done.

### **Mitigation**

- To prevent soil erosion during site preparation, disturbed soils should be compacted immediately. Development of storm water drains around the site should prevent erosion occurring on the site.
- Wind blown erosion is to be prevented by soil compaction and wetting the ground to prevent rising of soil particles.
- The final site grade should include an adequate drainage channel that should facilitate drainage and avoid flooding and pooling. A site drainage plan should be developed to protect against erosion. Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.
- Borrow areas (if any) should avoid agricultural areas; borrow areas should be reworked to blend into the surroundings. Re-vegetation should be performed using local plants. All slopes and working surfaces should be returned to a stable condition

### **Vehicular Emission**

During the construction phase of the thermal power plant, increased use of heavy equipment and machinery like trucks, and excavators will cause increased vehicular emission (CO<sub>2</sub>) in the atmosphere and will cause to some extent some form of atmospheric pollution. This impact though is expected to last only and up until

the construction phase which will take 18 months. However the use of motorised equipment like trucks, excavators, tippers and tractors that release emissions will only be for a period of 6 months.

#### **Mitigation**

- Install vehicles with emission reduction gadgets to reduce the quantities of emissions.
- Ensure that the vehicles are regularly services and properly maintained so as to reduce emissions.

#### **Visual Impacts**

The construction works for the installation of the substation and associated civil works is likely to cause visual impacts in the immediate surrounding.

#### **Mitigation**

Construction of lower profile structures, Use of less visible colors to fence off the site, planting of screening vegetation around the plant boundary and proper design of the stack and dispersion characteristics

#### **Noise Pollution**

The machinery and equipment that will be used to undertake different civil works during the construction phase of the plant will cause noise pollution in the immediate surrounding of the project area. The impact is expected to last only during the construction phase (18 months) and will be short term in nature and not very significant. The equipment and machines that will be used during the construction are mainly excavators and trucks and these do not normally generate noise to levels that would be of concern or harmful to the residents. It is only the operators of these equipment and workers who will be affected by the impacts from the construction equipment and for this reason PPEs will be provided.

#### **Mitigation**

- Noise emitting equipment should comply with the applicable Rwanda standards and World Bank noise standards.
- Construction traffic off-site will not contribute significantly to noise levels on public highways because roads leading to the site already have very heavily traffic.- The Kigali-Kinyinya-Deutsche Welle road is a major tarmac road with a lot of traffic already.
- Noisy equipment will be operated only during daytime. World Bank environmental regulations allow a maximum 45-55 dB noise level at the boundary of a construction area when the area is zoned as residential. This facility will only emit 39 decibels along the plant boundary during operation phase hence the impacts will be insignificant to the residents as already mentioned above.
- All workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry but not limited to facilities to protect against noise impacts, safety helmets, boots, dust masks, gloves, overall, goggles, helmets etc.
- Workers and personnel operating equipments and machinery producing incessant noise and vibration should stick to no more than 5 hours a day in handling of equipment and machinery.

#### **Destruction of vegetation cover/crops**

The project area is present with a variety of crops including Avocado trees, Tomato, Orange trees, Mango trees, Grevillea, Pepper, Ficus Trees, Eucalyptus Trees, Euphorbia Trees, Flowers, Cassava, Euphorbia live fence, Maracuja, Cactus tree, Lemon trees, Papaya trees among others as well as a few scattered

trees. These crops and trees will inevitably have to be removed to pave way for the construction of the substation.

### **Mitigation**

This impact is unavoidable and UERP/PCU will compensate for the crops that will be damaged as a result of the construction activities. The area will also be landscaped by replanting and replacing the few trees that will be destroyed in the process of construction works.

### **Accidents/Hazards**

As a result of the operation of equipment and machinery, there is a likelihood of accidents occurring especially to the workers when operating the equipments on and off the site.

### **Mitigation**

- All workers need to be provided with the recognised and appropriate Personal Protective Equipment while at the construction site including gloves, dust masks, boots, goggles, and overalls among others.
- ONLY competent workers and staff should be allowed to operate any machinery and equipment to reduce the incidents of accidents.
- During the construction the project site should be completely sealed off and warning signs erected informing the general public to keep off the construction site when construction is in progress.
- Personal protection gear must be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures. Training given to the employees should be backed by regular on- site training in safety measures.
- No ENTRY signs should be installed to keep away unqualified workers from access to restricted areas.
- The contractor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.
- The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the construction.

### **Increased Traffic/Road Accidents**

It is expected that during the construction, an increase in traffic along the Kinyinya-Deutsche Welle road will be experienced along the road and more specifically closer to the construction site because of the several vehicles that will be getting in and out of the construction site. This increased vehicle movement will increase the general traffic of the area which is already heavy and is likely to cause traffic congestion. Also the area could experience road accidents owing to the increased traffic.

### **Mitigation**

The entire heavy vehicles that is likely to cause traffic congestion when delivering goods in the construction yard should provide these services during traffic off peak hours to reduce traffic congestion.



To reduce potential road accidents, there is need to erect speed bumps closer to the project area and warning signs limiting the speed when approaching the construction site.

- Install advance warnings and traffic signs indicating on going construction and heavy machinery frequently using the area. Install speed bumps to warn other road users of on going construction and also to reduce speed when approaching the area.
- Transport of heavy goods likely to congest traffic should be undertaken during off-peak times to reduce congestion
- Full time vigilance at the site during construction
- Request for the support of traffic police officers prior to construction works to control the traffic
- Adherence to road load cargo bearing capacity for Rwanda

### **Storage and treatment of solid waste**

Solid waste materials during the construction include paper wrapping, scrap metal, excavated soils, polythene, plastic and metal containers will cause pollution and littering of the immediate and localized environment.

### **Mitigation**

- ELECTROGAZ and contractor should develop a solid waste disposal plan which includes the provision of receptacles at strategic points within the construction site, recycling programmes for recyclable wastes, separation of wastes.
- The ELECTROGAZ and the contractor should engage a refuse handling company to remove the wastes from the site to the recommended dumping site.
- Warning signs against littering and dumping within the construction site should be erected by the contractor.
- The contractor must construct toilets for use in the site during the construction which must be connected to the existing sewer line.

### **Fire Hazards/Accidents**

During the construction phase the chances of fire hazards occurring cannot be overlooked due to the use of combustible machinery and equipment in undertaking the construction works.

### **Mitigation**

- A robust fire prevention program and fire suppression system should be developed by the contractor. **(A draft fire suppression plan is attached herewith but needs further refinement by the UERP and the contractor who must carry out a vulnerability assessment before refining this plan into a final suppression program).**
- The construction site must contain fire fighting equipments of recommended standards and in key strategic points all over the site. Fire pumps, Hydrants, Sprinkler/water spray systems, Hose houses, Dry chemical systems, -alternative systems, Carbon dioxide systems, Detection/alarm systems, Portable fire extinguishers among others.

- A fire evacuation plan must be posted in various points of the construction site including procedures to take when a fire is reported
- All workers must be trained on fire management and fire drills undertaken regularly.

### 7.2.2 Adverse Impacts

The following adverse impacts are anticipated to occur during the operation phase of the substation plant.

#### Noise Pollution

Generally during operation of sub stations the only source of noise that can be considered adverse is from the transformers. The typical noise in decibels that emanate from this type of transformers will not exceed 39 decibels within the plant boundary according to international best practise design. Therefore, the residents around the project site will not be impacted by the noise from this plant. However, the workers operating the plant will experience noise impacts during plant operations and mitigation measures are described below. Annex 1 of this report details the ambient noise levels required by the bank.

From above figure, noise limits on the table below for various land uses, the project will not exceed the levels as specified on the World Bank standards below.

#### World Bank Maximum Noise Levels

Location/Zone	Day	Night
Residential, educational or institutional area	55 dB(A)	45 dB(A)
Industrial or commercial area	70 dB(A)	70 dB(A)

#### Mitigation

- The equipment should be designed and enclosed in an acoustic enclosure to limit noise to 39 decibels (A), and thereby meet World Bank requirements. Workers in close proximity to this equipment would be required to use hearing protection.
- All equipment and machinery installed MUST be tested to verify if they are compliant with the World Bank acceptable standards of noise as contained in the World Bank PPAH 1998. The tested noise levels should be recorded as baseline and used for future monitoring.
- All workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry but not limited to facilities to protect against noise impacts, hearing protection etc.
- Personal protection gear will be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear to handle noise impacts.
- Training given to the employees should be backed by regular on- site training in safety measures.

#### Oil spills Occurrences

Oil spills could occur during the transport, unloading and transfer of the fuel used for the transformer to the site and during storage. Approximately 16,000 litres of transformer oil is needed as a start up in running the transformers and cooling the plant.

## Mitigation

- Need to design appropriate protection devices against accidental discharge of toxic substances
- Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment (dikes) to prevent spills and the contamination of soil, ground and surface water
- A retention area should be designed that surrounds the fuel storage tanks;
- The plant operator should provide containers for the storage of chemical and lubricating products
- A spill and emergency response plan would be developed and put in place prior to commencement of construction. **(Annex 3, 4, and 5 of this report is a draft response plan for further refinement by the ELECTROGAZ/UERP).**
- A written emergency response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill.
- All waste oils and lubricants from maintenance of construction equipment should be segregated and disposed properly in accordance with REMA requirements for disposal of this type of waste.

## Solid waste pollution and littering

Wastes generated from the operation of the plant will include wastewater, used oil, solid waste including oil filters, papers etc.

## Mitigation

- ELECTROGAZ and contractor should develop a solid waste disposal plan which includes the provision of receptacles at strategic points within the construction site, recycling programmes for recyclable wastes, separation of wastes.
- ELECTROGAZ and contractor should engage a refuse handling company to remove the wastes from the site to the recommended dumping site within Kigali city
- Warning signs against littering and dumping within the construction site should be erected by the contractor.

## Accidents at the work place from operating of machineries and equipment by workers

The potential for accidents and hazards occurring in the substation during the operation of the equipment and machinery is a likely adverse impact that could lead to loss of life or injury to the workers.

## Mitigation

- All workers entering the construction site must be equipped with PPE including goggles, factory boots, overalls, gloves, dust masks, among others. The PPE should be those that meeting the international standards of PPE.
- Personal protection gear will be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid

storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures.

- Training given to the employees should be backed by regular on- site training in safety measures.
- No ENTRY signs should be installed to keep away unqualified workers from access to restricted areas.
- Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.
- The contactor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.
- The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the operation.
- A perimeter fence should be erected all around the project site to keep the place secure and ward of any unauthorised persons.

#### Fire risk

##### Mitigation

- A robust fire prevention program and fire suppression system should be developed by the contactor. **(A draft fire suppression plan is contained in annex 4 of this report but needs further refinement by ELECTROGAZ who must carry out a vulnerability assessment before refining this plan into a final suppression program).**
- The site must contain fire fighting equipments of recommended standards and in key strategic points all over the site. Fire pumps, Hydrants, Sprinkler/water spray systems, Hose houses, Dry chemical systems, Carbon dioxide systems, Detection/alarm systems, Portable fire extinguishers among others.
- A fire evacuation plan must be posted in various points of the construction site including procedures to take when a fire is reported.

### 7.2.3 Project Decommissioning

Decommissioning of the plant will involve shutting down the substation, removing the structures from site, dismantling the supporting infrastructure and all those structures that were not on site before the project implementation.

Some of the impacts of this project phase are similar to those that have been discussed during construction and operational phase.

But there are those impacts that are specific to project decommissioning after the project life is over. After the project decommissioning, the proponent will be required to rehabilitate the site to its former status or near what it was before the project was commissioned. ELECTROGAZ will be responsible for preparing the decommissioning plan because it is the proponent and as specified by the Organic Law, the project proponent remains responsible for this. As per the regulations of REMA the proponent will bear the costs for decommissioning and site rehabilitation.

