

REPUBLIC OF RWANDA
Ministry of Infrastructure

**ENERGY WATER AND SANITATION
AUTHORITY (EWSA)**



Electricity Access Rollout Programme (EARP)

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**PROJECT BRIEF FOR THE INSTALLATION OF LOW
VOLTAGE AND MEDIUM VOLTAGE LINES AND
SERVICE CONNECTIONS IN BUNGWE – KIVUYE -
GATEBE AREA IN BURERA DISTRICT**

December 2011

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LIST OF ACRONYMS

ARAP	Abbreviated Resettlement Action Plan
EMF	Electromagnetic Fields
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
IAPs	Interested and Affected Parties
IDA	International Development Association
LV	Low Voltage
MV	Medium Voltage
MININFRA	Ministry of Infrastructure
FONERWA	National Fund of the Environment in Rwanda
NDF	Nordic Development Fund
PPE	Personal Protective Equipment
PCBs	Polychlorinated biphenyls
PAPs	project Affected Parties
PCU	Project Coordination Unit
RPF	Resettlement Policy Framework
RoW	Right Of Way
REMA	Rwanda Environment Management Authority
EARP	Electricity Access Roll-Out Program
MINIFOM	Ministry of Mines and Forests
MINELA	Ministry of Environment and Lands
KCC	Kigali City Council
EWSA	Energy, Water and Sanitation Authority

0. BACKGROUND

The Government of Rwanda, in its effort to sustain economic growth, has increased and stabilised the power production since the severe power shortages in 2004. However, infrastructure bottlenecks in the urban areas and limited access in the rural areas have emerged as a significant constraint. One of three major strategic objectives of the Economic Development and Poverty Reduction Strategy (EDPRS 2008-2012) is to expand access while also improving the quality and lowering the cost of economic infrastructure – especially transport, power, and communications. The Government of Rwanda (GoR) also exercises a strong leadership role in donor coordination and has begun to work with donors on a clearer division of labour by identifying areas of individual donor comparative advantage.

In connection with the mentioned strategy, the Government of Rwanda through Energy, Water and Sanitation Authority (EWSA) is embarked on a country-wide **Electricity Access Program** to realize the primary EDPRS target for the electricity sector of tripling access by 2012 to about 16 percent of households and at least 50 percent of identified public institutions in health, education and local administration. This will require about 160'000+ with new grid connections, and will also include efforts to reach rural consumers and service providers currently off the national grid.

In this regard, EWSA has established a new Electricity Access Scale-up Roll-out Program (EARP) as a part of its corporate structure. The program will be implemented within the framework of a Sector Wide approach (SWAp) to encompass all donors active in the sector under one common sector investment program. The overall investment envelope for the first SWAp time (2009-2013) is estimated at \$378 million, for the program period covered by the Prospectus that has been endorsed by all the Partners and key sector institutions in Rwanda, including EWSA.

The prospectus outlines the overarching spatial least cost rollout plan and priority connection targets through the medium term, the rollout strategy and the financing policy platform for the EARP. Additionally, the EARP implementation will be subject to a monitoring, evaluation and results framework as well as the oversight and accountability process of regular reviews as agreed with the energy sector working group (SWG), chaired by Ministry of infrastructure (MININFRA) on advice from the partners.

A number of development partners so far committed to support the program including World Bank IDA, World Bank GEF/ESMAP CEIF, African Development Bank, BADEA, OFID, Saudi Funds, Netherlands, Japan, and others.

It is in this regard that Rwandan Government through its cooperation with IDA/ World Bank applied for grant to undertake the construction of transmission and distribution lines in Bungwe - Kivuye area in Burera district. (43.4 km of MV and 87.4 km of LV).

I. DESCRIPTION OF THE PROJECT

I.1. INTRODUCTION

This is a rural electrification project which is in the context of the effort of the Ministry of Infrastructure to meet the national Economic Development and Poverty Reduction Strategy (EDPRS) target to increase access to electricity on a national scale, and to supply reliable and affordable energy to Rwandan householders. This lack of electricity in some parts of rural areas caused concentration of economic activities in urban areas, causing a lot people to shift from nearby centres for green pasture.

The electricity access roll-out program aims at increasing connections, boost economic activities all over the country, direct and indirect creation of jobs and raise off-firm jobs. The ongoing EARP will enable energy sector stakeholders to connect at least 16% of the population or 350,000 customers to the grid by 2012. It is in this regard therefore that remote areas have been identified to benefit this grant.

Currently, the Rwandan transmission system is composed of 370 km 110 kV and 70 kV lines linking the southern substation Mururu II to Gikondo as well as the 70 kV line from Jabana to Rwinkavu. The transmission system has also eleven 110kV substations, and four 70kV substations that supply all Country.

According to the high energy demand the Rwandan generated electricity needs to be transmitted and distributed to the beneficiaries. It is in this line that there is a need of the construction of transmission and distribution lines in Bungwe and Kivuye area in Burera district.

I.2. OBJECTIVES OF THE PROJECT

The purpose and objectives of this project are as follow:

- Reducing poverty through increase of electricity access rate by direct or indirect job creation
- Reduce CO₂ emissions from kerosene by providing clean electric energy
- Uplift living standards in the targeted areas as investors have been limited by having no electricity guarantee
- To reduce the use of charcoal which result in deforestation and end up causing soil erosion

- To create foundation for other infrastructure like ICT infrastructure and other investments that require electricity.

I.3. PROJECT ACTIVITIES

The project components shall consist of the construction of transmission and distribution lines Bungwe and Kivuye area in Burera district. (43.4 km of MV and 87.4 km of LV).

The Works will consist of:

- Construction and installation of MV and pole mounted transformer substation in along the transmission line in the subproject area
- Construction and installation of LV lines and poles along the distribution line in the subproject area
- Transportation of line building materials from Kigali to the Contractor's warehouse on site
- Storage and management of the materials in the warehouse
- Line and topographic surveys, profile calculations and calculation of structures and detailed plans for pole and cables
- Providing as built drawings of the lines.
- Arrangement of system shut-downs and outage notifications
- Testing and commissioning of works
- Inventory of damaged items in transit

I.4. CONSTRUCTION PROGRAMME

Lot1												
Proposed Construction Program												
Month	1	2	3	4	5	6	7	8	9	10	11	12
Task												
Submit Detailed Program	█											
Line Profiling MV		█	█	█								
Line Profiling LV		█	█	█								
Order Materials				█	█							
Material Delivery						█	█	█	█			
Construction							█	█	█	█	█	
Service Connections							█	█	█	█	█	
Final Handover												█

I.5. TECHNICAL DESCRIPTION

Description of Works

This part of the document will give a detailed explanation of the works to be completed. The MV networks will mainly be constructed with 12m wood poles. Where anchoring of poles with a stay is not possible, or where the excavation for the stay will result in high expropriation cost, unsupported concrete poles will be used. The correct design strength for the pole must be calculated, and the correct foundation type must be used.

Allowance is made or some 14m wood and steel poles for special needs.

Conductors used include 35/6 and 70/12 and 120/20 mm² ACSR.

Low Voltage lines will be constructed with ABC conductor on 9m wood poles.

The installation of service connections and split prepaid meters are included in the Contract. Prepaid meters will be supplied by EWSA.

The transformer sizing as well as LV and MV conductor sizing was done by means of a load forecast study and load flow analysis and is assumed to be accurate. The Contractor must report any instance where this information seems to be inaccurate due to actual consumers to be connected on the network.

The overall project plan is shown in figure 1 below.

Line Profiling

The proposed line route is indicated in ArcGIS software. This route is an indication of the route to be surveyed by the Contractor. The positions of LV lines and transformers are given as accurate as possible and final surveying of this must be done by the Contractor. Conductor sizes were calculated in the preliminary design and the information is available from the ArcGIS database.

