E2761 v2

225 kV
Bolgatanga – Ouagadougou Interconnection Project
(Ghana side)
Environmental and Social Impact Assessment Study

ENVIRONMENTAL IMPACT STATEMENT

FINAL REPORT

August 2010

CabIRA

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EXECUTIVE SUMMARY

Project Background

The electricity demand in the capital of Burkina Faso, Ouagadougou, is primarily met through thermal power generation. The economic difficulties of operating oil-fired thermal power plants especially their high costs of production have led to gradual degradation in the quality of electricity supply to the population of Ouagadougou, which has in turn impacted on their productivity. Additionally, the negative environmental impacts of oil-fired thermal generation with regard to green-house gas emissions and their effects on global warming and climate change need to be avoided wherever possible. Furthermore, due to growing demand that has far surpassed available generating capacity, combined with these economic difficulties, there is a need for the Société Nationale d"Electricité du Burkina (SONABEL), the national electric power utility provider to reinforce its quality of supply especially through the diversification of its mode of electricity production.

The ongoing and near-planned electricity generation projects in Burkina Faso"s southern neighbor Ghana, in addition to the extension of the existing interconnection line emanating from Côte d'Ivoire through Ghana and Togo/Benin to Nigeria with the 330 kV Ikeja West (Nigeria) – Sakete (Benin) transmission line project, will increase the available spare capacity in Ghana. This, coupled with the anticipated generation from power plants in Ghana to be fired by gas from the recently commissioned West Africa Gas Pipeline, will permit the exportation of cheaper power to Ouagadougou from Ghana through a transmission interconnection line from Bolgatanga (Ghana) to Ouagadougou (Burkina Faso), in line with the adopted West African Power Pool (WAPP) Master Plan.

The WAPP is a regional power market development initiative by the Economic Commission of West African States (ECOWAS), created by Decision A/DEC.5/12/99 at the 22nd Summit of the Authority of ECOWAS Heads of State and Governments in order to address the issue of power supply deficiency within West Africa. Its primary objective is to establish a regional electricity market in West Africa through the judicious development and realization of key priority infrastructure that would permit accessibility to

economic energy resources, to all member states of the ECOWAS. Currently, WAPP member countries comprise Benin, Burkina Faso, Cape Verde, Côte d"Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

The Volta River Authority (VRA) is the national electric power utility company in Ghana, established under the Volta River Development Act 1961, Act 46, with functions including the generation and transmission of electric power for industrial and domestic needs of Ghana. In addition, the VRA sells electricity to nearby countries of Togo and Benin, and has interconnection with la Cote d"Ivoire. Recently, a new company called Ghana Grid Company Limited has been formed out of VRA to solely manage power transmission. The generation system of VRA consists of two (2) hydroelectric power plants on the Volta River at Akosombo (1,020 MW) and Kpong (160 MW) and a Thermal Generation plant at Aboadze near Takoradi (550 MW). The Kpong Hydro Electric Plant (HEP), located some 24 km downstream of the Akosombo HEP Generation station, has four generating units, each individually rated at 40 MW. The Akosombo HEP Generation Station has six generating units; four of the units were completed in 1965 whilst the other two were completed in 1972. The six units originally had a total installed capacity of 912 MW, including 15% overload capacity. In 2005, VRA completed a retrofit of the generating units which included the replacement of the turbines runners which has increased the total plant installed capacity to 1,020 MW.

The Takoradi Thermal Power Plant is presently run on light crude oil and consists of the 330 MW Combined Cycle Takoradi Thermal Power Generating Station (TTPS); and currently a 220 MW from the 330 MW CC Takoradi International Company Plant. The TTPS is wholly owned by VRA and comprises two nominal 110 MW Combustion Turbine Generators and a nominal 110 MW Steam Turbine Generator.

The TICO plant is a joint venture arrangement between VRA and TAQA of Abu Dhabi and consists of two simple cycle 110 MW Combustion Turbine Generators. Plans are well advanced to expand the Takoradi Thermal Power Plant from the existing capacity of 550 MW to its ultimate capacity of 660 MW by converting the TICO plant into a combined cycle plant with the addition of the 110 MW steam Turbine – generator. The proposed Bui Dam

project in the north-western part of Ghana is expected to add about 400 MW of power to the national power pool after its completion to shore up Ghana"s energy base. The Government of Ghana has also acquired a 125 MW simple cycle barge mounted Thermal Plant at Effasu which has been handed over to a private investor for operation. It has also commenced the construction of the Tema Thermal Power Projects consisting of a 126MW Tema Thermal 1 Power Project, 80 MW Mines Reserve Power Plant, 300MW Kpone Thermal Power Project and the 50 MW Tema Thermal 2 Power Plant. These plants are in their various stages of construction. With Ghana's recent oil find with associated gas, its energy generation potential has shot up, justifying the construction of this project in anticipation of evacuation of spare power to Burkina Faso.

VRA"s transmission system comprises approximately 4000 - circuit km of High Voltage lines and 42 switching and bulk supply points (substations). The transmission network consists of about 3700 km 161 kV transmission lines spread over the whole country as well as a 128 km 161 kV double circuit line and a 75 km 225 kV single circuit transmission line for interconnection with Togo and Benin in the east and Cote d"Ivoire in the west respectively. There is also about 100 km of 69 kV transmission line in the eastern part of the country.

The construction of a 215 km 330 kV transmission line from TTPS, Aboadze to the Volta substation, Tema which forms part of the 330 kV WAPP Coastal Transmission Backbone is now ongoing. The procurement process for the construction of a 330 kV transmission line from the Volta substation through Mome-Hagou, Togo to link up with the Sakete, Benin to Ikeja West, Nigeria is also in progress. Again, the bidding processes for the Ghana – Burkina Faso Cross Border Project from Bawku (Ghana) to Bittou (Burkina Faso) as well as the 330 KV Aboadze-Prestea-Kumasi-Han Transmission System and the 330 KV Tumu-Han –Wa Transmission Line Project both in Ghana are in progress.

Major Significant Impacts

Significant environmental and social impacts identified with the proposed project include compensation and resettlement for affected land and properties at the pre-construction phase. At the construction phase, major

issues include loss of vegetation in an area already under threat of desertification, noise nuisance, opening up of restricted areas as a result of the transmission line, air quality (dust and exhaust emission) impacts, impacts on water resources as well as public health and safety issues, particularly, HIV/AIDS and sexually transmitted diseases. The construction phase is also expected to infuse some income into the local economy. Appropriate mitigation measures have been prescribed for the identified impacts.

The operational and maintenance phase will be implemented under the VRA"s Operation and Maintenance Guidelines, which document is periodically updated in line with the Authority"s operations.

Project Alternatives

Alternatives that have been analysed during this study include a "no-development" scenario, an optimal transmission line route, alternative modes of evacuation, types of conductors and tower design, among others. The project has significant economic and political benefits for both Ghana and Burkina Faso as immediate neighbours and members of a regional economic group, ECOWAS. Phase conductors and tower design have been selected taking into consideration climatic conditions such as wind strength and ambient humidity. Various alternatives line routes were assessed, and the line route that encountered the least number of physical developments was selected. This is in view of the fact that cost of compensation and resettlement of such properties and project-affected persons adds to the overall project costs; and the higher the compensation costs, the less viable the project becomes. Alternative mode of evacuation that has been considered has been burying the cables underground, which has not augured well in a largely agricultural terrain. The cost of protection and maintenance of an underground transmission line could be prohibitive, no to talk about the risks of vandalism and electrocution of wildlife and humans.

Results of Public Consultations

The most common issue that kept coming up throughout the consultations has been the prompt and equitable payment of compensation for project-affected persons. Eighty seven houses and one hundred and thirty nine economic trees have been identified to fall within the right-of-way, with a

composite open market value of Eight hundred and twenty six thousand, two hundred and forty three Ghana cedis, eighty pesewas (GHC 826,243.80). Some doubts were expressed about the payment of compensation because according to respondents from the affected communities, the VRA has in the past failed to pay compensation for similar projects.

Mitigation Measures and Mitigation Plan

Suitable mitigation measures have been designed for the identified impacts. The VRA has developed a Land Acquisition and Resettlement Plan under World Bank guidance that has over the past several years guided its implementation of projects that have involved the compulsory acquisition of land with attendant involuntary resettlement. This document will be employed to ensure an equitable and satisfactory resettlement of project-affected persons. Vegetation clearing will be limited to the cutting of trees within the right-of-way that could interfere with the operations of the line, while re-growth of grasses and surface vegetation will be allowed to give vegetative cover to exposed soil surfaces. A mitigation plan has been designed and is as presented below :

Mitigation Plan

PROJECT ACTIVITY	POTENTIAL ENVIRON-MENTAL IMPACTS	LOCATION	PROPOSED MITIGATION MEASURE(S)	MONITORING/FOLLOW-UP	NET EFFECTS
PRE- CONSTRUCTION PHASE	Clearing of vegetation for Route survey.	Along entire length of line route.	Vegetation clearing shall be kept to the barest minimum. Existing and available farm tracks and footpaths shall be used as access routes for surveyors.	VRA Project Management Team.	Will minimise vegetation clearing and exposure of soil surface.
	Impact of RoW acquisition on Land ownership and use.		RoW acquisition shall involve consultations with stakeholders. Compensation shall be paid for all properties in the RoW excluding land as per the various Land (Wayleaves) legislation. All cultural and religious properties shall be avoided.	VRA to acquire RoW as per LI 542. CabIRA shall prepare Property Impact Report. VRA to pay appropriate compensation in consultation with Lands Valuation Board.	Payment of Compensation will offset economic and housing losses of affected persons.
CONSTRUCTION PHASE	Impact of RoW acquisition on Land ownership and use.	Tower sites	Avoiding routing of construction access roads through farmlands as much as possible. Existing and available farm tracks to be used as much as possible. Replanting of access roads with fast growing grasses to check erosion.	Project Contractor	Minimised damage to crops and hence of compensation to be paid by VRA. Avoidance of exposure of soil surface.
	Sedimentation and Erosion of nearby water bodies	Tower sites	Number of passes of trucks to and from site will be regulated. Access roads shall be selected to avoid crossing streams and water bodies.	Project Contractor	To minimise soil destabilisation.
	Noise	Tower sites	Constructional activity shall be limited to daylight hours when noise impacts are minimal.	Project Contractor	To minimise the risk of accidents.
	Public Health and Safety	Adjoining roads	Warning notices "NO ENTRY,NO TRESPASSING" shall be placed at entry points of access roads. Trucks and machinery shall display appro-priate road safety signals. Safe speed limits shall be observed (10-20kph)	PMT/Project Contractor Project Contractor	To minimise the risk of accidents To minimise the risk of accidents.

	Loss of vegetative cover	Tower sites	Existing access tracks shall be used as much as possible. Construction of new access tracks will be kept to a minimum. After construction, regrowth of limited ground cover shall be encouraged.	PMT/Project Contractor	To minimise damage to crops and vegetation
	Soil Erosion	"	Ground surface at tower sites shall be graded to drain run-off away from tower legs. Terracing, cribbing or rip-rap may be used to protect tower foundations.	Project Contractor/PMT	To avoid erosion around tower legs and possible tower collapse
CONSTRUCTION PHASE	Loss of vegetative cover	"	Bush clearing shall be restricted to tower spots only to ensure minimal damage to vegetation cover. Final selection of line route shall consider minimal number of trees to be cut. Forestry Services guidelines shall be adhered to in forest reserves.	Forestry Services/ Project Contractor	To minimise damage to vegetation and trees
	Occupational Health and Safety, Public Health	"	Strict adherence to safety precautions as per Factories, Offices and Shops Act, 1970 (Act 328) and VRA Corporate Safety Rules 1993. Appropriate traffic warning signals such as "SLOW DOWN, LINE STRINGING IN PROGRESS" shall be placed along the road. ICAO safety standards shall be observed near the vicinities of known aircraft activity.	Project Contractor/ PMT	To ensure workside safety and avoid accidents
	Pollution of nearby water bodies	"	Drains leading from work areas shall be directed to existing drains to prevent them polluting nearby water bodies.	PMT/Project Contractor	To avoid contamination of nearby natural water bodies

OPERATION AND MAINTENANCE PHASE	Dropping of "live" Conductors	Along entire length of line route	RoW shall be acquired and access restricted. Towers shall be marked "DANGER-225 KV".	VRA Maintenance Team	To minimize possible effects of earthing and electrocution.
	Dropping of "live" Conductors	"	RoW shall be acquired and access restricted. Towers shall be marked "DANGER-225 KV".	VRA Maintenance Team	To minimize possible effects of earthing and electrocution.
	Collapse of tower	"	Use of anti-theft fasteners to check tower vandalism and its consequences.	VRA Maintenance Team	Avoid occupational accidents.
	Maintenance of RoW vegetation clearing	"	To be done only when necessary	VRA Maintenance Team	To ensure safe and proper disposal of generated wastes
	Rust treatment, painting of Towers	"	Painting in dry season to minimize paint failure and run-off into water bodies.	VRA Maintenance Team	
	Occupational Safety risks	"	Work Safety procedures as per VRA Corporate Safety Rules 1993 and Act 328.	VRA Maintenance Team	
	Waste generation from vegetation clearing and Packaging materials (solid wastes).	"	Trees, stumps, cut brush and conductor drums shall be made available to the communities for firewood. Non-metal solids will be disposed of through the public waste collection system. Waste cloths used for cleaning, special wastes in the form of empty chemical, oil and solvent containers. Hazardous wastes will be segregated and disposed by total destruction. Metal waste will be sold as scrap to dealers. All wastes will be stored in areas isolated from surface drains.	VRA Maintenance Team	Avoid environmental degradation
	Liquid wastes		Liquids from concrete works, washing of equipment, fuel, oil and chemical spills, pumped-out water from excavations and storm water will be directed into drains away from nearby water bodies.		Avoid contamination of nearby water bodies

Environmental and Social Monitoring Plan

A monitoring plan has been designed for the identified impacts at the various stages of the project implementation, and is as presented below.

Monitoring Plan

Parameter	Frequency	Responsibility	Remarks
Pre-Construction Phase			
Sélective vegetation clearing	Daily	Project Contractor/	Contractor will ensure that some vegetative cover remains
Compensation and Resettlement	Throughout Pre-Construction phase	VRA Estate Department	VRA LARP will be employed to ensure prompt and equitable compensation payment
Construction Phase			
Selective vegetation Clearing	Daily	Project Contractor	Contractor will ensure that some vegetative cover remains
Noise levels	Weekly	Project Contractor	Contractor will elicit feedback on noise from community members
Air Quality	Weekly	Project Contractor	
Traffic Impacts	Daily	Project Contractor	
Occupational Health and Safety - use of PPE	Daily	Project Contractor	Contractor will ensure that all personal use supplied PPE
Public Health and Safety including HIV/AIDS	Weekly	Project Contractor/PMT	Contractor will hold weekly meetings and distribute condoms to personnel.
Impacts on Water Resources	Weekly (During rainy season)	Project Contractor/PMT	PMT will monitor nearby water bodies for run-off from project excavations
Waste generation	Weekly	Project Contractor/PMT	PMT will ensure wastes generated are properly disposed of.
Employment and Income generation	Monthly	Project Contractor/PMT	PMT will monitor ensure that some vegetative cover remains
Operations and Maintenance Phase			
Operational and maintenance Hazards	Monthly	VRA Maintenance Department	Monitoring to be done by VRA Engineering Department

Recommendations

In view of the identified impacts and the designed mitigation measures, and the potential economic and political benefits to the two countries and the West African sub-region in general, the project is recommended for approval.

ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
C*ab*IRA	Cabinet d'Ingénierie et de Recherche Appliquée
DCE	District Chief Executive
ECOWAS	Economic Community of West African States
EC	Energy Commission
EIS	Environmental Impact Statement
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ESIA	Environmental & Social Impact Assessment
ESMP	Environmental and Social Management Plan
GRIDCO	Ghana Grid Company
HEP	Hydro Electric Plant
HIV	Human Immunodeficiency Virus
HV	High Voltage
ICNIRP	International Commission for Non-Ionisation Radiation Protection
INGEMA	Société Maghrébine d'Ingénierie
kV	Kilovolt
LI	Legislative Instrument
LVB	Land Valuation Board
PAPs	Project-affected Persons
SONABEL	Société Nationale d'Electricité du Burkina
RAP	Resettlement Action Plan
RoW	Right of Way
ToR	Terms of Reference
VRA	Volta River Authority
TTPS	Takoradi Thermal Power Station
TICO	Takoradi International Company
WAPP	West African Power Pool

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1. INTRODUCTION

The per capita consumption of, and the level of access to energy supply services are key indicators of socio-economic development of any country. One of the obstacles to achieving the Millennium Development Goals (MDGs) is the lack of access to energy services such as electricity. A major strategy identified by the Governments of Economic Community of West African States (ECOWAS) for increasing energy access is the interconnection of power systems and the encouragement of trans-boundary electricity supply. The objective is for countries that are better endowed in terms of electricity to provide the less endowed member states with access to cost-competitive energy.

To address the constraint of lack of access to electricity, ECOWAS, the Authority of Heads of States and Governments of Member States authorized the establishment of the West African Power Pool (WAPP). The WAPP is expected to provide a mechanism and the institutional framework for integrating the power systems of the ECOWAS Member States by providing reliable and sustainable electricity supply for the economic development of the sub-region.

It is within this framework that the WAPP Secretariat, and the national energy utilities of Ghana and Burkina Faso, (Volta River Authority, VRA and the Société Nationale d"Electricité du Burkina (SONABEL) is undertaking a project that will comprise the construction of a 206-kilometre long, 225 kV transmission line from Bolgatanga in the Upper East Region of Ghana to Ouagadougou in Burkina Faso to transmit high-tension electric power from Ghana to Burkina Faso. To that effect, the WAPP Secretariat on behalf of VRA and SONABEL, has procured the services of CabIRA-INGEMA Consultancy to undertake a Line Route survey and an Environmental and

Social Impact Assessment study for the proposed 225kV Bolgatanga-Ouagadougou Interconnection project.

On the Ghanaian side, the project will result in the following:

- construction of approximately 37 km of 225 kV transmission line,
- the extension of the 161 kV substation in Bolgatanga (Ghana)
- construction of one (1) new 225/161 kV substation in Bolgatanga (Ghana).

In accordance with the Environmental Assessment Regulations, 1999, (LI 1652), the project will be registered with the Environmental Protection Agency (EPA) and an Environmental Impact Assessment is to be carried out on the proposed project, which will form the basis for consideration for an environmental approval/permit by the EPA for the implementation of the proposed project.

1.1 SCOPE OF STUDY

CabIRA-INGEMA Consultancy, a consortium made up of Cabinet d'Ingénierie et de Recherché Appliquée (CabIRA) and INGEMA, Maghrebi Consulting Engineers (INGEMA), has been engaged by the WAPP Secretariat to undertake the update of the Line Survey and the Environmental and Social Impact Assessment study for this project. By the trans-boundary nature of the project, separate environmental requirements need to be met for both Ghana and Burkina Faso. A Scoping study has already been conducted, and the report submitted to the Ghana EPA for review and comments. The proposed Terms of Reference for the ESIA that was submitted as an annex of the approved Scoping report (attached as Annex 1) forms the basis of this Environmental and Social Impact

Statement. The ESIA is presented in a format prescribed by the Ghana EIA Procedures and generally follows the outline recommended globally.

This chapter (Chapter 1) presents a brief background of the project, its objectives and justifies the need for the project. It also discusses the various legal, administrative and policy issues that would affect the implementation of the project.

Chapter 2 describes the various proposed project activities to be carried out, giving sufficient details on the aspects that have potential environmental impact.

Chapter 3 is a description of the baseline environmental conditions, covering both the bio-physical and socio-economic/cultural components. Chapter 4 presents a discussion of the analysis of the various project alternatives The significant environmental impacts arising from the various project activities, and proposed mitigation measures are presented in Chapter 5; Chapter 6 outlines a monitoring plan to be used to verify the predicted impacts and ensure compliance with recommended mitigation procedures, as well as serve as an early warning system for any adverse environmental impacts resulting from the project.

The Provisional Environmental Management Plan is covered in Chapter 7.

The ESIA process has involved consultations with various stakeholders including the relevant state agencies such as the Environmental Protection Agency, Lands Valuation Board, the local government authorities in the three (3) administrative districts (Kassena-Nankana, Kassena-Nankana West and Bolgatanga Municipal Assemblies), community leaders and other stakeholders. Their inputs have informed the impact identification process, and have been incorporated in the relevant sections, and have been

summarized in Chapter 8. Chapter 9 concludes the report with recommendations.

1.2 BRIEF BACKGROUND OF PROPONENT – WAPP, VOLTA RIVER AUTHORITY, SONABEL

The WAPP

The West African Power Pool (WAPP) is a regional power market development initiative by the Economic Commission of West African States (ECOWAS), created by Decision A/DEC.5/12/99 at the 22nd Summit of the Authority of ECOWAS Heads of State and Governments in order to address the issue of power supply deficiency within West Africa. Its primary objective is to establish a regional electricity market in West Africa through the judicious development and realization of key priority infrastructure that would permit accessibility to economic energy resources, to all member states of the ECOWAS. Currently, WAPP member countries comprise Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

In order to further advance the implementation of the priority projects of the West African Power Pool (WAPP), the WAPP Secretariat, located in Cotonou, Benin, and the WAPP Members have commenced preparatory works towards the implementation of the following priority interconnection projects:

- 330 kV Volta (Ghana) – Mome Hagou (Togo) - Sakete (Benin) transmission project
- 150 kV Sikasso – Koutiala (Mali) - Segou (Mali) transmission project
- 330 kV Aboadze (Ghana) – Prestea (Ghana) transmission project

- 225 kV Bolgatanga (Ghana) – Ouagadougou (Burkina Faso) Interconnection project.

The WAPP Secretariat on behalf of the Volta River Authority (VRA) of Ghana and the Société Nationale d'Electricité du Burkina (SONABEL) of Burkina Faso have engaged the services of CabIRA-INGEMA, a consortium of environmental and engineering consultants, to undertake the following activities:

- Update an existing Line Route survey, produce maps, plans and profiles, and
- Undertake an Environmental and Social Impact Assessment study of the surveyed route and prepare an Environmental Impact Statement.

The Volta River Authority

The Volta River Authority (VRA) is the sole public corporation established under the Volta River Development Act 1961, Act 46, with functions including the generation and transmission of electric power for industrial and domestic needs of Ghana. In addition, the VRA sells electricity to nearby countries of Togo and Benin, and has interconnection with la Cote d'Ivoire. Recently, a new company called Ghana Grid Company Limited has been formed out of VRA to solely manage power transmission.

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VRA's transmission system comprises approximately 4000 - circuit km of High Voltage lines and 42 switching and bulk supply points (substations). The transmission network consists of about 3700 km 161 kV transmission

lines spread over the whole country as well as a 128 km 161 kV double circuit line and a 75 km 225 kV single circuit transmission line for interconnection with Togo and Benin in the east and Cote d'Ivoire in the west respectively. There is also about 100 km of 69 kV transmission line in the eastern part of the country. Figure 1 is the Map of Ghana showing transmission grid and generating plant sites.

The construction of a 215 km 330 kV transmission line from TTPS, Aboadze to the Volta substation, Tema which forms part of the 330 kV WAPP Coastal Transmission Backbone is now ongoing. The procurement process for the construction of a 330 kV transmission line from the Volta substation through Mome-Hagou, Togo to link up with the Sakete, Benin to Ikeja West, Nigeria is also in progress. Again, the bidding processes for the Ghana – Burkina Faso Cross Border Project from Bawku (Ghana) to Bittou (Burkina Faso) as well as the 330 KV Aboadze-Prestea-Kumasi-Han Transmission System and the 330 KV Tumu-Han –Wa Transmission Line Project both in Ghana are in progress.

By the Volta River Development Act, 2005, Act 692, the power transmission functions of the VRA has been transferred to a transmission utility company known as Ghana Grid Company (GRIDCO). However, at present GRIDCO is operating in close collaboration with VRA with regard to this project, and may be referred to interchangeably for the purpose of this project.

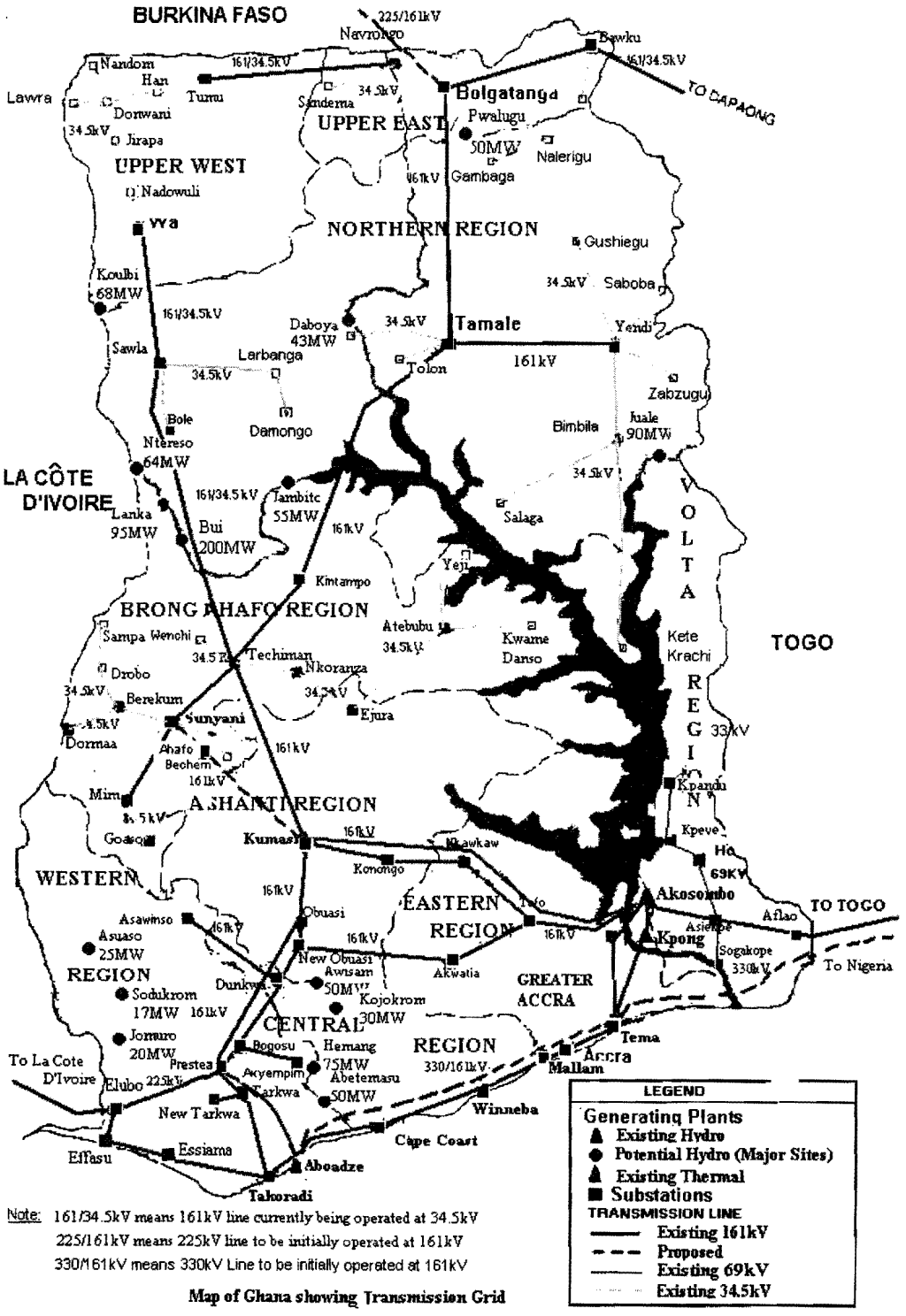


Figure 1: Map of Ghana showing transmission grid and generating plant sites

Société Nationale d'Electricité du Burkina

The Société Nationale d'Electricité du Burkina (SONABEL) was established as a state-owned enterprise in 1995 after having gone through several transformations commencing from its genesis in 1954 as a private company called AOF Energy responsible for production and transmission of electricity in Ouagadougou. It is the sole utility responsible for the production, transmission and transmission of electricity in Burkina Faso. In addition to electricity importation from Côte d'Ivoire, its national electricity generation park consists primarily of thermal stations and some hydroelectric power sources with an approximate cumulative installed capacity of 180 MW as at 2004. In 2004, importation constituted about 17% of its energy generation, hydroelectricity from the Burkina stations at Kompienga and Bagre about 18%, whilst thermal generation dominated with about 65%.