# 8.0 PUBLIC DISCLOSURE AND CONSULTATION PROCEDURE

Public consultation and dialogue was held during the previous EIA study with the following persons with an aim of ensuring that the stakeholder views and comments are used to inform the decision making and guide the EIA study in terms of scope. They include:

## **List of people consulted**

1. Mr. KAMALI Sylvestre Land Owner
2. Mrs. NYIRAHITIMANA Land Owner
3. Mr. NSANZABAGANWA Straton Land Owner
4. Seventh Adventist Church Land Owner
5. BIZIMANA Emmanuel, Secretary General of the Kigali City Council
6. Theobald Mashinga Director of Compliance and Enforcement REMA
7. Jean Pierre Mutsinzi-UERP/PCU Manager
8. Jeane Gisana UERP/PCU Finance Manager
9. Frank Muvunyi-UERP/PCU Procurement Officer

All the project affected persons have been compensated in accordance with the RPF and an ARAP prepared detailing the compensation and resettlement process. This ARAP has been approved by World Bank and REMA and advertised locally and in the infoshop.

# 9.0 ENVIRONMENTAL MANAGEMENT PLAN FOR BIREMBO SUBSTATION

## 9.1 Environmental Mitigation and Management Measures

An Environmental Management Plan (EMP) has been developed for this project and will be implemented by UERP/PCU and the relevant implementing agencies namely Ministry of Infrastructure (MININFRA), Rwanda Environmental Management Authority (REMA), RURA, and ELECTROGAZ.

This EMP defines the measures needed to prevent, minimize, mitigate, or compensate for adverse impacts, and to improve environmental performance while ensuring compliance with applicable environmental standards during the planning and design phase, construction and operation and eventual decommissioning of the sub station at the Birembo site.

The recommendations for main environmental mitigation measures include waste management and disposal planning, soil erosion mitigation, noise abatement measures, fire suppression as well as the purchase of necessary emergency response equipment. These mitigation measures are being incorporated in the project design and are already included in the tender documents for procurement of the equipments.

In order to develop institutional capacity in implementing and enforcing the EMP, training should be provided with adequate budgets to ensure satisfactory achievement of sound environmental performance. The training proposed here should include capacity building and training in environmental assessment, environmental mitigation plans, and environmental monitoring. In some cases, it may be appropriate to include the staff from the environmental implementation agencies, such as REMA, and other relevant ministries involved in the implementation of the UERP.

Training and capacity building will be vital in implementing the EMP especially ELECTROGAZ staff who will be responsible for primarily ensuring that mitigation and monitoring of the key activities are followed. The proposed training will target relevant UERP, ELECTROGAZ, REMA, RURA and MININFRA staff and will entail training in monitoring and evaluation, impact mitigation and internal self environmental audit.

### Development of internal tracking/monitoring system

The Environmental Advisor is in the process of developing a participatory computer based monitoring and tracking sheet that will be used to monitor the mitigation of the adverse impacts of the project. The tracking sheet will use Microsoft Access program application and upon its completion, all the implementing agencies for UERP will be trained on how to use this tool to monitor compliance.

## 9.2. Responsibility of Institutions in Implementing the EMP

The company that will be awarded the contract to construct and install Birembo substation will remain the key responsible institution for undertaking the mitigation measures proposed as well as the monitoring activities/measures associated with this mitigation plan. The other institutions mainly ELECTROGAZ, REMA, UERP/PCU, etc. will be solely involved in supporting the monitoring to ensure compliance. The tender documents clearly specify the mitigation measures that the contractor must institute during construction phase to minimise adverse impacts.

Upon successful installation, commissioning and handing over of the substation to ELECTROGAZ by the contractor, ELECTROGAZ shall henceforth become the sole and lead institution responsible for ensuring proper mitigation measures and monitoring as indicated in the EMP document is followed. However the contractor will provide one technical advisor for a period of one year to provide capacity building support in all the related management and maintenance field.

Specifically in Monitoring and Evaluation the following institutions will play the following roles namely;

### **9.2.1 Roles of Rwanda Environment Management Authority (REMA):**

#### Oversight Monitoring

As the lead agency responsible for the protection of environment in Rwanda, REMA will play the leading oversight role of monitoring the activities of the project according to the legislation establishing REMA and its functions.

#### Site Inspection Visits

REMA will undertake regular site visits to inspect and verify for themselves the nature and extent of the impacts. They will then be expected to make viable recommendations based on their findings to the EA, World Bank, UERP and ELECTROGAZ. REMA is mandated by the Organic Law to conduct period visits and site inspections at will in any facility in Rwanda. They have a budget for this type of work, they have conducted visits for other projects and it is expected that they will continue providing this regulatory and enforcement role in this project.

#### Periodic Reports

REMA will prepare periodic environmental consolidated reports on the monitoring progress of the substation plant and submit to the proponent in this case ELECTROGAZ as required and stipulated by the Organic Law.

### **9.2.2 Role of the Contractor**

#### Daily and Routine Monitoring

The company that will be awarded the contract to construct the Birembo substation will undertake the major role of ensuring the mitigation measures in the EMP are followed to the detail during construction phase.

During construction the contractor will undertake regular monitoring of all the activities occurring in the project site to ensure compliance to the EMP.

The contractor will bear all the costs related to monitoring activities during the construction and installation phase of the substation.

### **9.2.3 Role of the Environmental Adviser/UERP**

The UERP/PCU assisted by the Safeguards Advisor will undertake regular monitoring of all their planned activities during all the phases of the project as specified in the EMP document.

The Safeguards Advisor will assist the UERP/PCU to develop suitable records of the site inspections and visits for submission to REMA and the World Bank. This will involve efforts towards building the capacity of the UERP/PCU towards this end as well.

The Safeguards Advisor will also be responsible for assisting in building capacity of the UERP/PCU in monitoring the impacts and mitigation measures resulting from the action of the contractors, transporters and suppliers and all third parties in the course of their duties under the project.

### **9.2.4 Kigali Fire Brigade**

#### Site Inspection

During the construction and installation of equipments in the project area, the Kigali Fire Brigade which is the agency responsible for fire management in the City Kigali will undertake site inspection to verify if a fire management plan is in place before construction works begin. Thereafter upon commissioning of the project, this agency will further ascertain that the correct fire management equipments as stipulated in the fire response plan are in place and in the right points.

#### Fire Drills

The EMP provides for regular fire drills preferably once annually. The overall objective is to ensure that there is a high level of preparedness against fire outbreaks at all times. ELECTROGAZ will organise its own fire drills but efforts will be made to bring on board the Kigali Fire Brigade depending on resource availability and if the brigade is available to conduct these drills.

### **9.2.5 World Bank**

#### Approval

The World Bank will provide approval to the final EMP and RAP for the Birembo substation developed before construction activities begin. This approval will only be given if the World Bank is satisfied with the EMP and RAP developed.

### **9.2.6 Role of ELECTROGAZ**

#### Routine Monitoring

ELECTROGAZ will provide routine monitoring at all the stages of the project implementation as indicated in the EMP. More specifically during the operation phase of the plant, ELECTROGAZ will be the main responsible institution for undertaking all the mitigation and monitoring requirements in the EMP.

## **9.3 Clarification of Responsibilities Related to Monitoring**

### **9.3.1 Contractor**

The contracted company will be solely responsible for ensuring that monitoring and adherence to the EMP beginning from the construction phase up to the point where they install the substation and it is commissioned. Thereafter their responsibility to the project monitoring ceases henceforth. However, the contractor will for a period of one year provide one technical person to provide capacity building support in all the related management and maintenance field.

### **9.3.2 UERP/PCU**

The UERP PCU will provide oversight monitoring of the project in accordance with the EMP up until the 4 year life span of the project. Upon the end of the project duration, the UERP PCU will no longer be responsible for any monitoring activities associated with the project thereafter.

### **9.3.4 ELECTROGAZ**

ELECTROGAZ will remain the sole institution that will fundamentally be responsible for undertaking monitoring through out the project phase, when the contractor hands over the project and also after the UERP PCU winds up as a project. ELECTROGAZ will be expected to ensure monitoring through out the project phase until if it gets decommissioned.



## PLANNING AND DESIGN PHASE

Activity/Adverse Impacts	Mitigation Measure(s)	Implementation Schedule	Responsible Person(s)	Cost Estimates
<p><b>Land Acquisition</b></p> <p><i>Conflict over land acquisition, ownership and compensation</i></p> <p>Dispute and possible conflict over the land identified can arise owing to forced eviction, and absence of compensation and dialogue with the PAPs.</p>	<p>Ensure that the land identified for the project is acquired as per the requirements of the Government of Rwanda and World Bank guidelines in relation to land acquisition, resettlement and compensation.</p> <p>Involve and meaningfully engage the PAPs, general public including administration, and local/traditional leaders in the transparent acquisition of the land.</p> <p>Utilize the RPF document available and develop RAP to be used in acquisition of the land.</p>	Before Construction works begin	<p><u>UERP/PCU</u> Safeguards Advisor ELECTROGAZ REMA</p>	Costs are reflected in the RAP and will be met by ELECTROGAZ
<p><b>Site Selection</b></p> <p><i>Inappropriate/incompatible site selected.</i></p> <p>Poor selection of project site for the plant can cause conflict over environmental degradation including the destruction of sensitive ecosystems and or protected areas</p>	<p>Do not select sites that trigger any of the World Bank's Operational policies on: Natural Habitats; Forestry; Cultural Property.</p> <p>Do not select land that contravenes the regulations of the Government of Rwanda in relation to natural resources and sensitive ecosystems</p> <p>Do not select land that will trigger concerns in relation to international convention on environment and natural resources.</p> <p>Undertake detailed EIA study on selected site</p>	Before Construction works begin (Already performed Task)	<p><u>ELECTROGAZ</u> Safeguards Advisor <u>UERP/PCU</u> REMA World Bank</p>	No costs involved

Activity/Adverse Impacts	Mitigation Measure(s)	Implementation Schedule	Responsible Person(s)	Cost Estimates
<p><b>Plan Designs</b></p> <p><i>Poor designs of plans, inadequate equipment and machinery specification.</i></p> <p>Inadequate and poor designs and plans including equipments and machinery can possibly cause environmental degradation.</p>	<p>Ensure during planning and design to incorporate environmental sound design concepts as appropriate.</p>	<p>Before Construction works begin</p>	<p><b>Safeguards Advisor</b> <u>UERP/PCU</u> <u>ELECTROGAZ</u></p>	<p>No costs involved</p>
	<p>All designs, equipment and machineries to be procured should include instructions on their environmental specifications and requirements.</p>	<p>Before Tender is advertised and Tender Documents dispatched to selected bidders</p>		
	<p>All instructions or planning for civil, mechanical, engineering and electrical specifications including technical specifications must have stringent environmental obligations in accordance with the World Bank guidelines, international or local guidelines whichever emerges as stringent in terms of environmental and social requirements.</p>	<p>(Already performed Task)</p>		