A number of poles with different strength specifications, as well as strain insulators are included in the BOQ. The Contractor must design the lines to fall within the specifications of this equipment as far as possible.

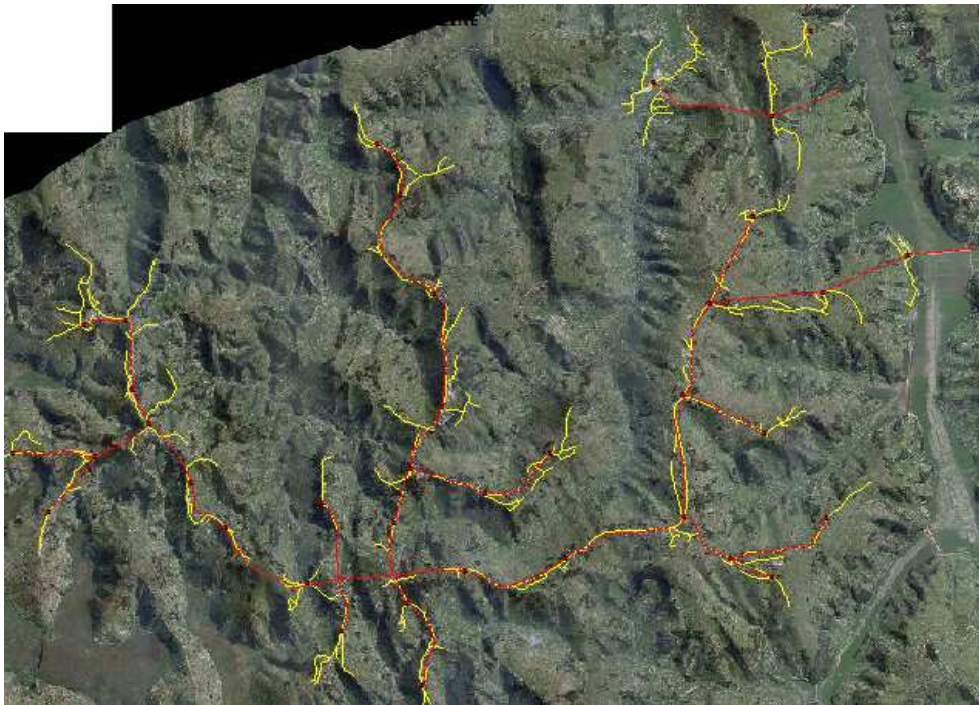


Figure 1: Proposed MV and LV Line Routes for Bungwe - Kivuye area

General Technical Specifications

Scope

This section covers the general technical specifications for the electrical part of the works and consequently describes the supply, installation and commissioning of all the electrical

equipment for the 30kV/15kV/400V networks in Rwanda. Where the specification refers to items not required for the project, the specific clauses shall be ignored.

Environmental Data

The project is located in an area of Rwanda with a climate characterized as sub-tropical to tropical.

The following summarised climate data will form the design data for the working conditions of the equipment:

Air Temperatures:

Maximum outdoor temperature	+40°C
Minimum outdoor temperature	+ 5°C
Maximum daily average temperature	+30°C
Annual average temperature	+20°C

Rainfall

Annual average rainfall	1,500mm
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Solar Radiation

Maximum solar radiation	5,200 W/m ²
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Isokronic Level

Average	70 days/year
Altitude	> 1,500m

Air Humidity:

Maximum at +35°C	95%
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Wind:

Maximum wind velocity	40 m/s
Maximum Sustained Wind speed	29m/s

Safety Precautions

The contractor shall work strictly in accordance with the safety precautions of the Rwandan Government. The contractor shall take all the necessary precautions to ensure the safety of

personnel when working on or near live electrical equipment. The Contractor shall notify the Engineer in advance of all switching or disconnecting of HV equipment.

The contractor shall hold monthly safety meetings and minutes of such meetings must be forwarded to the engineer.

Quality Assurance

The supplier shall provide current certification showing the manufacturer's compliance with ISO 9000 or equivalent national standard.

Packing and Shipping

Packing

All equipment, including accessories, shall be packed and securely clamped against movement in robust, wooden, non returnable packing cases to ensure safe transit from the manufacturer's works to the work sites.

All equipment be handled with due care. Specifically, poles shall not be bound together, they shall not be dragged along the ground and hand cant hooks, pole tongs and other pointed tools shall not be applied to the ground line section of treated poles. The packing shall provide suitable protection against all climatic conditions prevailing during transport and on site.

Equipment or material liable to deterioration by sea water, moisture, or ingress of foreign matter shall be totally sealed in strong polythene bags.

All accessories shall be carefully packed so that they are fully protected during transport and handling operations and in storage.

Internal surfaces of loose accessories shall be sealed off by means of gaskets and blanking off plates. Equipment and surfaces liable to deterioration due to condensation shall be protected by packs of silica gel or other approved desiccant.

The manufacturer or supplier may be consulted on the adequacy of warehousing arrangements and he or she shall be required to accept responsibility for the advice given, in so far as these arrangements may have a bearing on the behaviour of the equipment in subsequent service.

Poles shall be securely clamped against movement to ensure safe transit from the supplier's facilities to the site. All accessories (such as wood plugs) shall be carefully packed so that they are fully protected during transport and handling operations and while in storage.

Shipping or Inland Transportation

The contractor shall be responsible for the shipping of all plant and equipment supplied from abroad to the ports of entry and for the transport of all goods to site and for all the costs and expenses resulting from it, including customs clearance, offloading, warehousing and insurance.

All transport accessories, such as riding lugs, jacking pads, blanking off plates, etc. shall become the property of EWSA.

Each consignment shall be accompanied by a fully detailed shipping or inland transportation list in a sealed waterproof envelope. One copy of each information list shall be sent to EWSA prior to dispatching.

Hazardous Substances

The supplier shall submit safety data sheets for all substances used in the preservative treatment of the poles. These substances shall be classified in accordance with the European Union SI 426: European Communities (dangerous substances) (classification, packaging, labelling and notification) regulation, 1992, or any subsequent amendment.

The Contractor shall give an assurance that there are no other substances classified as hazardous with the poles supplied. The supplier shall accept responsibility for the disposal of such hazardous substances, should any be found.

The Contractor shall also be responsible for any injury resulting from the use of hazardous substances.

STANDARDS AND SPECIFICATIONS

LOW VOLTAGE AERIAL BUNDLE CABLES (600/1000V)

The present specification is applied to the isolated aerial bundled cables (twisted cables) for rated voltage U_0/U equal to 0.6/1 kV, with a cross-linked polyethylene (XLPE) insulating sheath and intended for overhead low voltage lines.

This specification fixes the characteristics of these isolated twisted cables and defines the tests to which they shall comply.

CABLE DESIGN

Conducting cores

The core of conductors has a circular stranded cross-section.

The wires of the support core neutral conductor are in aluminium-silicon-magnesium alloy.

Core of conductors other than neutral messenger is carried out in aluminium wires with purity at least equal to that corresponding to 1350 code in conformity with IEC 60889 standard.

The presence of welding on the elementary wires of the stranded core is tolerated, but when one considers the whole of the wires of the support neutral, two consecutive weldings must be distant at least 50 m.

Insulating sheath

The insulating sheath is an extruded sheath in black colour reticulated polyethylene. It must be possible to withdraw it easily.

In the case of neutral messenger, a paper-type separator can be applied to the core.

For phase conductors, the presence of a separator is optional, but when there is one separator, it must be coloured in the mass and must be the same on all the twisted cable cores.