Presently, the main transmission lines that exist in Burkina Faso are a 132 kV line linking the hydroelectric stations of Kompienga and Bagre to the capital Ouagadougou, and a 225 kV line from Côte d'Ivoire terminating at Bobo Dioulaso. The total length of the transmission lines is approximately 1,370 km. The 225 kV Bobo Dioulaso – Ouagadougou transmission line project of approximately 350 km, will be completed by 2008. It is anticipated that the implementation of the 225kV Interconnection Project by the West African Power Pool (WAPP) will go to strengthen power system supply and reliability in Burkina Faso.

1.3 PROJECT BACKGROUND AND OBJECTIVES

The electricity demand in the capital of Burkina Faso, Ouagadougou, is primarily met through thermal power generation. The economic difficulties of operating oil-fired thermal power plants especially their high costs of

production have led to gradual degradation in the quality of electricity supply to the population of Ouagadougou, which has in turn impacted on their productivity. Additionally, the negative environmental impacts of oil-fired thermal generation with regard to green-house gas emissions and their effects on global warming and climate change need to be avoided wherever possible. Furthermore, due to growing demand that has far surpassed available generating capacity, combined with these economic difficulties, there is a need for the Société Nationale d'Electricité du Burkina (SONABEL) to reinforce its quality of supply especially through the diversification of its mode of electricity production. SONABEL is the electric power utility company in Burkina Faso and is the sole utility responsible for the production, transmission and transmission of electricity in Burkina Faso. The ongoing and near-planned electricity generation projects in Ghana in addition to the extension of the existing interconnection line emanating from Côte d'Ivoire through Ghana and Togo/Benin to Nigeria with the 330 kV Ikeja West (Nigeria) – Sakete (Benin) transmission line project, will increase the available spare capacity in Ghana. This, coupled with the anticipated generation from power plants in Ghana to be fired by gas from the recently commissioned West Africa Gas Pipeline, will permit the exportation of cheaper power to Ouagadougou from Ghana through a transmission interconnection line from Bolgatanga (Ghana) to Ouagadougou (Burkina Faso), in line with the adopted WAPP Master Plan.

The VRA transmission system is basically a 161 KV loop serving loads in the southern part of the country and a single radial line from Kumasi to the north, referred to as the Northern transmission circuit. This radial circuit supplies the loads of five major towns: Tamale, Sunyani, Techiman, Wa and Bolgatanga. The Northern circuit has been extended to supply other communities in Ghana and to serve as an interconnection to Dapaong and Cinkasi in Northern Togo.

In Burkina Faso, in addition to electricity importation from Côte d'Ivoire, the national electricity generation park consists primarily of thermal stations and some hydroelectricity with a cumulative installed capacity of 171 MW as at 2002. In 2003, importation constituted about 14.4% of its energy generation, hydroelectricity from the Burkina stations at Kompienga and Bagre about 20.58%, whilst thermal dominated with 65.02%.

The WAPP Secretariat on behalf of the VRA of Ghana and SONABEL of Burkina Faso proposes to construct a 225 kV transmission line from Bolgatanga in Ghana to Ouagadougou in Burkina Faso. The implementation of this project, known as the "225 kV Bolgatanga - Ouagadougou Interconnection Project" has also been identified in the WAPP Masterplan It is envisaged that the transmission line would initially be operated at 161 kV but would be upgraded to 225 kV at very low cost in the very near future.

Figure 2 shows the interconnection of the proposed power line route from Bolgatanga in Ghana to Ouagadougou in Burkina Faso.

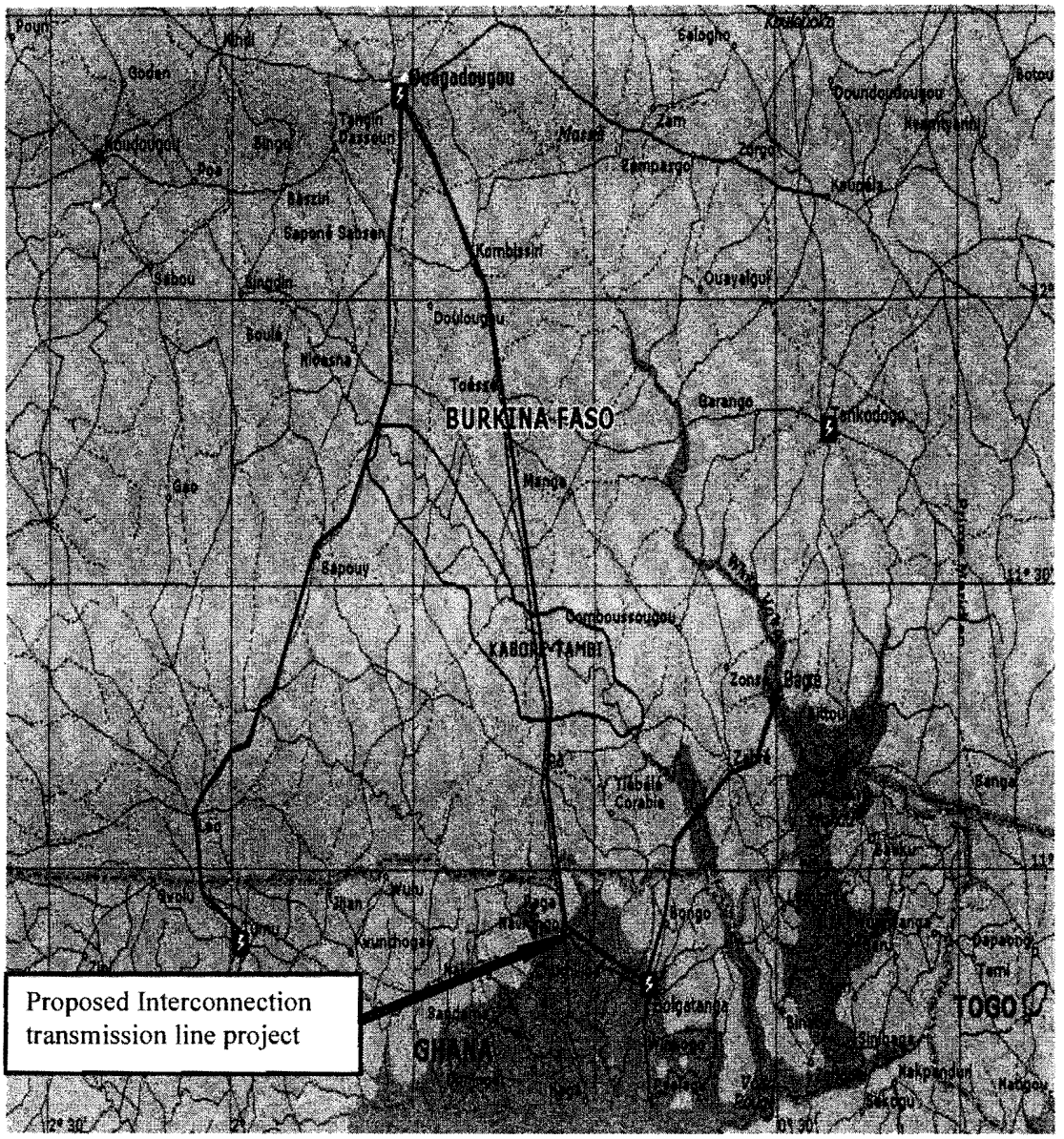


Figure 2: Map showing the location of the proposed 225 kV Bolgatanga – Ouagadougou Interconnection Project

1.4 LEGAL, REGULATORY AND INSTITUTIONAL CONSIDERATIONS

The relevant policies and regulatory conditions that must be considered for the successful implementation of the project in Ghana have been assembled and presented below as part of the ESIA process. The concerns

of all key stakeholders, including the relevant government ministries, departments and agencies (MDAs) which are deemed essential for the success of the project are discussed in Chapter 8 Consultations. The observance of the relevant cultural and community traditional beliefs and practices are essential to promote the social acceptance of the project by the beneficiary communities. The significant legislation considered includes :

- Environmental Protection Agency, Act 1994 (Act 490),
- Environmental Assessment Regulations, 1999 (LI 1652),
- Energy Commission Act, 1997 (Act 541),
- The Forestry Commission Act, Act 453, 1993,
- National Museum Decree, 1969, (NLCD 387),
- Lands (Wayleaves) Act, 1963 (Act 186),
- VRA Operational Safety Guidelines,
- World Bank Environmental Procedures and Guidelines,
- Convention on Biological Diversity Convention on International Trade in Endangered Species (CITES),
- International Tropical Timber Agreement, 2006

In compliance with the Environmental Protection Agency (EPA) Act, 1994 (Act 490), the proponent, the VRA has registered the project with the Ghana EPA. Under the provisions of the Ghana Environmental Assessment Regulations, 1999 (LI 1652), the erection of Power Transmission Lines falls under the category of Environmentally Critical Projects for which an Environmental Assessment is mandatory. The VRA registered the project with the EPA in July 2008 as the first step towards acquiring an environmental permit prior to the commencement of construction activity. A Scoping study has been undertaken and a Scoping report and a proposed Terms of Reference (ToR) for the Environmental and Social Impact Assessment (ESIA) study submitted to Ghana"s EPA, which agency has approved the ToR and authorized the undertaking of this ESIA study. EPA's

review comments of the Scoping report are attached under Annex 2 Correspondence.
The LI 1652 also defines environmentally sensitive areas, and this has been attached as Annex 3.
Extracts of the relevant sections of Ghana EPA's Energy Sector Specific Guidelines have also been attached as Annex 4.

The Energy Commission Act, Act 541, 1997 requires all services providers within the energy sector to comply with various licensing requirements. The VRA has complied with the various licensing requirements under the Act.
Where the transmission lines have to traverse a national or private forest reserve, The Forestry Commission Act, Act 453, 1993 makes provision for arrangements to be made between the VRA and the owners toward the efficient management of the line within the forest reserve. The VRA has a standing Memorandum of Understanding with the Forestry Commission to this effect, so should the line encounter any forest reserve, the dictates of the MoU shall take effect.

In case of the chance finding of any archaeological artefact in the course of vegetation clearing or excavation for the erection of the transmission towers, the National Museums Decree, 1969 (NLCD 387), which governs the operations of the National Museums and Monuments Board will apply. Procedures to be followed on the discovery of any such artefact are outlined in NLCD 387, and involve the halting of activity near the object and inviting the Ghana Museums and Monuments Board to take over the find.

The construction phase of the power line project would raise issues of the acquisition of wayleaves (Right-of-way). The determination of the line route and the acquisition of the right-of-way of the project will be done within the framework of the various Lands (Wayleaves) legislation identified above. The Lands Statutory Wayleaves Act 1963 Act 186 facilitates the entry into any land for the purposes of construction, installation and maintenance of

public utility works and the creation of right of ways and other similar right for such works. The Act and its accompanying Regulation, the Lands Statutory Wayleaves Regulation 1964 (LI 334) provides the modalities and procedures for the acquisition of the statutory rights-of-way.

The VRA has functional Operational Safety Guidelines covering all aspect s of its operations. These guidelines will guide the workplace health and safety aspects of the pre-construction, construction and operational phases of the project.

The World Bank"s Operational Policies (OP) includes guidance on Environmental Assessment requirements. The Bank"s Safeguard Policies, ten of them, is meant to ensure that operations of the Bank do not lead to adverse impacts or cause any harm.

The Safeguard Policies are categorized into Environment, Rural Development, Social Development and International Law. The following four out of the ten are relevant for considerations under the transmission line project. These are :

- Environmental Assessment (OP 4.01);
- Involuntary Resettlement (OP/BP 4.12);
- Forestry (OP/BP 4.36); and
- Management of Cultural Property (OPN 11.03).

Environmental Assessment (OP 4.01)

The OP 4.01 requires among others that screening for potential impacts is carried out early, in order to determine the level of EA to assess and mitigate potential adverse impacts. The Bank's project screening criteria group projects into three categories:

- Category A – Detailed Environmental Assessment;
- Category B - Initial Environmental Examination and
- Category C – Environmentally friendly

The EA ensures that appropriate levels of environmental and social assessment are carried out as part of project design, including public consultation process, especially for Category A and B projects. The OP 4.01 is applicable to all components of Bank financed projects, even for co-financed components.

Involuntary Resettlement (OP/BP 4.12)

The Policy on Involuntary Resettlement is intended to assist displaced people arising from development projects, in order not to impoverish any affected people within the area of influence of projects. An action plan that at least restores the standard of living must be instituted, in cases where resettlement is inevitable or loss of assets and impacts on livelihood occurs. Public consultation of "re-settlers" as well as the host communities is significant for the successful resettlement process and implementation of the action plan, in order to incorporate appropriate choices.

Forestry (OP/BP 4.36)

The OP/BP 4.36 aims at enhancing the environmental and social contribution of forested areas, and the need to reduce deforestation. The protection of forests through the control of forest-related impact of all investment operations is a concern of the policy. It promotes the restriction of operations affecting critical forest and conservation areas, while requiring that the sector and other relevant stakeholders should be consulted as appropriate.

Management of Cultural Property (OPN 11.03)

The policy is premised on the need to investigate and take inventory of cultural resources likely to be affected. Mitigations are provided for in cases of adverse impacts on physical cultural resources. Mitigation measures

should be undertaken in conjunction with the appropriate authorities, organizations and institutions who are also required to be consulted and involved in the management of cultural property.

The Bank does not support development actions likely to significantly damage non-replicable cultural property, and does assist only those projects sited or designed to prevent such damage.

Bank's Policy on Disclosure

The Bank's policy on disclosure currently under review requires that all the people residing in the given areas of a project have the right to be informed of the proposed development project in their respective areas. Prior to project appraisal therefore, the summary of the study of the development action along with other relevant information should be disclosed to or at the level of the Bank and the project area.

Ghana has a long history of energy development and the associated development of power evacuation infrastructure. Over the years, a number of regulations have been developed that are specific to the VRA and its activities, among which are the current project. The following relevant regulations have been considered :

- The Volta River Development Act, 1961 (Act 46),
- Volta River Authority (Transmission Line Protection) Regulation,1967 (LI 542),
- Volta River Authority (Transmission Line Protection; Amendment) Regulation, 2004.

The Volta River Authority (Transmission Line Protection) Regulations, 1967 (LI 542) provides security for electricity transmission lines belonging to the Volta River Authority. Under this legal instrument certain development

activities, such as construction of buildings, farming, etc are not permitted in the Right of Way (RoW). Thus, public health and safety is also protected.
With respect to land issues in Ghana, there are laws and legislation relevant to land acquisition for the purpose of transmission line right-of-way, and related issues. These include the :

- Administration of Lands Act, 1962 (Act 123);
- State Lands Act, 1962 (Act 125 as amended);
- State Lands Regulations 1962 (LI 230);
- State Lands (Amendment) (No. 2) Regulations 1963 (LI 285);
- Lands (Statutory Wayleaves) Act, 1963 (Act 186); and
- Lands(Statutory Wayleaves Amendments) Regulation, 2004
- Office of the Administrator of Stool Lands Act, 1994 (Act 481);
- The Ghana Land Policy, 1999.

The bulk of relevant local policies and regulatory framework that must be considered for the successful implementation of the project have been captured in the VRA Land Acquisition and Resettlement Policy (VRA LARP) document. This comprehensive document encapsulates the relevant sections of the current constitution of the Republic of Ghana, the State Lands Act, 1962, (Act 125), the Volta River Development Act, 1961, (Act 46), the Volta River Authority (Transmission Line Protection) Regulations, 1967, (LI 542), the Lands (Statutory Wayleaves) Act, 1963, (Act 168), the Lands (Statutory Wayleaves) Regulations, 1964, (LI 334), State Lands Regulations, 1962, LI 230, the Ghana Land Policy, 1999, Forestry Commission Act, 1999, the Environmental Protection Agency Act, 1994, (Act 490) and the Environmental Assessment Regulations, 1999, LI 1652. The document also identifies categories of project-affected persons (PAPs), modes of land acquisition, format and content of a resettlement action plan (RAP), compensation matrix, valuation of affected properties and the assessment/payment of compensation entitlements. Other details of the

document include the time frame for payment of compensation, conflict resolution or grievance procedure, monitoring and evaluation and record management. The Framework defines in specific terms the major legal and regulatory framework governing land acquisition for power generation and transmission activities in Ghana. Some of the regulations are explained below.

VRA's corporate environmental policy statement also indicates the Authority's commitment to environmental preservation and sustainable development and outlines steps and actions toward implementing the policy.

Ghana has signed and ratified the Convention on Biological Diversity since 1992 and 1994 respectively. Article 6 of the Convention on Biological Diversity provides for signatory countries to develop national strategies for the conservation and sustainable use of their biological diversity. In Ghana, the dictates of the Convention has devolved into the National Biodiversity Strategy for Ghana, a document that outlines the plans and activities to be taken to achieve the goal of conserving and the sustainable management of biological diversity. Subsequently, Ghana has gone ahead to pass several legislation in relevance to biodiversity. These include the Timber Resource Management Act, 1997, Act 547 which guides the utilization of timber resources.

The Convention on International Trade in Endangered Species (CITES) regulates the capture of and trade in endangered species. Floral and faunal surveys along the line route did not identify any such species.

International Tropical Timber Agreement, 2006 seeks to provide the effective framework for the regulation of international timber trade in a sustainable manner. However, the trees to be cut in this project are not being harvested or extracted as timber products. Neither are they being cut

for commercial purpose. Thus the dictates of the Agreement do not apply in this case.

1.5 PROJECT SCHEDULE

The update of the line survey and the Environmental and Social Impact Assessment study precedes the project commencement and would culminate in the issuance of an environmental permit by the Ghana EPA.

2. DESCRIPTION OF PROPOSED PROJECT

2.1 PROJECT LOCATION

Bolgatanga is the capital of the Upper East Region of Ghana. Together with the Upper West and Northern Regions, the Upper East Region falls under the Northern Ghana territory. Northern Ghana lies within the Sudan or Short Grass savannah vegetation belt of West Africa which is characterized by grasses interspersed with low density wood land of drought and fire-resistant species. In Ghana, this vegetation belt is limited to the extreme northern part covering an area of about 10,540 square kilometers. Figure 3 below illustrates the various ecological zones in Ghana. Bolgatanga is located at the northernmost section.

The proposed line will originate from the VRA substation in the Bolgatanga Municipality, traverse the Kassena – Nankana District and the newly established Kassena - Nankana West District and exit Ghana near Paga into Burkina Faso in a north-easterly direction. It must be mentioned at this point that the first one kilometre from the substation is a well built up area that presents some unique engineering challenges. Engineering options include burying the lines or acquiring the right-of-way, in which case there will high values of compensation to be paid. The options are discussed under Section 4 Analysis of Alternatives. From the substation, the line traverses close to about 13 communities to the Ghana – Burkina Faso Border at the Goiree community in the Kassena Nakana West District. The length of the Ghana side of the 225 kV Bolgatanga – Ouagadougou Transmission Project is approximately 37.0 km, out of the entire project distance of about 204.0 km.

The project corridor lies between latitude 10° 45 to 11° 45 N and longitude 1° 7"30" W to 0° 52"30" E.

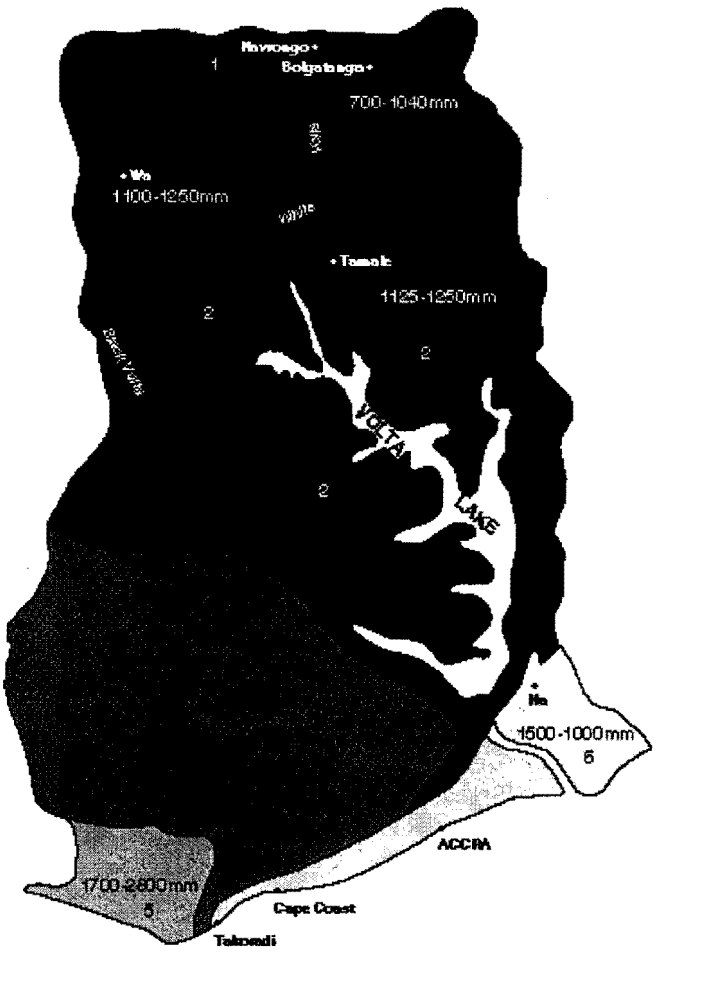


Figure 3: Map showing Vegetation Zones of Ghana

2.2 PROJECT OVERVIEW

The following project description is based on the proposed route, together with the current designs for the construction and operation of the proposed

225kV Bolgatanga – Ouagadougou Transmission Project (Ghana Side). Primarily, the line is expected to provide electrical energy supply directly to Burkina Faso.

Following a preliminary study by Tractebel Energy Engineering in 1990 / 1991 on the Ghana – Burkina Faso Interconnection at the instance of the Volta River Authority, Tractebel were again commissioned to conduct a feasibility study on the project in 1996 on behalf of the VRA and SONABEL. The scope of this study, amongst others, included the conduct of technical and economic studies in addition to environmental and social impact assessments. The project was, however, shelved for several years. In the intervening period, private developments have occurred within or close to the proposed project corridor, since it was not acquired, necessitating the need for an update of the line route. Subsequently, in June 2008, a joint venture led by Cabinet d'Ingénierie et de Recherche Appliquée (CabIRA) of Côte d"Ivoire, was commissioned to update the line route survey studies and undertake an environmental and social impact assessments, while STUDI International of Tunisia was commissioned to undertake the technical and economic feasibility studies.

It is a requirement under the Environmental Assessment Regulations, 1999, LI 1652 of Ghana that the proposed project be registered with the EPA. VRA registered the project with the EPA in July 2008 as the first step towards acquiring an environmental permit prior to the commencement of construction activity.

Even though the line is designed to be built at 225 kV, it will at first be operated at 161 kV, the electric grid of Ghana also being operated at 161 kV. In Bolgatanga, there is already a 161 kV substation from which starts a line to Navrongo, and a bus bay reserved for the connection of this proposed line. Consequently, there will be no need for any modifications to be made at this installation. The main works at the substation will comprise :

- The levelling of 6,500 m2 of soil to a ± 2 m depth. The future installations will be built at a higher level than the level elsewhere in the substation.
- The installation of a reactance and a portal.
- The installation of two 161/225 kV transformers.
- No increase of the existing substation area is needed.

Some local personnel (about five) were be employed to assist in language translation and community entry assistance during the community consultation and property identification phase.

2.2.1 The Route

The proposed project consists of a 225 kV power transmission line running from the existing VRA sub-station at Bolgatanga, in the Bolgatanga Municipality through the Kassena - Nakana West District to the Ghana-Burkina Faso border at Goiree community, near Paga in the Kassena - Nakana West District. The route is designed to be as direct as possible, and has been designed to fit into existing land uses as much as possible. For most parts, the line follows or lies close to existing road transport infrastructure so aiding construction and maintenance activities.