## CONSTRUCTION PHASE

Activity/Adverse Impacts	Mitigation Measures	Implementation Schedule	Cost	Responsibility
<p><i>Removal/destruction of all vegetation from the project site./Site Clearing/Civil Works/Earth Moving</i></p> <p><i>Site earthworks activities include, but not limited to, site preparation, clearing, stripping, grading, soil removal, backfilling, compacting, disposal of surplus, landscaping, shoring as required and final site clean-up.</i></p> <p>Likely to cause increased soil run off hence erosion and sediment load in the canal from the excavation and civil works.</p> <p>Soil erosion and degradation from borrow sites.</p>	Vegetation cover available that will be destroyed should be replaced by landscaping and replanting of trees and grass when construction is complete.	During the construction and to continue after completion of construction into the operational phase.	Minor and to be met by contractor	<b>Contractor</b> <b>UERP/PCU</b> <b>REMA</b> <b>ELECTROGAZ</b> <b>Safeguards</b> <b>Advisor</b>
	While few trees could be affected by the site work, no trees should be cut that do not interfere with the site work, and any cleared wood should be made available to local residents.			
	The final site grade should facilitate drainage and avoid flooding and pooling. A site drainage plan should be developed to protect against erosion. Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.			
	Installation of drainage ditches, construction of runoff and retention ponds is necessary. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.			
	Borrow areas (if any) should avoid agricultural areas; borrow areas should be reworked to blend into the surroundings. Re-vegetation should be performed using local plants. All slopes and working surfaces should be returned to a stable condition.			
	Topsoil on the final site would be graded and planted as appropriate.			
<p><i>Dust Emissions from Equipments/On site processes</i></p> <p>Fugitive dust may be emitted from construction</p>	The dirt roads and exposed construction areas should be moisturised during the dry and windy season to prevent or minimise the fugitive dust emissions.	Watering to be undertaken regularly during the construction and when it is dry and	Minor and to be met by contractor	<b>Contractor</b> <b>UERP/PCU</b> <b>REMA</b> <b>ELECTROGAZ</b>

works and stock piles of materials including machinery as well as from truck traffic. This could cause health related impacts to the communities around and workers in the project site.		dusty		Safeguards Advisor
	Installation of speed bumps and speed limit signs to reduce speed of construction equipments capacity to blow dust	PPE should be available before construction works begin.		
	Install heavy duty muffler systems on heavy equipment and vehicles			
	Proper location of material stockpiles, especially sand and soil downwind from the commercial, residential and other establishments will be required; Frequent wetting of the stockpile and working area; screening of or providing wind breaks for stockpiles;			
	Diesel powered construction equipment and vehicles should be well maintained to minimise tailpipe emissions; Covering of trucks; and proper selection of equipment and control of speed limits in construction area.			
	Workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry but not limited to safety helmets, boots, dust masks, gloves, overall, goggles etc.			
<b><i>Noise and Vibrations from Equipment Operation</i></b> Noise from construction activity may be significant.	Substation construction works will be carried out during daylight hours. If power outages are required, it may be necessary to carry out some works at night or weekends. In such cases, the local population will be informed sufficiently in advance through local media.	During the construction and to continue after completion of construction into the operational phase.	Minor and to be met by contractor	<b><u>Contractor</u></b> UERP/PCU REMA ELECTROGAZ Safeguards

<p>Although the relevant Government of Rwanda noise standard is not likely to be exceeded during the construction period, construction noise may nevertheless be disturbing but localized especially only to the workers and personnel on the project site during construction</p>	<p>All workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry but not limited to facilities to protect against noise impacts, safety helmets, boots, dust masks, gloves, overall, goggles etc.</p> <p>Workers and personnel operating equipments and machinery producing incessant noise and vibration should stick to no more than 5 hours a day in handling of equipment and machinery. They should also be provided with a pint of milk everyday and a supervisor should be available to oversee these requirements.</p> <p>Plant trees to create a noise buffer zone</p>			<p>Advisor</p>
<p><b>Storage and management of Wastes</b> generated from construction and demolition activities</p> <p>Solid waste materials during the construction include paper wrapping, scrap metal, excavated soils, polythene, metals, wood, concrete, etc will cause pollution and littering of the immediate and localized environment.</p>	<p>Wastes to be sorted and placed in temporary storage on-site. Subsequently, removed by licensed contractors for disposal at government- approved sites, or sold for reprocessing to companies with legitimate operating permits.</p> <p>Contractor should develop a solid waste disposal plan which includes the provision of receptacles at strategic points within the construction site, recycling programmes for recyclable wastes, separation of wastes.</p> <p>Warning signs against littering and dumping in wrong places within the construction site should be erected by the contractor</p> <p>The contractor must construct toilets for use in the site during the construction which must be connected to the existing sewer line.</p>	<p>During the construction and to continue after completion of construction into the operational phase.</p>	<p>Minor and to be met by contractor</p>	<p>Contractor UERP/PCU REMA ELECTROGAZ Safeguards Advisor</p>

<i>Harmful and dangerous material</i>	Temporary storage on-site at a location that is specially prepared to receive these materials (impervious base, fenced and locked with only authorized access etc.) and removed by firms with valid license recognized by the REMA	During the construction and to continue after completion of construction into the operational phase.	Minor and to be met by contractor	<u>Contractor</u> UERP/PCU REMA ELECTROGAZ Safeguards Advisor
<i>Accidents at work place during construction from operating of machineries and equipment by workers</i>	<p>All workers entering the construction site must be equipped with PPE including goggle, factory boots, overalls, gloves, dust masks, among others. The PPE should be those that meeting the international standards of PPE.</p> <p>Personal protection gear must be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures. Training given to the employees should be backed by regular on- site training in safety measures. Fence the site to keep away intruders.</p> <p>No ENTRY signs should be installed to keep away unqualified workers from access to restricted areas.</p> <p>Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.</p> <p>The contractor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.</p> <p>The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the construction.</p>	During the construction and to continue after completion of construction into the operational phase.	Minor and to be met by contractor	

<i>Fire Hazards/Accidents</i>	A robust fire prevention program and fire suppression system should be developed by the contractor.	Before the construction and to continue after completion of construction into the operational phase.	Minor and to be met by contractor	<u>Contractor</u> UERP/PCU REMA ELECTROGAZ Safeguards Advisor  Kigali Fire Brigade
	The construction site must contain fire fighting equipments of recommended standards and in key strategic points all over the site. Fire pumps, Hydrants, Sprinkler/water spray systems, Hose houses, Halon systems, Dry chemical systems, Halon-alternative systems, Carbon dioxide systems, Detection/alarm systems, Portable fire extinguishers among others.			
	A fire evacuation plan must be posted in various points of the construction site including procedures to take when a fire is reported.			
	All workers must be trained on fire management and fire drills undertaken regularly.			
<i>New equipment</i>	New equipment is not to contain any PCBs.	During the construction and to continue after completion of construction into the operational phase.	Minor and to be met by contractor	
<i>Traffic Disruption congestion and or Road Accidents</i>	Install advance warnings and traffic signs indicating on going construction and heavy machinery frequently using the area. Install speed bumps to warn other road users of on going construction and also to reduce speed when approaching the area	Before the construction and to continue after completion of construction into the operational phase.	Minor and to be met by contractor	<u>Contractor</u> UERP/PCU REMA ELECTROGAZ Safeguards Advisor
	Transport of heavy goods likely to congest traffic should be undertaken during off-peak times to reduce congestion.			
	Full time vigilance at the site during construction Request for the support of traffic police officers prior to			

	construction works to control the traffic			
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\* Items indicated to be the responsibility of the contractor have been specified in the bid documents

## OPERATION PHASE

Activity/Adverse Impacts	Mitigation Measure (s)	Implementation Schedule	Cost	Responsibility
<p><b>Noise and Vibration</b></p> <p>There will be no significant noise levels resulting from operation of the Substation that can be harmful to workers and adjacent local communities.</p>	<p>All equipments and machinery installed MUST be tested to verify if they are compliant with the World Bank acceptable standards of noise emissions. The tested noise levels should be recorded as baseline and used for future monitoring</p>	<p>During the commissioning of the plant, to continue during the operation phase on a regular basis</p>	<p>Minor and to be met by contractor</p>	<p><u>Contractor</u></p> <p>UERP/PCU</p> <p>REMA</p> <p>ELECTROGAZ</p> <p>Safeguards Advisor</p>
	<p>Noise emitting equipment should comply with the applicable Rwanda and World Bank noise standards and should be properly maintained. The Rwanda/World Bank environmental regulations allow a maximum 75 Db noise level at the boundary of an area.</p>			
	<p>Considering the existing background noise level, the operations activity during daytime is not expected to seriously affect the noise level in areas adjacent to the construction site.</p>			
	<p>All workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry but not limited to facilities to protect against noise impacts, hearing protection etc.</p>			



	Personal protection gear will be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear to handle noise impacts.			
<i>Electric and magnetic field strength at ground level</i>	Any new equipment purchased shall limit electromagnetic field levels to within Rwanda standards and/or in accordance with good international practices	During Tower Design	Minor and to be met by contractor	<b>Contractor</b> UERP/PCU REMA ELECTROGAZ Safeguards Advisor
	Tower heights will be designed and built to International Electric Commission (IEC) standards to assure ground level electric and magnetic fields meet standards: E ≤ 5kV/m B≤ 100mT			
<i>Soil and subsoil</i>	All new equipment will be placed upon impervious bases with bunding high enough to contain any liquid spills or with channelling of spills to other safe, temporary depository	During Construction	Minor and to be met by contractor	
<i>Accidents at the work place from operating of machineries and equipment by workers</i>	All workers entering the construction site must be equipped with PPE including goggle, factory boots, overalls, gloves, dust masks, among others. The PPE should be those that meeting the international standards of PPE.	On going /continuous activity to start during the construction phase all the way to the operational phase of the project.	Minor and to be met by contractor	
	Personal protection gear will be provided and its use made compulsory to all. The entire workforce of the substation should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures.			
	Training given to the employees should be backed by regular on- site training in safety measures.			
	No ENTRY signs should be installed to keep away unqualified workers from access to restricted areas.			

	Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.			
	The contractor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.			
	The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the operation.			
	Ensure that tender documents explicitly specify procurement of equipment free from concentrations of PCBs as per the specifications of the Stockholm Convention on PoPs.			
<i>Risks of contamination by the Polychlorobiphenyles (PCBs)</i>	Inspect all the shipped equipments to verify concentrations of PCBs.	To be verified upon arrival of the equipments.	Minor and to be met by contractor	<u>Contractor</u> UERP/PCU REMA ELECTROGAZ Safeguards Advisor
	Transformers or equipment having PCBs should not be installed.			
<i>Fire risk</i>	A robust fire prevention program and fire suppression system should be developed by the contractor. (A draft fire suppression plan is attached herewith but needs further refinement by the contractor who must carry out a vulnerability assessment before refining this plan into a final suppression program).	The fire response plan should be developed before construction begins and used through out the operations of the plant.	Minor and to be met by contractor	<u>Contractor</u> UERP/PCU REMA ELECTROGAZ Safeguards Advisor Kigali Fire Brigade
	The site must contain fire fighting equipments of recommended standards and in key strategic points all over the site. Fire pumps, Hydrants, Sprinkler/water spray systems, Hose houses, Dry chemical systems, Carbon dioxide systems, Detection/alarm systems, Portable fire extinguishers among others.			
	A fire evacuation plan must be posted in various points of the construction site including procedures to take when a fire is			

	reported.			
<i>Right-of-way (ROW) land clearance</i>	Clearance of the area to be performed by manual and/or mechanical means-that there will be no pesticide use Any Wood should be sold locally, vegetative scrap trucked to local official municipal disposal site	Before construction works begin	Minor and to be met by contractor	
<i>ROW erosion control</i>	Any Steep slopes will have minimal clearance of vegetation and replanted as a priority	Before construction works begin	Minor and to be met by contractor	

\* Items indicated to be the responsibility of the contractor shall be specified in the bid documents

### DECOMMISSIONING PHASE

Activity/Adverse Impacts	Mitigation Measure(s)	Monitoring Program/Indicators	Implementation Schedule	Responsible Person(s)	Cost Estimates
Waste Debris from Equipments and Machines when substation is dismantled.	Ensure all the machines and equipment are disposed in the right places	Site supervision during the decommissioning	During decommissioning	ELECTROGAZ	All costs related to decommissioning will be met by ELECTROGAZ
Noise and dust impacts during the dismantling	Apply the noise reduction /mitigation impacts specified in the construction phase of the project	Site supervision during the decommissioning	During decommissioning	ELECTROGAZ	All costs related to decommissioning will be met by ELECTROGAZ
Accidents during decommissioning including oil spills	Apply the accidents reduction /mitigation impacts specified in the construction phase of the project	Site supervision during the decommissioning	During decommissioning	ELECTROGAZ	All costs related to decommissioning will be met by ELECTROGAZ

## **9.4 Monitoring Protocol for Birembo Sub Station**

### **9.4.1 Monitoring Plan**

A detailed environmental monitoring plan has been developed to verify that predictions of environmental impacts are accurate and that unforeseen impacts are detected at an early stage and allow corrective measures to be implemented, if needed. During the construction phase the plan provides for dust, noise and safety monitoring.

During the operation period, monitoring is planned in terms of routine inspection of the health and safety of the workers. The Monitoring Plan is developed is presented at the end of this report as part of the EMP.

### **9.4.2 Responsibilities and Costs for Environmental Mitigation Measures**

Table below outlines the overall package of environmental mitigation measures that will be implemented in relation to the facility as outlined in detail in the EMP document. The table also assigns general responsibilities for implementing each group of mitigation measures. A detailed implementation schedule has also been developed.