SPECIFICATIONS

Characteristics of the conducting cores

The aluminium wires used for manufacturing of phase conductor cores of abc cables without neutral messenger shall present before wiring, a tensile strength at least equal to 120 MPa.

The aluminium alloy wires used for conducting cores manufacturing of the support core neutral must present before wiring, the following characteristics:

Nominal diameter of wires: 3.15 mm for the 54,6 mm² for the neutral messenger

Linear expansion rate: $23 \cdot 10^{-6}$ per degree Celcius

Modulus of elasticity: 62.000 MPa

600/1000V GENERAL PURPOSE LV CABLES

The cable design offered for use at L.V. shall meet the following requirements.

Conductors

The conductors shall conform to IEC-228. Refer to Table 1 for conductor type and size.

Insulation

Cable insulation shall consist of polyvinyl chloride, **PVC**. Insulation thickness shall conform to IEC-502.

Armouring

Armouring shall be applied helically forming a layer of galvanised steel wire over an inner covering. Armour shall comply with the requirements of IEC 502, Clause 11.

Oversheath

All cables shall have a **black coloured P.V.C. oversheath**, which shall be embossed at regular intervals as per Clause 12.4 of this specification.

Core Identification

Individual cores shall be colour coded as per Table 1.

CABLE OVERSHEATH

The following requirements apply to 600/1000V cables.

The thickness of PVC oversheaths shall be in accordance with IEC 502.

PVC oversheaths shall be of a heat, moisture, and sunlight resistant material that is fire retardant and low acid emitting when subjected to the temperature limits of the underlying insulation. Solutions to which the oversheath is resistant shall include petrol, oil, acids and alkalis. The oversheath shall contain a termite, insect and rodent repellent of a permanent nature.

LV SERVICE DROP CABLES

This specification establishes the technical characteristics of single phase LV concentric power cables for overhead service drop with nominal voltage 0,6/1 kV. This cable is self supported type. Metal shall be **copper**.

The cable will be installed aerially between pole top and house meter.

CABLE DESIGN

Circular stranded hard drawn copper phase conductor, XLPE insulated with identified neutral and bare earth conductors arranged concentrically around it, polyethylene sheathed 600/1000v service connection cable. Nylon ripcord laid under sheath

Characteristic requirements

Phase cores constitution: Circular stranded hard drawn copper phase conductor, XLPE insulated

Neutral conductor: bare or isolated wires arranged concentrically around insulated phase conductor,

Communication pilot cores: a pair of isolated communication pilot cores to allow using the service drop cable with split prepayment meters. The pair of communication cores shall be isolated in proper colour of insulating matter, different from color of neutral wires insulation matter.

Outer sheath: Polyethylene sheathed 600/1000v house service drop cable with Nylon ripcord laid under sheath.

CONDUCTOR CHARACTERISTICS

Conductor characteristics shall be in conformity with the standard of reference.

The conductor will be delivered completely lubricated including the external layer with a neutral grease with respect to aluminium.

This grease must be in conformity with the requirements of standard NFEN 50.326; its dropping point ("point de goutte") must be at least equal to 105°C.

15KV DISTRIBUTION TRANSFORMERS

This specification establishes the technical characteristics of Three-phase 15KV/BT conventional overhead distribution transformers for distribution overhead network.

STANDARDS

The equipments shall comply with this specification and the following standards:

IEC 60076 : power transformer,

or

ANSI/IEEE C 57.12.90: Test code for liquid immersed distribution power and regulating transformer

ANSI/IEEE C 57.12.80: Power and Distribution transformer

ANSI/IEEE C 57.12.00: Liquid-immersed distribution Power and regulating transformer,

30KV DISTRIBUTION TRANSFORMERS

This specification establishes the technical characteristics of Three-phase 30KV/BT conventional overhead distribution transformers for distribution overhead network.

STANDARDS

The equipments shall comply with this specification and the following standards:

IEC 60076 : power transformer,

Or

ANSI/IEEE C 57.12.90: Test code for liquid immersed distribution power and regulating transformer

ANSI/IEEE C 57.12.80: Power and Distribution transformer

ANSI/IEEE C 57.12.00: Liquid-immersed distribution Power and regulating transformer.

TRANSFORMER LV DISTRIBUTION BOX

LV DB

LV equipment shall be housed in a Galvanized box with two hinged doors and lockable latch. The cost for padlocks shall be included in the LV DB price.

Mounting of the box shall be by means of fixing it to two (2) lengths of suitably sized Galvanized angle iron mounted between the poles below the transformer for the new pole mounted transformers.

The box shall have an insulated neutral busbar connected to the neutral bushing but insulated from the body to a basic insulation level of 1000V.

The box shall have a gland plate to accept 2 x 95mm² 4 core armoured copper cables from the transformer LV bushings.

A reliable earthing terminal, having a clamping screw or nut, for connection to an earth conductor suitable for the fault condition specified shall be provided. The diameter of the clamping screw/nut shall be M12 or greater and shall be connected to the HV earthing system.

Phase rotation will be indicated in the door of this box.

15KV SURGE ARRESTORS

This specification establishes the technical characteristics of arresters designed to protect equipment and used to limit overvoltages on the distribution overhead network.

STANDARDS

The arresters shall comply with this specification and the following standards :

IEC 60099-4 : Surge arresters - Part 4 : Metal-oxide surge arresters without gaps for a.c. systems.

Or

ANSI/IEEE C-62-11: Arresters for AC power circuits.

CHARACTERISTICS OF NETWORK

The arresters will be installed on the 3 wires overhead network with isolated neutral:

Nominal voltage of network : 15 KV.

Maximum voltage of network : 16.5 KV.

Frequency : 50 Hz

30KV SURGE ARRESTORS

This specification establishes the technical characteristics of arresters designed to protect equipment and used to limit overvoltages on the distribution overhead network.

STANDARDS

The arresters shall comply with this specification and the following standards :

IEC 60099-4 : Surge arresters - Part 4 : Metal-oxide surge arresters without gaps for A.C. systems.

Or

ANSI/IEEE C-62-11 : Arresters for AC power circuits.

30KV INSULATED FUSE CUTOUTS

This specification establishes the technical characteristics of MV fuse cutout for overhead distribution network operated on 15kV or 30kV, but insulated on **30KV**.

STANDARDS :

Cut outs shall comply with this specification and the following standards :

ANSI/IEEE C-62-11 : Arresters for AC power circuits.

ANSI C 37.41: IEEE Standard Design Test for High Voltage Fuses, Distribution Enclosed Single Pole Air Switches, Fuse and Accessories.

or

IEC 60282-2 : High Voltage Fuses.

IEC 61109 : Insulators for overhead lines – Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria.

WOOD POLES

The present technical specification concerns the supply of wood poles intended for the construction of electrical distribution (Medium voltage and low voltage) overhead lines regardless of their rated voltage.

NORMATIVE REFERENCES

The following standards are applicable to the present specification

- NFC 67-100 : wood pole for overhead lines-specifications.
- EN 12490 : Durability of wood and wood-based products — Preservative-treated solid wood — Determination of the penetration and retention of creosote in treated wood
- EN 12465 : Wood poles for overhead lines- Durability requirements
- EN 12479: Wood poles for overhead lines-Sizes- Methods of measurement and permissible deviations
- EN 12510 : Wood poles for overhead lines-Strength grading criteria
- EN 50423-1 : Overhead electrical lines exceeding AC 1 kV up to and including AC 45 kV – Part 1 : General requirements – Common specifications
- EN 12511: Wood poles for overhead lines- Determination of characteristic values
- EN 60652 : Loading tests on overhead line structures
- EN 12509 : Timber poles for overhead lines-Test methods- Determination of modulus of elasticity, bending-strength, density and moisture content
- SABS 754 (latest version): Eucalyptus poles, cross-arms and spacers for power distribution and telephone systems

Any other international standards guaranteeing for this type of material a quality higher or equal to the standards above mentioned are also accepted.