In order to select an optimal line route, the existing environmental data and obstacles were evaluated using information from field trips, topographical maps, and data collection activities. Consultations have also been held with major stakeholders, resulting in changes and realignment of the line route in several sections. The topography of the line route in Ghana is generally flat terrain. The proposed route in Ghana covers an approximate distance of 37 Km. Table 1 provides an outline of the line route and the communities affected. This environmental assessment is subsequently being carried out on the identified route in line with the legal requirements in Ghana.

A 40 m right of way (RoW) also referred to as a wayleave, will be required for the entire route, i.e. 20 m each side of the centre of the line within which vegetation will be cleared close to ground level. This right-of-way width is deemed adequate for the transmission line even though tower heights range between 20 m and 35 m. This adequacy stems from the fact that tower failures rarely affect the lower half. The foundation and broad base of towers endow strength and stability, and the transmission lines would tend to hold the towers up. So in the unlikely event of a tower failure, it is improbable that a falling tower would fall outside the right-of-way.

Table 1: List of affected communities traversed by the proposed line route

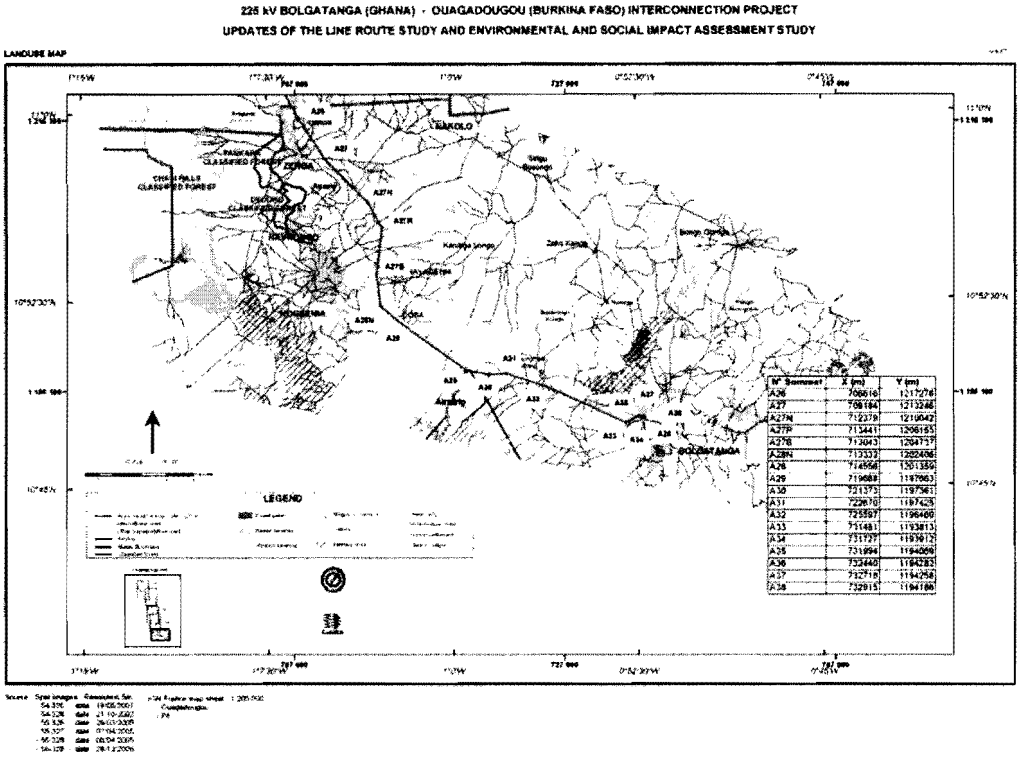
DISTRICT/MUNICIPALITY	CAPITAL	AFFECTED COMMUNITY(S)
Bolgatanga Municipality	Bolgatanga	Sokabisi
		Zorbisi
		Yikene
		Sumbrungu
		Anateem
Kassena-Nankana East	Navrongo	Pungu
		Doba
		Nayagnia
		Nyangua
		Pinyoro
Kassena-Nankana West	Paga	Zenga
		Baduno
		Nyania

Source: Revised Project Line Route Report, 2009 (CabIRA)

A 3 m wide maintenance road will also be required along the length of the proposed power line route, linking successive towers within the RoW. The maintenance road will not require any additional land take to the RoW, although this land take will be permanent as the road will be required for both construction and operation of the line. Wherever practicable this road will be continuous along the length of the line, with the exception of areas of difficult terrain such as marshy areas and swamps. In such localities access

will be obtained from either end of the area and there would be a break in the continuity of the road.

Figure 4 below is a map showing the location of communities along the line route in the project area in Ghana.



A 40 m right of way (RoW) also referred to as a wayleave, will be required for the entire route, i.e. 20 m each side of the centre of the line within which vegetation will be cleared close to ground level. A 3 m wide maintenance road will also be required along the length of the proposed power line route, linking successive towers within the RoW. The maintenance road will not require any additional land take to the RoW, although this land take will be permanent as the road will be required for both construction and operation of the line. Wherever practicable this road will be continuous along the

length of the line, with the exception of areas of difficult terrain such as marshy areas and swamps. In such localities access will be obtained from either end of the area and there would be a break in the continuity of the road.

The power line route will follow existing roads and tracks wherever practical. The line will commence from the VRA Bolgatanga substation in Zorbisi and travel northwest through Sorkabisi, Yikene and Sumbrungu. Between Yikene and Sumbrungo, the line will traverse a tributary of the Yarogatouga River. It continues in the northwestern direction till Doba, when it turns in a direct north course, passing by Nayagenia. It again heads in a northwestern direction towards Zenga and Paga to exit Ghana near Goiree close to the Ghana – Burkina Faso border. It must be noted that a review of the line route following consultations with the Ghana Civil Aviation Authority has ensured that the line passes about 1 kilometre clear of the proposed civil airport at Anateem. For the most part, the line runs parallel and close to the Bolgatanga – Navrongo road and the existing high voltage (HV) Bolgatanga – Navrongo transmission line, until just after Doba (A28N), where it parts in a direct north path. It moves slightly westward toward the Navrongo-Dakola road as it approaches the Ghana-Burkina Faso border.

Since the initial studies by Tractebel in 1991, Bolgatanga has seen remarkable development and expansion, attaining municipal status in 2004. Thus, the initial 1 kilometre from the VRA substation is built-up. The optimal line route to the substation would encounter buildings and a school block. The technical options available for the line to enter the Bolgatanga sub-station are analyzed under Section 4 below. Plate 1 shows an existing school block within the proposed RoW from the VRA substation. The final line route avoided this school.

Plate 1: School block within the line route close to the Bolgatanga VRA substation

2.2.2 Project Components

The principal components and activities of the project are:

Right of Way Selection

VRA (Transmission Line Protection) (Amendment) Regulation, 2004 (LI 1737) provides for the right-of-way distances for 69 kV, 161 kV, 225kV, 330 kV transmission lines. The RoW for 225 kV and 330 kV transmission towers is 40 meters, extending from the centre line of the transmission towers. In accordance with LI 1737 a 40 m right of way (RoW) is required for the entire length of the proposed line, which will comprise a 20 m corridor either side

of the power line. This regulation prohibits any activity in the RoW which will conflict with its use, such as mining, construction of buildings, and cultivation of plantation crops.

The selection of the RoW has taken into consideration existing land uses, natural and community resources so as to minimize the environmental and social impacts. Detailed consultations have been held with as many stakeholders as possible in the selection of the RoW. These have included statutory institutions like local government authorities within whose jurisdictions the proposed route falls (Municipal and District Assemblies), Lands Valuation Board and owners of properties that fall within the corridor. Consultations have also been held with the Ghana Civil Aviation Authority, which institution has acquired land for a proposed airport near Anateem. Such consultations have helped in defining the line route as presented.

Acquisition of Right-of-Way

After identifying the proposed line route, properties that may be located within the corridor will need to be relocated where possible, or demolished and compensated for if immovable. Activities within the identified corridor that will conflict with the safety and use of the proposed line will be prohibited. That calls for an enumeration and evaluation of all such properties that may include buildings, plantations and other structures, and the identification of property-affected persons. Appropriate compensation and or resettlement will then be paid for the affected properties prior to the commencement of construction of the project. The acquisition of the right-of-way is backed by legislation discussed under Section 1.5 above.

Construction of the Transmission Line

Having acquired the right-of-way, the proponent would commence the construction of the transmission line, which will involve activities such as

tower spotting, tower construction, stringing of conductors, testing and commissioning of the lines. Construction of access roads and maintenance tracks are also part of the construction activities.

After construction, maintenance activities would also be required to ensure the operational safety and reliability of the line. These would include replacement of conductors, tower members, etc.

2.3 PROJECT ACTIVITIES

Project activities have been categorized under Pre-Construction phase, Construction phase and Operations and maintenance phase. Various activities will be undertaken at each phase, as described below.

2.3.1 Pre-Construction Phase Activities

The following activities will be undertaken at the pre-construction phase of the 225 kV Bolgatanga – Ouagadougou Interconnection Project.

Line route selection and Acquisition

Generally, the process identifies an optimal route for the proposed transmission lines through an analysis of alternatives taking into account constraints on the social and natural environment. These constraints are mostly the presence of built-up areas and environmentally sensitive sites. Others are community/cultural properties such as sacred groves, shrines and cemeteries. Physical constraints, such as rivers, mountains, etc. also impacted on the selection of the line route.

A final line route for the project has been established following field surveys, reviews of existing maps and consultations with major stakeholders of the project. The survey works assisted in selecting the best option and established land profiles for the route. The legal basis for the acquisition of the right of way has already been established in Section 1.5. Due process would be followed in the acquisition of the RoW. For a 225 kV High Voltage transmission line, a right-of-way of approximately 40 meters (20 meters on either side of the tower) is the approved width. Thus the total land take along the entire stretch of the 37 Km stretch will need to be secured for the RoW. Conventionally, farmers will be allowed to harvest any crops within areas to be acquired prior to the securing of the RoW.

Once the route of the transmission line has been established, the land lying within the RoW will be subject to provisions of the Wayleaves laws, which prohibit a number of activities in the RoW, including mining, construction of buildings and cultivation or farming. Local government authorities will be consulted to assist in identifying PAPs through community consultations.

Compensation and Resettlement

As part of the ESIA, a Property Impact Assessment is underway to identify affected properties, their owners, their replacement values and the preferred form of payment, whether physical replacement or cash payment. This has involved institutional and community consultations that have helped in identifying PAPs and determining the values of affected properties. Institutional consultations have involved the Lands Commission, Town and Country Planning Department, a number of telecommunication companies, the Water Resource Commission, the Bolgatanga Municipal Assembly, the Kassena-Nankana West and the Kassena-Nankana District Assemblies. The Ghana Civil Aviation Authority have also been consulted to determine the exact location for a proposed airport near Anateem.

When all values are agreed upon, compensation payment will be effected. Grievance procedures will be instituted for person(s) dissatisfied with their compensation packages to seek redress. Closure would be brought to issues of compensation, as much as possible, before construction activities begin.

Tower Spotting

Geological studies have been undertaken along the proposed line route to determine the possible tower sites. Survey wells of depth of 3.0 m were dug. The study indicated a soil structure that is composed of weathered ferriferous laterite materials. The soil structure were of two main types, the thalweg type made of argillacous silt with sand and /or sand and clay, and the slope type composed of laterite gravel or laterite clay with gravel, sometime variegated. These various lateritic layers in general rest on the quartz sands of the bed-rock or on the bed rock itself. The specific sites (spots) for locating the individual towers will be finally determined based on various criteria including baseline information presented under Section 3 below.

2.3.2 Construction Phase Activities

The construction phase of the project will involve activities such as:

Clearing of tower base buffer and RoW

The construction and operation of the proposed line will require a 40-metre corridor, 20 m on either side of the centre line of the transmission line. This total of 40 m wide corridor, which will run the total length of the transmission line from Bolgatanga to Goiree, at the Ghana-Burkina Faso border on the Ghana side of the project, shall be cleared of trees and vegetation to a

height of about 1.25 m above ground level. Trees considered to be potentially capable of threatening the proposed transmission line beyond the 20 m width on either side of the centre line of the transmission line will be cut down or pruned as appropriate. These will be trees which could damage the transmission line should they fall on it or whose branches could to tamper with the lines. All vegetation clearance will be done by physical means. No chemicals or weedicides will be applied.

Tower base clearing will involve the total clearing of vegetation at tower spots and adjacent areas to make room for the construction of tower bases. Clearing the tower base and right of way will create access route for the transportation of equipment to the selected tower points for the tower construction.

Construction of access and tower corridor tracks

Electric power transmission systems include the transmission line, its right of way (RoW), switchyards, and access or maintenance roads. Construction of these systems will affect several resources within and sometimes beyond the RoW. To gain access to the RoW for both construction and maintenance activity, regular access routes from existing nearby public roads to the RoW are required. These are usually perpendicular or oblique to the corridor. A tower corridor track of approximately 3 m width shall be constructed under the towers almost continuously along the centre line of the line route. The tracks will be cleared of tree stumps, shrubs and other vegetation likely to obstruct the transport of construction machinery, equipment and operational and maintenance staff to the tower corridor. Local farm access tracks shall be used to gain access to the proposed line.

Where there are no such tracks, access tracks will be constructed from the closest public roads to the RoW at intervals along the proposed line route. New access tracks which will be constructed during the constructional

phase in addition to the tracks constructed during the line route survey will be retained and maintained for the operational phase activities. This measure will prevent the clearing of additional vegetation to make way for new access tracks for the operational phase. The tracks will be used for this phase of the project cycle for the transportation of materiel to the line route for the installation of towers and the stringing of the lines. Cut trees will be neatly stacked to one side of the proposed tracks for the use of, or sale by, the communities close to the site of clearance.

Clearing and excavation of tower base areas

Also to be cleared will be the proposed tower base areas. The extent of clearing and depth of excavation depends on the physio-chemical properties of the soil. These will be selected spots within the RoW for mounting the towers. The area to be cleared for a single tower will be made up of the dimensions of the tower base of 29 m2.

Tower foundations will vary according to the prevailing geology. The majority of them will however have footings of the pad and chimney type, which will be excavated mechanically. By this method, a concrete pad will be constructed at the bottom of the excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete. After about two days, the formwork will be removed, and the excavation will then be backfilled to original ground level and consolidated.

The ground surfaces of the tower sites will be so graded as to gently provide drainage away from the tower legs and to avoid the collection of water (leading to the creation of stagnant pools) at the tower bases. Where necessary, (particularly on hillsides), terracing, cribbing or riprap may be used to provide protection for tower foundations from soil erosion. In flood-prone areas (swampy areas) a raft foundation for transmission line towers may be used. The raft foundation is similar in concept to the pad and

chimney foundation except all four feet of each tower will be set on a single raft of concrete.

Transportation of equipment and materials

Almost all the materials to be used in the construction of the transmission line will be imported. Such components include tower steel and its components in broken down form, conductors, insulators, transformers, switchgear, etc. Materials that will be procured locally will include aggregates, cement, sand, stone and other miscellaneous supplies and services.

The imported components will be delivered by ship to either the Tema or Takoradi port. After clearance from the ports, the materials shall be stored at the Contractor's storage site.

During construction, the materials will be transported to the site via public roads and access tracks. Vehicle movements will be minimal since the work camps will be sited close to the proposed sites.

Site Offices

Site offices will be erected along the corridor to serve as storage points for machinery and other materials that will be used for the construction. These will, however, be demolished upon completion of the construction activities. The locations of the site offices cannot be specified at this stage of the project but their construction will not involve extensive vegetation clearance. The site office will be constructed at least 1 km from natural water courses and marshlands as well as from settlements and on relatively level ground

The location of the site office will not impact negatively on cultural properties, and on forest reserves. It will also be so located as to avoid the destruction of crops and buildings

Tower Erection & Stringing of Conductors

Once foundations have achieved their design strength the towers will be assembled and erected. These works will be undertaken within the RoW to avoid any additional vegetation clearance. Construction materials of the towers will be delivered to site and the full assemble conducted at the tower locations. The average span between towers will be about 350 m depending on the characteristics of the terrain. Depending on the characteristics of the soil at the selected tower spot, a foundation depth of 2 – 3m meters concrete footing will be used. The project shall utilize the conventional four-legged freestanding towers of horizontal configuration (see Figure 5). The tangent towers will have an average height of 26m under cross arms and an average total height of 30m. Angle towers are necessarily stronger and heavier, but have a similar height. The height will vary from tower to tower depending on the site topography. The height of the towers will be such as to provide a minimum of 7.5 – 8 m clearance between the lines and open ground and 8 m clearance for roads. From the technical studies conducted, average tower spacing would be about 420 m apart, and it is estimated that a maximum of about a 90 towers shall be required for the approximately 37.0 km span.

The transmission line will be equipped with a 3 AMS (Aluminium alloy) conductors of 475 mm2 (1 per phase). There will be at a distance of 6.4 m from one another, and this will make the line 12.8 m wide. The conductors will suspend from an insulator string composed of 15 toughened glass insulators. The conductors are to conform to the standard VRA specification for high-tension transmission lines. This is a requirement of the VRA, in order to cater for any future developments in the area. The line will be fitted

with an optic fibre conductor (OPGW), which will be used for power system protection, control and communication purposes

Once the towers have been assembled, the conductors will be strung. This involves attaching pulleys to each isolator, threading a rope through these and then pulling the conductor through, under tension, so as to ensure that no contact is made with the ground. Any damage to the conductor during this process (particularly any contact with the ground) could impair the line function.

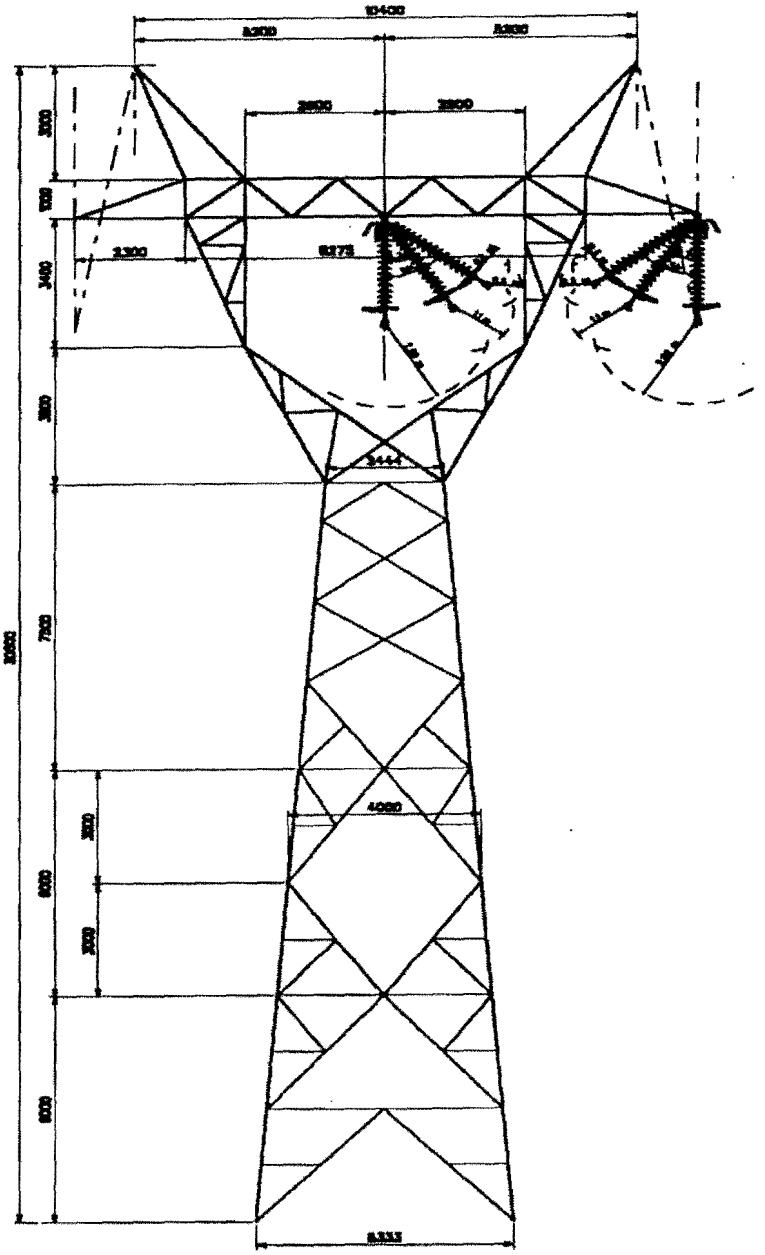
Chance Archaeological Finds

The line route corridor has been selected to, as much as possible, avoid areas of community and cultural properties that have historic, cultural or tourist value. These include shrines, sacred groves, and cemeteries. Continued consultations with communities will help in identifying such properties in order to avoid them.
During excavations, chance archaeological discoveries may be made. Such finds will be immediately sealed off and officials of the Ghana Museums and Monuments Board informed to take custody of any such find.

Substation works

Some construction works are expected to be done at the existing Bolgatanga substation to pave way for the new line. Construction at the substation site shall involve the casting of all the necessary concrete foundation required to support the new equipment. Once these are cured and have achieved a suitable strength the electrical equipment will be delivered and mounted. This would involve use of heavy lifting equipment to position the equipment followed by wiring and connection.

Figure 5: Horizontal Configuration Towers



2.3.3 Operational Phase Activities

Upon completion of construction, the operation of the line will involve:

Testing and Commissioning

This will comprise connecting the line to the substations at both the Ghana end and the Burkina Faso end to transmit power. Final commissioning involves the testing of the towers to ensure that all steelwork joints are correctly made and are tight. Connection of electrical plant will be checked and once approved power connections established.

Right-of-Way (RoW) Management and Access Road Maintenance

Right-of-Way and access road maintenance is aimed at eliminating hazards and reducing travelling time required to access transmission lines. Access roads and line tracks are maintained at regular time intervals based on ground patrol reports and observations. Maintenance would include erosion prevention, maintenance of culverts and bridges and the prohibition of any obstacle or activity within the RoW which will endanger the lines or public health, such as blasting, excavations and fire hazards.

Vegetation control measures are applied during the operational phase of the project to manage vegetative growth within the RoW. The objective is to prevent interruption of power supply due to trees tampering with or falling on the lines. It also facilitates access for line maintenance activities. During the operational phase of the project the RoW will be maintained in such a condition as to ensure that the transmission line function and public safety are not compromised. This involves both the control of land uses undertaken within the RoW and the management of the vegetation.

To allow access to the RoW for maintenance, vegetation clearance and emergency maintenance, a network of access tracks will be maintained. These will be graded, un-surfaced tracks that will be maintained on a

regular basis to ensure they provide suitably clear access to the RoW. In addition to this a 3 m wide access road will be maintained running the full length of the RoW down the centre of the corridor. This will not be graded but will consist of cleared tyre tracks with vegetation between these tracks kept cut. This track will not cross any large streams or swamp areas and where these are encountered there will be a requirement to leave the RoW, travel on the existing road networks to cross the watercourse before tracking back along the graded access roads to the RoW. The Volta River Authority (Transmission Line Protection) Regulations 1967 set out the statutory framework for the management of the RoW. For the purposes of these regulations the RoW is defined as an area extending 20 m either side of the centre line of the transmission towers. The regulations prohibit activities such as cultivation and the construction of physical structures within the corridor. In addition to the restriction on land uses within the RoW the vegetation has to be managed to ensure that it does not impede the line. In addition, tall trees outside of the RoW that could fall on the line should they fall or be cut will also be pruned or cut down. This work will be managed by the VRA utilizing local contractors for the works themselves. Vegetation clearing is carried out up to twice a year on every line.

VRA has an established Safety Code that is strictly followed when working on maintenance projects.

Line Maintenance

The VRA has comprehensive planned and emergency maintenance programmes through its technical operations during the operation and maintenance phase for transmission lines. This consists of routine maintenance carried out by the Transmission Systems Department to ensure the integrity and safety of the lines. The maintenance activities carried out here include:

- Aerial surveillance by helicopter. This is done to ensure that potentially hazardous defects are pre-empted and the integrity of the line is maintained and sustained. This is done on an annual basis.
- Foot patrol. The Line Maintenance team carries out routine physical examination of the transmission line and its component parts to ensure the safety, security and integrity of the line. Such activities are carried out at least twice a year.
- Security patrol. This is done to check on segments of the line close to populated areas for signs of vandalism, tampering, and general security of the lines. It is to ensure an early detection of and rapid response to acts of vandalism and to rectify such situations as promptly as possible.

During the operational phase of the line there will be limited need for regular access with line inspection only being conducted, typically, on a six monthly basis and shut downs for maintenance only being required once every 2 to 3 years. In the course of operation, defects that are identified are repaired. Such defects may include the replacement of defective conductors, flashed-over insulators, defective dampers, vandalized components, and maintenance of access tracks and RoW.

Strict documented procedures will be put in place for the various technical operations. The VRA's generic guidelines for safety for all projects are presented in two key documents; Volta River Authority Corporate Safety Handbook and Volta River Authority Corporate Safety Rules.

By the Volta River Development Act, 2005, Act 692, the power transmission functions of the VRA has been transferred to a transmission utility company known as Ghana Grid Company (GRIDCO). However, at present GRIDCO is still operating under the umbrella of VRA until such time that a formal separation could be established.

Tower Maintenance

Tower auditing and repairs provides a means of assessing the ageing process of towers. It starts one year after the commissioning of a line section and it follows a one-year cycle. In a cycle of tower auditing, 10% of all suspension towers and all dead-end towers are thoroughly examined. As the line ages, it is subjected to wear and fatigue which may not be noticeable by a distant visual inspection. Detection and tightening of loose bolts on supports and hardware can reduce premature wear and indicate for replacement of worn components before failure.

Corrosion surveys are undertaken to ensure that the towers and associated parts are protected from atmospheric, chemical or electrolytic corrosion. Corroded towers are re-galvanized. Infra Red Surveys also done to help to identify overheated connectors, clamps, etc, following which such line hardware are replaced before any failure can occur. Vibration studies known as Aeolian vibrations are done based on ground patrol reports to analyze the nature of vibrations on lines. Vibration dampers are used to stop this.

Insulator washing is done periodically to avoid the building up of contaminants on the line insulators, which can cause flashovers. This is carried out using insulator washing machines and a high pressure stream of water. Security patrols are carried out to check tower vandalism and other illegal activities along the RoW.