Consistent with the UERP/PCU and World Bank's contracting strategy of integrating environmental protection and mitigation activities into the Contractor's Scope of Work, the specifications for many of the activities were included in the bid package upon which the Contractor is developing its base rates. Therefore, since many of the costs associated with environmental protection and mitigation activities are included in the Contractor's base rates, it is not possible to present a detailed accounting of all the monies devoted to the project's construction phase environmental protection and mitigation activities. These costs are therefore described as 'Within contract budget' in Table below. Similarly, mitigation or monitoring measures that will be carried out by ELECTROGAZ staff, with no additional expenditure required, are described as 'Within operational budget' in Table below.

## Construction Phase

<b>What</b> <i>Parameter to be Monitored</i>	<b>Where</b> <i>is the parameter to be monitored?</i>	<b>How</b> <i>is the parameter to be monitored/ type of monitoring equipment?</i>	<b>When</b> <i>is the parameter to be monitored frequency of measurement or continuous?</i>	<b>Monitoring Cost</b> <i>What is the cost of equipment or contractor charges to perform monitoring</i>	<b>Responsibility</b>
Worker health	At construction site	Visual: Worker wearing Equipment	Weekly: random times	Minor	Construction Contractor
Dust levels		Dust visible	Weekly, more frequently during dry, windy weather	Minor	
Noise	At construction site	dB meter	Weekly or if there are local complaints	Minor	Construction Contractor
Machinery engine emissions	At construction site	Visual: Examine engine exhaust Certification	Equipment first comes to project site	Minor	Construction Contractor
Building Demolition waste materials transport and disposal	At construction site	Visual: Trucks covered or watered	Weekly: Random times Weekly	Minor	Construction Contractor
	At disposal site	Material properly deposited		Minor	Construction Contractor

Access road construction	Equipment and material delivery routes	Visual: Existing roads used	Weekly	Minor	Construction Contractor
Disruption of local traffic patterns	Roads at or near construction site	Visual: Alternate routes clearly indicated	Monthly	Minor	Construction Contractor

\* Items indicated to be the responsibility of the contractor shall be specified in the bid documents

## Operation Phase

What Parameter to be Monitored	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>	When <i>is the parameter to be monitored frequency of measurement or continuous?</i>	Monitoring Cost <i>What is the cost of equipment or contractor charges to perform monitoring</i>	Responsibility
Electric and magnetic field strength at ground level	Lowest cable point under connector line, and edge of ROW	Electrometer	Once	Minor	ELECTROGAZ

- Items indicated to be the responsibility of the contractor shall be specified in the bid documents

- *\*\* In the EMP and Monitoring tables above the principal responsible party for each mitigation is underlined. However, in any EMP no single party has overall mandate over mitigation and monitoring. The rest of the parties mentioned will be responsible for undertaking oversight monitoring and enforcement as is the case with REMA and this is why they have all been included\*\*.*

### 9.4.3 Capital cost related activities

The table below provides a summary of the capital (one off) costs that will be incurred by either the contractor or Electrogaz during monitoring. The costs to be met by the contractor in ensuring mitigation will be contained in the final bid document and for this reason cannot be reflected in this table at this point in time.

The costs for resettling and compensating the PAPs will be met by UERP/ELECTROGAZ and is contained in the separate Abbreviated Resettlement Acton Plan already developed as a separate document.

Activity	Estimated Cost in (USD)	Cost to be met by
Compensation for displaced persons or destroyed crops and vegetation	This cost is reflected in the ARAP which is has already been developed and approved by the bank	90, 751, 815.00 RFW
Mitigating Impacts of civil construction related works	Within Contractor's Budget. The costs associated to mitigating the impacts of the construction activities will be met by the contractor.	Contractor
<b>TOTAL CAPITAL COSTS-Excluding contractors cost.</b>	<b>90, 751, 815.00</b>	

### 9.4.4 Recurring cost related activities

Reccuring costs imply costs that will be met by Electrogaz either on annual or monthly basis. At this point in time, the costs related to replacement of new PPE will largely depend on the rate of wear and tear, however initial cost is estimated as 5,000.00 USD as indicated below.

Cost related to maintenance of the fire equipment will be met bi annually and costs towards solid waste disposal will be monthly though out the project life.

Activity	Estimated Cost in (USD)	Cost to be met by
Procurement of PPE for ELECTROGAZ staff	5,000 and costs to be incurred depending on the rate of wear and tear of the PPE.	ELECTROGAZ
Procuring services of Solid Waste Disposal Company	500.00 per month	ELECTROGAZ
Regular Maintenance of Fire Equipment	2,000.00 after every 6 months	ELECTROGAZ
<b>Total Recurring Costs</b>	<b>7,500.00</b>	

**\*\*N/B**

- 5,000 USD for PPE is based on cost estimated provided by ELECTROGAZ staff following incurred costs in other power plants or sub stations. The cost is recurrent and spread over 4 years. It is not related to monitoring but to mitigation costs.
- The maintenance of fire equipment is going to be the responsibility of ELECTROGAZ. The contractor will hand over the plant to the client after commissioning and would only retain 1 expert if agreed with ELECTROGAZ for a period of one year to offer technical advice after which the plant



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will be fully operated and managed by ELECTROGAZ. According to the contract, the client does not provide financial resources and support for maintenance instead the contractor only offers technical support.

- ELECTROGAZ will outsource this services related to OHS training.

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# 10.0 CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, the project is environmentally and socially viable with minimal adverse environmental impacts. Being an emergency project, most of the impacts will be short term with low magnitude confined within the project site.

Some of the impacts are inevitable and can only be minimised due to inadequate or lack of effective technology. If the Environmental Management is implemented, the impacts of the project will either be eliminated or minimised to a manageable and sustainable levels.

## **10.1 Recommendations**

The contractor should develop an Emergency Response Plan (ERP) for the plant after undertaking a vulnerability assessment for the plant.

When decommissioning the project, the proponent should rehabilitate the site to its former status.

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## REFERENCE

1. Bikwemu G, 2001: The types of the swamps of Rwanda. MINIAGRI
2. ELECTROGAZ/UERP, 2005: Tender document for construction of substations. 6. Technical Specification
3. Rwanda Energy Policy 2004.
4. Institute of the energy and the environment of the French speaking countries, 1999-2000: Environmental Assessment. Networks of E7 appraisal for the Global environment.
5. MINITERE: Organic Law carrying management and protection of the environment, the law N° 4/2005 of April 8, 2005
6. MINITERE: Organic Law carrying regime fundamental N°08/2005 of the 14/07 /2002
7. REMA EIA Regulations and Guidelines 2006.
8. UERP, 2004: Environmental and Social Management Framework
9. UERP, 2004: Resettlement Policy Framework
10. World Bank, 1999 Manual on environmental assessment. Policies, procedures and sectoral guidelines.
11. World Bank, December 2004: UER Project appraisal document

# ANNEXE

## ANNEX 1. Ambient Noise

Noise abatement measures should achieve either the levels given below or a maximum increase in background levels of 3 decibels (measured on the A scale) [dB (A)]. Measurements are to be taken at noise receptors located outside the project property boundary. For this project noise levels of 55 during the day and 45 at night will be used because the area is a mix of residential and institutional.

Receptor	Maximum allowable log Equivalent (hourly Measurements), in dB (A)	
	Day (07:00–22:00)	Night (22:00–07:00)
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70

## INSTITUTIONAL REQUIREMENTS AND MONITORING

ELECTROGAZ will undertake environmental monitoring to ensure that the construction and operation of the Birembo substation complies with high environmental standards and the requirements of the environmental legislation applicable in Rwanda and the policies and guidelines by World Bank.

Annual monitoring reports arising from the monitoring activities will be made available to REMA and World Bank and others as requested and appropriate. If any standards have been exceeded, the operator will investigate probable causes and if any are traced to the operation of the plant, remedial measures will be implemented to restore compliance.

ELECTROGAZ will submit to World Bank and REMA an annual report containing the summary of the

- (i) Monitoring results for the noise levels
- (ii) Copies of all permits, licenses, and clearances related to the environment and safety issued by the relevant government agencies; and
- (iii) In the event that in the reporting period the project has been cited for violation of any environmental or safety regulations, the report will include a certification from the relevant government agency that the defect has been corrected or an acceptable plan to correct the defect has been approved.

Monitoring data will be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Records of monitoring results will be kept in an acceptable format. The results will be reported in summary form, with notification of exceptions, if any, to the responsible government authorities and relevant parties, as required. In the absence of specific national or local government guidelines, actual monitoring or surrogate performance data will be reported at least annually.

## **ANNEX 2. EQUIPMENT TECHNICAL SPECIFICATIONS**

### **Noise Measurement Kit with Calibrator**

The NM 102 Sound Level Meter is available as part of a Noise Measurement Kit, order code NM102-K, which includes:

- Sound Level Meter
- Sound Level Calibrator
- Wind Shield
- Hard Carrying Case (for all items)
- Soft Carrying Case (for meter)
- Batteries for Meter and Calibrator
- Manual for Meter and Calibrator

### **Specifications**

Display	4 Digit LCD with black and white, update rate 0.5s
Indicators	Low battery, frequency and time weighting, min/max
Resolution/Accuracy	0.1dB/1.5 Db (ref 94 dB@ 1 kHz)
Frequency Range	31.5 Hz to 8 kHz
Level Range	30 to 130 Db (A), 35 to 130 Db (C)
Frequency Weighting	A and C
Microphone	1/2" electret condenser
Time Weighting	Fast (125ms) and Slow (1s)
Dynamic Range	50 Db
Battery	One 9V battery supplied
Battery Life	About 50 hours (alkaline battery)
Temp. & Humidity	5 C to 40 C, BELOW 80% RH
Dimensions	8" X 2.1" X 1.5", 6 ounce (inc. battery)

### **NoiseMeters USA**

14781 Memorial Drive, Suite # 2174

Houston, TX 77079, USA

Email: [info@noisemeter.com](mailto:info@noisemeter.com)

### **ANNEX 3. EMERGENCY RESPONSE PLAN FOR PROPOSED PLANT**

The construction and installation including the operation of the proposed Birembo substation is expected to trigger the likelihood of potential incidences which require the need for the development of an Emergency Response Plan to arrest such incidences whenever and if they occur.

This is a framework of how the emergency response plan for the sub station is expected to look and is by no way the actual response plan. It is expected that the winning company to be awarded the contract of constructing the substation will develop a comprehensive response plan which will be guided by a vulnerability assessment for which the company will have to undertake. This emergency response plan has incorporated separate sections handling responses to fire hazards in the plant including steps for reporting incidences.

#### **Why develop an Emergency Response Plan?**

An ERP is a definite plan to deal with major emergencies in any enterprise and in effect is an important element in all thermal power plants and programs. Besides the major benefit of providing guidance during an emergency, developing the plan has other advantages. Unrecognized hazardous conditions that would aggravate an emergency situation may be uncovered, allowing them to be eliminated. The planning process may bring to light deficiencies, such as the lack of resources (equipment, trained personnel, supplies), items that can be rectified before an emergency occurs. In addition an emergency plan promotes safety awareness and shows the organization's commitment to the safety of workers.

The lack of an emergency plan could lead to severe losses such as multiple casualties and possible financial collapse of the organization.

An attitude of "it can't happen here" may be present. People may not be willing to take the time and effort to examine the problem. However, emergency planning is an important part of company operation.

Since emergencies will occur, preplanning is necessary to prevent possible disaster. An urgent need for rapid decisions, shortage of time, and lack of resources and trained personnel can lead to chaos during an emergency. Time and circumstances in an emergency mean that normal channels of authority and communication cannot be relied upon to function routinely. The stress of the situation can lead to poor judgment resulting in severe losses.