NB: Wood Poles proposed according to SAS Standard shall have at least the minimum pole characteristics required by NFC 67 100.

PRESERVATIVE TREATMENT

Wood specie and preservative treatment:

The adopted treatment process shall be compatible with the proposed wood specie, in accordance with NFC 67 100 standard or equivalent. The supplier shall indicate the proposed specie and adapted preservative treatment in its offer.

Freshly felled poles are accepted as well as dried poles. The preservative treatment process shall be adapted to each of both cases, in accordance with NFC 67 100 or equivalent.

For dry poles, drying minimum period of time shall be at least 6 months for the smallest poles.

CONCRETE POLES

The present technical specification concerns the supply of Prestressed Concrete poles (PCP) intended for the construction of electrical distribution (Medium voltage and low voltage) overhead lines regardless of their rated voltage.

NORMATIVE REFERENCES

The following standards are applicable to the present specification

EN 12843 : Precast concrete products Masts and poles

NFC 67 – 250: Prestressed Concrete poles

NFC 67 – 220: Supports for overhead lines- Concrete poles of Class D and E

Any other international standards guaranteeing for this type of material a quality higher or equal to the standards above mentioned are also accepted.

STEEL POLES

This Technical Specification covers the technical characteristics of welded round conical steel poles (“tubular”) used in overhead distribution systems, regardless of their rated voltage.

STANDARDS:

The following standards are applicable for the present specification:

EN 10025: Hot rolled products of structural steel

EN 10149 : Hot-rolled flat products made of high yield strength for cold forming

EN 10079 : Definition of steel products

NFA 35 - 503 : Steel for galvanization by hot immersion.

ISO 1461: Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.

ISO 14713: Protection against corrosion of iron and steel in structures - Zinc and aluminium coatings - Guidelines.

Any other international standards guaranteeing for this type of material a quality higher or equal to the standards above mentioned are also accepted.

SETTING OUT AND ERECTION

General

Wayleaves and right of access facilities, subject to the requirements of landowners and tenants will be provided by the Employer, but the Contractor will be responsible for the provision of access routes or tracks along the line routes to enable him to carry out the erection of the transmission line.

The Contractor will be provided with a set of plans showing the routes of the transmission lines and any setting out details which may be required. The terminal points at ends of each line will be indicated by the Engineer.

The Contractor shall set out the route of the line determining the alignment and the co-ordinates of all terminal and turning points. The work shall be undertaken by competent surveyors who are familiar with the requirements and working conditions.

The route shall be pegged on the centre-line by means of steel pins positioned every kilometre, or such smaller distance as may be required to provide intervisibility between intermediate points. Each turning point shall be pegged and referenced by providing four additional steel pins, giving a means of relocating should the turning point marker be displaced or removed. Each turning point position and reference system shall be recorded on a field distance. The fourth peg shall be placed in any convenient location and recorded. Where distinctive features are present these shall be recorded also. The steel pins shall be 16mm diameter and not less than 750mm long, and shall be driven into the ground to leave 50mm protruding.

At overhead line or telephone crossings where the line being surveyed crosses between two poles or structures, the conductor height shall be assumed to be an imaginary straight line connecting the uppermost attachment point on the two poles or structures and not the actual height of any conductors at the crossing point.

Field sketches of all power and communication line crossings shall be made at the time of setting out, show the general disposition of conductors, insulators and earth wire. The pole height to the upper attachment shall be measured accurately from the elevation datum.

Planting Depth

Poles excavations shall normally be as follows:

USE	LENGTH (m)	PLANTING DEPTH (mm)
LV	9	1500
MV	12	1700
MV	13	1800
MV	14	1900
MV	15	2000

Backfill and Compaction

Backfilling and compaction of the hole shall be done in layers of not more than 200mm. Each layer shall be compacted to the normal adjacent soil density or better. Manual or mechanical means of compaction may be used. Inspections of compaction density shall be done by the Engineer.

All excavated material must be returned in the foundation, and no material should be left over.

Pegging of Structure Positions

The Contractor shall be responsible to ascertain the correctness of structure positions on site according to the drawings and shall, where so required, re-measure and determine positions in conjunction with the Engineer. The co-ordinates for each pole shall be accurately measured and the type of structure, i.e. strain, intermediate, etc, shall be noted.

The as-pegged as well as the as-built information shall be submitted to the Engineer in both hardcopy and ArcGis software format.

Network poles must be available to every consumer stand after construction allowing an average of 4 consumer connections per pole. The network shall stop within 40m of each house in the zone under construction.

Site Preparation

The Contractor will be responsible for the pruning or complete removal of trees where necessary along the routes of overhead lines.

Where trees are to be removed, the Contractor shall completely uproot the relevant trees by means of a monkey winch or other approved methods, and stack them in a position approved by the Employer or Engineer. All holes caused by such uprooting shall be filled by him to leave the site clean and tidy, all to the satisfaction of the Engineer. Utmost care shall be taken when uprooting trees, as the Contractor will be responsible for all the claims due to any damage and/or injury caused by such uprooting of trees.

Where the branches of trees are to be pruned, such pruning shall be neatly carried out in an effective and workmanlike fashion to the satisfaction of the Engineer.

Unless specifically indicated otherwise herein or on the accompanying drawing, Tenderers shall allow in their tenders for:

The removal of trees, except shrubs, with trunks within 5m from the nearest conductor along the routes of all lines.

The pruning of all tree branches, along the routes of all lines, in such a way that no branch will project through a vertical plane parallel to and 3m from the nearest conductor, on the understanding that such branches of which the highest points are below 6m above ground level need not be pruned unless it is within 3m from any pole.

Protection of Natural Vegetation

The Contractor shall exercise proper care not to destroy damage or remove any natural trees and vegetation, except where he is instructed or given permission to do so in cases where it is unavoidable. No trucks or plants shall be allowed to run over areas not specifically set aside for this purpose.

The Contractor shall take care not to have field fires developing from his site. He shall be responsible for any losses and claims, which could arise from field fires starting due to his negligence. In the case of any field fires threatening the site, he shall give all assistance to protect the site against such fires from elsewhere. The Contractor shall at his own expense do all the protection as described and shall not be specially paid for any fencing or fire breaks, etc.

The following trees shall under no circumstances be uprooted or damaged in any way except with the consent of the Engineer:

Transvaal Ebony	<i>Diospyros mespiliformis</i>
Baobab	<i>Adansonia digitata</i>
Wild Fig	<i>Ficus Capensis</i>
Cape Ash	<i>Ekebergia Capensis</i>
Yellow woods	<i>Podocarpus</i>
Stinkwoods	<i>Ocotea Bullata</i>
Kiaat	<i>Pterocarpus Angolensis</i>
Tambotie	<i>Spirostachys Africana</i>
Cabbage Tree	<i>Cussonia's</i>

CONSTRUCTION

When the Contractor is about to commence work on any property he shall be responsible for ascertaining from the Engineer that the Wayleaves are in order and give the occupier of such property adequate notice of the commencement of the work.

If the Contractor wishes to make a camp on any property he shall first obtain written permission to do so from the occupier of such property. All staff shall be provided with badges indicating their employment by the Contractor and adequate supervision shall be employed to protect the interests of the occupier of the property.

When the Contractor is about to carry out erection of the conductors or installation of earth electrodes or counterpoise along or across public roads, telegraph or telephone lines, railways or across power lines he shall be responsible for giving the requisite notice to the appropriate authorities of the date and time at which he proposes to perform the work.