Tower Footing Resistance measurement is done to ensure that ground resistance is within acceptable limits in order to keep outages caused by lightning to a minimum. Lightning surges flash across insulator strings to a phase of the line when ground resistance is too high (above 18-20 ohms) to dissipate the lightning charges. Subsequently, there is continuous checking of the grounding rods and counterpoise for continuity.

Public Safety

Transmission lines present potential public health and safety hazards when the local populace are not properly informed and educated with regard to the potential hazards, such as collapse of towers, which actually occurs only rarely. In addition to the hazards posed to the public due to transportation of equipment and materials, other hazards such as potential exposure to Electromagnetic field (EMF) effects, potential collapse of towers and electrocution exists. These potential hazards require mitigation to ensure the safety of the public.

Since the hazardous effects (e.g. falling on people and electrocution) of the collapse are normally felt only within the RoW public safety is ensured by restricting public access to the right-of-way. In line with existing VRA practice, the towers will be clearly marked with a red inscription on white background - "DANGER – 225,000 Volts", usually with the standard skull-and-crossbones image to warn off trespassers and prevent them from exposing themselves to the potential dangers of electrocution. Further, regular maintenance through VRA's technical operations ensures the minimizing of corrosion and wearing out of parts of the towers and their accessories.

3. DESCRIPTION OF EXISTING ENVIRONMENT

The line will traverse three administrative districts in the Upper East Region of Ghana before entering Burkina Faso. These are the Bolgatanga Municipality, the Kassena-Nankana District and the Kassena-Nankana West District. The three administrative districts traversed by the line share the same baseline environmental conditions. This section is therefore presented compositely for the three contiguous districts.

3.1 LOCATION OF PROPOSED ACTIVITIES

The Ghana section of the line traverses the three mentioned districts in a slight northwesterly manner. The proposed line project extends from a site in Bolgatanga, within 1 km stretch from the Bolgatanga sub-station and then traverses various communities to the Ghana – Burkina Faso Border at Goiree community in the Kassena Nakana West District.

A 40 meter Right of Way (thus 20m on each side of the transmission line) will be acquired. The length of the Ghana side of the 225 kV Bolgatanga – Ouagadougou Transmission Project is 37 km out of the entire project distance of 204.3 km. In all, an estimated thirteen (13) communities are identified to be within the project influence.

The detailed Line Route Report has been prepared, and is awaiting the approval of the ESIA study report by the EPA. Once the ESIA study report is approved work on the selected line route will begin.
In selecting the line route, all efforts have been made to avoid or minimize involuntary resettlement and damage to natural habitats. The line has undergone several re-alignments to this effect.

3.2 BIOPHYSICAL ENVIRONMENT

3.2.1 Topography

The project area is generally low-lying with gentle slopes with inselberg outcrops and some upland, as is typical of the north-eastern parts of Ghana. The landscape is generally undulating with isolated hills rising up to about 300 metres. Notably among these hills include Fie (280 metres), Busono (350 metres) and Zambao (360 metres). It falls within the Birimian, Tarkwaian and Voltarian rock formations. There is ample evidence of the presence of minerals, especially gold.

A typical feature of the low lying nature of the project area is shown in Plate 2 below.

Plate 2: Atypical feature of the low lying nature of the project area

3.2.2 Drainage

The main rivers are the White Volta, Red Volta, and their tributaries. The drainage system in the project area is constituted mainly around the tributaries of the Sissili River – Asibelika, Afumbeli, Bukpegi and Beeyi. Within the project area, there is the Yarogatouga river as well as two (2) main dugouts ponds of over 1.5 km2 in surface area located at Sumbrungo-Kulbia and Doba which are used for livestock, crop farming and domestic purposes. These could be impacted upon during project implementation because they are quite close to the line route, although very well outside the line route buffer zone.

3.2.3 Soils

The transmission line route intermittently encounters two main types of soil along its length in Ghana, namely the Savannah ochrosols and groundwater laterite. The Savannah ochrosols are porous, well drained, loamy, and mildly acidic, and interspersed with patches of black or dark-grey clay soils. This soil type is suitable for cultivation and hence accounts for the arable land sites including most parts of the Tono Irrigation Project sites where both wet and dry season farming activities are concentrated.

The groundwater laterites are developed mainly over shale and granite. Due to the underlying rock type (granite), they become waterlogged during the rainy season and dry out during the dry season, thus causing cemented layers of iron-stone (hard pan), which makes cultivation difficult.

Plate 3: Dug-out at Sumbrungu-Kulbia close to the proposed Line Route

3.2.4 Vegetation

The vegetation is covered mainly by the Sahel and Sudan-Savannah types of vegetations; comprising open savannah with fire-swept grassland and deciduous trees. Some of the most densely vegetated parts can be found along river basins and forest reserves. Examples are the Sissili and Asibelika basins, Kologo and Naaga forest reserves. Most of these trees in the forest areas shed off their leaves during the dry season.

There is also of Guinea savannah grassland consisting of short deciduous trees widely spaced and a ground flora, which gets burnt by fire or scorched by the sun during the long dry season. Human activities such as bush burning, tree felling for domestic fuel, inappropriate agricultural activities and gravel winning contribute immensely to vegetation destruction.

Common trees found are dawadawa (Sphenostylis stenocarpa), baobab (Adansonia digitata) and the shea nut tree (Butyrospermum spp.). The neem tree (Azadirachta indica) and mangoes (Mangifera indica) also thrive here. The line route has been selected to avoid heavily wooded areas.

3.2.5 Fauna

Mammals in the project area include elephants, monkeys, sitatunga, antelopes and duikers, lions and cheetahs, especially along the banks of the White Volta and its tributaries. Birds include Terns, cattle egrets, hawks, pied crows (Corvus albus) and a number of migratory birds. Reptiles such as the monitor lizard (Varanus niloticus) and the Nile crocodile (Crocodylus niloticus) are common, especially near water bodies in the Kassena Nankana West District, where they are a famed tourist attraction. Snakes are also common, especially the puff adder and the striped cobra. The line route avoids all such environmentally sensitive areas.

3.2.6 Climate

The climate conditions of the project area are characterized by the dry and wet seasons, which are influenced mainly by two (2) air masses – the North-East Trade winds and the South-Westerlies (Tropical Maritime). The Harmattan air mass (North-East Trade Winds) is usually dry and dusty as it originates from the Sahara Desert. It is noteworthy that the construction of the transmission line could overlap the dry season, when the North-East Trade winds could be prevalent, and thus aggravate air quality (dust) conditions. The impact will be examined in detail under Chapter 5 *Potential Environmental Impacts and Proposed Mitigation*.

During such periods, rainfall is virtually absent due to low relative humidity, which rarely exceeds 20 per cent and low vapour pressure less than 10mb. Day temperatures are high recording 42° Celsius (especially February and March) and night temperatures are as low as 18° Celsius. Seasonal fires during the dry periods of the year are common features, and trees here are naturally adapted to bush fires.

The project area in Ghana experiences the tropical maritime air mass between May and October. This brings rainfall averaging 950mm per annum while maximum temperature is 45°C in March and April with a minimum of 12°C in December.

3.2.7 Ecologically Sensitive Areas

At an area close to Sumbrungu, the line passes close to the Yarogatounga river, the basin of which river is cultivated during the rainy season. Appropriate mitigation measures will be put in place to avoid contamination of the river during construction of the line.

3.3 SOCIO-ECONOMIC ENVIRONMENT

Profiles of the three administrative districts are presented here.

3.3.1 Bolgatanga Municipal Assembly

The Bolgatanga Municipal Assembly is located in the central part of the Upper East Region of Ghana, and is also the regional capital. It has a total land area of 729 square-kilometres, and is bordered on the north by the Bongo District, on the south and on the east by the Talensi-Nabdam District and on the west by the Kassena-Nankana District.

Climate and Vegetation

The climate is classified as tropical, and has two distinct seasons – a wet season that runs from May to October, and a long dry season that stretches from October to April with hardly any rains. Mean annual rainfall is 950mm, while maximum temperature is 45°C in March and April, with a minimum of 12°C in December. The natural vegetation is that of Guinea savannah grassland, consisting of short deciduous trees widely spaced, and a ground flora which gets burnt or scorched by the sun during the long dry season. The most common economic trees here are the shea nut, dawadawa, baobab and acacia. The municipality has a forest reserve, the Atamwidi Forest Reserve, which primarily protects most of the headwaters in the area.

Topography And Drainage

The municipality has gentle slopes ranging from 1% to 5% gradient with some isolated rock outcrops and some uplands which have over 10% gradient. It falls within the Birimian Takwaian and Voltaian rocks of Ghana. There are ample evidence of the presence of minerals, especially gold.

Demographic Characteristics

The 2000 National Population and Housing Census (PHC 2000) gave the Bolgatanga municipality"s population at 147,729 and growing at 1.7 percent per annum, lower than the national average of 2.7%. The population density is 141.2 persons per square kilometer, greater than the national average of 79.3 persons per square kilometer. The current population of the district can thus be estimated at about 167,820 made up of 51 percent females and 49 percent males. Some of the municipality"s main settlements include Zuarungu and Sumbrungu.

Ethnic, Religious and Cultural Heritage

Bolgatanga has a cosmopolitan population, numbering about 75,000 (Source MHA-Bolga). The indigenes are the Frafra people. Although the majority of the people are from northern ethnic origins, there has been a significant influx of the major ethnic groups in Ghana, including Akans, Ewes, Ga-Adangbes into the municipality due to its regional capital status. Most of these ethnic groupings are organized around chiefs and traditional leaders, while others come together as social groupings.

Social and Economic Infrastructure

The district has fourteen (14) health facilities, made up of a regional hospital, four private clinics and a nutrition rehabilitation centre. Also, there are about four (4) health centres and six (6) clinics in other parts of the municipality. In all, there are about fourteen (14) doctors and 208 nurses.
Until 2001, only Bolgatanga township, parts of Zuarungu and Sumbrungu were connected to the national electricity grid. Currently, only four major communities, including Bolgatanga township, are connected to the national grid. Yet, many households continue to rely on kerosene-powered hurricane lamps because they cannot afford the electricity tariffs. However, efforts are on-going to extend electricity to five additional communities and other major towns.

Transport services are needed to facilitate effective communication and information dissemination, as well as to ensure equity in the transmission and allocation of productive resources, one of the conditions for the realization of poverty reduction in the District.

The principal modes of transport service delivery in the project are includes roads of varied forms, the use of footpaths and to a lesser extent, the air space. The major service providers, in terms of road use for people

travelling within and outside the District include the Ghana Private Road Transport Union of the Trades Union Congress, STC Ltd. Kingdom Transport Services Ltd., Imperial Transport Services, who travel long distances whilst the Metro Mass Transit, individual/privately owned and/ operated trucks, mini-buses and taxi cabs serve travelers within the central townships, between communities. Various institutional transport facilities also go a long way to augment transportation services within the District.
The existing airstrip at Paga serves as the only means of air transport. There are plans to complete the construction of a new airport, located 3.5 km off the Bolgatanga-Navrongo road near Sumbrungu.

Education

Educational institutions in the municipality include pre-schools, first and second cycle institutions and a polytechnic. There are sixty four (64) nursery schools, 68 primary schools, 41 Junior Secondary Schools, 4 Senior Secondary Schools, 1 Technical Institute and 1 Polytechnic. The Municipality has the distinct characteristic of enrolling more girls than boys in school, especially at the primary and junior secondary school levels.

Land Tenure and Ownership

Land ownership is mainly by families. Family heads hold lands in trust for the entire family, allocating portions to adult family members for their cultivation. Such members enjoy usufruct, but do not have the right to lease or sell the land without the approval of the family head or the entire family.

Land Use

Land use is mainly for cultivation and pasture. However, the rain-fed nature of agriculture makes farming a seasonal event, except in areas where there are dug-outs, dams and impoundments, or close to river basins and

tributaries. Construction of sandcrete buildings is an emerging trend. The gradual urban spread is gradually making land for cultivation scarce, and farmers have had to move to more peri-urban areas to access large tracts of land for cultivation, or close to water bodies.

Employment/Economic Activities

The main economic engagements in the district are agriculture which engages 57 percent of the work force (food crop, cash crop and fishing), trade and commerce 19&, manufacturing (mainly textile, handicraft, and metal-based industries) 19%, and others like mining, construction and utility services.

Due to neighbouring Burkina Faso, some individuals engage in monetary exchanging transactions especially around the border towns. Carpentry, masonry, bicycle, motor and vehicle repair works, milling, footwear servicing, metal works especially peasant farming tools, vulcanizing and some other scattered forms of personal services are prevalent in the District especially in the growth points/centres during market days.

The following are some of the personal services; blacksmith, welders, fitters, tailors and seamstresses. These economic activities are gender sensitive. This sector offers employment to most of the community members as it requires simple skill endowments and relatively less capital. Trading and commercial activities in the project area revolves around mainly foodstuffs, semi-processed food and craft items etc. These items are sold in the local markets as well as outside the Municipality with some specialized ones meant for the international market though on a small-scale.

About 95 per cent of those engaged in these activities are women. Foodstuffs traded in include millet, sorghum, cowpea, groundnuts and rice.

Other items including cassava, gari, palm fruits, plantain, citrus fruits are mainly from southern Ghana, with Techiman being the main point of purchase. The processed items include baobab powder, shea butter, dawadawa, milled products from maize, millet, groundnut extracts including 'kulikuli', processed malt for the pito drink (i.e., locally beer brewed from millet), woven items including smocks, hats, baskets, pottery products and locally made ceramics for domestic use are also traded in the markets.

The handicraft industry in straw baskets and hats, leather tanning, leather bags and hats, smock weaving is a major one in the project area. To all intents and purposes, it is the most important single source of cash earnings for the people of the settlements in and around near Bolgatanga. Most of the straw and leather products are either exported to other parts of the country or abroad particularly Western Europe.

Pito (a local beer) brewing is the major economic activity of most women in the area. The main raw materials used in brewing are guinea corn (sorghum) and water. Wood fuel serves as the main energy source.

Investment opportunities exist in the areas of agro-processing, especially of tomato and meat from livestock. The handicraft industry, especially in leather, textiles and basket weaving, also presents considerable investment potentials. Tourism is another investment avenue.

Agriculture

Agriculture is the mainstay of the economy in the project area; employing over 60 per cent of the economically active population. Farming activities are mainly rain-fed mixed cropping. However, irrigation facilities, smaller dams/dugouts and some other water bodies serve as sources of water for dry season farming.

Crop mixture is mostly cereal-cereal but occasionally a cereal-legume mixture. The types of crop mixtures are early millet/sorghum, early millet/late millet and early millet/sorghum/local beans. Leguminous crops are normally sown sole. Land preparation is mostly done by bullocks and the hoe. However tractor is also used. The major staple crops grown are: millet, sorghum and Frafra potatoes and the cash crops are maize, rice, groundnuts and sweet potatoes.

Although crop farming is the highest contributor to agricultural development, in practice, the people integrate other non-cropping activities such as fishing, hunting, livestock and poultry keeping with their cropping activities. Livestock and poultry rearing is the second most important feature in agricultural development after crop production. Almost all farmers are engaged in the rearing of at least one type of livestock and poultry. Apart from supplying the protein needs of the people, it is also a very good source of income for farmers especially when there is crop failure.

It must however be noted that rearing of livestock and poultry apart from swine is not normally done as a business in the villages. All the livestock and poultry being reared are normally left on free range. Nevertheless, the non-cropping activities are less intensely practiced as compared to cropping which is relied on to satisfy the domestic needs through direct consumption and sale of others to patch up non-food requirements.

Fishing is carried out in a few water bodies scattered throughout the municipality. Women mostly do fish processing.

Public Health including HIV/AIDS

Health care in the project area are meant for the prevention of diseases and promotion of healthy lifestyle, and is decentralized to bring quality health care closer to the people. The Navrongo War Memorial Hospital located in

the capital of the Kassena - Nakana District and the Bolgatanga Regional Hospital located in the Bolgatanga Municipality serves as referral point to all health centres and clinics in the district.

Life expectancy in the project area is estimated at about only 50 years; compared to the national figure of 55 years. The high level of illiteracy and poverty as well as the limited access to safe drinking water and the existence of poor sanitation and unhygienic practices have exposed many people to health hazards which contribute to the lowering of the living standards of the people. The prevalence of diseases like malaria, diarrhoea, anaemia, acute respiratory infections and gynaecological disorders as well as the outbreak of epidemics such as cholera, anthrax and Cerebro-Spinal Meningitis can be traced to the above factors. Other conditions such as malnutrition and micro-nutrient deficiency (mostly among children) are also prevalent in the municipality.

According to the Ghana HIV Sentinel Report for 2009, HIV prevalence at regional level in the Upper East Region is 2.3%, above the national prevalence of 1.9%. Prevalence at regional level is calculated by aggregation of samples from all sites in the region. The sites used for the Upper East Region were hospitals in Bolgatanga and Navrongo, all sites close to the proposed project site. The survey was done on pregnant women attending antenatal clinics during the survey period and persons seeking treatment for sexually transmitted diseases also during the survey periods.

Affected Environmentally Sensitive sites

At Sumbrungo, the line passes close to the Yarogatounga River, which basin is cultivated during the rainy season. Measures will be taken to protect the water body from contamination and sedimentation during the construction phase.

Bushfires are an annual phenomenon here, particularly during the dry season.

3.3.2 Kassena-Nankana District

The Kassena-Nankana District lies within the Guinea Savannah lands. The district falls approximately between latitude 11°10" and 10°3" North and longitude 10°1" West. It is one of the nine (9) districts in the Upper East Region of the Republic of Ghana. However, it has recently been split into two along an almost longitudinal section to give rise to the new Kassena-Nankana West District. The capital is Navrongo.

The District has a total land area of about 1,674 sq.km and stretches about 55km North-South and 53km East-West. The District shares boundaries to the north and the west with the newly created Kassena-Nankana West district, to the East with Bongo and Bolgatanga Districts, South with West Mamprusi District (in the Northern Region). The District has a total of 216 communities.

Climate and Vegetation

The climate conditions of the District are characterized by the dry and wet seasons, which are influenced mainly by two (2) air masses – the North-East Trade winds and the South-Westerlies (Tropical Maritime). The Harmattan air mass (North-East Trade Winds) is usually dry and dusty as it originates from the Sahara Desert. During such periods, rainfall is virtually absent due to low relative humidity, which rarely exceeds 20% and low vapour pressure less than 10mb. Day temperatures are high recording 42° C (especially February and March) and night temperatures are as low as 18° C. The District experiences the tropical maritime air mass between May and October. This brings rainfall averaging 950mm per annum.

The District is covered mainly by the Sahel and Sudan-Savannah types of vegetations; comprising open savannah with fire-swept grassland and deciduous trees. Some of the most densely vegetated parts of the District can be found along river basins and forest reserves. Examples are the Sissili and Asibelika basins, Kologo and Naaga forest reserves. Most of these trees in the forest areas shed off their leaves during the dry season.

However, the human activities over the years have affected the original (virgin) vegetation cover. Common trees found are dawadawa, baobab, sheanut and mangos.

Topography and Drainage

The District is generally low-lying. The landscape is generally undulating with isolated hills rising up to about 300 meters in the western parts of the District. Notably among these hills include Fie (280 metres), Busono (350 meters) and Zambao (360 meters).

The drainage system of the District is constituted mainly around the tributaries of the Sissili River – Asibelika, Afumbeli, Bukpegi and Beeyi. A tributary of the Asibelika River (Tono River) has been dammed to provide irrigation facilities, which is of great economic importance to the entire District. There are some few dugouts and ponds, which are used for livestock, crop farming and domestic purposes.

Geology and Soils

Two main types of soil are present within the District namely the Savannah ochrosols and groundwater laterite. The northern and eastern parts of the district are covered by the Savannah ochrosols, while the rest of the District has groundwater laterite.

The Savannah ochrosols are porous, well drained, loamy and mildly acidic, interspersed with patches of black or dark-grey clay soils. This soil type is suitable for cultivation and hence accounts for the arable land sites

including most parts of the Tono Irrigation Project sites where both wet and dry season farming activities are concentrated.

The groundwater laterites are developed mainly over shale and granite and covers approximately 60 per cent of the District's land area. Due to the underlying rock type (granite), they become waterlogged during the rainy season and dry out during the dry season, thus causing cemented layers of iron-stone (hard pan), which makes cultivation difficult.

Environmental Concerns

The Kassena-Nankana District lies within the dry land zone. The natural environment is fairly degraded as it faces serious threats of severe drought with high temperatures and perennial outbreak of bush fires. It is evident that high population densities (especially in towns) with high demand for land for constructional activities, extensive cultivation, over-grazing, erratic rainfall and the extent of devastation do affect the natural environment thereby pre-disposing it to desertification.

Demographic Characteristics

The population of the District from the 2000 Population and Housing Census was estimated to be 149,491. The figure represents 1.0 per cent increase over the 1984 figure of 149,680. This inter censual growth rate of 1 per cent is below the national growth rate of 2.7 per cent. The current population in 2009 is thus estimated to be 161,451. The sex composition of the District's population favours female. The female forms a little over one-half of the total population of the District, representing 51.9 per cent while the male population represents 48.1 per cent of the population. (Source: 2000 Population & Housing Census). However, having split in 2008, the current population will be estimated in the next census year, which is 2010. The District recorded a population density of 91 persons per sq. km. This is higher than the national density of 79.7 persons per sq km but below the regional density of 104.1 persons per sq. km. The age structure of the

District follows the Regional and National patterns of large population of children under 15 years and a small proportion of elderly persons of 65 years and above. The population density of 92 people per square kilometre shows how dispersed the population is. The District consists of 216 communities – majority of which are rural, only 13 per cent of the population live in towns. At least three out of four people living in the District reside in the rural areas.

Out-migration is seasonal and more pronounced in the dry season. The youth (10-34 years) are the majority that migrates to the southern parts of the country in search of greener pastures. Most of them after the dry season return home to commence farming activities whiles others continue to hustle with great ambitions. This explains why the District recorded a tremendously low population growth rate of 0.1 in the year 2000 Population and Housing Census.

The trend of in-migration is very insignificant as mostly nomads from Burkina Faso and Mali, transferred workers and traders, especially during the tomato season travel into the District.

Ethnicity, Religion and Culture

The predominant ethnic groups in the District are Kassena, Nankana and Builsa; all co-existing peacefully. However, there are few migrant workers from other parts of the country.

The payment of bride price takes the form of cola nuts, tobacco and guinea fowls. However, bridegrooms pay seven sheep and a cow together with the aforementioned items. It becomes obligatory for the bridegroom to present a cow upon the death of the bride if initially he did not present one. If even one was unable to pay the sheep and the cow the children would be mandated to pay before they can dowry their own wives.

Festival is a significant cultural practice in the District. The Fao festival is the predominant in Paga Traditional area. This festival is celebrated in to thank the gods for bumper harvest and ensuring food security. Another post-harvest festival called Gakwea is celebrated to thank the gods for bumper harvest.

The patrilineal system of inheritance is practised. The eldest son inherits the deceased father in trust of the family. There is no form of ownership of family assets by daughters regarding the traditional system.
Funerals are another major customary practice of the people. Funerals are mostly organized after the harvest (and especially during the long dry season). A lot of food is used during such funerals which is in part a cause to food insecurity in the District. Funerals are performed to mark the end of the transition from earth to life after death (The spirit world).

Social and Economic Infrastructure

The District is physically accessible by roads, air and footpath. There are four (4) trunk roads over 100km in length, three secondary roads and five (5) feeder roads, all totaling about 327.6km in length. The roads can be classified as first, second or third class standards. The first class roads (35km) links Navrongo to Paga, the Kassena-Nankana West District capital and Bolgatanga, the regional capital. The second-class roads are either tarred in patches or fully, linking the District capital to Chuchuliga as well as institutions in and around the fringes of Navrongo. The third class roads are mostly feeder, linking the capital Navrongo to other growth points and service centres including Chiana, Sirigu, Naaga, Nakong etc. Though these feeder roads are motorable, they need periodic maintenance to keep them functional throughout the year. Foot and bush paths are available, linking people, beasts of burden and bicycles to settlements, farms, market centres. The major service providers, in terms of road use for people travelling within and outside the District include the Ghana Private Road

Transport Union (GPRTU) of the Trades Union Congress (TUC), STC Ltd. Kingdom Transport Services Ltd. (KTS), Imperial Transport Services, who travel long distances whilst the Metro Mass Transit, individual/privately owned and/ operated trucks, mini-buses and taxi cabs serve travellers within the central townships, between communities and across to other surrounding districts such as Paga, Builsa, Bolgatanga, and Bongo. Various institutional transport facilities also go a long way to augment transportation services within the District.

The main departure and destination points for most transport service facilities are located in the growth points/centres including Sirigu, Chiana and Navrongo. Aside festive periods, intensity in delivery as well as high traffic periods in the commercial road transport services within the District occurs during the late afternoon periods on the market days of major settlements. During such periods, goods and people are transported within the District, thus from production centres – mainly the rural settlements to the market facilities' domain – usually the urban areas. Others are also sent from the District across to Tamale, Kintampo, Techiman, Kumasi, Accra, Takoradi and other parts of the country and even beyond especially neighbouring Burkina Faso.

The District is equipped with a number of health facilities. The Navrongo War Memorial Hospital located in the capital, serves as referral point to all health centres and clinics in the district. There are three Health Centres in the district; twenty-five CHIPS Compounds; three health posts being run by the catholic; one private clinics; one health Research Centre; and sixteen chemical sellers.

Currently, there exists a relatively large postal and telecommunication service office, situated at Navrongo (i.e., the district capital), serving both receivers and senders of ordinary mails, parcels and oral information transmitters, through the ordinary mail box (es), courier services such as

EMS and both desktop and installed telephone booth facilities respectively. The outfit also operates postal and money transfer services to customers. Transmissions of these messages through the outfit go beyond the confines of the District, region and country, extending to other parts of the globe. In addition to the above, privately operating telecommunication centres Vodafone telephone booths located at vantage points within the growth points/centres including Navrongo and Sirigu, and those provided and located in some institutions serve the bulk of the District's populace. Mobile phone usage is a common practice, particularly among relatively higher income earners in the District. Internet service facilities exist currently at the Navrongo Health Research Centre, (though not commercially operated), the District Assembly, UDS campus at Navrongo, DERF- Network (Developing the Rural Folk Network), an NGO, and some few (rich) homes. Plans are underway to set up Community Information Centre at Navrongo to provide Internet and computer training services to the public.