#### **What is the overall objective of this plan?**

This emergency plan specifies procedures for handling sudden unexpected situations. The objective is to reduce the possible consequences of the emergency by:

- Preventing fatalities and injuries;
- Reducing damage to buildings, stock, and equipment; and
- Accelerating the resumption of normal operations.
- Development of the plan begins with a vulnerability assessment. The results of the study will show:
  - How likely a situation is to occur
  - What means are available to stop or prevent the situation and
  - What is necessary for a given situation

From this analysis, appropriate emergency procedures can be established. At the planning stage, it is important that several groups be asked to participate. Among these groups, the setting up of a joint occupational health and safety committee can provide valuable input and a means of wider worker involvement. Appropriate municipal officials should also be consulted since control may be exercised by the local government in major emergencies and additional resources may be available. Communication, training and periodic drills will ensure adequate performance if the plan must be carried out.

## **Vulnerability assessment**

Although emergencies by definition are sudden events, their occurrence can be predicted with some degree of certainty. The first step is to find which hazards pose a threat to any specific enterprise. When a list of hazards is made, records of past incidents and occupational experience are not the only sources of valuable information. Since major emergencies are rare events, knowledge of both technological (chemical or physical) and natural hazards can be broadened by consulting with fire departments, insurance companies, engineering consultants, and government departments.

The company to be contracted will be expected to undertake a comprehensive vulnerability assessment for the Birembo substation project site. The hazards identified here are merely the common hazards associated with substations. They are classified into two categories mainly:

### **Technological hazards**

Areas where flammables, explosives, or chemicals are used or stored should be considered as the most likely place for a technological hazard emergency to occur. Examples of these hazards are:

- Fire
- Explosion
- Major structural failure
- Spills of flammable liquids
- Accidental release of toxic substances
- Loss of electrical power

### **Natural Hazards**

- Floods,
- Earthquakes,
- Other severe wind storms,
- Severe extremes in temperature

### **What is the series of events or decisions that should be considered?**

Having identified the hazards, the possible major impacts of each should be itemized, such as:

- Sequential events (for example, fire after explosion)
- Evacuation
- Casualties
- Damage to plant infrastructure
- Loss of vital records/documents
- Damage to equipment
- Disruption of work

Based on these events, the required actions are determined. For example:

- Declare emergency
- Sound the alert
- Evacuate danger zone
- Close main shutoffs
- Call for external aid
- Initiate rescue operations
- Attend to casualties
- Fight fire

The final consideration is a list and the location of resources needed:

- Medical supplies
- Auxiliary communication equipment
- Power generators
- Respirators
- Chemical and radiation detection equipment
- Mobile equipment
- Emergency protective clothing
- Fire fighting equipment
- Ambulance
- Rescue equipment
- Trained personnel

### **Elements of the emergency plan to be developed by the contractor**

The emergency plan should include;

- All possible emergencies, consequences, required actions, written procedures, and the resources available
- Detailed lists of personnel including their home telephone numbers, their duties and responsibilities
- Floor plans, and
- Large scale maps showing evacuation routes and service conduits (such as gas and water lines).

Since a sizable document will likely result, the plan should provide staff members with written instructions about their particular emergency duties.

The following are examples of the parts of an emergency plan. These elements may not cover every situation in every workplace but serve they are provided as a general guideline when writing a workplace specific plan:

#### **Objective**

The objective is a brief summary of the purpose of the plan; that is, to reduce human injury and damage to property in an emergency. It also specifies those staff members who may put the plan into action. The objective identifies clearly who these staff members are since the normal chain of command cannot always be available on short notice. At least one of them must be on the site at all times when the premises are occupied. The extent of authority of these personnel must be clearly indicated.

#### **Organization**

One individual should be appointed and trained to act as Emergency coordinator as well as a "back-up" coordinator. However, personnel on the site during an emergency are key in ensuring that prompt and efficient action is taken to minimize loss. In some cases it may be possible to recall off-duty employees to help but the critical initial decisions usually must be made immediately. Specific duties, responsibilities, authority, and resources must be clearly defined. Among the responsibilities that must be assigned are:

- Reporting the emergency
- Activating the emergency plan
- Assuming overall command
- Establishing communication
- Alerting staff
- Ordering evacuation
- Alerting external agencies



- Confirming evacuation complete
- Alerting outside population of possible risk
- Requesting external aid
- Coordinating activities of various groups
- Advising relatives of casualties
- Providing medical aid
- Ensuring emergency shut offs are closed
- Sounding the all-clear

This list of responsibilities should be completed using the previously developed summary of countermeasures for each emergency situation. In organizations operating on reduced staff during some shifts, some personnel must assume extra responsibilities during emergencies. Sufficient alternates for each responsible position must be named to ensure that someone with authority is available onsite at all times.

External organizations that may be available to assist (with varying response times) include:

- Fire department
- Ambulance services
- Police departments
- Telephone company
- Hospitals
- Utility companies
- Government agencies

These organizations should be contacted in the planning stages to discuss each of their roles during an emergency. Mutual aid with other industrial facilities in the area should be explored. Pre-planned coordination is necessary to avoid conflicting responsibilities. For example, the police, fire department, ambulance service, rescue squad, company fire brigade, and the first aid team may be on the scene simultaneously.

A pre-determined chain of command in such a situation is required to avoid organizational difficulties. Under certain circumstances, an outside agency may assume command.

Possible problems in communication have been mentioned in several contexts. Efforts should be made to seek alternate means of communication during an emergency, especially between key personnel such as overall commander, on-scene commander, engineering, fire brigade, medical, rescue, and outside agencies. Depending on the size of the organization and physical layout of the premises, it may be advisable to plan for an emergency control centre with alternate communication facilities. All personnel with alerting or reporting responsibilities must be provided with a current list of telephone numbers and addresses of those people they may have to contact.

## **Procedures**

Many factors determine what procedures are needed in an emergency, such as

- The degree of emergency,
- The size of organization,
- The capabilities of the organization in an emergency situation,
- The immediacy of outside aid,
- The physical layout of the premises, and
- The number of structures determines procedures that are needed.

Common elements to be considered in all emergencies include pre-emergency preparation and provisions for alerting and evacuating staff, handling casualties, and for containing of the emergency.

Natural hazards, such as floods or severe storms, often provide prior warning. The plan should take advantage of such warnings with, for example, instructions on sand bagging, removal of equipment to needed locations, providing alternate sources of power, light or water, extra equipment, and relocation of personnel with special skills. Phased states of alert allow such measures to be initiated in an orderly manner.

The evacuation order is of greatest importance in alerting staff. To avoid confusion, only one type of signal should be used for the evacuation order. Commonly used for this purpose are sirens, fire bells, whistles, flashing lights, paging system announcements, or word-of-mouth in noisy environments. The all-clear signal is less important since time is not such an urgent concern. The following are "musts":

- Identify evacuation routes, alternate means of escape make these known to all staff; keep the routes unobstructed.
- Specify safe locations for staff to gather for head counts to ensure that everyone has left the danger zone. Assign individuals to assist handicapped employees in emergencies.
- Carry out treatment of the injured and search for the missing simultaneously with efforts to contain the emergency.
- Provide alternate sources of medical aid when normal facilities may be in the danger zone.
- Containing the extent of the property loss should begin only when the safety of all staff and neighbours at risk has been clearly established.

### **Testing and Revision**

Completing a comprehensive plan for handling emergencies is a major step toward preventing disasters. However, it is difficult to predict all of the problems that may happen unless the plan is tested. Exercises and drills may be conducted to practice all or critical portions (such as evacuation) of the plan. A thorough and immediate review after each exercise, drill, or after an actual emergency will point out areas that require improvement. Knowledge of individual responsibilities can be evaluated through paper tests or interviews.

The plan should be revised when shortcomings have become known, and should be reviewed at least annually. Changes in plant infrastructure, processes, and materials used and key personnel are occasions for updating the plan.

It should be stressed that provision must be made for the training of both individuals and teams, if they are expected to perform adequately in an emergency. An annual full-scale exercise will help in maintaining a high level of proficiency.

## **ANNEX 4. FIRE RISKS AND MANAGEMENT PLAN**

ELECTROGAZ, through the Urgent Electricity Rehabilitation Project is in the process of selecting a company to install a substation in Birembo as part of the Urgent Electricity Rehabilitation that is aimed towards alleviating the power problems experienced in Rwanda.

An Environmental Management Plan for the project has been developed to provide a plan for mitigating and monitoring the adverse impacts identified.

Even though the EMP contains measures for mitigating the potential risk of fire occurrences in the substation, the UERP Safeguards Advisor has developed a Fire Risk and Fire Management Plan aimed at setting out an outline of procedures to manage and suppress any fire out breaks that could occur during the functioning of the plant.

This plan is a draft guideline and it is expected that the selected company will refine this plan upon the undertaking of a vulnerability/risk assessment.

This fire safety plan has been developed and will make every effort to comply with and enforce the requirements of the Government of Rwanda Fire Code, and all other statues, policies, protocol, procedures and instructions as may be issued by the Kigali Fire Brigade.

The plan is expected to provide for the safety of plant occupants through the elimination and control of fire hazards, maintenance of fire protection and life safety systems, establishment and implementation of fire safety plans, procedures, and inspections of the plant.

The eventual contracted company to install the equipments will be expected to develop a written fire safety plan which is intended to protect occupants from fire and helps to ensure effective evacuation of the building under all emergency conditions.

### **Training**

Fire safety training and emergency evacuation practice drills for workers must be conducted jointly by a competent Security/Fire Safety firm or Kigali Fire Brigade no less than once every twelve months.

### **Emergency Evacuation**

In the event of fire or other emergencies that require emergency evacuation of the plant, the procedures contained in this Fire Safety Plan shall be carried out upon refinement by the contractor.

### **Emergency Procedures for Occupants**

Emergency procedures signage should be affixed to the wall at all key strategic points within the substation.

Note: It should be mandatory to evacuate the substation upon sounding of the Fire Alarm.

### **Upon Discovery of Fire:**

- Leave the fire area immediately and close all doors
- Activate the Fire Alarm
- Call the Kigali Fire Brigade
- Leave building via nearest Exit
- Do not return until it is declared safe to do so by a Fire Official

### Upon Hearing Fire Alarm:

- Before opening doors, feel door and doorknob for heat. If they are not hot, brace yourself against the door and open it slightly. If you see smoke, or feel air pressure or a hot draft, close the door quickly.
- Leave building via nearest Exit
- Close all doors behind you

### Fire Alarm Systems

The purpose of the fire alarm system is to alert all occupants to a fire emergency so that evacuation procedures can be initiated. The fire alarm audible devices should be heard throughout the substation. The fire alarm system should consist of the following components:

**Alarm Initiating Devices** – These devices should be installed throughout the plant designed to detect heat, smoke or flame causing an electrical signal to be sent to the Central Control Panel.

**Central Control Panel** – A microprocessor-based device that receives and processes electrical signals from alarm initiating devices located throughout the plant including heat detectors, smoke detectors, manual pull stations, sprinkler system alarm switches, etc, then transmits signals that cause audible and visual alarm devices such as bells, horns, strobe lights, etc to operate.

**Annunciator Panel** – a lighted or graphical display device, located in the main entrance to the plant that indicates the location or zone of the activated initiating device, e.g. detector that has responded to the presence of smoke, heat or flame; or a manual pull station that has been activated by an occupant.

**Signaling Devices** – audible and visual devices (horns and strobe lights) located throughout the building in corridors and rooms to indicate the actuation of the fire alarm system.

### Fire code maintenance requirements

A certified firm should be contracted and made responsible to implement the following schedule of checks, tests & inspections; and will maintain records of tests, inspections and maintenance work performed. Records will be kept in a Fire Log Book at the Physical Plant Office and will be made available to the Chief Fire Official upon request.

#### Required item Daily

Check to ensure that all exit lights are not damaged, are illuminated and clearly legible.

- Check Fire alarm system for indication of trouble in the system.
- Check Fire pump room temperature during freezing weather
- Check that all fire separation doors are kept closed.