Where the local authorities and other public undertakings affected deem it necessary for the protection of the public and the assistance of traffic, to provide flagmen or watchmen or installation of warning lights, etc., the cost of such provision shall be borne by the Contractor.

The Contractor shall be held responsible for any injury to the Public and damage to livestock due, in the opinion of the Engineer, to failure to comply with the above requirements.

In the event of any dispute or questions of damage or for the adequacy of provisions made for permanent or temporary replacement or repair, the Contractor shall at once inform the Employer.

II. DESCRIPTION OF THE ENVIRONMENT

II.1. DESCRIPTION OF THE PHYSICAL ENVIRONMENT: METEOROLOGY, HYDROGRAPHY, GEOLOGY, RELIEF AND BIODIVERSITY

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 of impacts and influence the overall direction in the development of the project.

Project Location

The project area is situated in the Northern zone in Burera district which is one of the five districts of the North Province, Burera is located in a mountainous area with abundant rainfall, water systems typically utilize springs with gravity-fed systems. Combinations of limited individual connections and public water points or kiosks exist at the village level. Community water supplies are increasingly managed by private operators with a growing network of technical support.

The district is divided into 17 sectors : Bungwe, Butaro, Cyanika, Cyeru, Gahunga, Gatebe, Gitovu, Kagogo, Kinoni, Kinyababa, Kivuye, Nemba, Rugarama, Rugendabari, Ruhunde, Rusarabuge and Rwerere. It has 69 cells, 571 villages, 339,200 habitants and 64.5 square kilometres and is bordered as follows:

- In the East: Gicumbi district (Northern Province)
- In the West: Musanze district (Western Province)
- In the North: The Republic of Uganda
- In the South: Gakenke and Rulindo districts (Southern Province)



Figure: Sectors of Burera district

DESCRIPTION OF THE ENVIRONMENT

Description of the Physical Environment: Meteorology, Hydrography, Geology, Relief and Biodiversity

RELIEF.

The District of Burera belongs to the agro bio climatic zone of highlands of BUBERUKA and highlands of Lave. His average altitude is 2100 meters. His relief is characterized by steeply sloping hills connected either by valleys steep-sided or by flooded marshes. The most

remarkable hills are: Bisaga (2 401m); Kabyaza (2 392m); Kabona (2 348m); Karurunga (2 305m); Seta (2 305m); Nyanamo (2 225m).

CLIMATE

The climate of the District is of the type wet, characterized by two dry seasons and two rainy seasons which set out again over all the year in the following way: a small dry season extends from mid-December to February a great season of rain extends from March to mid-June a great dry season extends from June until September and a small season of rain extends from mid-September to December. Annual precipitations reach 1400 mm, the temperature varies between 9°C and 29°C, according to the places and the season.

HYDROGRAPHY

Located in the agro bioclimatic zones of the highlands of BUBERUKA and the highlands of IAVE, the district of BURERA has an important hydrographic network composed of lakes BURERA (55 km²) and RUHONDO (28 km²), marsh of which the RUGEZI (6735 hectares), several rivers such as river URUGEZI, river CYERU, river KABAYA, river KABWA and many non made-up sources. The district profits from regular precipitations of an importance of more than 1.400 mm/an, which offers to him a theoretical reserve of 531,560,000 m³ water each year.

SOIL

The BUBERUKA region is characterized by a ground mainly forms black schist and by places of the latelitic soil. While the ground of the volcanic area is typical volcanic ground.

FLORA

Eucalypts is the dominant woody species of the district. Of autes gasolines present in the area are the forest agro species such as Alinus and grevilleas and some relics of the local species, in particular the ficus and the markhamia which are often planted around the dwellings. The cultures cover most of the surface of the district. The principal crop plants are the sorghum, the Corn, the bean, the apple ground, the garden pea, the banana tree, it but, the vegetables and the fruit trees.

POPULATION

The total population of the BURERA district is 336.739 people and is grouped in 67.925 households , that is to say an average of 5 people by household. The average density is 522 inhabitants to km².

DESCRIPTION OF THE SOCIO-ECONOMIC ENVIRONMENT

AGRICULTURE

Major economic activities are small scale businesses and agriculture. The Northern Province is leading in the production of food in country, the region has been blessed by its fertile soils and its geographical location as it bordered by Uganda in the north, and this also boosts business across the border. There is a variety of farm products cultivated in the higher altitude north and in the lower altitude central, east and southern parts of the province.

It has fertile agricultural land, producing crops like rice, maize, Cassava, Bananas, beans and coffee. Lush pastures support the cows which produce milk for nation, as well as sheep and goats.

INFRASTRUCTURE

The industrial sector in Burera District is not very well developed. In the district there are only 12 coffee processing centers and two centers for seedling variety improvement. This is usually brought about by lack of socio-economic infrastructure like roads, water, electricity etc. Roads covering a distance of 33km were constructed and these are Kaziba-Akarere, Kirenge-Rushashi, Buranga-Murambo. There were also small roads that were repaired during the monthly community work exercise covering a distance of 59.4km. Four bridges of Cyacika, Mugunga-Vunga, Kamina, Kivuruga were constructed.

Roads and bridges

Burera District has both tarmac and murrum roads, 94km of roads are currently in good shape, 75.5km are being rehabilitated and 89 km are still bad pending rehabilitation next year. Most bridges are being rehabilitated. The total number in kilometer is 268.6

Electricity

Homes that have power supply are 540, there are 27 schools that use both hydro-power together with solar energy and biogas, also 12 trading centers have electricity

Water

32% of clean water is distributed among the inhabitants of Burera District and 35% of people trek about 500 meters in radius to fetch water.

EDUCATION

The number of schools in Burera District is in three categories, those include Kindergartens, Primary schools, Secondary schools and collages (Amasomero). There are 149 Kindergartens with 3.557 pupils together with 149 teachers.

There are 85 Primary schools with a total number of pupils amounting to 89.524; the number of teachers in primary schools is 1.305. There are 24 secondary schools with 295 teachers; the number of students is 8.068.

INDUSTRY

There are a number of industries and their products in Burera District, these include; Maize Milling plant, a juice making factory, hand crafts, local ambulance in Murenge sector, a shoe making factory, brick making Dairy product factory and honey products. These industries are located in different sectors in the District.

The main factories and the products which are processed are: COAMV(Gahunga Sector) - Maize Milling KAUKO (Rugarama Sector) - Sugar cane Juice and Wine UMUTAKO(Rugarama

Sector) - Variety of arts and crafts from horns, paper etc... Bungwe Sector - Local Ambulance Factory Rugarama Sector - Shoe making factory INGANZO (Cyeru Sector) - Clay products factory i.e. bricks, roofing tiles etc Cyeru and Butaro Sectors - Cheese making factory FAV (Rugarama Sector) - Honey processing factory

BUSINESS

The District of Burera indulges in trade through shops, small bars, restaurants and some hotels. There are some markets of which some are well constructed and others still operate without any roofing and traders have to endure the risk of rain and sun throughout the day. There are also micro finance institutions, banks and credit and saving cooperatives. The district also trades with the neighboring districts especially in agricultural products. The district has built and upgraded some markets and this has facilitated the smooth running of trade within the district. There is a remarkable increase in trade with more people getting involved.

There is need to encourage foreign investors to invest in the district especially in the agricultural sector due to the soil fertility in the district and abundance of cheap labor. There is also need to encourage the population to use modern methods of technology in order to increase their productivity and hence improve their standards of living.

HEALTH

The district of Burera has established family planning committees in all the villages in the district and family planning services are being offered in six secondary family planning posts put in place by religious organizations. The number of women that have been participating have grown from 8.1% to 16%, however, men have also been participating in this endeavor with 70 men in 2007 but have tripled to 288 in 2008.