Aside the Navrongo market, there are ten (10) other satellite markets in the main towns and villages. The smaller markets act as collection points for the wide range of agricultural products sourced from the District locality. Trading in primary products, semi-processed food items, and some other small-scale industrial products of the District are the major activities of economic importance to most of the local folks in the markets.

Functional storage facilities for agricultural produce are generally inadequate. Few farmers can afford to contract their community members to help build local food barns for storing grains and cereals after harvest. However, several defunct FASCOM storage facilities lie scattered all over the District. The Irrigation Company of Upper Region (ICOUR) operates grain silos for its activities under the Tono Irrigation Scheme. Post-harvest losses for especially perishable commodities like tomato are very high due to non-existence of storage facilities and processing factories. Improper drying and packaging of cereals and also the depletory tendencies that

follow funerals and other culturally related practices ill-motivates the District's farmers to establish storage posts.

The Kassena-Nankana District has some few formally operating banking institutions, situated in the District. These are the Naara Rural Banks in Navrongo and Chiana and Ghana Commercial Bank in Navrongo. These banks apart from channelling salaries to workers in the formal sector and pensioners in the District, mobilize micro-finance credits to individuals and groups engaged in agricultural and small-scale industrial activities.

Hospitality facilities in the district include: Mayaga Hotel, Tono Guest and Club Houses, Catholic Social Centres in various communities, CEDEC Guest House, M & J Hospitality, St. Lucion Restaurant, First & Last restaurant, Peace & Love Restaurant, Jet Club, Anipola Spot, Prison View, Pierre Lodge, and many other spots, pito bars, registered homestay-compounds, food chop-bars etc. spread all over the District. Due to the underdeveloped nature of the tourism industry in the District, the hospitality industry depends mainly on the inhabitants, especially paid workers for their customers.

In effect, the hotels, clubs, restaurants and lodges are mainly situated in the urban settlements where formal sector employees reside. Peak periods in their operations occur on festive days and market days immediately following salary disbursement periods as well as after the "tomato" seasons, when markets for the irrigated crops are good.

Education

The majority of the people in the district have had no formal education. According to a 2003 Core Welfare Indicators Questionnaire (CWIQ) survey, the adult illiteracy rate in the District was 26.7 per cent, which was slightly higher than the regional average of 23.0 per cent but less than the national

average of 53.0 per cent. The youth illiteracy rate was also estimated to be 55.7 per cent, which was higher than the regional average of 45.0% but lower than the national average of 68.8 percent.

There are 98 functioning primary schools throughout the District. Junior Secondary Schools are much fewer at 44 with only 6 SSS and 3 Vocational Training Institutions. Forty-two (42) Pre-Schools, Teacher Training College and Faculty of Applied Science of the University for Development Studies (UDS) Campus are also located in the District.

It is a well-known fact that girl-child education is a problem in the country, particularly in the three northern Regions. The KND has its fair share of this problem. However, evidence shows that there has been a remarkable improvement in girl-child school enrolment.

The dynamics of school enrolment depicts a progressive decline in the number of pupils enrolled as they climb upwards along the educational ladder.

Land Title and Ownership

Individuals do not own lands but the family heads. The chiefs oversee the transmission and sale of land. The Tidanas/Tigatu are the original owners of the land; however they transfer land to other family heads. There are a few state owned land, and also some owned by individuals.

Land Use

For a district where agriculture engages the majority of the working category of the population (68.7%), land availability and use is key to survival. Relatively high population densities in the urban areas have given rise to the rapid development of cottages at the peri-urban areas. This is gradually

putting stress on land availability and use. Extensive cultivation, over-grazing, an erratic rainfall pattern and soil degradation is pre-disposing land here to desertification. That the district is close to the Sahelian zone makes the situation more precarious.

Employment/Economic Activities

The mainstay of the local economy is agriculture, which accounts for about 68.7 per cent of the employable population. Public servants, traders, food processors and small-scale artisans constitute the remaining 31.3 per cent. The District has virtually no sizeable manufacturing industries. Agricultural pursuits dominate the employment scene in the District. Other areas that offer employment opportunities to the people include public services, retail/wholesale services, food processing, and pottery in order of importance.

Under-employment rather than unemployment is the main problem facing the population of the District. Many school leavers and the entire youth engage in menial jobs such as water rending, hawking and "loading boys" at vehicle station. A substantial number of farmers in the District also become under-employed during the agricultural off-season. During this period, those without alternative sources of income, have no option than to migrate to the south for greener pastures.

The rate of out-migration has been on the increase of late. However, some pragmatic measures put in place by the government and District Assembly to create job opportunities for the youth have had a positive impact on the rate of migration.

The major occupations in the District are Agriculture, employing about 68.7 per cent of the total labour force; production / transport operators and labourers constitute 10:4 per cent, Sales workers (9.2%), service workers

(5.6%), Administration / Managerial workers (0.1%), professional technical workers (3.5%) and others (1.0%).

Agriculture and related workers (68.7%) are the single largest occupation; followed by production and transport equipment workers (10.4%), Sales workers are otherwise the third major occupation in the District.

The extractive industry is also worth mentioning. The most common form of extractive activities in the District are sand and clay mining whilst on few occasions, there occurs some quarrying although much rock-piles exists in the District. Sand and clay mining activities are basically meant to satisfy domestic and other related informal needs such as putting up of housing structures for the homes. Others go in to gather raw materials for pottery and other handicraft production.

Quarrying activities are carried out on a small scale. Although the District abounds in rock-piles, most of these resources are left untouched. Few settlements harvest them and in turn, sell to contractors as chippings. Most quarry products used for road construction activities in the District are acquired elsewhere.

Formal manufacturing industrial activities do not exist in the Kassena-Nankana District. However, small-scale entrepreneurial activities dominate the entire industrial scene of the District. They form about 8.5 per cent of the economic activities in the District, and account for the industrial revenue and its associated employment. The activities involved in the sub-sector's domain include small-scale agro-processing such as fibre, cotton, groundnuts, shea fruits, dawadawa, rice, among others and small-scale construction works. The sub-sector's activities offer value-adding opportunities to the raw agricultural produce in the District as well as offer coping mechanism to majority of the poor in the District, particularly during the off-farming season periods.

Due to stress caused by poverty some people would, in the absence of such employment opportunities from the small-scale activities, migrate to the southern regions in search of non-existing jobs or stay behind and sometimes indulge in activities detrimental to the District in the long run, vis-à-vis its socio-economic development.

On the construction scene, much is not accrued in terms of revenue to the local economy, neither paid employment. Activities embarked on in this sub-sector's domain are geared towards satisfying domestic needs and other informal interests such as putting up local structures and ovens. Major constructional activities including road construction are highly dependent on the central government's initiative and implementation arrangements. Although enough rock-piles exist, chippings are usually gotten outside the District due to the absence of quarry industry.

The service/tertiary sector activities contribute about 32 per cent of total employment in the District. Apart from the sector's activities regarding the aggregation of the economy's GDP and employment generating indices, the services from this sector complement, extend and consequently, add value to the outputs gotten from the primary sector's activities, e.g., telecommunication. In effect, these services do not only generate revenue but also fill in the livelihood gaps left after agricultural activities impact.

Trading and commercial activities in the District revolves around mainly foodstuffs, semi-processed food and craft items etc. These items are sold in the local markets as well as outside the District with some specialized ones meant for the international market though on a small-scale. About 95 per cent of those engaged in these activities are women. Foodstuffs traded include millet, sorghum, cowpea, groundnuts and rice. Other items including cassava, gari, palm fruits, plantain, citrus fruits are mainly from southern Ghana, with Techiman being the main point of purchase. The processed

items include baobab powder, sheabutter, dawadawa, milled products from maize, millet, groundnut extracts including 'kulikuli', processed malt for the pito drink (i.e., locally brewed beer), woven items including smocks, hats, baskets, pottery products and locally made ceramics for domestic use are also traded in the markets.

By its proximity to the Ghana-Burkina Faso border, illegal currency trading (black market) is common. Carpentry, masonry, bicycle, motor and vehicle repair works, milling, footwear servicing, metal works especially peasant farming tools, vulcanizing and some other scattered forms of personal services are prevalent in the District especially in the growth points/centres during market days. Blacksmithing, welding, mechanical workshops and dressmaking are some of the services rendered. These economic activities are gender sensitive. This sector offers employment to most of the District's population, as it requires simple skill endowments and relatively less start-up capital.

Agriculture

Agriculture is the mainstay of the District economy; employing over 60 per cent of the economically active population. Farming activities are mainly rain-fed. However, irrigation facilities at Tono Irrigation project areas, smaller dams/dugouts and some other water bodies serve as sources of water for dry season farming.

Although crop farming is the highest contributor to agricultural development, in practice, the people in the District integrate the other non-cropping activities such as fishing, hunting, livestock and poultry keeping with their cropping activities. Nevertheless, the non-cropping activities are less intensely practiced as compared to cropping which is relied on to satisfy the domestic needs through direct consumption and sale of others to patch up non-food requirements.

Energy Sources

Energy is needed for home consumption, work places and other areas to enhance livelihoods. About 8.7 per cent of the District's population has access to the use of electric power supply. The bulk of the remainder resorts to fuel steel lattice usage where millet and maize stalks are heavily relied upon after harvest. Some others depend on charcoal, kerosene and Liquefied Petroleum Gas (LPG) as their main sources of energy. In the District, the percentage of households using electricity, as the main source of lighting is 8.7 percent as compared with the national average of 43.7 per cent. The percentage of households using kerosene lamps as a major source of lighting is 88.7 percent as compared with the regional average of 84.6 percent. In light of the fact that availability of electricity is not meant only for household lighting, cooking and food preservation but also promotes industrial and other economic activities, the programme of rural electrification needs to be intensified in the district.

There are great potentials for generating and using solar energy, considering the high annual average temperature of 32°, the low canopy structures of most trees sparsely located in communities, thus allowing direct sun-rays on the ground levels among other factors. To this end, usage of solar energy is becoming common in the district even among the rural settlements.

The most commonly use of cooking fuel in the District is firesteel lattice. It accounts for about 76.0 per cent of cooking fuel in the District as compared with the Regional average of 66.5 per cent. Millet stock and corn stock is used by 10.8 per cent of households and charcoal is used by 10.1 per cent.

Each of the main sources of fuel used for cooking has associated problems. The use of fuel steel lattice is cumbersome, affects the health of women

and children, and leads to the depletion of the forest. The use of charcoal, in the long run, is expensive and also results in reduction in the forest cover of the charcoal producing areas.

Gas and electricity are not very affordable and accessible to most households. With the exception of few households – mostly in the urban areas, that can afford electricity, solar panels and/or Liquefied Petroleum Gas as their energy sources. Most rural households resort to steel lattice pots (coal pot) charcoal as their source of energy.

In all, 86.1 per cent of the households in the District use steel lattice and charcoal as cooking fuel that depletes the forest cover. The environmental implications should therefore be a District concern. Attempts should be made to intensify agro-forestry, including cultivation of drought resistant trees and fuel steel lattice such as acacia, Nim and shea-nut trees.

Public Health including HIV/AIDS

With limited access to health care facilities and unhealthy lifestyles of the residents, life expectancy is below the national average of 55 years. Malaria is endemic in the Kassena-Nankana District accounting for over 60% of all outpatients seen at health facilities and 25% of under-five mortality in the district. Like most communities in Ghana and West Africa, malaria continues to rank first on the ten (10) causes of OPD attendance in the district. Nutritional problem is second to diseases that are induced by poor sanitary conditions.

Navrongo, the regional capital, is served with three (3) water pumping stations located at Navrongo Town Centre, Doba and Boscos. Plans are far advanced to expand the Paga Water system to increase coverage and also construct a new water system at Sirigu. There are also several boreholes and hand-dug wells serving the rural and urban population.

About 58% of the total population has access to safe water sources, thus pipe borne and boreholes. Though, there are a number of hand-dug wells in the system, most of them are not covered and others also do dry up during the long dry season. As a result of inadequate safe water sources in the District some people are compelled to resort to unprotected water sources like dams/dugouts, rivers and streams for their water needs which invariably affect their health.

The strategic position of the KND, close to the Ghana - Burkina Faso border, makes it prone to the HIV/AIDS infection rate and this has far reaching consequences on the socio-economic development of the people. Control measures put in place by the District Assembly has resulted in the infection rate falling from 4.4 percent in 2003 to 2.2 percent in 2009, with a slight increase from 2.0 percent in 2005.

Poverty runs top on the list of causes of the continuing spread, which compel people into wayward behavioural habit. Mother-to-child transmission and the use of sharp materials used by infected people also aid the spread of the virus. Polygamy and other traditional practices such as Female Genital Mutilation undoubtedly promote the spread of the virus. Majority of the youth who migrate to the southern parts of the country during the long dry season in search of non-existing jobs later indulge in unsafe sexual behavioural patterns, which undoubtedly, increases their risk of acquiring the virus. Paga being an inland port or transit point on the Trans-ECOWAS Route serves as a great threat to the spread of the HIV/AIDS menace.

3.3.3 Kassena-Nankana West District

Kassena Nankana West district with its capital Paga has recently been carved out of the Kassena-Nankana District by an Executive Instrument in

February 2008. As a new district, it is yet to be profiled separately by the National Development Planning Commission. However, due to its contiguity with the two other districts aforementioned, some characteristics can safely be presumed to be similar. Some distinct characteristics are discussed below.

Tourism

The District abounds in tourism potentials including various sites, practices and other features of tourist interests. Potentials include the Paga Sacred Crocodile Ponds, Paga-Pio's palace, Pikworo Slave Camps, Nania Gardens, Caves at Chiana, the Fao festivals, sacred groves, shrines, the unique Catholic Cathedral edifices, pottery projects, the village architecture in Sirigu and Kayoro Community-Based Eco-tourism Project etc. There are also rock sites of different forms which, combined with other elements, brightens up the eco-tourism potential.

Few informal groups including the Paga Ecotourism Committee, the American Peace Corps groups and some individuals are into tourism activities development, supporting the activities of the ill-equipped Tourist Board Management Team in the District. Also, only a few indigenous folks in the District have any serious interest in tourism, resulting in the untapped development and tourism potential in the various communities of the District.

Employment/Economic Activities

Agriculture is a key employer of the working population here. By virtue of its proximity to the Ghana-Burkina Faso frontier, illegal forex activities (black market) are common here. Cross-border trade in items that offer significant profit margins across the border also thrive.

Public Health including HIV/AIDS

Relatively higher incidence of HIV/AIDS could be a major public health concern here due to cross-border movement and activities across the Ghana – Burkina Faso frontier. Burkina Faso has a higher HIV/AIDS incidence rate than Ghana.

4. ANALYSIS OF ALTERNATIVES

The proposed project in Ghana will principally involve the construction of a bus-bay at the VRA's Bolgatanga substation, installation of steel lattice pylons and stringing of conductors on them across the 37 km length on the Ghana section, to enter Burkina Faso near Goiree.

A description of the proposed development has been provided in Section 2 of this report. However, prior to the selection of the various components of the proposed development, various alternatives were considered both in terms of equipment and the feasibility of the project itself during the project planning stage.

At this stage of the proposal, the alternatives considered are:

4.1 THE "NO DEVELOPMENT" SCENARIO

The implementation of the 225 kV Bolgatanga - Ouagadougou Transmission Project will facilitate the evacuation of high voltage electrical energy from the VRA's Bolgatanga sub-station in Ghana to SONABEL's Zagtouli substation in Ouagadougou. The main objective is to provide a reliable and secure transmission of electrical power to Burkina Faso.

The 'no development' scenario could be inimical to the VRA and Ghana as a whole, as revenue generation from the sale of electrical power to Burkina Faso would be lost. In the unlikely event of the failure of VRA and SONABEL to carry out the proposed development, Burkina Faso will be deprived of the opportunity to provide electrical power to several towns and communities. This will pose a serious obstacle to its developmental goals. Ghana and the VRA will also miss opportunity of generating income through

the exportation of electric power to Burkina Faso. It will also deal a major blow to regional integration and sustainable development.

4.2 ALTERNATIVE MODE OF TRANSMISSION

The project proponents intend to use overhead cables on steel lattice towers for the project. Another alternative means of transmission is underground cables. However, burying transmission lines in underground cables over long distances is not practicable and might entail financial and environmental costs that might be too high. Again, buried lines require high levels of insulation and are difficult to install over steep terrain or within fluvial valleys and are expensive to maintain. Installation of long runs of buried, high voltage line is therefore cost prohibitive.

4.3 SELECTION OF OPTIMAL TRANSMISSION LINE ROUTE

Construction of transmission lines can have adverse environmental, social, and cultural impact on living conditions, as well as undermine use of land by residents. If a selected line route is located in areas with many obstacles, efforts to avoid such adverse obstacles could compromise stability and integrity of the line. As a result, construction costs would increase. The optimum line route is defined as a line route that maximizes construction feasibility and stability while minimizing negative influences and cost of construction.

A direct line from Bolgatanga to link Po in the Burkina Faso would have been the shortest and most direct route (please refer to Figure 2). However, that would have encountered more built-up areas and encroachment on civil properties, resulting in a higher compensation package than has currently been determined. Particularly, the around the Bolgatanga sub-station is

considerably built up, and a direct line route would have involved the demolition of many buildings with attendant high compensation costs which would have swollen overall project costs. The line had to be diverted to avoid a site earmarked for a civil airport near Anateem, and also the Atamwidi Forest Reserve (see Figure 4). The selected line route eliminates to the barest minimum the need to demolish and replace private properties. Also, a network of corridors has been designed to interconnect identified demand vertices, defined to meet the requirements of Ghana and Burkina Faso. It is also to foster interconnection with existing networks in each country and with other planned networks of WAPP. The selected line route reinforces that network. Any other line route would have distorted the network.

The choice of the line has taken into account the following constraints and general considerations, which have repercussions on the feasibility and cost of project implementation:

- To be as short and as direct as possible, to minimize costs.
- To avoid crossing identified problem zones, requiring non-standard and more costly technical solutions.
- To stay a reasonable distance from urbanized areas;
- To avoid crossing protected areas, such as parks, nature reserves, etc.
- To avoid crossing tourist areas or important panoramic sites.

Additionally, the choice of the line is to avoid as far as possible, sensitive environmental elements located inside the zone of study. Currently, a provisional line route has been chosen based on several factors, the major considerations being the avoidance of environmentally sensitive areas, communities and settlements.

4.4 ALTERNATIVE PHASE CONDUCTORS

At present, the types of cable most currently used for high tension and very high tension overhead lines are ACSR Conductors (Aluminum Conductor Steel Reinforced), i.e., aluminum conductors with a steel wire core, AAAC (All Aluminum Alloy Conductors) and less frequently, ACAR conductors (Aluminum Conductors Alloy Reinforced) where the conductors are reinforced with some aluminum alloy wires.

Copper conductors are now only used in a number of particular cases due to the high cost of overhead lines equipped with this type of conductors. This high cost originates from the cost of these cables themselves, but especially from the high density of copper they require, this is in turn resulting from considerable mechanical loads and significantly greater sag, so that compared to lines with aluminum conductors of equal spans the higher sag calls for taller towers if sufficient clearance has to be preserved. It now makes sense to use copper for more sophisticated applications than for line conductors.

For this project, AAAC cables have been chosen over the other types for the following technical advantages :

- Significantly lighter cables (by about 25%)
- Slightly better transmission capacity with respect to thermal limit and short circuited withstand
- Surface hardness off alloys wires is double that of aluminum wires
- Better resistance to corrosion as a benefit from the absence of galvanic corrosion (as would be the case with ACSR conductors between Zn/Al and then AL/Steel after consumption of the galvanization of the core).

4.5 ALTERNATIVE TOWER DESIGN

Independently from such characteristics as width of the tower base, angle of the members, height of the cross arms at the top of the tower, which dimensions result mainly of experience and the static design constraints, a tower is defined by its typical dimensions which include;

- Phase-to-phase clearances
- Phase-to-earth wire clearances correlated with the earth wire position(s) to provide effective protection of the phase conductor against lighting strokes
- The clearances to the tower structure
- The height with respect to ground level of the attachment point of the suspension and anchor strings.

There are various types of towers that can be used for supporting high voltage power transmission lines. Three configurations were studied for the suspension towers and these were:

- Triangular configuration tower with two earth wires
- Cat's head configuration tower
- Horizontal configuration tower

In analyzing the types of towers to be used, factors such as loading stresses, wind loads, safety factors are all analyzed. For the project, the weight based on economic study for the three types of towers was as follows:

Tower Type	Weight (%)
Horizontal configuration tower	100
Triangular configuration tower with two earth wires	104.7
Cat's head configuration tower	105

Source: 225 kV Bolgatanga – Ouagadougou Interconnection Project Feasibility Study: Volume 1, Part A, October 1997.

Conclusion was that the horizontal configuration type tower is the most economic one and at the same time presents excellent behaviour with respect to weight (the estimated weight of a horizontal type suspension tower with the lower cross arm 24m above ground level: 3.7 tons)

Subsequently, VRA has opted for the erection and use of horizontal configuration type tower based on the required strength, heights, safety and security for this international line. The added advantage of this tower type is that they require less land for the tower support system and are very robust for construction.

4.6 DETERMINATION OF ECONOMIC SPAN

Based on the economic study, the number of towers necessary in five different cases of average span (300, 400, 440, 480 and 520 m) were estimated, making the assumption that the average working span between towers would equal 0.9 times the design wind span.

From these different spans, maximum heights (above ground level) were defined for the cross arms (22, 24, 26, 29 and 32) with each considered span and taking into account ground clearance of 7.5 m.

These various parameters made it possible to determine the total weight of the intermediate suspension towers as a whole and identify the most economic span as 420m.

5. POTENTIAL ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION

The construction of transmission lines is a linear project that may impact on natural and socio-cultural resources within the project corridor. This section discusses the potential environmental impacts and proposes actions to mitigate and/or manage the adverse impacts and enhance the benefits of the positive aspects.

While the pre-construction and construction phases will be handled by the selected Contractor the operation and maintenance phase will be managed by a Special Purpose Company (SPC) comprising WAPP, VRA and SONABEL. The project phase activities have been described in sufficient detail in Chapter 3 above. These have been discussed below under the headings of pre-construction, construction and Operation maintenance phases, with the recommended mitigation measures.

Table 5.1 below is the Rapid Impact Matrix that has been drawn up from the impact assessment. The information used in the impact identification and evaluation has been based on:

- Environmental Guidelines and literature review (including Ghana EPA Standards and World Bank Environmental Procedures and Guidelines).
- Stakeholder (public/community and institutional) consultations.
- Overlay mapping of the project details and the baseline environmental conditions.
- Review of relevant literature on bio-physical and socio-economic and cultural background of the project area.
- Experience gained by the Consultants (CabIRA-INGEMA) from similar linear projects (transmission lines and various road projects).

The matrix shows the various environmental impacts under each phase of the project, a numerical evaluation of the impact whether positive or negative on a scale of -5 through 0 (zero) to +5), and a succinct description of the impact. Impacts are objectively assessed and quantified based on magnitude, extent, duration and reversibility.

The impact identification and management focuses on the pre-construction and construction activities and their impacts, mainly on the bio-physical environment, with some insights into the operational activities, because after its construction, testing and commissioning, the operational phase of the project will be managed by the SPC mentioned above, under the existing Operational Guidelines of VRA.

5.1 IDENTIFIED POTENTIAL IMPACTS

5.1.1 Potential Pre-construction Phase Impacts

The pre-construction activities to be undertaken for the transmission line project are line route survey (including tower spotting) and acquisition of the right-of-way (Row).

Loss of Vegetation

There will be minimal vegetation clearing from the line route survey and related activities. A 1 m wide transect will be cleared of vegetation, representing the line route. This will basically be by slashing of grasses and trees using machetes, to ensure that there is a clear line of vision. Cleared vegetation may include some food and cash crops within the 1 m width path. This could cause some anxiety among farmers and people whose

crops and other properties may be affected. The northern part of Ghana falls within the Sudan savannah ecological belt, and has over the past decades suffered gradual desertification. So, vegetation clearing especially of young trees and saplings could pose a significant ecological threat. However, within the sparse vegetation, trees and saplings are so few and far between that this impact would be of little effect, if any at all.

Land ownership and compensation

Once the 37 km line route has been selected VRA will acquire the RoW prior to construction of the transmission line. Acquiring the RoW would have not have any significant impact on the land ownership and land use within the corridor. Any land use activities that are not compatible with the RoW will have to cease or be removed, and this will introduce issues of compensation and resettlement. For the entire stretch, a total of 1.48 km2 (computed as 37 km m x 0.04 km). It is noteworthy that most of the land to be acquired for the right-of-way is not through farmlands. From the property impact survey, eighty seven (87) housing units and over 129 economic trees will be affected. These are units that are homes to families and individuals, and their demolition would cause housing deficits in the project area. The trees are not in plantations, but are scattered across the entire length of the line. They include shea nut, mango, baobab, plantain and teak trees of varying sizes. However, sales of their fruits are occasional sources of income for their owners when in season, and therefore will require some monetary compensation when they are cut off.

The loss of access to land and land use under the RoW may be classified as a residual impact. The restriction of access to the RoW is necessary for the safety of both the transmission line and the public. The VRA is empowered by the Wayleaves law to restrict access to the RoW. This will however, be addressed during the implementation of the resettlement phase.

5.1.2 Potential Construction Phase Impacts

Construction impacts associated with transmission line projects at any given location are transient and of limited duration. The main construction activity of concern has to do with clearing of vegetation to varying degrees at various sections of the projects. These are described below.

Under the VRA Corporate Safety Rules 1995, the construction of overhead lines is so done as to ensure that they are integrated into their surroundings as much as possible, and do not pose any safety hazards to the beneficiary communities. It is also a policy to ensure that steel lattice towers that are used in the VRA"s networks have been guaranteed to have minimal adverse effects on the environment from their treatment.

Loss of Vegetation

The contractor may need to build temporary base camps at strategic locations along the project corridor for operational purposes. These would comprise an office, store and workshop from where construction activities could be coordinated. No accommodation facilities will be provided at the camp. However, the line runs parallel or close to the Bolgatanga-Navrongo-Paga road for the greater part. This means that the line could be easily accessed from the main road so there might be no need for a base camp.