#### Weekly

- Check that unsupervised fire protection water supply system control valves are always fully open.
- Check that air pressure on dry pipe sprinkler system is being maintained
- Check Water level in fire pump reservoirs
- Inspect Operate fire pump. The fire pump discharge pressure, suction pressure, Lubricating oil level, operative condition of relief valves, priming water and general operating conditions shall be inspected during the weekly operation of the fire pump.
- Check Hoods, filters and ducts subject to combustible deposits and clean as necessary

## Monthly

- Inspect all portable fire extinguishers
- Check all fire alarm components, including standby power batteries
- Test Fire alarm system
- Test Voice communication to and from floor areas to the central alarm control facility
- Inspect Hose cabinets to ensure hose position and that equipment is in place report deficiencies to Fire Department.
- Check all doors in fire separations
- Test sprinkler alarms using alarm test connection (mechanical signal only)
- Test all components of the emergency power systems, operate the emergency power generator set under at least 30% of rated load for 60 minutes

## Every Two Months

- Test Electrical sprinkler supervisory transmitters and water flow devices

## Every Six Months

- Check and clean crankcase breathers, governors and linkages on emergency generators

## Annually

- Service All portable fire extinguishers
- Test Fire alarm system in accordance with Government of Rwanda- "Inspection and Testing of Fire Alarm Systems".
- Test Fire alarm system voice communication in accordance with Government of Rwanda "Inspection and Testing of Fire Alarm Systems".
- Inspect Hose valves to ensure tightness and to ensure no water leakage
- Inspect remove and re-rack hose and replace worn gaskets
- Inspect Remove plugs or caps on fire department standpipe and hose system connections and inspect the threads for wear, rust or obstruction. Plugs or caps will be secured wrench tight.
- Check exposed sprinkler system pipe hangers
- Check all sprinkler heads
- Inspect remove plugs or caps on fire department sprinkler connections and inspect the threads for wear, rust or obstruction. Plugs or caps will be secured wrench tight.
- Test water flow on wet sprinkler system using most remote test connection
- Test Trip-test dry pipe trip system
- Test Flow of water supply using main drain valve
- Test Fire pump at full rated capacity
- Inspect All fire dampers and flue pipes and clean as necessary

## As Required

- Recharge Extinguishers after use or as indicated by an inspection or when performing maintenance.
- Test hydrostatically test standpipe systems that have been modified, extended or are being restored to use after a period of disuse exceeding one year
- Check All doors in fire separations to ensure that they are closed
- Check to ensure that the fire department sprinkler and standpipe connections are clearly identified and maintained free of obstructions for use at all times

- Check to ensure that fire access routes and access panels or windows provided to facilitate access for fire fighting operations are not obstructed at all times by vehicles, gates, fences, building materials, vegetation, signs or any other form of obstruction
- Check maintain corridors free of obstructions

### **Elimination of Ignition Sources**

All nonessential ignition sources must be eliminated where flammable liquids are used or stored. The following is a list of some of the more common potential ignition sources:

- Open flames, such as cutting and welding torches, furnaces, matches, and heaters-these sources should be kept away from flammable liquids operations. Cutting or welding on flammable liquids equipment should not be performed unless the equipment has been properly emptied and purged with a neutral gas such as nitrogen.
- Chemical sources of ignition such as D.C. motors, switched, and circuit breakers-these sources should be eliminated where flammable liquids are handled or stored. Only approved explosion-proof devices should be used in these areas.
- Mechanical sparks-these sparks can be produced as a result of friction. Only non-sparking tools should be used in areas where flammable liquids are stored or handled.
- Static sparks-these sparks can be generated as a result of electron transfer between two contacting surfaces. The electrons can discharge in a small volume, raising the temperature to above the ignition temperature. Every effort should be made to eliminate the possibility of static sparks. Also proper bonding and grounding procedures must be followed when flammable liquids are transferred or transported.
- The storage of any flammable or combustible liquid shall not physically obstruct a means of egress from the building or area.
- Containers of flammable or combustible liquids will remain tightly sealed except when transferred, poured or applied. Remove only that portion of liquid in the storage container required to accomplish a particular job.

### **Ventilation**

Every inside storage room will be provided with a continuous mechanical exhaust ventilation system. To prevent the accumulation of vapors, the location of both the makeup and exhaust air openings will be arranged to provide, as far as practical, air movement directly to the exterior of the building and if ducts are used, they will not be used for any other purpose.

### **Removal of Incompatibles**

Materials that can contribute to a flammable liquid fire should not be stored with flammable liquids. Examples are oxidizers and organic peroxides, which, on decomposition, can generate large amounts of oxygen.

### **Flammable Gases**

Generally, flammable gases pose the same type of fire hazards as flammable liquids and their vapors. Many of the safeguards for flammable liquids also apply to flammable gases, other properties such as toxicity, reactivity, and corrosivity also must be taken into account. Also, a gas that is flammable could produce toxic combustion products.

## **Location and Marking of Extinguishers**

Extinguishers should be conspicuously located and readily accessible for immediate use in the event of fire. They should be located along normal paths of travel and egress. Wall recesses and/or flush-mounted cabinets should be used as extinguisher locations whenever possible.

Extinguishers should be clearly visible. In locations where visual obstruction cannot be completely avoided, directional arrows should be provided to indicate the location of extinguishers and the arrows will be marked with the extinguisher classification.

If extinguishers intended for different classes of fire are located together, they will be conspicuously marked to ensure that the proper class extinguisher selection is made at the time of a fire. Extinguisher classification markings will be located on the front of the shell above or below the extinguisher nameplate. Markings will be of a size and form to be legible from a distance of 3 feet.

## **Condition**

Portable extinguishers should be maintained in a fully charged and operable condition. They should be kept in their designated locations at all times when not being used. When extinguishers are removed for maintenance or testing, a fully charged and operable replacement unit should be provided.

## **Mounting and Distribution of Extinguishers**

Extinguishers should be installed on hangers, brackets, in cabinets, or on shelves. Extinguishers having a gross weight not exceeding 40 pounds should be so installed that the top of the extinguisher is not more than 3-1/2 feet above the floor.

Extinguishers mounted in cabinets or wall recesses or set on shelves should be placed so that the extinguisher operating instructions face outward. The location of such extinguishers should be made conspicuous by marking the cabinet or wall recess in a contrasting color, which should distinguish it from the normal decor.

Extinguishers must be distributed in such a way that the amount of time needed to travel to their location and back to the fire does not allow the fire to get out of control. OSHA requires that the travel distance for Class A and Class D extinguishers not exceed 75 feet. The maximum travel distance for Class B extinguishers is 50 feet because flammable liquid fires can get out of control faster than Class A fires. There is no maximum travel distance specified for Class C extinguishers, but they must be distributed on the basis of appropriate patterns for Class A and B hazards.

## **Emergency Egress**

Every exit should be clearly visible, or the route to it conspicuously identified in such a manner that every occupant of the building will readily know the direction of escape from any point. At no time should exits be blocked. Any doorway or passageway which is not an exit or access to an exit but which may be mistaken for an exit should be identified by a sign reading "Not An Exit" or a sign indicating its actual use (i.e., "Storeroom"). Exits and accesses to exits should be marked by a readily visible sign. Each exit sign (other than internally illuminated signs) should be illuminated by a reliable light source providing not less than 5 foot-candles on the illuminated surface.

## **Fire Drills**

The purpose of the fire drill is to ensure that supervisory staff and occupants are totally familiar with emergency evacuation procedures, resulting in orderly evacuation with efficient use of exit facilities.

The Kigali Fire Brigade should oversee the fire drill and direct designated supervisory personnel to carry out the requirements of the Fire Safety Plan. All designated supervisory personnel should be provided access to the approved Fire Safety Plan prior to being assigned any fire related duties/responsibilities.

The drill should be reported to the Fire Department prior to commencement, in accordance with "Required Procedures for the Conducting of Fire Drills". The fire drill should include, but not necessarily be restricted to:

- Checking of the annunciator panel
- Identifying the alarm source/location (the elevators are not to be used)
- Reviewing the fire alarm systems, silence and re-set procedures.
- Reviewing the Fire Safety Plan documents required By the Fire Code
- Practicing the emergency evacuation plan

Following each drill, all persons with delegated responsibility should attend a debriefing session to report on the actions and the reactions of the participants. The Plant Manager should keep a record of the date of the drill, who directed the drill, what actions were taken, any problems with supervisory personnel and what corrective actions can be taken.

Information regarding the fire drills and Fire Code maintenance tasks should be entered in the **Fire Log Book** for inspection by the Chief Fire Official, if requested, and kept at the plant Reception Desk.



## **ANNEX 5. INCIDENTS REPORTING SYSTEM AND INVESTIGATION PROCEDURE**

### **Introduction**

The Incident Reporting System should be designed to:

1. Track and analyze employee injuries and illnesses, property and machinery damage, as well as serious events or near misses which might have resulted in personal injury, illness, or property and machinery damage
2. Initiate the worker's compensation process, if necessary
3. Meet regulatory reporting requirements

All incidents (accidents resulting in injury or causing illness to employees) and events (near-miss accidents) should be reported in order to:

- Establish a written record of factors, which cause injuries and illnesses and occurrences (near-misses), which might have resulted in injury or illness but did not, as well as property and machinery damage.
- Maintain a capability to promptly investigate incidents and events in order to initiate and support corrective and/or preventive action.
- Provide statistical information for use in analyzing all phases of incidents and events involving personnel.
- Provide the means for complying with the reporting requirements for occupational injuries and illnesses

The Incident Reporting System requirements apply to all incidences involving personnel arising out of or in the course of employment, which results in (or might have resulted in) personal injury, illness, and/or property and machinery damage.

### ***A. Incidents (Occupational injuries and illnesses)***

Injuries and illnesses that require reporting include those injuries and illnesses occurring on the job which result in any of the following: lost work time, restrictions in performing job duties, requirement for first aid or outside medical attention, permanent physical bodily damages, or death. Examples of "reportable injuries and illnesses include, but are not limited to, heat exhaustion from working in hot environments, strained back muscles from moving equipment, acid burns on fingers, etc.

Other incidents requiring reporting include those incidents occurring on the job which result in any of the following: injury or illness, damage to a machine, fire/explosion, property damage or chemical releases requiring evacuation of at least that immediate spill area. Examples of reportable incidents include denting the fender of machines/equipment, and release of pressurized air through a leaking valve into a room.

Examples of "non-reportable" injuries and illnesses include small paper cuts, common colds, and small bruises not resulting in work restrictions or requiring first aid or medical attention. Examples of other non-reportable incidents include, but are not limited to, dropping and breaking an empty glass sample bottle.

## *B. Events (Near Misses)*

Other incidents which, strictly by chance, do not result in actual or observable injury, illness, death, or property damage required to be reported. The information obtained from such reporting can be extremely useful in identifying and mitigating problems before they result in actual personal or property damage.

Examples of near miss incidences required to be reported include the falling of a compressed gas cylinder, overexposures to chemical, biological, or physical agents (not resulting in an immediately observable manifestation of illness or injury), and slipping and falling on a wet surface without injury.

## **Personnel Responsibilities**

All personnel have a responsibility to report all occupational injuries and illnesses, and other incidents or events under the Incident Reporting System.

### *A. Committee of Health and Safety*

OHS has the overall responsibility for implementing the Incident Reporting System, including review of incident/event reports, recommendation of corrective and/or preventive actions, and maintaining record keeping required by the regulations.

### *B. Supervision*

Supervisors are primarily responsible for ensuring that the Incident Report and appropriate workers compensation forms are completed and distributed as indicated on the forms in a timely manner.

### *C. Personnel*

All employees must be familiar with the procedures for reporting occupational injuries and illnesses and hazardous conditions or situations in which employees may be potentially exposed. All personnel have the responsibility to initiate the incident reporting sequence by informing their supervisors immediately of an actual or potential injury or illness as soon as possible after an incident has occurred.

## **Incident Reporting Procedures and Practices**

This section describes the specific procedures that shall be followed by personnel in order to effectively report occupational injuries and illnesses and other incidents or events.

### *A. Incidents (Injuries and Illnesses)*

Serious injury or illness posing a life-threatening situation should be reported immediately to the local emergency response medical services (Call 911).

Injuries and illnesses should be reported by the injured employee to his or her supervisor in person or by phone as soon after any life-threatening situation has been addressed. If the injured employee is unable to report immediately, then the incident should be reported as soon as possible.