The District upgraded some health centers including Muhondo, Coko, Bushoka, and Rutake Health Centers. These health centers helped in providing testing and counseling services (VCT&PMTCT) to more than 15,600 people.

People are being sensitized to look after their hygiene especially drinking boiled water, using clean food utensils, and cleaning their homesteads. At the village level, there are people responsible for monitoring how all this is being implemented. People have been encouraged to subscribe to the mutual health insurance and there is a big improvement with an increase in the number of registered members. Some organizations and corporate companies have been helping the vulnerable and the poor to be able to pay for this mutual health insurance.

TOURISM

The district lies in the northern part of Rwanda, adjacent to the Ugandan border, and between the cities of Ruhengeri and Byumba. It is home to Lakes Burera and Ruhondo, and the Virunga Lodge hotel, which lies between them, commanding views of the lakes and the nearby Virunga mountains, making it one of Rwanda's most popular tourist spots. The district also contains the Cyanika border post, gateway to Kisoro and southwestern Uganda.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

III.1. POLICIES RELEVANT TO THE PROJECT

A. 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 priority policy 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.

The 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.

Below are the priority policy actions:

- Meet the crisis of blackouts caused by delayed investment and drought
- Provide economic power by developing the use of Lake Kivu methane, and by bringing on line more hydro power.
- Enhance overall electrical infrastructure to meet demand growth and supply quality needs – generation, transmission and major distribution construction and rehabilitation.
- Deliver a programme of rural electrification on the basis of enhanced distribution networks, micro hydro, and solar power.
- Implement a wood and charcoal efficiency and substitution strategy to counter the deforestation crisis.
- Continue steady progress to a viable electricity and gas sector, consistent with meeting social needs.
- Commence utilisation of Kivu gas for other than power generation.

B. 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, 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 that 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.

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 4th 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 4th 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.

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.

C. Land Law

This organic law n° 08/2005 of 14/07/2005, determines the use and management of land in Rwanda. It also institutes the principles that are respected on land legal rights accepted on any land in the country as well as all other appendages whether natural or artificial.

Land is part of the public domain of all Rwandans; ancestors, present and future generations. With exceptions of the rights given to people, the state has supreme powers to manage all the national land, and this is done in public interest aimed at sustainable, economic development and social welfare, in accordance with procedures provided for by law. In that regard, it is the state that guarantees the right to own and use the land. The state also has rights to expropriation due to public interest, settlement and general land management through procedures provided by law and prior to appropriate compensation.

This organic law protects equally the rights over the land acquired from custom and the rights acquired from written law. With regard to law, owners of land acquired from custom are all persons who inherited the land from their parents, those who acquired it from competent authorities or those who acquired it through any other means recognized by national custom whether purchase, gift, exchange and sharing.

A land can be categorized urban and rural land (which is confined within boundaries of towns and municipalities established by law), individual land (composed of the land acquired through custom, written law which excludes public land or district, town, municipality and the City of Kigali land, the one acquired from competent authorities, purchased land, gift, exchange and sharing and state land (which makes up the public domain consists of all the land meant to be used by public or land reserved for organs of state services as well as national land reserved for environmental protection;

1° Land containing lakes and rivers as listed by an order of the Minister having water in his or her attributions;

2° Shores of lakes and rivers up to the length determined by an order of the Minister having environment in his or her attributions starting from the furthest line reached by water depending on successive floods. This is not concerned with exceptional floods;

3° Land occupied by springs and wells determined in accordance with an order of the Minister having water in his or her attributions;

4° National land reserved for environmental conservation composed of natural forests, national parks, reserved swamps, public gardens and tourist sites ;

5° State roads and their boundaries which were listed by the order of the Minister having infrastructure in his or her attributions;

6° Land and buildings the administration reserved for public activities or the land used by public administration organs).

Under this law, registration of land a person owns is obligatory. An employee called the Land Officer who directs the land bureau, shall keep land registers and issues certificates approving ownership of land.

Regarding land issues, he or she holds the power of the public notary and in regard to administration; he or she is supervised by administration of town, municipality or district in which the land he or she is responsible to register is located.

Without prejudice to laws related to human settlement, general land organization and use, the landowner shall enjoy full rights to exploit his or her land in accordance with the existing laws and regulations. However, the laws stipulates that the landowner has no right over minerals and any other wealth underground; they belong to the State but the landowner is allowed before others to enjoy rights of their exploitation upon his or her request and if he or she is capable.

Besides the rights that are enjoyed by the land owners, there some obligations that have to be full filled; unless it is considered to be necessary, the landlord shall not act against other people's rights.

In that regard he or she shall not:

- 1° refuse passage to his or her neighbors leading to their homes when there is not any other way;
- 2° blocking water that is naturally flowing through his or her land from other persons' land above his or hers;
- 3° refuse other people to draw water from a well found on his or her land unless he or she can prove that such a well has been dug or built by him or her.

The law envisages penalties in case of non compliance of the obligations of the land owners. There exist administrative penalties (requisition of degraded and the unexploited land, forceful confiscation of degraded and unexploited land, repossession of requisitioned land) and penal sanctions (payment of cash as fines).

III.2. ORGANIC LAW ON ENVIRONMENTAL 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 April 8th 2005.

Under the article 65 put, Rwanda Environment Management Authority (REMA) is the institution 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 67 clearly calls for the need to subject subprojects to mandatory Environmental Impact Assessment.

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

Article 67: Further specifies that every subproject 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 subprojects referred to in this Article shall be spelt out by the order of the Minister in charge of environment.

Article 68:

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

- A brief description of the subproject 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 subproject or, as the case may be, at the final evaluation stage of the subproject;
- A financial evaluation of measures recommended preventing, reducing or compensating for the negative effects of the subproject on the environment and measures for regular monitoring and control of relevant environmental indicators.

Article 69:

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 subproject 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 Subprojects 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 subproject that must be subjected to mandatory EIA has been put in place under article 30 of the Organic Law which 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.

III.3. ENVIRONMENTAL CLEARANCE PROCEDURES

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 subprojects 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 subproject 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 that any subproject 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 expansion of distribution network in Kigali City that involves construction of substation and electrical lines 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 subprojects classified under Impact Level III shall be subjected to a public hearing prior to the decision-making process.

III.4. INTERNATIONAL LEGISLATIONS RELEVANT TO THE SUBPROJECT

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 subproject are the World Bank and a number of United Nations agencies.

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 subprojects proposed for World Bank financing to help ensure that they are environmentally sound and sustainable.

The World Bank provides guidance on EIA requirements through the Environmental Assessment Sourcebook (World Bank 1994) which includes sectoral guidelines. The World Bank EIA process is implemented through a set of Operational Policies/Directives whose primary objective is to ensure that Bank operations do not cause adverse impacts and that they “do no harm”. These safeguard policies are grouped into Environment, Rural Development, Social Development and International Law.

The following safeguard policies have been considered in this EIA.

Environment

OP/BP 4.01 Environmental Assessment (January 1999)

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 subproject 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 subproject to one of three subproject categories, as defined below:

Category A: An EIA is normally required because the subproject may have diverse significant impacts (subprojects in this category are forestry, large industrial plants, irrigation and

drainage, mineral development (including oil and gas), pipelines (oil, gas, and water), resettlement, rural roads, tourism, urban development, large transmission lines, etc.).

Category B: A limited environmental analysis is appropriate, as the subproject may have specific environmental impacts. Subprojects in this category include agro-industries (small scale), aquaculture & marine culture, small industries, mini-hydropower station, public facilities (hospitals, schools, housing complexes, rural electrification, telecommunications, small-scale tourism, rural water supply, etc.