Tower spotting and foundation construction will also involve the clearing of vegetation for building the tower bases on which foundation the towers will be erected. Construction access roads will also be constructed at regular intervals perpendicular to the corridor from the nearest major road. Clearing of the tower corridor track that will be used to access towers from one to the next within the corridor also involves vegetation clearing. The length of the entire line is 37 km, and using the average span of 420 m between towers,

it is estimated that about 88 to 90 towers will be constructed. The project area has sparse vegetation, and is susceptible to insidious deforestation. Loss of vegetation would not bode well for the ecology of the area. Trees are few and far between, and the cutting of tall trees within the RoW could enhance the deforestation and desertification threat in the project area.

From the nature of soils encountered, the clearing of the land (especially at the high spots) and use of heavy plant and machinery could loosen the soil and lead to erosion and increased sedimentation of some water bodies especially during the rainy season.

Noise

Noise impacts from the use of heavy equipment and machinery at the construction phase are worth considering. These would nuisance effect on nearby human settlements and contribute to faunal displacement.

Opening up of restricted areas

Access roads open up closed areas and could enable unscrupulous persons to enter to carry out illegal/unauthorized activities such as hunting of wildlife and illegal logging, especially where the line passes close to forest reserves, such as the Atamwidi Forest reserve near Sumbrungo.

Air Quality

Changes in air quality from dust generation as a result of excavation and emission from machinery and equipment are anticipated to be considerable, especially during the dry season when the ambient air quality is dust-laden from the Harmattan winds. Air quality (dust) impacts from construction activities would exacerbate ambient quality. It has been determined that construction will be best done in the dry season. Air quality parameters

such as Total Suspended Particulates (TSP), Particulate Matter with aerodynamic diameter less than or equal to 10 microns (PM10) and smoke. It is also worth mentioning that bushfires are common during the dry season, compounding the air quality situation with smoke. Air emissions from the project could exacerbate the air quality in the project area and adversely affect the health of people within the project area.

Traffic Impacts

Once the access roads are prepared, trucks equipped with cranes will be used to transport construction machinery, lifting gears and towers/accessories, through the public roads and along the access roads, to the erecting points. Transporting heavy machinery through the relativity narrow roads in the rural communities poses risks to vehicular traffic and public safety. Trucks moving on the graded access tracks could cause soil compaction and increase exposure to erosion.

Occupational Health and Safety

Practically, the process of vegetation clearing as described under Section 2.3.2 is done in a very selective manner so as to minimize damage to vegetation cover and crops. Clearing the RoW and its immediate environs of all tall trees could result in loss of matured trees in the savannah. Cutting of trees presents occupational/public safety risks to the workers and farmers in the vicinity. Falling trees could trap and injure or kill personnel.

Tower Erection has been described in Section 2.3.2. The impacts arising from erection of towers are mainly related to occupational health and safety. Working at heights could present hazards to the climbers and to those on the ground from falling objects, tools etc. Working with cranes and other lifting equipment also present potential inquiry from broken wires, lifting tackle and swinging objects.

Table 5.1 Rapid Impact Matrix (Scale +ve impact=+5; -ve impact =-5)

ENVIRONMENTAL IMPACT	IMPACT SCALE	IMPACT DESCRIPTION
Pre-Construction Phase		
Loss of Vegetative cover	-2	Clearing of vegetation for Line route survey
Land ownership and compensation issues	-2	Identification of actual land owners for payment of compensation
Loss of land use	-2	Land acquisition and restriction of access could reduce available land for cultivation.
Construction Phase		
Loss of vegetative cover	-2	Clearing of vegetation for tower corridor track, construction of base camps and for access roads.
Noise and Vibration	-1	Noise impact on nearby settlements, dispersal of faunal species
Air quality	-2	Dust generation from excavation activities, and exhaust emissions from machinery and equipment will compromise air quality
Displacement of faunal species	-1	Clearing of vegetation could lead to the migration of birds and other animals from the project area
Soil erosion and sedimentation of water bodies	-1	Excavations for tower construction near water bodies could lead to siltation
Traffic impacts/congestion	-1	Transient disruption of road traffic within the project area
Occupational Health and Safety	-2	Work-related accidents
Impact on water resources	-2	Sedimentation of nearby water bodies
Income generation	+3	Employment for local hands
Operations Phase		
Maintenance Impacts	-2	Vegetation control within the RoW, Occupational safety risks to maintenance
Operational Hazard Impacts	-1	Accidental dropping of conductors, shattering of insulator units, pole collapse.
Glare effect and visual intrusion	-1	Newly installed towers and lines cause glare effect and visual intrusion on landscape
Socio-economic benefits	+5	Foreign exchange earnings for Ghana.

Public Health and Safety including /HIV/AIDS

In locations where the lines will cross other power lines, telephone lines, rail crossings, public roads, the appropriate agencies shall be duly notified and consent obtained prior to stringing. Stringing of lines creates impacts on occupational health and safety similar to those discussed above. In addition, stringing the lines across public roads and railway lines will require some temporary disruption to traffic. Placing of the lines limits grounds and aerial movements in the vicinity of the lines. Lines can pose collision hazards to birds as well as obstructing road haulage of tall structures. Where the lines will pass close to or through forest reserves along roads, fringe foliage will have to be pruned, and trees within the stipulated 2 m distance from the right-of-way will have to be harvested or cut to a height of 1.2 m or below.

The HIV/AIDS pandemic continues to be a social menace that requires attention and consideration of project promoters and managers. Projects such as the construction of a transmission line involve the mobility of several gangs of workers. Such workers necessarily spend considerable time away from their homes and satisfy their sexual needs on the road. Migration - short term or long term, increases opportunities to have sexual relationship with multiple partners, thus becoming a critical factor in the propagation of HIV/AIDS. Although awareness of the disease is said to be very high amongst the Ghanaian population, behavioural change lags far behind this awareness. This is likely to be the case among the workers as well and ether will be need for education for the workforce and monitoring of incidence of HIV among community members.

Dispersal of Faunal Species

Some faunal displacement/dispersion (especially birds) could result from the cutting down of some trees. Loss of tree cover would lead to increase evaporation particularly near small streams and creeks.

Impacts on Water Resources

Water quality impacts are classified under surface water. Three main surface water bodies have been identified in the project area. These are the Yarogatouga River as well as two (2) main dugouts ponds of over 1.5 square km in surface area located at Sumbrungo-Kulbia and Doba. Erosion, resulting from vegetation clearing and tower foundation excavations nearby could lead to downstream siltation resulting from run-offs with high sediment load. This will ultimately lead to contamination of water resources and cause sedimentation. Water pollution may also result from oil spillages, leaking fuel and grease from construction machines, rendering the water unfit for their ordinary uses.

Employment and Income generation

At the construction phase, some local labour, skilled and unskilled, will be engaged to support the contractor. This will result in some income generation into the project communities and enhance livelihoods.

5.1.3 Operation and Maintenance Impacts

Visual intrusion and Glare Effect

Steel lattice towers will be erected for the stringing and supporting the transmission lines. These will be located at approximately 420 meters apart, except for areas where the terrain will demand a revision of the span, such as near water body or in a natural depression, etc. When erected in place, the towers are quite imposing and in areas close to settlements and at entry points into substations, they create visual intrusion. During daylight hours, newly strung and shiny conductors produce a "glare" effect as they reflect

sunlight. This is a residual impact, which will fade away over time as the conductor material tarnished.

The operation and maintenance of overhead transmission lines pose various challenges that could affect the technical performance of the system itself as well as creating risks to the health and safety of both the line workers and the general public. These are discussed in detail below.

Operational hazard impacts

These arise from the safety risks associated with transmitting power along the overhead conductors. Although generally very rare in well maintained systems, the following are some of the major hazards that could impact on public/occupational health and safety during the operation of overhead transmission lines:

- **Dropping of Conductor** - a "live" conductor could snap and fall to the ground (drop) as a result of either a mechanical failure of insulator string(s) on the tower or snapping of the conductor. The failure of an insulator string could be caused by lightning strike, rusting of the insulator pins or a heavy project (possibly a tree), falling on the line. The snapping of a conductor could also be caused by the failure of a conduct joint. The power system protection provides that the dropping of a conductor would lead to a ground fault, which would automatically remove the line section involved from service and this would immediately affect the supply system. Any living object on which a live conductor falls could sustain severe burns or even die.
- **Shattering of Insulator Units** - insulators units can shatter in service. Shattering of an insulator unit produces very sharp edges of the fragmented pieces that are normally thrown about in all directions from the tower. This is a potential safety risk to persons who would happen to be passing near by the tower locations at the time of occurrence.

- **Collapse of Tower(s)** - towers could fall due to the following reasons: Rain/wind storms, Bush fires.
  The collapse of tower(s) would have the same effect as dropping of conductors since the collapsed tower(s) themselves normally fall within the right-of-way.

Maintenance Impacts

The maintenance procedures developed by the VRA over time shall be applied on the new line. Some aspects of the maintenance activities raise issues of environmental concern such as:

- Maintenance of right-of-way (vegetation/bush clearing)
- Occupational safety risks to one maintenance staff

Contractors under VRA supervision carry out vegetation control in the RoW using only means. Line maintenance has occupational health and safety implications for the staff, as they have the patrol the usually overgrown tower tracks on foot.

Waste Generation and Management

All aspects of the construction and operational phases discussed above will result in the generation of mainly solid waste ad these will have to be disposed off appropriately. Wastes expected to be generated from the construction phase includes:

- Vegetation- felled trees and tree stumps, leaves, under bush, shrubs etc.
- Packing materials- conductor drums, steel lattice, plastic, metal parts etc

Liquid waste will result from concrete works where tower bases will need concrete, washing of equipment, handling of fuels and oils.

Wastes generated from repair and maintenance of the lines would include:

- Damaged conductors and cables
- Broken insulators (both glass and porcelain)
- Packaging materials such as steel lattice in crates and paper cartons
- Organic waste from bush clearing
- Rags and cloths used for cleaning
- Special wastes in the form of empty oil and solvent containers.

Special Issues

There are some specific aspects of the project that will require special and detailed evaluation and assessment. These are as discussed below.

- Electro-Magnetic fields

  A special issue with regard to electricity is that of the suspected health effects of exposure to electric and magnetic fields, or electro-magnetic fields. There is also the problem of interference with the operation of various electronic gadgets like television sets.

  Electro-magnetic fields, also called EMFs, are produced wherever there is voltage or flow of electricity. They are thus produced by the voltage, which is the pressure behind the flow electricity. Electric fields are measured in volts per minute (Vm-1). Magnetic fields are generated the current, which is the quantity of electricity flowing. Magnetic fields are measured in amperes per metre (Am-1) or microtesla (μT) or milliGauss (mG). EMF is a combination of both electric and magnetic fields. Separately, electric fields can be shielded easily using insulators. Magnetic fields, however, are not

easily shielded and can pass through most materials, including the earth and buildings.

The cables and transmission lines to be used in the project, and all of VRA"s equipment and sub-stations generate various levels of EMF. Typical maximum field strengths associated with transmission line circuits like the ones involved in the project are as given below in Table 5.2.

Table 5.2 : Typical maximum Electric and Magnetic field strengths associated with High Voltage Transmission Lines

Line Voltage (kV)	Electric Field (kVm^{-1})	Magnetic Field (μT)
330	4	10
161	1.5	7

Research findings from the United Kingdom give some measurements of common magnetic fields as indicated in Table 5.3 below.

Table 5.3 :Measurements of some common Magnetic fields

Source/Location	Magnetic Field (μT)
At Electrical sub-station perimeter fence	Up to 10
Computer/TV screen at 1 metre distance	0.01 – 0.15
Electric meter (0.3 metre distance)	0.02 – 0.5
Electric hair dryer (0.3 metre distance)	0.01 – 7.0

Extensive research carried out worldwide, especially in Europe and the USA, have not been able to conclusively link EMF to any adverse health effects. All the same, it is also recommended that safe distances be maintained between power lines and installations on one side, and residential premises.

On the issue of EMF interference with the functioning of certain electronic gadgets, it is noted that manufacturers of electronic equipment are required to conform to certain standards concerning protection from EMF interference. Equipment containing Cathode ray tubes (CRTs) such as television sets and computer monitors tend to be sensitive.

- Corona Discharge

Transmission lines are known to experience „corona discharge" and this tends to increase with the increasing voltage. Corona is defined as a discharge occurring at the surface of a conductor or between two (2) conductors of the same transmission line, accompanied by ionisation of the surrounding atmosphere. Corona is frequently luminous (spark of light) and produces noise of a hissing character. Corona is known to produce Ozone, but this is unstable and reacts quickly with other gases.

Corona is caused by the electric field next to an object exceeding the breakdown value of air. The starting voltage for corona is typically 30 KV/cm radius. This may be lowered by the presence of dust, water particles and sharp edges on the object. Corona causes loss of power as energy is lost in the discharge process. Corona also encourages corrosion of the line conductors as the reaction with the surrounding air sometimes produces nitrous acid (in the presence of adequate moisture). Corona is also known to cause radio interference on radio sets and TV sets in close proximity to high voltage transmission lines.

- Effect on Telecommunication

Resonance effects of power frequency fields may also affect telecommunication. Electric power in Ghana is provided at an

alternating current (AC) with a frequency of 50 Hertz, with a wavelength of 5,000 kilometres. These features have the potential of disrupting telecommunication.

Five telecommunications companies operate within the Upper East Region, and they have been consulted on the potential effects of the transmission lines" electromagnetic force (EMF) on their operations since December 2009.

- Risk of Gas Leaks from Switchgears and Circuit breakers

Sulphur hexafluoride (SF6) is a gas with excellent electrical insulation properties, among other desirable ones. This has led to its widespread use in electrical switchgears and in a number of other industrial applications. However, there is concern over the SF6 that escapes into the atmosphere, since it is a potent green house gas (GHG). The Kyoto Protocol to the Climate Change Convention has recognized the need to curb emissions of GHGs, including SF6.

SF6 is used widely in the electricity industry throughout the world in medium and high voltage switchgears and circuit breakers because it is an extremely effective electrical insulator. Some of the advantages of SF6 over compressed air or oil in such applications include:

- No risk to land or water contamination, as is the case with oil-filled equipment.
- More compact equipment requiring a smaller land area, and thus reducing the visual impacts of sub-stations.
- Quieter operation, as against air-blast circuit breakers.
- Longer equipment lifetime, lower maintenance and enhanced reliability through hermetic sealing of high voltage conductors inside an earthed enclosure.
- Non-flammability.

These environment-enhancing advantages make SF6 a cost-effective insulation medium for switchgears. The VRA network is increasingly using more of these gas-filled breakers. Although stable under most operational conditions, SF6 can decompose under high temperatures as is the case when it is subjected to electrical arcs within switchgears. One of the products of such decomposition is a toxic powder. Also, as a heavy gas, any SF6 released into an enclosed space will accumulate at low levels of altitude, displace air (Oxygen) and in the absence of adequate ventilation cause asphyxiation of humans within the vicinity. VRA operating procedures, however, take this into consideration and ensure that the risks from these circumstances are reduced to the barest minimum by limiting enclosed spaces for switchgears and equipment as much as possible.

5.2 PROPOSED MITIGATION MEASURES

Under this section, mitigation measures for the identified impacts will be presented, also under the same categories of Pre-Construction, Construction and Operations and Maintenance phases. The Director, WAPP Projects at VRA will set up a Project Management Team, which will manage the pre-construction and construction phases of the project.

5.2.1 Pre-Construction Phase Mitigation measures

Vegetation Clearing

As much as possible, Pre-Construction and Construction activities will be undertaken in the dry season or post-harvest period, when there will be no crops in the field, and most natural vegetation would have wilted. If a significant number of trees would be felled to make way for the transmission

line, arrangements will be made with the Forestry Commission for an afforestation project to be undertaken at suitable location(s) while their owners will be suitably compensated.

Land ownership and Compensation

By the Wayleaves laws, the Government of Ghana is empowered to acquire land for the construction of public facilities, including transmission lines, and pay appropriate compensation. A Resettlement Action Plan (RAP) has been prepared which has identified all project affected persons (PAPs) and properties. A property enumeration and valuation procedure has been employed in valuing all affected properties, using the Land Valuation Board rates as reference point. Eighty seven (87) housing units and a hundred and thirty nine (139) economic trees have been identified to fall within the approved line route. Their respective owners have been identified and consulted with regard to whether they would want their properties replaced or would want monetary compensation. The majority indicated that they would prefer monetary compensation. Details of the mitigation of resettlement issues are presented in the Resettlement Action Plan, which is a separate document submitted to the WAPP. Presently, a total of eight hundred and twenty six thousand, two hundred and forty three Ghana cedis, eighty pesewas (GHC 826,243.80) have been determined as compensation to be paid for affected properties, comprising GHC 815,830.00 for houses and buildings and GHC 10,413.80 for economic crops and trees. A summary of the RAP is attached as Annex 5.

Property owners will be duly compensated, and grievance procedures instituted to address concerns of dis-satisfied PAPs. The guiding document will be the VRA"s Land Acquisition and Resettlement Plan. All these will be done before the commencement of the construction phase. The District Assemblies be involved to assist the beneficiaries in managing their financial packages. Recipients will be offered the opportunity of receiving their monies through the rural banks to help mop up excess liquidity.

Impacts on Land Use

The acquired land for the right-of-way will be a residual impact, about which nothing could be done. However, the wayleaves law only prohibits land use activities that conflict with the transmission line, so annual crops may be cultivated by PAPs. Buildings and structures that have been affected would be duly compensated for either by replacement or in monetary terms.

5.2.2 Construction Phase Mitigation measures

Vegetation clearing

Experience gained from many field trips has shown that it is not necessary to maintain a graded surface for vehicle access. Therefore, re-growth of limited ground cover shall be encouraged along these tracks to protect against soil erosion. Only mature trees that have the potential of growing to entangle the transmission lines will be cut off.

Noise

Construction activity will be restricted to daylight hours, where noise impacts are minimized by background din due to human activity.

Opening of restricted areas

VRA has a standing MOU with the Forestry Services Commission (FSC) of Ghana, which ensures that the FSC is notified of any breach on a forest as a result of VRA"s activity. Should the forest be breached in anyway, the dictates of the MoU will be applied to protect the forest. (A copy of the MOU is attached).

Air quality

This impact will be of limited intensity and in duration. Only the tower footings will be excavated, with average separation distance of 420 m.

Construction will be restricted to the dry season, when it might be difficult to find water to douse the operational area to minimize dust generation. Machinery and equipment will be maintained and serviced regularly to minimize emissions.

Traffic Impacts

Delivery of materiel for the construction of tower bases will be restricted to the off-peak traffic hours, in order not to add to any existing traffic situation. Delivery vehicles will be escorted by pick-ups that will warn the public and other road users about the vehicles behind. These would be of limited duration and would not cause serious impacts.

Occupational health and Safety

Personnel Protection Equipment such as safety boots, hard hats, gloves and safety goggles will be provided for personnel, and their use strictly enforced to ensure that personnel are protected from operational injury.

Public Health and Safety including HIV/AIDS

Stringing of lines across public roads will be preceded by public notices, such as roads signs reading "SLOW DOWN – LINE STRINGING AHEAD". Safety nets will be hung under the lines being strung to protect passing vehicles and people from lines that may fall accidentally. HIV/AIDS awareness programmes will be organized for project personnel, and condoms distributed to them to protect themselves and to prevent the spread of STDs.

Dispersal of faunal species

This is a temporary impact. After construction, most of the animals could return.

Impacts on Water resources

In areas where the line is passing close to water bodies, measures will be put in place to prevent the contamination of the water body with construction material. Mortar and liquid wastes will disposed off away from the water body, and the areas around tower foundations (tower buffer) will be cemented to avoid erosion and sedimentation.

Employment and Income Generation

This is a positive impact, albeit transient. The construction phase will introduce some liquidity into the local economy through salaries and wages.

Chance Archaeological Finds

The Ghana Museums and Monuments Board will be invited to take custody of such finds.

5.2.3 Operations and Maintenance Phase Mitigation measures

Visual Intrusion and Glare Effect

There is already an existing 161kV transmission line from Bolgatanga to Navrongo. This will be running parallel with it for most parts, and therefore will not cause much intrusion. With regard to the glare effect, the towers and the lines will tarnish over a short period of time and the glare will fade.

Operational Hazards Impact

Although they occur only rarely, almost all the harmful effects noted under operational hazards have maximum effect within the immediate vicinity of

the lines. It is therefore essential, for the safety of the public, that the right-of-way is acquired and public access restricted.

Impacts arising from natural causes such as lightning strikes and extreme wind gusts are classified as residual. However, tower design includes adequate factors of safety that takes the expected maximum wind speeds into consideration.

Maintenance Impacts

Work safety procedures as prescribed in the VRA Corporate Safety Rules 1993 and the relevant requirements of the Factories, Offices and Shops Act on occupational safety shall be strictly complied with by line maintenance staff.

Waste Generation and Management

All wastes shall be stored in areas that are isolated from surface drains. These and tree stumps shall be gathered together and made available to the communities for use as fuel wood. Other forms of vegetation wastes shall be piled up at the sites and uses for mulch or burnt off depending on the situation.

Each drum of wire covers approximately 3 km length. For the 37 km, the wooden drums used for the conductors and shield wires will be more than 12 units and these will constitute substantial waste. The resident of the various communities could use the wood for the carpentry works or even or even as firewood.

Electromagnetic fields

During community consultations, significant emphasis was placed on the need for community members to strictly observe the restriction from buffer

distances as indicated by the Wayleaves Law. This seems to have gone down very well with most of the communities since some of them already have transmission and distribution lines running close by.

Corona Discharge

Corona discharge is promoted by moist humid environment and the presence of sharp edges. Therefore every care shall be taken in the design, construction and operation of the transmission lines to ensure that corona discharge is minimized. This will be achieved by avoiding sharp edges on the conductor cables and ensuring that adequate protection is built into the design of insulators and other power line accessories.

Effect on Telecommunication

Previous experience and research indicate that some overhead fixed telephone lines experience interference from "induction effect" when they run parallel and close to power transmission lines. In Ghana, telephone lines are generally strung within road reservations while VRA transmission lines run a considerable from the road reservation. In view of the vertical separation between telephone lines and the proposed transmission lines (the towers are about 40 m high), interference at spots where the two sets of lines cross each other are expected to be minimal. Thus, it can be inferred that the stringing of the 225 kV line will have minimal impact on communication. It is instructive to note that similar systems are in use in other countries where higher voltages are in use, without any problems. Therefore so long as the transmission lines remain a considerable distance from the communication masts and overhead telephone lines the transmission line project would have minimal impact on telecommunications. Further, VRA takes care of this effect during stringing

by changing the positioning of the conductors from tower to tower (trans-positioning).

The major telecommunications infrastructure in the project area is mobile telephony. There are no fixed lines close to the line route, as they are concentrated in the metropolitan section. Mobile telephony in Ghana employs frequencies in excess of 9,000 Hz while the frequency of the power to be transmitted will be at 50 Hz. The disparity between the two frequency ranges gives little concern for interference in any form. The spatial separation between the dish receivers on the masts, some as high as 60 metres, and the towers at 35 metres maximum buttresses the point of no interference between the transmission lines and telecommunication infrastructure. This is emphasized by the co-existence of VRA"s extensive transmission network and the scattered nature of telecommunication masts across Ghana.

6. MONITORING PLAN

The potential environmental impacts for which mitigation measures have been designed will be monitored constantly throughout the project. These would include vegetation clearing, compensation and resettlement during the Pre-Construction phase, air quality, noise, traffic impacts and occupational health and safety, and condition of machinery and equipment at the Construction phase.

During the Operations and Maintenance phase, the impacts that will be monitored are operational and maintenance hazards.

6.1 PRE-CONSTRUCTION PHASE MONITORING PLAN

This monitoring plan will be implemented during the Pre-Construction phase, and will cover the following.

6.1.1 Vegetation clearing

Vegetation will be restricted to relevant sections only. Where necessary, re-growth will be permitted to cover the soil surface and avert erosion.

6.1.2 Compensation and Resettlement

The implementation of the Resettlement Action Plan will ensure that all project-affected persons and properties are promptly and adequately compensated for. PAPs will be assisted to relocate, where necessary. The

VRA"s Land Acquisition and Resettlement Policy will be applied in compensating and resettling all PAPs. Grievance procedures will be implemented and PAPs settled as much as possible, prior to commencement of construction.

6.2 CONSTRUCTION PHASE MONITORING PLAN

At the Construction phase, the impacts that will be monitored include:

6.2.1 Noise

This will be done on a weekly basis. The EPA guidelines levels for noise will be the benchmark for monitoring noise.

6.2.2 Air quality

This will be monitored on a weekly basis. The EPA guidelines for air quality will be the benchmark.

6.2.3 Traffic Impacts

Traffic impacts of the project on adjoining major roads will be monitored on a daily basis.

Table 6.1 : Monitoring Plan

Parameter	Frequency	Responsibility	Remarks
Pre-Construction Phase			
Vegetation clearing	Daily	Project Contractor/	
Compensation and Resettlement	Throughout Pre-Construction phase	VRA Estate Department	
Construction Phase			
Vegetation Clearing	Daily	Project Contractor	
Noise levels	Weekly	Project Contractor	
Air Quality	Weekly	Project Contractor	
Traffic Impacts	Daily	Project Contractor	
Occupational Health and Safety – use of PPE	Daily	Project Contractor	
Impacts on Water Resources	Weekly (During rainy season)	Project Contractor	
Waste generation	Weekly	Project Contractor/PMT	
Employment and Income generation	Monthly	Project Contractor/PMT	
Operations and Maintenance Phase			
Operational and maintenance Hazards	Monthly	VRA Maintenance Department	

6.2.4 Occupational Health and Safety

Personal Protection Equipment (PPE) will be provided for all personnel and their use enforced to prevent accidents and injuries to personnel. Operational safety procedures shall be designed by the Contractor and

strictly enforced at all times to streamline the activities of employees on site. All on-site accidents and injuries will be investigated to determine their cause to avoid recurrence.

6.2.5 Impacts on Water Resources

In areas close to water bodies, impacts of soil erosion and sedimentation due to project construction activities will monitored daily, especially during the rainy season.

6.2.6 Condition of Machinery and Equipment

To ensure that machinery and equipment operate smoothly with minimal noise and emissions, they will be maintained weekly.