### *B. Events*

Incidents not involving injury or illness, but resulting in property damage, must also be reported on within 48 hours of the incident. In cases of a fire or explosion that cannot be controlled by one person, vehicular accident resulting in injury or damage, or a chemical release requiring a building evacuation, the involved party must immediately report the incident to the emergency response services in the area (911 - police, fire, etc.) If injuries or illnesses occur, the reporting must follow those procedures outlined in above.

All near miss incidences are also required to be reported on the Incident Report Form within 48 hours of occurrence. In place of indicating the result of the incident (i.e., actual personal or property damage), the reporting person shall indicate the avoided injury or damage. Events, hazardous working conditions or situations, and incidents involving contractor personnel must be reported to OHS immediately.

### ***C. Record keeping***

OHS will maintain the required and summary of (recordable) Occupational Injuries and Illnesses and the Supplementary Record of Occupational Injuries and Illnesses for each calendar year.

## **Incident Investigations**

OHS personnel should review each reported incident and event to:

1. Determine if further investigation is required and then perform the investigation
2. Make recommendations for corrective and/or preventative actions necessary to reduce or eliminate hazardous conditions and monitor the status of the abatement actions.

## **Health and Safety Manual**

Each new employee should be given a copy of the Health and Safety Manual upon starting employment. This manual describes health and safety programs and is available to the employee as a reference dealing with health and safety issues.

## **Training**

To ensure that personnel are cognizant of the Incident Reporting System requirements and are aware of their own and other's responsibilities, a series of informational and instructional training opportunities should exist. Personnel new to the plant should attend New Employee Orientation training, which will inform them on organizational structure, resources, and procedures. This orientation will ensure that new personnel are aware of the existence of this Manual and of its contents, and who the responsible persons in their organizations are.

## **Review and Audit**

The effectiveness of a program can only be accomplished if the program is implemented. Therefore, periodic reviews and audits should be conducted to confirm that all employees have obtained a copy of this Manual and are familiar with the incident reporting requirements. Furthermore, review and auditing should include an inspection of report submissions and filing systems.

## **Implementation**

Implementation of the Incident Reporting System should be effected through a combination of mechanisms. The general theme of these means is focused on program education, understanding, and awareness which include:

1. Distribution of the Health and Safety Manual
2. Training for supervisors
3. Program review and audit

## **ANNEX 6. GENERAL ENVIRONMENTAL MANAGEMENT CONDITIONS**

This section describes the general environmental management conditions to be observed and complied with during the construction of the sub station. These general conditions have been presented here but are also expected to be included in the construction contract with the aim of guiding the contractor on the conditions to comply with. It is expected that the procurement department of the UERP/PCU will include this section as an attachment to the construction contract.

- In addition to these general conditions, the Contractor shall comply with any specific Environmental Management Plan (EMP) for the works he is responsible for. The Contractor shall inform himself about such an EMP, and prepare his work strategy and plan to fully take into account relevant provisions of that EMP. If the Contractor fails to implement the approved EMP after written instruction by the Supervising Engineer (SE) to fulfil their obligation within the requested time, the Owner reserves the right to arrange through the SE for execution of the missing action by a third party on account of the Contractor.
- Notwithstanding the Contractor's obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an EMP. In general these measures shall include but not be limited to:
  - (a) Minimize the effect of dust on the surrounding environment resulting from earth mixing sites, asphalt mixing sites, dispersing coal ashes, vibrating equipment, temporary access roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity dust producing activities.
  - (b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.
  - (c) Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. In as much as possible restore/rehabilitate all sites to acceptable standards.
  - (d) Upon discovery of ancient heritage, relics or anything that might or believed to be of archeological or historical importance during the execution of works, immediately report such findings to the SE so that the appropriate authorities may be expeditiously contacted for fulfillment of the measures aimed at protecting such historical or archaeological resources.
  - (e) Implement soil erosion control measures in order to avoid surface run off and prevents siltation, etc.
  - (f) Ensure that garbage, sanitation and drinking water facilities are provided in for construction workers.
  - (g) Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.
  - (h) Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.

- The Contractor shall indicate the period within which he/she shall maintain status on site after completion of civil works to ensure that significant adverse impacts arising from such works have been appropriately addressed.
- The Contractor shall adhere to the proposed activity implementation schedule and the monitoring plan / strategy to ensure effective feedback of monitoring information to project management so that impact management can be implemented properly, and if necessary, adapt to changing and unforeseen conditions.
- Besides the regular inspection of the sites by the SE for adherence to the contract conditions and specifications, the Owner may appoint an Inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State environmental authority (REMA) may carry out similar inspection duties. In all cases, as directed by the SE, the Contractor shall comply with directives from such inspectors to implement measures required to ensure the adequacy rehabilitation measures carried out on the bio-physical environment and compensation for socio-economic disruption resulting from implementation of any works.

### **Worksite Waste Management**

- All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals shall be banded in order to contain spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable government waste management regulations.
- All drainage and effluent from storage areas, workshops shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.
- Used oil from maintenance shall be collected and disposed off appropriately at designated sites or be re-used or sold for re-use locally.
- Entry of runoff to the site shall be restricted by constructing diversion channels or holding structures such as banks, drains, dams, etc. to reduce the potential of soil erosion and water pollution.
- Construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a daily basis.
- If disposal sites for clean spoil are necessary, they shall be located in areas, approved by the SE, of low land use value and where they will not result in material being easily washed into drainage channels. Whenever possible, spoil materials should be placed in low-lying areas and should be compacted and planted with species indigenous to the locality.

### **Material Excavation and Deposit**

- The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas.
- The location of quarries and borrow areas shall be subject to approval by relevant local and national authorities, including traditional authorities if the land on which the quarry or borrow areas fall in traditional land.

- New extraction sites:
  - a. Shall not be located in the vicinity of settlement areas, cultural sites, wetlands or any other valued ecosystem component, or on high or steep ground or in areas of high scenic value, and shall not be located less than 1km from such areas.
  - b. Shall not be located adjacent to stream channels wherever possible to avoid siltation of river channels. Where they are located near water sources, borrow pits and perimeter drains shall surround quarry sites.
  - c. Shall not be located in archaeological areas. Excavations in the vicinity of such areas shall proceed with great care and shall be done in the presence of government authorities having a mandate for their protection.
  - d. Shall not be located in forest reserves. However, where there are no other alternatives, permission shall be obtained from the appropriate authorities and an environmental impact study shall be conducted.
  - e. Shall be easily rehabilitated. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.
  - f. Shall have clearly demarcated and marked boundaries to minimize vegetation clearing.
- Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.
- Stockpile areas shall be located in areas where trees can act as buffers to prevent dust pollution. Perimeter drains shall be built around stockpile areas. Sediment and other pollutant traps shall be located at drainage exits from workings.
- The Contractor shall deposit any excess material in accordance with the principles of these general conditions, and any applicable EMP, in areas approved by local authorities and/or the SE.
- Areas for depositing hazardous materials such as contaminated liquid and solid materials shall be approved by the SE and appropriate local and/or national authorities before the commencement of work. Use of existing, approved sites shall be preferred over the establishment of new sites.

### **Rehabilitation and Soil Erosion Prevention**

- To the extent practicable, the Contractor shall rehabilitate the site progressively so that the rate of rehabilitation is similar to the rate of construction.
- Always remove and retain topsoil for subsequent rehabilitation. Soils shall not be stripped when they are wet as this can lead to soil compaction and loss of structure.
- Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.
- Re-vegetate stockpiles to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.

- Locate stockpiles where they will not be disturbed by future construction activities.
- To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.
- Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.
- Identify potentially toxic overburden and screen with suitable material to prevent mobilization of toxins.
- Ensure reshaped land is formed so as to be inherently stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.
- Minimize the long-term visual impact by creating landforms that are compatible with the adjacent landscape.
- Minimize erosion by wind and water both during and after the process of reinstatement.
- Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.
- Revegetate with plant species that will control erosion, provide vegetative diversity and, through succession, contribute to a resilient ecosystem. The choice of plant species for rehabilitation shall be done in consultation with local research institutions, forest department and the local people.

### **Water Resources Management**

- The Contractor shall at all costs avoid conflicting with water demands of local communities.
- Abstraction of both surface and underground water shall only be done with the consultation of the local community and after obtaining a permit from the relevant Water Authority.
- Abstraction of water from wetlands shall be avoided. Where necessary, authority has to be obtained from relevant authorities.
- Temporary damming of streams and rivers shall be done in such a way avoids disrupting water supplies to communities down stream, and maintains the ecological balance of the river system.
- No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses.
- Wash water from washing out of equipment shall not be discharged into water courses or road drains.
- Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

### **Traffic management**

- Location of access roads/detours shall be done in consultation with the local community especially in important or sensitive environments. Access roads shall not traverse wetland areas.
- Upon the completion of civil works, all access roads shall be ripped and rehabilitated.

- Access roads shall be sprinkled with water at least five times a day in settled areas, and three times in unsettled areas, to suppress dust emissions.

### **Disposal of unusable elements**

- Unusable materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures will be disposed of in a manner approved by the SE. The Contractor has to agree with the SE which elements are to be surrendered to the Client's premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.
- As far as possible, abandoned pipelines shall remain in place. Where for any reason no alternative alignment for the new pipeline is possible, the old pipes shall be safely removed and stored at a safe place to be agreed upon with the SE and the local authorities concerned.
- AC-pipes as well as broken parts thereof have to be treated as hazardous material and disposed of as specified above.
- Unsuitable and demolished elements shall be dismantled to a size fitting on ordinary trucks for transport.

### **Health and safety**

- In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS.
- Adequate road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.
- Construction vehicles shall not exceed maximum speed limit of 40km per hour.

### **Repair of private property**

- Should the Contractor, deliberately or accidentally, damage private property, he shall repair the property to the owner's satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.
- In cases where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the SE. This compensation is in general settled under the responsibility of the Client before signing the Contract. In unforeseeable cases, the respective administrative entities of the Client will take care of compensation.

### **Contractor's environment, health and safety management plan (EHS-EMP)**

Within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an EMP for the works. The Contractor's EHS-MP will serve two main purposes:

- For the Contractor, for internal purposes, to ensure that all measures are in place for adequate EHS management, and as an operational manual for his staff.
- For the Client, supported where necessary by a SE, to ensure that the Contractor is fully prepared for the adequate management of the EHS aspects of the project, and as a basis for monitoring of the Contractor's EHS performance.



The Contractor's EHS-MP shall provide at least:

- a description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an EMP;
- a description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
- a description of all planned monitoring activities (e.g. sediment discharges from borrow areas) and the reporting thereof; and
- the internal organizational, management and reporting mechanisms put in place for such.

The Contractor's EHS-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the Contractor's EHS-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

### **EHS Reporting**

The Contractor shall prepare bi-weekly progress reports to the SE on compliance with these general conditions, the project EMP if any, and his own EHS-MP. An example format for a Contractor EHS report is given below. It is expected that the Contractor's reports will include information on:

- EHS management actions/measures taken, including approvals sought from local or national authorities;
- Problems encountered in relation to EHS aspects (incidents, including delays, cost consequences, etc. as a result thereof);
- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects; and
- Observations, concerns raised and/or decisions taken with regard to EHS management during site meetings.

It is advisable that reporting of significant EHS incidents be done "as soon as practicable". Such incident reporting shall therefore be done individually. Also, it is advisable that the Contractor keeps his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendixes to the bi-weekly reports. Example formats for an incident notification and detailed report are given below. Details of EHS performance will be reported to the Client through the SE's reports to the Client.

### **Training of Contractor's Personnel**

The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project EMP, and his own EHS-MP, and are able to fulfil their expected roles and functions. Specific training should be provided to those employees that have particular responsibilities associated with the implementation of the EHS-MP. General topics should be:

- EHS in general (working procedures);
- emergency procedures; and
- Social and cultural aspects (awareness raising on social issues).

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**Cost of compliance**

It is expected that compliance with these conditions is already part of standard good workmanship and state of art as generally required under this Contract. The item "Compliance with Environmental Management Conditions" in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable EHS impact.

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## **ANNEX 7. Example Format: EHS Report**

**Contract:**

**Period of reporting:**

**EHS management actions/measures:**

Summarize EHS management actions/measures taken during period of reporting, including planning and management activities (e.g. risk and impact assessments), EHS training, specific design and work measures taken, etc.