Category C: Environmental analysis is normally unnecessary, as the subproject is unlikely to have significant environmental impacts. Subprojects in this category include education, family planning, nutrition, institutional development, technical assistance, etc.

OP/BP 4.04 Natural Habitats (June 2001)

Supports the conservation of natural habitats and the maintenance of ecological functions as a basis for sustainable development. The Bank does not support subprojects that involve the significant conversion or degradation of critical natural habitats.

Rural Development

OP 4.36 Forests (November 2002)

Aims to reduce deforestation and enhance, through sustainable economic development, the environmental and social contribution of forests. The Bank does not support subprojects which involve significant conversion or degradation of critical forest areas or related critical natural habitats.

Social Development

OP/BP 4.11 Physical Cultural Resource (July 2006)

Cultural property is defined to include both remains left by previous human inhabitants (e.g. middens, shrines) and unique natural environmental features such as canyons and waterfalls. The Bank does not support subprojects that will significantly damage non-replicable cultural property and assists only those subprojects that are sited or designed so as to prevent such damage.

OP 4.10 Indigenous Peoples (July 2005)

Indigenous peoples in particular geographical areas are identified by having: a close attachment to ancestral territories and to the natural resources in these areas; self-identification and identification by others as members of a distinct cultural group; an indigenous language, often different from the natural language; presence of customary social and political institutions; and primarily subsistence-oriented production.

The Bank's objective is to ensure that indigenous peoples do not suffer adverse effects from Bank financed subprojects and that they receive culturally compatible social and economic benefits. Effectively the World Bank requires a subproject to develop a program for addressing issues based on the informed participation of the indigenous people themselves. Any subproject that affects indigenous peoples is expected to include components or provisions that incorporate an "Indigenous Peoples Development Plan".

OP/BP 4.12 Involuntary Resettlement (December 2001)

Details involuntary resettlement, emphasizing the severe economic, social and environmental risks, if unmitigated. It ensures that the population displaced by a subproject receives benefits from it and also covers those with usufruct or customary rights to land or other resources taken for the subproject. The Operational Policy is specifically inclusive, ensuring that all those affected both directly and indirectly by subproject developments are compensated as part of the subproject. Affected population, include those with income derived from informal sector and non-farm activities, and from common property resources. The absence of legal title does not limit rights to compensation.

The World Bank's Policy objectives urge that involuntary resettlement be avoided whenever possible. If unavoidable, displaced persons need to:

- Share in subproject benefits,
- Participate in planning and implementation of resettlement programs, and
- Be assisted in their efforts to improve their livelihoods or standard of livings or at least to restore them, in real terms, to pre-displacement levels or levels prevailing prior to the beginning of subproject implementation, whichever is higher.

OP 17.50 Disclosures

This Policy details the Bank's requirements for making operational information available to the public. The Bank reaffirms its recognition and endorsement of the fundamental importance of transparency and accountability to the development process. In addition, timely dissemination of information to local groups affected by the subprojects and programs supported by the Bank, including nongovernmental organizations, is essential for the effective implementation and sustainability of subprojects.

Rwanda has ratified the following international conventions and protocols pertaining to the environment and which are of relevance to the Subproject:

- United Nations Framework Convention on Climate Change, 1992
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal adopted on 22 March 1989
- Bamako Convention on the Ban of the Import Into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, adopted 30 January 1991
- Convention on Biological Diversity, 5 June 1992
- Convention on the Protection of World Cultural and Natural Heritage ratified 1997.
- Convention on the Means of Prohibiting and Preventing the Elicit, Import, Export and Transfer of Ownership of Cultural property ratified 2003.
- Ramsar (wetlands) Convention

IV. PROJECT ALTERNATIVES

This chapter describe and examine the various alternatives available for the Project. Alternatives examined during the study included site and route alternatives, on-grid electrification, and finally a No Project alternative was also assessed to determine the impact of this No Project Scenario.

IV.1. ANALYSIS OF ALTERNATIVES

A. Alternative Routes

An analysis of alternative routes was undertaken through mapping and involvement of all the stakeholders in this selection process. At the end of this process, alternative routes were selected among the possible ones, based on the following general sitting criteria (which are related to economic and environmental values):

1. Proximity of existing lines;
2. Avoidance of restricted zones ;
3. Distance from zones of landscape value;
4. Distance from mountain edges, preference for valley routings;
5. Distance from residential areas;
6. Route with constant slope;
7. Minimisation of infrastructure crossing (e.g. roads, other power lines, etc.).

B. On-Grid Electrification

Provide on-grid electrification. This is the alternative that is proposed by this project. Through this all target beneficiaries will be provided with electricity from the existing grid system. The project is expected to significantly reduce demand for firewood, as this is the primary source of heating and lighting in these communities. This alternative will contribute positively to improving the lives of the target communities through reduced exposure to smoke, improvement of existing electricity infrastructures, improvement in living conditions, increased communication via use of mobiles and opportunities for seeking alternative livelihood options. Local government institutions will also benefit through reduced time and money spent on sourcing

firewood from local communities, as well as increase in accessibility to information through various media sources, internet and improved communication.

C. No project Alternative

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 if the new distribution and transmission lines are built. However the positive benefits will be forgone in terms of providing more access to electricity to the populace of the project area which would have in turn spurred and contributed to economic growth.

IV.2. COMPARISON OF ALTERNATIVES

The second alternative “providing improved on-grid electrification for the proposed beneficiaries” is the most feasible in the country, the positive environmental benefits, and most importantly because this is what the local communities prefer. The third alternative of “no-build” is not feasible because electricity is included as a measure of development in a village and therefore is always given high priority in the list of developmental activities for any district Development Plan. While there will be no environmental cost from this alternative, with increasing population it is expected that the demand for fuel wood will increase each year, putting very heavy pressure on the already dwindling forest resource.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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 a significant number of Rwandese through the project potential hazards that the project could pose to the public, pollution of water resources and atmospheric resources.

V.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.

Socio-economic Benefits

The positive impacts are numerous and wide-ranging. The benefits of the project for domestic supply and use in small-scale businesses and in access to electric power for schools and public services are evident. In the construction phase there will be temporary employment opportunities for local contractors and those who will be employed or supply services and provisions for workers and to contractors. Within the respective project areas there will be opportunities for petty trading and small business service provision along the power line routes.

Significant social benefit will come through employment generation and safer more efficient operation of key services, through provision of electricity access to the villages along the new distribution lines to be served by the project. Potential beneficiary enterprises affected by and contributing to regional socio-economic transformation will be small industries and other agricultural processing businesses which need electricity.

The long-term direct positive impact is therefore in access to reliable new electricity supplies, which will lead to better provision and easier management of goods and services, and enable new facilities for processing and storage. There will be better availability and supply of safe and

clean water (which needs pumping); data management with computers is made possible and communication facilities like internet will be increased, as also charging for mobile phones; also, electric lighting adds to security at night and enables extended opportunities for work and study.

Electricity access increase would support overall investment in education and strengthen the ongoing effort of capacity building to overcome critical constraints in the implementation of development programmes. Essential to this effort would be power supply to health facilities for the installation of cold storage facilities for the safe transportation and storage of vaccinations and other vital medications.

As a consequence the quality of life and extent of economic opportunity will be changed for the better. Social and environmental costs associated with the use of firewood and others means of lighting will be reduced and there may be a more limited requirement for firewood cutting and collection.

On employment the project expects to employ local casual and skilled labor on-site. 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. At this point, the number of women workers or those directly affected by the project who could be employed is unknown but EARP will advise that this group of persons be given priority.

Environmental Benefits

Increased distribution of electricity to the project area population will ease the pressure on the use of fuel wood that is rampant in the area and in effect would help to conserve the fragile and diminishing forest cover of the country by providing an alternative source of energy.