6.2.7 Waste generation and management

This will cover:

- Burying of waste vegetation
- Waste water handling (to prevent pollution of nearby water bodies)
- Waste segregation and recycling/re-use
- Waste dump sites
- Disposal of conductor drums
- Disposal of metallic waste

6.3 OPERATIONS AND MAINTENANCE PHASE MONITORING PLAN

The monitoring plan that will be implemented at this stage will cover the following.

6.3.1 Operational Hazards monitoring

The VRA Corporate Safety Rules 1993 1995 has provisions for scheduled and emergency maintenance of evacuation infrastructure.

- Routine ground inspection of lines
- Tower vandalism
- Insulators and accessories (damage, replacement)
- Accidents involving lines and structures
- Occupational hazards and accidents
- Accidents affecting public safety

7. PROVISIONAL ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN AND TRAINING

This section outlines a provisional environmental management plan and identifies training needs, to ensure sound environmental practices during the various stages of the project. It discusses and allocates appropriate resources for items discussed under mitigation and monitoring. Issues relating to training as well as procedures for the management of unexpected change that will result by the implementation of the project are also addressed in this section.

Since 2008, VRA has set up a special office to manage WAPP Project. Although the office designation is WAPP 330kV Coastal Transmission Projects, it is also responsible for the management of the Ghana section of this 225kV Bolgatanga-Ouagadougou Interconnection Project. The VRA-WAPP office in coordination with the VRA Environmental Department shall appoint a Project Environmental Coordinator who will also serve on the Project Management Team that will oversee site construction activities and monitor specific environmental criteria.

7.1 ENVIRONMENTAL MANAGEMENT STRUCTURE

Since 2001, the corporate structure of the VRA provides for a Department of Environment and Sustainable Development, headed by a Director. This structure is however being changed with the ceding of some of VRA"s original mandate to GRIDCo. However, environmental matters continue to receive priority attention.

A Project Environmental Management Team headed by an Environmental Coordinator shall be appointed and would work under the Director of Engineering. The Project Management Team (PMT) shall be responsible for all environmental issues at the pre-constructional and constructional phase of the project. Management of the post constructional operational phase shall be incorporated into the Authority's Corporate Environmental Management Plan, which is presently administered by VRA.

7.1.1 Qualifications of Project Environmental Personnel

The major environmental specialties associated with the management of electrical transmission line projects such as this are ecological and social impact assessment. In addition familiarity with health and safety management would be necessary.

VRA already has personnel with the requisite background experience in these areas, who shall be part of the PMT. Training of appointed environmental staff who constitute this team would be necessary to meet these requirements.

7.1.2 Functions of Project Management Team.

The functions of the PMT shall include:

- Ensuring project compliance with all relevant environmental, social, health and safety regulations
- Liaison with all relevant regulatory bodies and organizations – EPA, Factories Inspectorate, Energy Commission (Inspectorate unit), Forest Services Division.

- Formulation and review of environmental and social policies and practices associated with the project.
- Liaison between Environment and Sustainable Development and relevant VRA departments on all health, environment, safety and social matters connected to the project.
- Assist in the education and training of project staff in environmental, social and safety awareness.
- Make budgetary provision for project environmental programmes.
- Undertaking environmental and social monitoring activities for the project.

7.1.3 Project Environmental Coordinator

The coordinator shall be responsible for all environmental matters associated with the project. He shall be part of the PMT and will work closely with the project contractors and would report through the Project Engineer. The Director and staff of the Engineering Department under whose remit environmental matters fall would ensure that quality service is provided by the coordinator to the PIU.

The Coordinator should preferably be either an ecologist or a sociologist with a strong environmental background in transmission work or linear projects. Special environmental training in ecological and social impact assessment programmes would be necessary for the selected candidate who does not have this background.

The responsibilities of the coordinator shall include:

- Monitoring all environmental programmes for pre-construction and construction phases of the project, including those related to bio-physical and socio-economic/cultural components.

- Working closely with project contractors to ensure that all monitoring and mitigation guidelines recommended for the project are strictly adhered to during the various phases. This will include following all health and safety guidelines outlined and following strictly the Authority's environmental policy guidelines.
- To organise activities to motivate and maintain the interest of project staff in environmental issues
- To increase project staff awareness of environmental issues through training programmes and review meetings
- To coordinate investigations on all types of accidents.
- To conduct environmental audits in accordance with project monitoring guidelines.
- To serve as liaison between project contractors, the Authority and relevant regulatory agencies.
- To produce environmental reports covering the project
- To work closely and coordinate efforts with the EPA and other enforcement bodies to ensure full compliance with all legal and regulatory requirements
- To develop a work plan for the implementation of the EMP
- To establish and run a reporting system on progress (or otherwise) in implementing mitigation measures (including contractors obligation), training etc.

7.2 GENERAL HEALTH AND SAFETY PROCEDURES

VRA Health and Safety Rules (1993) and guidelines provided in the Factories, Offices and Shops Act, 1970 (Act 328) given below shall be strictly complied with at all stages (pre- constructional, constructional,

operational) of the project. These regulations cover the major safety areas. Further details of the two major safety sections (forestry work and line work) relating to this project are also outlined below.

- General Safety Rules for workers engaged in construction, operation or maintenance work.
- Safety guidelines related to the use of tools and equipment
- Safety procedures associated with the transportation and of personnel and materials
- Safety procedures in relation to Forestry work.
- Safety procedures relating to Transmission line work.
- Safety procedures for materials handling, storage and disposal

7.2.1 Safety guidelines for Forestry work

Important guidelines provided in the VRA Corporate Safety Rules 1993 for forestry work (rules 600 to 615) shall be strictly adhered to. These include:

- Protection for work
- Working near live conductors
- Permission to work on public roads and nearby properties
- Disposal of bush
- Felling trees
- Reporting location of forestry work
- Climbing precautions

7.2.2 Safety Guidelines for Transmission Line work.

Some of the important safety guidelines (line work) to be followed as per VRA Corporate Safety rules 1993 (rules 700 to 826) include:

- Transportation and handling of transmission towers
- Climbing precautions
- Installation of towers
- Installing ground rods
- Stringing, sagging or lowering conductors
- De-energizing new circuits
- Trimming of tree branches
- General safety rules for work on live lines

7.3 POLLUTION PREVENTION

In addition to the safety guidelines relating to health and safety, strict pollution prevention guidelines shall also be enforced during all phases to the project.

Most pollution incidents are avoidable if careful planning and management procedures are instituted. Pollution prevention measures are much cheaper to implement than costly clean up after the incident. For the prevention measures to be effective it is important that the environmental team must first be adequately trained in pollution prevention for this assignment.

Some of the important pollution prevention guidelines to be followed for this project shall include the following:

7.3.1 Planning and Preparation

Careful planning can reduce the risk of pollution significantly. As a first step environmental site meetings shall be organised between the local EPA

officer(s), the project team and contractors prior to commencement and during construction operations.

7.3.2 Site Offices (Base Camps)

A common cause of pollution is through acts of theft and vandalism. Project site camps/offices shall be adequately protected by fences and locked accesses where possible. Security personnel shall be engaged at site offices/yards. Care shall be taken to ensure that any contaminated site drain water does not flow into nearby rivers and streams.

Fire precautions to be observed at site offices shall include:

- Provision of adequate and suitable portable fire extinguishers
- Adequate ventilation for storage rooms containing flammable chemicals
- No smoking signals posted at sensitive locations such as fuel storage points
- Handling of flammable liquids by competent personnel only
- Rags soaked with flammable liquids shall be stored in metal containers and disposed of safely

7.3.3 Storage, Handling and Disposal of Materials/Oils/Chemicals

The Authority's Corporate Safety Rules 1993 (section ix) regarding above shall be strictly adhered to. In addition, the following guidelines shall also be followed in the handling of materials, oils and chemicals.

- Materials shall be stored in an orderly manner and in safe stacks, tiers or piles. Materials shall be stored so as not to obstruct passageways. Where necessary warning signals, lights and barricades shall be provided.

- Most chemicals used in construction operations such as oils, cement, cleaning materials, and paint have potential pollution hazards. All such materials shall be stored on an impervious base within a bund wall to contain any spillages.
- The VRA corporate safety rule (rule 219) concerning the use and handling of toxic and hazardous material shall be strictly complied with.
- Leaking or empty oil / chemical drums shall be removed from the site and safely disposed
- Contents of all tanks / drums containing chemicals shall be clearly marked.
- Disposal of all tanks and drums shall be done safely. All contents of tanks/drums to be disposed shall be emptied and perforated by competent personnel before final safe disposal.
- Fuelling of project equipment (trucks, bulldozers etc.) and vehicles may constitute the greatest spillage risks. This shall be done in designated areas with impermeable surfaces located away from drains or watercourses. Drip trays and spill kits shall be immediately available. Fuel hoses and valves shall be regularly checked for leakages and wear and tear.
- Emergency spillage procedures shall be clearly outlined and posted conspicuously. Absorbent materials for containing spillages shall be readily available on site. These shall include sawdust, sand, etc.

7.3.4 Concrete Works.

The construction of the tower pads and the minor extensions at the substations involve concrete works. Concrete and cement are very alkaline and corrosive and can have serious pollution impacts on watercourses. Therefore all concrete works shall be so sited and carefully monitored to

ensure that such material do not contaminate any streams and water bodies.

7.3.5 Silty Water Discharge.

Construction works in swampy areas may necessitate dewatering of excavations. Silty water could also arise from run-off from the exposed tower corridor track surfaces, graded access roads and the washing of plant and vehicle wheels.

The following guidelines shall be followed where necessary to avoid pollution of surface water sources and damage to river ecosystems:

- When discharging clean water to river courses pumping rates shall be carefully controlled to avoid disturbing riverbeds and stirring up silt or eroding soil material from the river banks.
- As much as possible water entry into excavations shall be prevented by the use of cut-off ditches.
- The amount of soil stockpiles shall be kept to a minimum.

7.4 WASTE DISPOSAL.

For the 225 kV Bolgatanga – Ouagadougou Interconnection Project, the major sources of waste would be from the vegetation clearing activities. A common way of bush disposal is by burning. The following guidelines shall be followed in the event of bush burning.

Other major sources of waste would be packing materials such as wood, plastics, metal scraps etc. Appropriate waste bins shall be provided at site for collection and disposal through public waste disposal system.

7.5 TRAINING PROGRAMME

A basic training programme, recommended for project management staff and key personnel of the contractor assigned to the project, in environmental awareness and environmental management will cover the following:

1. Management and monitoring of health, safety and environmental issues,
2. Management of the right-of-way acquisition process,
3. Management of the right-of-way during operations and maintenance phase of the project,
4. Social impact mitigation
5. Monitoring

7.6 ALLOCATION OF RESOURCES FOR ENVIRONMENTAL MANAGEMENT

Apart from the human resources to be made available for the environmental management of the project, financial provision would be made to ensure that mitigation (including compensation), monitoring and training programmes are effectively implemented.

It is estimated that financial resources for environmental management require up to 1-2 % of the project cost. However with an already established environment department in place, the Authority will make the necessary budgetary provisions to cover all the commitments.

Table 7.1 below shows an impact mitigation table, by which project activities, their anticipated impacts, proposed mitigation measures and their expected net effects are outlined and

Table 7.1 : Impact Mitigation Table

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	LOCATION	PROPOSED MITIGATION MEASURE (S)	MONITORING/FOLLOW-UP	NET EFFECTS
	Clearing of vegetation for Route survey.	Along entire length of line route	Vegetation clearing shall be kept to the barest minimum. Existing and available farm tracks and footpaths shall be used as access routes for surveyors.	VRA Project Management Team	Will minimise vegetation clearing and exposure of soil surface
PRE-CONSTRUCTION PHASE.	Impact of RoW acquisition on Land ownership and use.	"	RoW acquisition shall involve consultations with stakeholders. Compensation shall be paid for all properties in the RoW excluding land as per the various Land (Wayleaves) legislation. All cultural and religious properties shall be avoided.	VRA to acquire RoW as per LI 542. CabIRA shall prepare Property Impact Report. VRA to pay appropriate compensation in consultation with Lands Valuation Board.	Payment of Compensation will offset economic and housing losses of affected persons

	Impact of RoW acquisition on Land ownership and use.	Tower sites	Avoiding routing of construction access roads through farmlands as much as possible. Existing and available farm tracks to be used as much as possible. Replanting of access roads with fast growing grasses to check erosion.	Project Contractor	Minimised damage to crops and hence of compensation to be paid by VRA. Avoidance of exposure of soil surface.
	Sedimentation and Erosion of nearby water bodies	Tower sites	Number of passes of trucks to and from site will be regulated. Access roads shall be selected to avoid crossing streams and water bodies.	Project Contractor	To minimise soil destabilisation
CONSTRUCTIO N PHASE	Noise	Tower sites	Constructional activity shall be limited to daylight hours when noise impacts are minimal.	Project Contractor	To minimise the risk of accidents
	Public Health and Safety	Adjoining roads	Warning notices "NO ENTRY, NO TRESPASSING" shall be placed at entry points of access roads.	PMT/Project Contractor	To minimise the risk of accidents
		"	Trucks and machinery shall display appropriate road safety signals. Safe speed limits shall be observed (10-20 kph)	Project Contractor	To minimise the risk of accidents
	Loss of vegetative cover	Tower sites	Existing access tracks shall be used as much as possible. Construction of new access tracks will be kept to a minimum. After construction, regrowth of limited ground cover shall be encouraged.	PMT/Project Contractor	To minimise damage to crops and vegetation

	Soil Erosion	"	Ground surface at tower sites shall be graded to drain run-off away from tower legs. Terracing, cribbing or rip-rap may be used to protect tower foundations.	Project Contractor/PMT	To avoid erosion around tower legs and possible tower collapse
	Loss of vegetative cover	"	Bush clearing shall be restricted to tower spots only to ensure minimal damage to vegetation cover. Final selection of line route shall consider minimal number of trees to be cut. Forestry Services guidelines shall be adhered to in forest reserves.	Forestry Services/ Project Contractor	To minimise damage to vegetation and trees
CONSTRUCTION PHASE	Occupational Health and Safety, Public Health	"	Strict adherence to safety precautions as per Factories, Offices and Shops Act, 1970 (Act 328) and VRA Corporate Safety Rules 1993. Appropriate traffic warning signals such as "SLOW DOWN, LINE STRINGING IN PROGRESS" shall be placed along the road. ICAO safety standards shall be observed near the vicinities of known aircraft activity.	Project Contractor/ PMT	To ensure workside safety and avoid accidents
	Pollution of nearby water bodies	Tower sites	Drains leading from work areas shall be directed to existing drains to prevent them polluting nearby water bodies.	PMT/Project Contractor	To avoid contamination of nearby natural water bodies

OPERATION AND MAINTENANCE PHASE	Dropping of "live" Conductors	Along entire length of line route	RoW shall be acquired and access restricted. Towers shall be marked "DANGER-225 KV"	VRA Maintenance Team	To minimize possible effects of earthing and electrocution.
	Shattering of insulator Units	"	Regular routine and emergency maintenance of line route. Improved insulator materials	VRA Maintenance Team	Minimise incidence of insulator shattering
	Collapse of tower	"	Use of anti-theft fasteners to check tower vandalism and its consequences	VRA Maintenance Team	Avoid occupational accidents
	Maintenance of RoW vegetation clearing	Along entire length of line route	To be done only when necessary	VRA Maintenance Team	To ensure safe and proper disposal of generated wastes
	Rust treatment, painting of Towers	"	Painting in dry season to minimize paint failure and run-off into water bodies.		
	Occupational Safety risks	"	Work Safety procedures as per VRA Corporate Safety Rules 1993 and Act 328		

OPERATION AND MAINTENANCE PHASE	Waste generation from vegetation clearing and Packaging materials (solid wastes)	Along entire length of line route	Trees, stumps, cut brush and conductor drums shall be made available to the communities for firewood. Non-metal solids will be disposed of through the public waste collection system. Waste cloths used for cleaning, special wastes in the form of empty chemical, oil and solvent containers. Hazardous wastes will be segregated and disposed by total destruction. Metal waste will be sold as scrap to dealers. All wastes will be stored in areas isolated from surface drains.	VRA Maintenance Team	Avoid environmental degradation
	Liquid wastes	"	Liquids from concrete works, washing of equipment, fuel, oil and chemical spills, pumped-out water from excavations and storm water will be directed into drains away from nearby water bodies.	VRA Maintenance Team	Avoid contamination of nearby water bodies

8. CONSULTATIONS

The ESIA process has involved consultations with identified stakeholders. Consultations have been held with a number of statutory agencies and affected communities to facilitate the identification of key environmental and social concerns associated with proposed project. At this stage, consulted stakeholders include:

- Environmental Protection Agency
- Upper East Regional Coordinating Council
- Bolgatanga Municipal Assembly
- Kassena-Nankana East District Assembly
- Kassena-Nankana West District Assembly
- Lands Commission
- Ghana Civil Aviation Authority
- Telecommunications companies, Vodafone, MTN, Zain, Tigo, Glomobile
- Gia/Nabio Agro-forestry Development Organization
- Elders and members of affected communities (12 communities)

8.1 METHODOLOGY

Our approach to the consultation process has been participatory as much as possible. The VRA facilitated all consultations with introductory letters and staff to introduce the consultation team in all engagements. With the institutions, discussions were held with the relevant officials and details of the project were discussed, including maps showing the line route in the

districts. Their inputs, concerns and comments were sought and documented. Where personal contact was not possible, letters were dispatched describing the project details, and requesting for their concerns and comments.

In the communities Participatory Rural Appraisal (PRA) tools were employed in open discussions. Particular attention was paid to community traditions and customs by way of community entry techniques in order to breach cultural sensibilities. The assistance of local government authorities (district assemblies) were solicited to introduce the team to traditional leaders and to state our mission. Local language interpreters were engaged to assist in communication where no common language was found between the community consultation team and the locals. During consultations with local chieftains, their assistance was sought in identifying owners of properties within the selected right-of-way. Later meetings were scheduled involving the entire community, at which the local chieftains introduced the team. The team would define their mission, describing the proposed project, its location and the potential effects on properties within the right-of-way. The floor would then be opened for comments and discussions. Largely, major concerns were with compensation for buildings and economic trees that would be affected, since some PAPs in some previous projects had not been compensated satisfactorily. Photographs of such forums were taken where recording of minutes were not possible.

8.2 INSTITUTIONAL CONSULTATIONS

Statutory bodies in the affected Districts have been contacted and briefed about the project and their concerns and expectations noted. Generally, they all have committed to assist in the process (including identification of affected persons and properties) to ensure that the affected persons in their

Districts were compensated appropriately. Consultations have also been held with communities traversed by the transmission line.

Consultations held with the various relevant agencies, NGOs and affected organisations are discussed below.

Consultations with the Environmental Protection Agency (EPA)

Upon review of the submitted Scoping report, the EPA approved the report and has given the go-ahead for this ESIA to be prepared. The Upper East Regional EPA office was consulted with regard to the proposed project. This was necessitated by the fact that though the project has been registered with the EPA head office in Accra, the project is located within the jurisdictional area of the Bolgatanga Regional office, which will be required to do the verification of information provided in the report. Mrs. Wasai-King assured the Consultant"s project team of her office"s support and assistance for the project.

Consultation with Upper East Regional Coordinating Council

Consultations have been held with some members of the Regional Coordinating Council, namely its Chief Director, Samuel N"Lary and Mark O. Woyongo, the Regional Minister. Mr. N"Lary intimated that the issue of electricity supply from Ghana has been discussed at a tripartite meeting among Ghana, Burkina Faso and Togo, and was thus happy that such a project was about to take off, since it will address that issue. Mr. Woyongo wondered how the Upper East Region was going to benefit from the project, in the face of northern Ghana" almost total dependence on the Techiman – Sawla line for power supply and wondered if the project could not reinforce electricity supply to northern Ghana rather. It was explained to him that this project is part of a regional (West African) project, and that another project was in the offing that will address his concern. He iterated

the need for proper and exhaustive consultations to ensure its smooth implementation.

Consultation with Lands Commission

The newly constituted Lands Commission which now includes the erstwhile Lands Valuation Board has also been consulted. Mr. Eben Dusam, the Regional Lands Officer, intimated that it will be necessary to involve the Lands Valuation department of the Commission in the determination and payment of compensation values.

Consultation with Bolgatanga Municipality

Consultations were held with Mr. Yakubu Andani Abukari, the Municipal Coordinating Director, in which he pledged the commitment of the municipal authority to the project and intimated that the prompt payment of adequate compensation will be important in ensuring the success of the project.

Consultation with Kassena-Nankana District

Discussions were held with the District Chief Executive, Mr. Emmanuel Achegeweh and the Planning Officer, Mr. Collins Ohene. They indicated their preparedness to assist in identifying project-affected persons. Of major concern were the needs to ensure extensive public education in the affected communities, and to ensure the prompt payment of fair and adequate compensation to project affected persons.

Consultation with Kassena-Nankana West District

The District Chief Executive, the District Coordinating Director and the District Planning Officer were engaged in discussions. While pledging their

support for the project, they indicated their requested that the team should pay another visit, during which the team will be introduced to the Chief of Paga, who will assist in disseminating information about the project within the communities.

Consultation with Telecommunication Companies (Vodafone, MTN, Tigo, and Zain) and the National Communications Authority (NCA).

Since December 2009 when consultation letters were sent to the telecommunications companies, no official responses have been received yet. Follow-ups are currently being done to elicit their comments on any potential interaction with their operations.

In August 2010, the National Communications Authority (NCA) of Ghana was consulted to offer its technical opinion on the potential interference between transmission lines and the operations of the telecommunications company. (The NCA is the independent statutory regulatory body responsible for the allocation and regulation of frequencies). The NCA has also taken copies of the letters sent earlier to the telecom companies, and is expected to give an authoritative position with respect to the matter. A copy of the letter to the NCA is attached as Annex 7.

Consultation with Ghana Civil Aviation Authority (GCAA)

GCAA has long acquired a site for an airport near Anateem, about 3.5 km from the Bolgatanga-Navrongo road. Airports have more than just land surface influence, as aircraft landing and take-off involve airspaces far outside their terrestrial limits.

Consultations have been held with the deputy director of Safety Regulation (Air) of GCAA, Daniel Acquah, at the GCAA"s head office Accra, during which a „no objection" response was given to the project. However, special

safety measures such as highly visible markers and insulated separators of International Civil Aviation Organization (ICAO) standards (bright orange) will have to be installed on the lines if the lines will be anywhere within the airport"s landing and take-off area, since strong winds and vibration could cause the lines to touch each other and short-circuit itself. This will also warn pilots of the presence of the transmission lines.

Table 8.1 below is a summary of the institutions consulted and their concerns/comments expressed. Institutional consultations were conducted between November and December 2009.

Table 8.1 : Summary of Institutions Consulted and Concerns/Comments Expressed

INSTITUTION	NAME	POSITION	COMMENTS/ CONCERNS RAISED	MITIGATION MEASURE(S)
Kassena-Nankana District	Ben Awine Collins Ohene	Deputy District Coordinating Director Planning Officer	Compensation matters should be addressed promptly and carefully	The VRA Estate Department will facilitate prompt payment of adequate compensation.
Kassena-Nankana West District	Thomas Dalun, Alhassan Ibrahim	District Chief Executive District Coordinating Director	Compensation matters should be addressed promptly and carefully	The VRA Estate Department will facilitate prompt payment of adequate compensation.
Bolgatanga Municipal	Yakubu Andani Abubakari	Municipal Coordinating Director	Appropriate compensation should be paid to PAPs on time	The VRA Estate Department will facilitate prompt payment of adequate compensation.
Regional Coordinating Council	Mark Woyongo Samuel N'Lary	Regional Minister Chief Director	Will the project stabilize power supply in the region? Hopes the project will strengthen integration within ECOWAS members.	Project solely for power supply to Burkina Faso
Lands Commission	Eben Dusam	Regional Lands Officer	Need to involve Lands Valuation department of the commission in the determination and payment of compensation.	Lands Valuation department will be involved in the payment of compensation.

INSTITUTION	NAME	POSITION	COMMENTS/ CONCERNS RAISED	MITIGATION MEASURE(S)
Environmental Protection Agency	Mrs. Zenabu Wasai King	Regional Director	Need to ensure that all stakeholders are consulted.	Exhaustive consultations will be held with all stakeholders.
Telecommunication Companies • Vodafone • MTN • Zain • Tigo	• J. Ametsitsi • J. Buaragre • F. Akolgo • R. Samari	• Engineer • Engineer • Customer Service • Customer Service	No response yet " " "	
Ghana Civil Aviation Authority	Daniel Acquah	Deputy Director, Safety Regulation (Air)	Need for re-routing of a section of the line from Zenga (A29) to Nayagenia (A39) through Kazigo, and fitting this section with marker balls in ICAO-approved colour (Aviation orange)	The relevant section of the line has been re-routed. Marker balls with the stated specifications will be strung on the line at the indicated sections.
Gia/Nabio Agroforestry Development Organisation (GNADO)	Julius Awaregya	Programme Officer	Need to limit vegetation clearing as much as possible.	Vegetation clearing will be limited to areas where it is necessary only.

8.3 COMMUNITY CONSULTATIONS

All the communities traversed by the proposed transmission line have been consulted in meetings, where they were briefed them about the proposed project and their concerns and expectations heard. These communities are Sorkabisi, Zorbisi, Yikene, Anateem and Sumbrungu in the Bolgatanga municipality, Pungu, Doba, Nayagnia and Nyangua in Kassena-Nankana East district and Paga-Zenga, Nyania and Baduno in the Kassena-Nankana West district. Some fears and apprehensions, especially about compensation, have been allayed at the consultation meetings. Socio-economic surveys were carried out among the communities and these formed parts of the socio-economic baseline data used in Chapter 3.3.

During the community consultations, various concerns were repeatedly raised by the people contacted. These included prompt payment of adequate compensation, especially in view of previous land acquisitions that were not compensated for by the VRA. A summary of the community consultations is presented in Table 8.2 below.

Consultation with Gia/Nabio Agroforestry Development Organisation GNADO

Over time, non-governmental organizations (NGOs) and community-based organizations (CBOs) have played advocacy roles for individuals and communities with inadequate representation, such as rural communities, women and children. Their roles in ensuring transparency and equity have gained prominence. GNADO was selected in the project area and briefed about the proposed project. They have committed to assist in information dissemination and support the project-affected persons in ensuring that they receive fair and adequate compensation in a prompt manner. GNADO as an environmental NGO has been consulted with regard to perceived impacts of the 225kV Bolgatanga-Ouagadougou Interconnection Project on the natural and environmental resources along the corridor on the line route. The Programme Officer, Julius Awaregya, indicated that it is important for clearing of vegetation to be limited as much as possible in the execution of the 225 kV Bolgatanga – Ouagadougou Transmission Line project.