**EHS incidents:**

Report on any problems encountered in relation to EHS aspects, including its consequences (delays, costs) and corrective measures taken. Include relevant incident reports.

**EHS compliance:**

Report on compliance with Contract EHS conditions, including any cases of non-compliance.

**Changes:**

Report on any changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects.

**Concerns and observations:**

Report on any observations, concerns raised and/or decisions taken with regard to EHS management during site meetings and visits.

**Signature (Name, Title Date):**

**Contractor Representative**

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**ANNEX 7. Example Format: EHS Incident Notification**

**Provide within 24 hrs to the Supervising Engineer**

**Originators Reference No:**

**Date of Incident:**

**Time:**

**Location of incident:**

**Name of Person(s) involved:**

**Employing Company:**

**Type of Incident:**

**Description of Incident:**

Where, when, what, how, who, operation in progress at the time (only factual)

**Immediate Action:**

Immediate remedial action and actions taken to prevent reoccurrence or escalation

Signature (Name, Title, Date):

**Contractor Representative**

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## **ANNEX 8. Example Format: Detailed EHS Incident Report**

The Incident Notification should be followed up by a Detailed EHS Incident Report containing the following information where applicable

1. **Incident Summary**
2. **Specific Details**
  - Date
  - Time
  - Place
  - Weather/Visibility
  - Road conditions
3. **Persons Involved**
  - Name/s
  - Age/s
  - Experience
  - Date joined Company
  - Last Medical Check
  - Current Medical Treatment
  - Evidence of Drugs/Alcohol
  - Last Safety Meeting attended
  - Infractions/Incidents record
4. **Equipment Involved**
5. **Description of Incident**
6. **Findings of Investigation Team Interim/Final**
  - Investigation Team Members
  - Persons Interviewed
  - Recommendations & Remedial Actions
  - Investigation Methodology
7. **Signature (Name, Title, Date):**
8. **Attachments**
  - Photographs

Witness Statements and Incident Notification Report



## ANNEX 9. REMA Approval of EA Report

### CONDITIONS OF APPROVAL

- **The developer shall conform to the minimum basic health, safety, operational and environmental protection standards, and undertakes to comply with the following conditions:**
- ☞ The Urgent Electricity Rehabilitation Project Coordination Unit shall fence the perimeters of substation in order to prevent any encroachment, which may be a source of accident;
- ☞ Undertake to construct drainage channels, which shall drain the storm water to the nearest appropriate water body;
- ☞ The equipments of the central cooling system should not contain CFC gases;
- ☞ The Project developer shall develop the fire safety and prevention measures rather than leaving the responsibility of safety and prevention measures to the contractor;
- ☞ The disposed of used oil is the sole responsibility of the user, however, the developer has the right to enter into contract agreement with another company including supplier or any other person to dispose of used oil on his behalf. It should be borne in mind that the supplier should provide technical advice/measures to dispose of used oil;
- ☞ The proposed mitigation measures during construction phase should be part of the construction contract obligations.
- ☞ These conditions should be included in the Environmental Management Plan and be submitted to REMA for approval within a period of three months from the signing dates.
- ☞ The EIR is thus approved subject to the fulfillment of the conditions described above.

**N.B: Note that in case of non-compliance of the conditions described above, the certificate shall be withdrawn.**

**Dr Rose MUKANKOMEJE**  
**Director General**  
**KIGALI**

**UERP/PCU Manager**  
**REMA**  
**Gasabo District**  
**KIGALI CITY**

## ANNEX 10. Crop Quantities to be destroyed including structures.

Name: NYIRAHITIMANA Zanabia

N°	DESIGNATION DES OUVRAGES	UNITE	QUANTITE	P. UNIT AIRE	P.TOTAL
I	Elevation en pise`	m3	7,6	5775	43890
II	Toiture en tole simple	m2	30	2500	75000
III	Enduit au terre	m2	142	600	85200
IV	Chaulage	m2	142	700	99400
	Portes rudimentaires	pc	3	3750	11250
	Fenetre en bois	m2	1,75	5000	8750
<b>V</b>	<b>CULTURES</b>				
	Enclos d'euphorbe grosses	m2	48	500	24000
	Imisave gros	pc	13	3000	39000
	Ficus moyen	pc	12	500	6000
	Euphorbia grosses	pc	10	300	3000
	Eucalyptus gros	pc	3	3000	9000
	Citronnelles	pc	5	100	500
	Oranger(2-3 ans)	pc	1	1350	1350
	Manguier(2-3 ans)	pc	1	1675	1675
	Pili pili	pc	4	50	200
	Manioc legume	pc	5	150	750
	Avocatier en Production /	pc	1	5020	5020
	Fleurs	pc	3	90	270
	Grevelia(2-3 ans)	pc	1	600	600
	Tomate	pc	5	150	750
	Maracuja	pc	1	500	500
	<b>TOTAL</b>				<b>416105</b>



**RAPPORT D'EXPROPRIATION DANS LA PARCELLE ATTRIBUEE A L'ELECTROGAZ  
SISE A KINYINYA**


**EGLISE ADVENTISTE DU 7è Jour KINYINYA**  
 Pasteur: HAKIZIMANA Charles  
 C.I. 08023

N°	DESIGNATION DES OUVRAGES	UNITE	QUANTITE	P. UNITAIRE	P.TOTAL
I	Fondation en moellon lié au mortier de ciment	m <sup>3</sup>	14,8	25000	370000
II	Elevation en brique adobe	m <sup>3</sup>	62	11140	690680
III	Toiture en tôle simple	m <sup>2</sup>	196,4	2500	491000
IV	Enduit au sable ciment	m <sup>2</sup>	248	2000	496000
V	Pavement au ciment lissé	m <sup>2</sup>	359,6	3000	1078800
VI	<b>HUISSERIES</b>				
	Portes en plancher	pc	4	20000	80000
	Fenêtre en bois	m <sup>2</sup>	10,2	5000	51000
VII	<b>CULTURES</b>				
	Eucalyptus gros	pc	20	3000	60000
	Imisave gros	pc	20	2000	40000
	Fleurs	pc	40	90	3600
	Euphorbes moyennes	pc	10	150	1500
VIII	Revêtement en brique cuite	m <sup>2</sup>	204	8000	1632000
	<b>TOTAL</b>				<b>4994580</b>

**Valeur de la parcelle**

1543,5 m<sup>2</sup>x1500= 2 315 250 FRW

**Le total à payer est de 7 309 830 FRW**


*Hakizimana Charles Louis* 

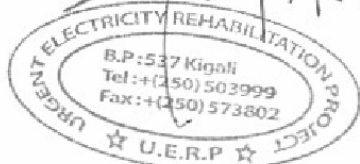
*Eng. Ruzibira Modest*

*ESTATE MANAGEMENT / ELECTROGAZ*

*[Signature]* 25109  
06

**PAID BY CHEQUE**  
N° 259842

*Apprové*   
**Jean Pierre MUTSINZI**  
**PCU Manager**

*15/11/06*  
  
 URGENT ELECTRICITY REHABILITATION PROJECT  
 U.E.R.P.  
 B.P.: 537 Kigali  
 Tel: +(250) 503999  
 Fax: +(250) 573802

NSANZABAGANWA Straton  
C.I. 06827

PAID BY CHECK  
N° 259.840

N°	DESIGNATION DES OUVRAGES	UNITE	QUANTITE	P.UNITAIRE	P.TOTAL
	<b>Maison principale</b>				
I	Fondation en moellons liés au mortier de ciment	m³	32,2	25000	805000
II	Elevation en briques cuites	m³	107,3	24000	2575200
III	Toiture en tôle dure	m²	170,56	4000	682240
IV	Enduit au sable ciment	m²	938,7	2000	1877400
V	Pavement en béton non armé	m²	144,76	41000	5935160
	S/ pavement en brique cuite	m²	49,5	1500	74250
VI	<b>HUISSERIES</b>				
	Porte métallique vitrée	pc	4	58200	232800
	Porte en triplex	pc	9	35000	315000
	Fenêtre métallique vitrée	pc	11	30000	330000
	Clastras	pc	38	300	11400
VII	<b>INSTALLATION SANITAIRE</b>				
	Fosse septique	pc	1	250000	250000
	Puits perdu	pc	2	100000	200000
	<b>ANNEXE.I</b>				
I	Fondation en moellons liés au mortier de ciment	m³	19,8	25000	495000
II	Elevation en briques cuites adobe	m³	49,44	11140	550761,6
	Elevation en brique cuite	m³	16,4	24000	393600
III	Toiture en tôle simple	m²	119,78	2500	299450
IV	Enduit au sable ciment	m²	247,2	2000	494400
V	Pavement au ciment lissé	m²	102,4	2500	256000
	S/pavement en briquillons	m²	50,3	1500	75450
VI	<b>HUISSERIES</b>				
	Porte en triplex	pc	7	35000	245000
	Porte en plancher	pc	3	20000	60000
	Fenêtre métallique vitrée	m²	4	23280	93120
	<b>ANNEXE .II+W.C.</b>				
I	Fondation en brique cuite	m²	9,8	11000	107800
II	Elevation en pise	m³	24,54	6500	159610
	Elevation en brique adobe	m³	12,1	11140	134794
III	Toiture en tôle simple	m²	35,38	2500	88450
IV	Enduit au terre	m²	245,4	400	98160
	<b>FERME</b>				
I	Fondation en moellons lié au mortier de ciment	m³	14,3	25000	357500
II	Elevation en pisé	m³	47,7	6500	310050
III	Toiture en tôle simple	m²	125,4	2500	313500
IV	Pavement en béton non armé	m²	15,6	41000	639600
V	<b>CULTURES</b>				
	Roseaux-penisetum	are	224,7	20000	4494000
	Eucalyptus gros	pc	272	3000	816000
	Goyavier en prod	pc	6	2670	16020
	Grévellia (5-10ans)	pc	24	1200	28800
	Imisave(5-10ans)	pc	48	1500	72000
	Fucus gros	pc	30	2000	60000
	Euphorbes gros	pc	25	400	10000
	Sacaranda	pc	1	300	300
	Enclos d'euphorbes	ml	485	500	242500
	<b>TOTAL</b>				<b>24200216</b>

*J. J. K...*

NYIRAHITIMANA Zanabia

C.I 16613

N°	DESIGNATION DES OUVRAGES	UNITE	QUANTITE	P. UNITAIRE	P.TOTAL
I	Elevation en pisé	m <sup>3</sup>	7,6	5775	43890
II	Toiture en tôle simple	m <sup>2</sup>	30	2500	75000
III	Enduit au terre	m <sup>2</sup>	142	600	85200
IV	Chaulage	m <sup>2</sup>	142	700	99400
	Portes rudimentaires	pc	3	3750	11250
	Fenêtre en bois	m <sup>2</sup>	1,75	5000	8750
V	<b>CULTURES</b>				
	Enclos d'euphorbe grosses	m <sup>2</sup>	48	500	24000
	Imisave gros	pc	13	3000	39000
	Ficus moyen	pc	12	500	6000
	Euphorbes grosses	pc	10	300	3000
	Eucalyptus gros	pc	3	3000	9000
	Citronnelles	pc	5	100	500
	Oranger(2-3 ans)	pc	1	1350	1350
	Manguier(2-3 ans)	pc	1	1675	1675
	Pili pili	pc	4	50	200
	Manioc légume	pc	5	150	750
	Avocatier en production	pc	1	5020	5020
	Flours	pc	3	90	270
	Grévelia(2-3 ans)	pc	1	600	600
	Tomate	pc	5	150	750
	Maracuja	pc	1	500	500
	<b>TOTAL</b>				<b>416105</b>

**Valeur de la parcelle**

1064 m<sup>2</sup>x1500= 1 596 000 FRW

**Le total à payer est de 2 012 105 FRW**

**PAID**

Eng. Ruzibiza Modest  
Estate Management / ELECTROZAZ

Approved  
Jean Pierre MUTSINZI  
PCU Manager  
5/11/06  
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Tel: +(250) 503999  
Fax: +(250) 573802  
U.E.R.P. ☆