V.2. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES.

The table below presents the anticipated environmental impacts, corresponding mitigation measures related to the pre-construction, construction and operation of the distribution and transmission lines of the project. Mitigation measures for pre-construction and operation phases shall be implemented by EWSA/EARP while those for construction phase shall be implemented by contractors.

Impact Description	Mitigation Measures	EARP Subcomponent Type
Preconstruction		
Land acquisition for MV transformers, overhead line installation and loss of income due to acquisition of agricultural land and plantation forests.	Expropriation shall be made for the affected lands, tress or any other property in consistency with GoR and World Bank requirements.	Construction of Medium and low voltage overhead transmission lines and transformers.
Land acquisition mayll require relocation of some households.	Prior to any site works, EWSA and MININFRA shall undertake compensation and relocation in coordination with affected families and local authorities.	Construction of Medium and low voltage overhead transmission lines and transformers.
Disturbance to agricultural land uses through permanent and temporary land acquisition	Carry-out detailed design of ROW and towers in a way that minimizes disturbance to agricultural land. Utilize tower designs that minimize ROW width and land use impacts. Adjust power line span length to avoid specific tower pad impacts. As far as practical, schedule construction works to take place after crop harvesting	Construction of Medium and low voltage overhead transmission lines and transformers.
Safety risks due to presence of UXO	EWSA/EARP shall engage qualified organizations to remove UXOs prior to site works.	Construction of Medium and low voltage overhead transmission lines and transformers.
Lack of consultations with local authorities on route selection	During FS and detailed design, EWSA/EARP and MININFRA shall coordinate with local authorities regarding selection of suitable alignments for transmission and distribution lines to ensure minimal impacts to affected communities.	Construction of Medium and low voltage overhead transmission lines and transformers.
Construction		
Vegetation clearing for construction for the provision of buffer zones for medium voltage lines	EWSA/EARP shall coordinate with affected families and local authorities for compensation of trees lost following Government/ WB policies	Construction of Medium and low voltage overhead transmission lines

	<p>Contractors shall confine vegetation clearing within required area, unnecessary cutting of trees shall be prohibited</p> <p>As much as possible, contractors shall undertake vegetation clearing through manual methods. Use of herbicides shall be prohibited.</p> <p>Contractors shall replant disturbed sites</p>	and transformers.
Increased exploitation of forest products	Workers shall be prohibited from hunting and gathering other forest products	Construction of Medium and low voltage overhead transmission lines and transformers.
Direct discharge of construction run-off may cause siltation of watercourses. Improper storage and disposal of excavation spoils, wastes and other construction materials could adversely affect water quality and flow regime.	<p>Run-off and drainage control shall be provided in construction areas to avoid siltation of nearby watercourses.</p> <p>Sediment laden construction water will be discharged into settling ponds prior to final discharge, if practical.</p> <p>Earth, stones and solid wastes will be properly stockpiled and disposed of so that these do not block canals, rivers and creeks in the vicinity of the project areas.</p>	Construction of Medium and low voltage overhead transmission lines and transformers.
Flooding of adjacent areas	Proper drainage shall be installed to avoid flooding of surrounding properties.	Construction of Medium and low voltage overhead transmission lines and transformers.
Improper storage and handling of fuel, lubricant and other hazardous substances could contaminate soil and water.	Fuel and other hazardous substances shall be stored in roofed, concrete-lined and bunded areas.	Construction of Medium and low voltage overhead transmission lines and transformers.
Elevated noise and dust emission levels may be experienced by nearby households and other sensitive receptors.	<p>The following measures will be implemented to minimize impacts to local communities during construction:</p> <ul style="list-style-type: none"> - Provision of cover on haul trucks transporting materials, gravel, excavated soil and other construction materials, access roads shall be regularly cleaned to keep these free from debris - Water spraying on exposed areas near residential and commercial areas to suppress 	Construction of Medium and low voltage overhead transmission lines and transformers.

	<p>dust emission,</p> <ul style="list-style-type: none"> - Proper maintenance of equipment and use of mufflers, as appropriate, to minimize noise, - Speed restrictions for trucks and vehicles shall be enforced to minimize dust and noise emission - Scheduling of noise generating activities during daytime, as much as possible, to avoid disturbance to nearby communities; if evening construction is necessary, affected households and groups should be notified beforehand - Ensure all vehicles and equipment are properly maintained to meet emission standards and are covered by valid operating permits 	
Disruption to traffic movements may occur due to construction- related activities.	<p>Proper coordination with local authorities regarding traffic flow supervision and diversion shall be made.</p> <p>Road closures and corresponding schedules as well as posting of traffic advisory signs to minimize traffic build-up shall be implemented in coordination with local authorities.</p> <p>Design travel routes for construction vehicles to avoid areas of congestion</p>	Construction of Medium and low voltage overhead transmission lines and transformers.
Irrigation canals in adjacent agricultural land, dykes may be damaged during construction.	Any damage to irrigation channels shall be immediately repaired and damages shall be compensated, as appropriate.	Construction of Medium and low voltage overhead transmission lines and transformers.
Access roads used during transport of construction materials and equipment may be damaged.	Restoration of damaged roads shall be undertaken upon completion of construction.	Construction of Medium and low voltage overhead transmission lines and transformers.
Failure to restore temporary construction sites.	All temporary construction sites will be cleared of debris and structures, ground shall be leveled (as necessary), revegetated (as necessary) and restored before turning over to communes and households.	Construction of Medium and low voltage overhead transmission lines and transformers.
Possible conflicts with and/or disruption to local community	If construction worker camps are required, select the locations in consultation with local authorities.	Construction of Medium and low voltage overhead transmission lines

	Train workers on suitable interactions with local community including prevention of transmissible diseases.	and transformers.
Health risks due to unhygienic conditions at workers' camps.	<p>Basic medical care shall be provided at camp sites.</p> <p>Workers shall be provided with potable water supply and hygienic sanitation facilities.</p> <p>Proper storage as well as regular collection and proper disposal of solid wastes shall be implemented.</p> <p>Health and safety orientation shall be conducted for construction workers.</p>	Construction of Medium and low voltage overhead transmission lines and transformers.
Safety hazards during construction	<p>Workers will be oriented on safe practices and shall be provided with appropriate personnel protective gear (e.g., safety shoes, hard hats, safety goggles).</p> <p>There will be provision for adequate protection to the general public, such as safety barriers and warning signs in construction areas.</p> <p>Appropriate lighting shall be installed in construction areas when works occur after dark</p>	Construction of Medium and low voltage overhead transmission lines and transformers.
Operation		
Safety hazards	Unauthorized persons shall not be allowed at the transformer.	Operation of Medium and low voltage overhead transmission lines and transformers.
Pollution due to use of herbicides	Use of herbicides to control vegetation height within the right of way shall be prohibited	Operation of Medium and low voltage overhead transmission lines and transformers.
Soil and water contamination due to leaks of hazardous substances	<p>PCB-containing equipment shall not be used.</p> <p>Power companies shall secure hazardous substance management permit prior the operation.</p> <p>Leaks shall be repaired immediately and waste oil shall be stored and disposed of consistent with applicable laws and regulations.</p>	Operation of Medium and low voltage overhead transmission lines and transformers.

	There shall be provisions for concrete-lined transformer bays as well as drainage and oil-water separator to handle spills, leaks and oily water run-off that could emanate from the transformers.	
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V.3. PROJECT DECOMMISSIONING

Decommissioning of the project will involve dismantling and removing all the structures of the dismantling the supporting infrastructure (towers) and all those structures that were associated with this 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. EWSA 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.

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