Table 8.2 Community consultations and their Concerns/Comments

No.	Locality	Comment/Concern/Question	Mitigation/Action to be Taken
1	Bolgatanga Municipality • Sokabisi community • Zorbisi • Yikene • Sumbrungu • Anateem	- Would compensation be paid for multiple properties owned by the same individual?	- Each property will be enumerated and compensated for, irrespective of the owner.
		- When would construction begin, and would affected people be given enough time to relocate?	- Adequate time will be given for all affected people to relocate before construction begins.
		- Previous land acquisitions by VRA in the area have not compensated for. There are doubts that it will be different this time.	- The process will be more transparent this time round. Adequate compensation shall be paid promptly.
		- In view of land scarcity for farming and settlement, affected persons will have to relocate elsewhere, adversely affecting communal cohesion.	- All project-affected persons will be resettled prior to commencement of construction.
		- No prior information about survey works in the community resulting in tensions over land.	- This is a regrettable error that will not be repeated.
		- Need to employ people from local communities.	- As much as possible, local labour will be given priority.
		- Why is electric power being exported to	- This project is for the West African region (ECOWAS),

		Burkina Faso while some local communities do not have power?	while a local component is being planned by VRA.
2	Kassena-Nankana East District • Pungu • Doba • Nayagnia • Nyangua • Pinyoro	- In view of land scarcity in the area, affected persons need to be adequately compensated. - Team of surveyors for the project exhibited poor community entry techniques which created disaffection for the project. - Would economic trees be compensated for? - Why would VRA not construct houses and relocate PAPs prior to commencement of project?	- All project-affected persons will be resettled prior to commencement of construction. - This is a regrettable error that will not be repeated. - Economic trees will be compensated. - PAPs who prefer to have their houses replaced will have houses at the determined value.
3	Kassena-Nankana West District • Zenga • Baduno • Nyania	- Resettlement should be made prior to the rainy season - Some properly acquired lands are not covered by any documentation.	- Resettlement will be done at a period convenient to all parties, as much as possible. - The Lands Commission and local chieftains will assist in determining ownership of lands.

9. CONCLUSION

As a major factor undergirding development, electricity supply is a major contributor to economic progress.

The WAPP Secretariat, on behalf of VRA and SONABEL proposes to extend electricity from the VRA substation at Bolgatanga northwards across the Ghana-Burkina Faso border to Ouagadougou, the capital of Burkina Faso. The project is intended to provide affordable electricity to Burkina Faso to boost economic and social development, while enabling Ghana earn foreign exchange from sale of electrical energy.

Bolgatanga is situated in the Upper East Region of Ghana. It is the regional capital, and the power transmission line will emanate from here, through the Kassena-Nankana and the Kassena-Nankana Districts to enter Burkina Faso near Goiree. The line will traverse mainly savannah grassland and close to a few water bodies before exiting Ghana.

From the environmental and social assessment carried out, it can be seen that there are no adverse environmental impacts associated with the project that cannot be assuaged or mitigated. For the greater part, the line will run through open grassland or farmlands where annual crops are cultivated seasonally.

If the mitigation measures proposed are implemented, the negative impacts identified could be minimized or eliminated thereby making the project environmentally acceptable.

In the light of these considerations and particularly of the benefits that would accrue to the two countries and to the ECOWAS region as a whole, it is recommended that the 225kV Bolgatanga-Ouagadougou Interconnection Project be permitted to proceed.

ANNEXES

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ANNEX 2 Scoping Report Review Comment

ANNEX 3 Definition of Environmentally Sensitive Areas under the Environmental Assessment Regulations, 1999, LI 1652

ANNEX 4 Ghana EPA's Energy Sector Specific Guidelines

ANNEX 5 Summary of Property Impact Report

ANNEX 6 Records of Community Consultations

ANNEX 7 Copy of Correspondence to NCA and Telecom Companies

Annex 1: Terms Of Reference

Economic Community
Of West African States

Communauté Economique
Des Etats de l'Afrique de l'Ouest

WEST AFRICAN POWER POOL
SYSTEME D'ECHANGES D'ENERGIE ELECTRIQUE OUEST AFRICAIN
General Secretariat / Secrétariat Général

225 kV BOLGATANGA (GHANA) – OUAGADOUGOU (BURKINA FASO) INTERCONNECTION PROJECT

TERMS OF REFERENCE FOR THE UPDATE OF THE LINE SURVEY AND THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY

October 2006

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WEST AFRICAN POWER POOL (WAPP) SECRETARIAT
225 KV BOLGATANGA (GHANA) – OUAGADOUGOU (BURKINA FASO) INTERCONNECTION PROJECT

TERMS OF REFERENCE
FOR UPDATE OF LINE SURVEY AND ENVIRONMENTAL
AND SOCIAL IMPACT ASSESSMENT STUDY

1. INTRODUCTION

In order to further advance the implementation of the priority projects of the West African Power Pool (WAPP), the WAPP Secretariat and its Members have commenced preparatory works towards the implementation of the following priority interconnection projects:

- 330 kV Volta (Ghana)-Mome-Hagou (Togo)-Sakete (Benin) transmission project
- 150 kV Sikasso-Koutiala (Mali) - Ségou (Mali) transmission project
- 330 kV Aboadze (Ghana) – Prestea (Ghana) transmission project
- 225 kV Bolgatanga (Ghana) – Ouagadougou (Burkina Faso) interconnection project.

The WAPP Secretariat on behalf of the Volta River Authority (VRA) of Ghana and the Société Nationale d'Electricité du Burkina (SONABEL) of Burkina Faso intends to procure the services of an International Consulting firm to undertake the following activities under the 225 kV Bolgatanga (Ghana) – Ouagadougou (Burkina Faso) transmission project:

- Line route survey and production of maps, plan and profile drawings
- Environmental and Social Impact Assessment of the surveyed route and preparation of the Environmental Impact Statement.

1.1. Volta River Authority

The Volta River Authority (VRA) was established under the Volta River Development Act, Act 46, of 1961 as a body corporate. It operates as a power generation, transmission and distribution utility providing electric power for industrial and domestic needs of Ghana. In addition VRA sells electricity to nearby countries of Togo and Benin (CEB) and has an interconnection with Cote d'Ivoire.

VRA currently operates two (2) hydroelectric power plants on the Volta River, with installed capacities of 1020 MW (following recent retrofitting programme) and 160 MW at Akosombo and Kpong Generating Stations respectively; a 30 MW Diesel Plant

at Tema in a standby mode and a 330 MW Combined Cycle (CC) Takoradi Thermal Plant at Aboadze. VRA and CMS Generation of Michigan under a joint venture arrangement operate a 220 MW Simple Cycle Plant also at Aboadze. Currently VRA is planning to increase the capacity of the plant by converting it to combined cycle. VRA also plans to build a new 330 MW power generating station at Tema.

The transmission system of VRA comprises approximately 3985-circuit km of HV lines and 38 primary substations. This comprises of approximately 75km of 225kV, 133 km of 69 kV and 3778 km of 161 KV lines. These lines run the length and breadth of the country.

A 161 kV line and a 225kV transmission line also provide interconnections to Togo and Benin in the east and Cote d'Ivoire in the west respectively.

1.2. Société Nationale d'Electricité du Burkina

The Société Nationale d'Electricité du Burkina (SONABEL) was established as a State-Owned enterprise in 1995 after having gone through several transformations commencing from its genesis in 1954 as a private company called AOF Energy responsible for production and distribution of electricity in Ouagadougou. It is the sole utility responsible for the production, transmission and distribution of electricity in Burkina Faso. In addition to electricity importation from Côte d'Ivoire, its national electricity generation park consists primarily of thermal stations and some hydroelectricity with an approximate cumulative installed capacity of 180 MW as at 2004. In 2004, importation constituted about 17% of its energy generation, hydroelectricity from the Burkina stations at Kompienga and Bagre about 18%, whilst thermal dominated with about 65%.

At the present, the main transmission lines that exist in Burkina Faso are a 132 kV line linking the hydroelectric stations of Kompienga and Bagre to the capital Ouagadougou, and a 225 kV line from Côte d'Ivoire terminating at Bobo Dioulaso. The total length of the transmission lines is approximately 1,370 km. The 225 kV Bobo Dioulaso – Ouagadougou transmission line project of approximately 350 km, will be completed by 2008.

1.3. Proposed Project

The electricity demand in the capital of Burkina Faso, Ouagadougou, is primarily met through thermal power generation. The economic difficulties of operating thermal power plants especially their high costs of production, have negatively impacted on the productivity and the competitiveness of the national economy. Furthermore, the growing demand has surpassed available generating capacity especially during peak periods. This situation requires that the energy supply capacity of SONABEL be reinforced urgently especially through the diversification of its mode of electricity provision.

The ongoing and near-term electricity generation projects in Ghana in addition to the extension of the existing interconnection line emanating from Côte d'Ivoire through Ghana and Togo/Benin to Nigeria with the 330 kV Ikeja West (Nigeria) – Sakete (Benin) transmission line project, will increase the available spare capacity in Ghana. This combined with the availability of gas in Ghana from the West African Gas Pipeline from 2007, will permit the exportation of low cost power to Ouagadougou from Ghana through an interconnection line from Bolgatanga (Ghana) to Ouagadougou (Burkina Faso).

With the implementation of the West African Power Pool (WAPP), which is expected to foster power exchanges among the countries in the West African sub-region, particularly power exchanges between Ghana, Côte d'Ivoire and Burkina Faso, a high capacity transmission interconnection from Ghana to Burkina Faso will be required, which will also be in line with the adopted WAPP Masterplan. The implementation of the Bolgatanga - Ouagadougou project will complete the ringed transmission network between Ghana, Côte d'Ivoire and Burkina Faso, as the link between Bobo Dioulaso and Ouagadougou is currently being implemented and will be commissioned by 2008.

Accordingly, the WAPP Secretariat, VRA and SONABEL intend to undertake a project that will comprise the construction of a 225 kV transmission line from Bolgatanga in the northern part of Ghana to the capital of Burkina Faso, Ouagadougou, to facilitate the power exchanges among the countries in the West African sub-region. This project is known as the **225 kV Bolgatanga (Ghana) - Ouagadougou (Burkina Faso) Interconnection Project**.

The project, which would be executed in Ghana and Burkina Faso will result in the following as depicted indicatively, on the map in Annex 1:

- construction of approximately 200 km of 225 kV transmission line,
- the extension of the 161 kV substation in Bolgatanga (Ghana)
- construction of one (1) new 225/161 kV substation in Bolgatanga (Ghana),
- construction of one (1) new 225/90/33 kV substation in Ouagadougou (Burkina Faso).
- the eventual construction of 90 kV network and 90/33 kV substation in Ouagadougou to ensure adequate evacuation and delivery of energy from the interconnection to Ouagadougou.

Prior to the preparation of Bidding documents for the works, a preliminary line route selection and survey has to be undertaken. Furthermore, in line with the requirements of the Funding Agency and the member countries as indicated in Appendix 4 ("Guidelines For Environmental and Social Impact Assessment of Electric Power Generation and Transmission Systems In West Africa"), an Environmental and Social Impact Assessment (ESIA) has to be carried out.

The Consultant shall therefore undertake the surveying activities required and based on the approved surveyed route to conduct the ESIA for the project.

1.4. Status of Project

Following a preliminary study by Tractebel in 1990 / 1991 on the Ghana – Burkina Faso Interconnection, Tractebel Energy Engineering were again commissioned to conduct a feasibility study on the project in 1996 on behalf of the VRA and SONABEL. The scope of this study, amongst others, included the conduct of technical and economic studies in addition to environmental and social impact assessments. However owing to developments in the various countries over the years, the identified line route would have to be assessed and a preliminary survey conducted. An ESIA would then accordingly be carried out on the approved route in line with the legal requirements in Ghana and Burkina Faso.

VRA shall take steps to have the project registered prior to the commencement of any activity and in line with the requirements of Ghana's Environmental Protection Agency (EPA). In Burkina Faso, the study will be performed in line with the national environmental laws and regulations.

2. OBJECTIVE OF THE TERMS OF REFERENCE (TOR)

The objective of this TOR is to engage the services of a qualified and experienced International Consulting firm to submit proposals for the Preliminary Line Route Survey and Environmental and Social Impact Assessment for the 225 kV Bolgatanga - Ouagadougou Interconnection Project.

3. SCOPE OF SERVICES

The Consultant shall undertake the surveying activities required and based on the approved surveyed route to conduct the ESIA for the project. The Consultant will be required to provide services in accordance with internationally recognised practices for consultancy services and in line with the provisions of the conditions of this contract. The Consultant shall also perform the services independently in accordance with acceptable international standards, applicable laws and regulations in the various countries and the World Bank. Should there be any contradiction between the applicable laws and regulations, the regulations of the World Bank shall take precedence.

The Consultant shall keep accurate and systematic records and accounts in respect of the Services in such form and detail as is customary and as shall be sufficient to establish accurately that the costs and expenditures have been duly incurred.

The Consultant shall ensure the timely submission of the Line Route Study Report to the Feasibility Study and shall collaborate closely with the Consultant for the Feasibility Study in order to ensure the timely completion of the Feasibility Study.

3.1. Line Survey

The scope of services by the Consultant shall include, but not be limited to the following:

- Study of proposed line route
- Detailed survey and profiling of line route
- Drafting and preparation of maps and drawings.
- Close collaboration with the Consultant implementing the update of the Feasibility Study in relation to the Line Route.

3.1.1. Study of Proposed Line Corridor / Preliminary Survey

The assignment to be carried out by the Consultant is to study and establish a "Right-of-Way" (ROW) for the entire length of line in accordance with ROW requirements and regulations of the various countries. It should be noted that the width of the ROW and minimum distance of the ROW from the center of any road are as follows:

Country line	***Width of ROW***	***Min. distance of transmission from road center***
• Ghana	40 metres	40 metres
• Burkina Faso	60 metres	40 metres

In selecting the line route, the following, amongst others, should be considered:

- The line should not be routed in areas with large transversal slope, or in areas narrower than the length of the maximum possible span, as provided in Section 3.1.3 and the appendix to this TOR.
- If inaccessible areas are crossed, it is necessary to compare and judge the benefits and burdens caused by selection of an alternative route at that section.
- Areas marked for future development as obtained from the relevant Town and Country Planning Department Office responsible for the area.
- Technical, economic, environmental and social issues.
- Guidance from VRA and SONABEL as appropriate regarding routing and planning standards in Ghana and Burkina Faso respectively.

A detailed description of the selected ROW shall be provided by the Consultant with the location of all structures, relief features and all other details. The description shall include but not be limited to the location of the following on the relevant maps:

a) Manmade structures (residential structures of all types, non-residential structures like roads, streets, hospitals, offices, commercial buildings, government buildings,
b) Utility Installations (existing power transmission and distribution lines, existing telephone lines, microwave towers, etc.)

c) Geographical/physical features (rivers, streams, road crossing, mountains, valleys, rail crossings, footpaths, swamps, stream crossings, farmlands, etc.)

3.1.2. Corridor Mapping

During the study for the selection of the corridor, the corridor shall be mapped in XYZ coordinate system and the XYZ data of the corridor submitted in an appropriate spreadsheet format acceptable to the Client, VRA and SONABEL. Following the selection of a line route, a list of station, numbers, XYZ coordinates of all traverse points, line angles etc. along the proposed line route shall be submitted in a format acceptable to the client. The Consultant shall bear in mind that the information to be submitted shall be used for further detailed survey and subsequently tower spotting on the line. At the end of the study a report on the corridor and a line route map shall be submitted to the Client for approval.

3.1.3. Detailed Survey and Profiling of Line Route

The detailed survey would proceed after approval of the pre-selected line route by the Client. The survey shall be conducted using appropriate survey methods and in accordance with standards in the various countries.

The Works shall involve, but not be limited, to the following:

- Traversing including clearing and pillaring with the use of concrete pillars.
- Leveling of the centerline at 30m interval and at closer intervals on slopes to define mountain slopes and valleys
- Detailing of roads/lanes, buildings, water bodies and other visible landmarks.
- Drafting and preparation of layout maps as well as plans and profiles drawings.

In carrying out the detail survey, the Consultant shall note the following:

- The number of angles shall be minimised. Angles should be placed preferably on level ground at relatively high elevation; angles should not be placed on slopes or in places that are at lower elevations in comparison with the profile on the two sides.
- The angle points shall be selected appropriately and pegged, by keeping in mind that, obviously, in each angle point a tower must be located. Angle points should be visible from one to the next; in case there are obstacles in-between, intermediate stakes should be placed.
- The two spans adjacent to one angle shall be longer than 100 m. An angle shall not be located on the top of a mountain, if the distance to the start of slope down is less than 100 m.
- Reference pillars shall be erected to enable effective checking and vetting of the surveys and drawings. Reference pillars shall be in accordance with specifications provided by the utilities.
- Visibility of the pillars should be maintained at all times.

- A uniform interval not exceeding 500 metres shall be maintained between adjoining pillars except in the case of a significant terrain slope, which may hinder visibility between pillars.
- In many mountainous places, the slope of terrain in direction perpendicular to line axis is important and may cause intolerable reductions of the clearance from conductors to ground, if not taken into account in the survey. It is therefore necessary to survey and profile a parallel route from the line centre-line, under the external conductor, on the uphill side, whenever the terrain slope perpendicular to line axis exceeds 5%. In case the transversal slope exceeds 50% in particular points, some profile stretches in direction perpendicular to line axis should also be surveyed, with a length of about 40 m on uphill side.
- The visual nature of the ground shall be noted whether pasture, woodlands, arable, etc, with special reference to such items as marshy, soft ground or rock and other relevant information such as soil instability.
- Ordnance datum shall be the basis for all levels and the level shall be shown at 2-m vertical intervals and at the beginning and end of each section; levels shall be shown of each section and at every obstruction or geographical feature.

A detailed survey report shall be presented to the Client. The report should include, among others:

- Information to facilitate recovery or re-establishing of angle points in the event of the pillar being destroyed, either by witness pillars or otherwise.
- Detailed list of reference pillars established and their locations during the traverse and how they were established.
- Types of instruments used and their accuracies, standard deviations and variance
- Accuracy of levels
- Field books, computations sheets and all related documentations in hard and soft copies.
- Information identifying the nearest access roads to each section of the line.
- Photographs showing the nature of the intervening terrain between pillars and confirming the absence of construction (buildings, etc.) along the route.

3.1.4. Preparation of Maps and Drawings

The drafting and preparation of drawings shall be in compliance with the requirements of the utilities in the various countries namely VRA-Ghana and SONABEL – Burkina Faso.

3.1.4.1.Line Route and Corridor

The line route shall be drafted as follows:

- A general map showing the line route/right-of-way on topographical sheets on a scale of 1:50,000 and 1:2500 at heavily inhabited areas

- A Key Map showing the line route, in 4-km sections, on topographical sheets on a (1:50,000) scale.

3.1.4.2.Plan and Profile Drawings

Drafting of the survey works should be in AutoCAD 2006 or later version. The plan shall be in the following scale:

• Plan		=	1:5000
• Profile:	*Horizontal*	=	1:5000
	Vertical	=	1:500

Each sheet should contain not more than 4 km of line route and shall be drawn from left to right on the sheet in the scales indicated. Each sheet should show the plot (with dotted line) of the supplementary profile under external conductor where appreciable slopes are present.

Centesimal degrees should be preferred, to facilitate calculations. Degrees (°), minutes (') and seconds (") should be indicated. All angles between two adjacent straight line sections should be indicated.

In general, all features such as hedges, fences, ditches, roads, railways, rivers, streams, canals, buildings, huts and all power and telecommunication lines shall be shown. Details of all crossings, e.g. power lines, major pipelines, phone lines, canals roads, etc. any other pertinent comments, observations, landmarks, etc., that may be deemed necessary for the future intended use of the drawing are required.

The following details on power line crossings are specifically required:

* Rated voltage, configuration of conductors (triangular, flat, etc.);
* Level above ground at point of crossing;
* Height of top conductor/shield wire(s) at crossing point;
* Distances of crossing point to supporting towers/poles;
* Angle of crossing;
* Ambient temperature and the time intervals measurements were taken.

In particular, the plan and profile shall detail out/show:

3.1.4.2.1. Plan

- High and low voltage power lines crossings
- Telecommunication lines or mast
- All crossings including but not limited to road crossings, footpaths, tracks, canal roads, railways, etc.
- Relief features including but not limited to swamps, rivers, streams, hedges fences
- Angles between two adjacent straight line sections

- Details of obstacles including but not limited to houses, roads, pipelines, bridges, surface nature and the like to a width of 30 m on both sides of the centreline

3.1.4.2.2. Profile

- Details of all crossings, e.g. power lines, major pipelines, phone lines, canals, roads, etc.
- Where ground slope across the line route exceeds 5%, the level of the ground left and right of the centre-line shall be recorded at offset distance of 6.0m. The offset levels shall be indicated on the profile as broken and/or chained dotted lines.
- The profile shall indicate all changes in level and deviation of 300 mm or more along the centre-line of the route.
- All features such as hedges, fences, ditches, roads, railways, rivers, streams, canals, buildings, huts and all power and telecommunication lines shall be shown.
- Ordnance datum shall be the basis for all levels and the level shall be shown at 2-m vertical intervals and at the beginning and end of each section; levels shall be shown of each section and at every obstruction or geographical feature.
- The visual nature of the ground shall be noted whether pasture, woodlands, arable, etc, with special reference to such items as marshy, soft ground or rock and other relevant information such as soil instability.
- In general, the transversal slopes are not provided in the profiles. However, a supplementary profile under the external conductor should be surveyed and plotted (with dotted line), where appreciable slopes are present.
- In many mountainous places, the slope of terrain in direction perpendicular to line axis is important and may cause intolerable reductions of the clearance from conductors to ground, if not taken into account in the survey. It is therefore necessary to survey an additional profile on a parallel route at a distance of 6m from the line centre-line on the uphill side, whenever the terrain slope perpendicular to line axis exceeds 5%. In case the transversal slope exceeds 50% in particular points, some profile stretches in direction perpendicular to line axis should also be surveyed, with a length of about 40 m on uphill side.

3.2. Substation Sites

The scope of services by the Consultant shall include, but not be limited to the following:

- Detailed survey of substation sites
- Preparation of topographical drawings.

3.2.1. Study of Substations Sites

The assignment to be carried out by the Consultant is to study the substation sites in accordance with the requirements and regulations of the various countries.

In selecting the substation sites, the following, amongst others, should be considered:

- The substation sites shall not be located in areas with large transversal slope.
- Areas marked for future development has to be obtained from the relevant Town and Country Planning Department Office responsible for the area.
- Technical, economic, environmental, cultural and social issues.
- Guidance from VRA and SONABEL as appropriate regarding siting and planning standards in Ghana and Burkina Faso respectively.

A detailed description of the selected sites shall be provided by the Consultant with the location of all structures, relief features and all other details. The description shall include but not be limited to the location of the following on the relevant maps:

a) Manmade structures (residential structures of all types, non-residential structures like roads, streets, hospitals, offices, commercial buildings, government buildings,
b) Utility Installations (existing power transmission and distribution lines, existing telephone lines, microwave towers, etc.)
d) Geographical/physical features (rivers, streams, road crossing, mountains, valleys, rail crossings, footpaths, swamps, stream crossings, farmlands, forest reserves, cultural sites, etc.)

3.2.2. Detailed Survey of substation Sites

The detailed survey would proceed after approval of the pre-selected line route by the Client. The survey shall be conducted using appropriate survey methods and in accordance with standards in the various countries.

The Works shall involve, but not be limited, to the following:

- Identification including clearing and pillaring with the use of concrete pillars.
- Detailing of roads/lanes, buildings, water bodies and other visible landmarks.
- Drafting and preparation of layout maps as well as plans and profiles drawings.

In carrying out the detail survey, the Consultant shall note the following:

- Reference pillars shall be erected to enable effective checking and vetting of the surveys and drawings. Reference pillars shall be in accordance with specifications provided by the utilities.
- Visibility of the pillars should be maintained at all times.

- The visual nature of the ground shall be noted whether pasture, woodlands, arable, etc, with special reference to such items as marshy, soft ground or rock and other relevant information such as soil instability.
- Ordnance datum shall be the basis for all levels and the level shall be shown at 2-m vertical intervals and at the beginning and end of each section; levels shall be shown of each section and at every obstruction or geographical feature.

A detailed survey report shall be presented to the Client. The report should include, among others:

- Information to facilitate recovery or re-establishing of boundary points in the event of the pillar being destroyed, either by witness pillars or otherwise.
- Detailed list of reference pillars established and how they were established.
- Types of instruments used and their accuracies, standard deviations and variance
- Accuracy of levels
- Field books, computations sheets and all related documentations in hard and soft copies.
- Information identifying the nearest access roads to each substation site.
- Photographs showing the nature of the terrain and confirming the absence of construction (buildings, etc.) on the sites.

3.2.3. Preparation of Topographical Drawings

The preparation of drawings shall be in compliance with the requirements of the utilities in the various countries namely VRA-Ghana and SONABEL – Burkina Faso.

The substation site maps shall be drafted as follows:

- A general map showing the location of the substation sites on topographical sheets on a scale of 1:10,000.

The maps shall detail out:

- Relief features including but not limited to hedges, fences, swamps and streams
- Details of obstacles including but not limited to houses, roads, pipelines, bridges, surface nature and the like to a width of 30 m around the substation sites.

3.3. Environmental and Social Impact Assessment (ESIA)

The ESIA shall facilitate the understanding and determination of the likely implications of the proposed project, the relevant considerations, planning and mitigation options, that will ensure that the project is implemented in an

environmentally sound and sustainable manner. It will also form the basis for consideration for environmental approval by funding agencies and permits from the Environmental Protection Agencies of the various countries for the implementation of the proposed project.

The Consultant shall review all necessary data and reports on the proposed 225 kV Bolgatanga - Ouagadougou Interconnection Project and any other additional information that could help in the development of the Environmental Impact Statement (EIS). The Consultant shall study the national, international environmental policies, procedures and legislation and regulatory frameworks as they apply to the assignment. The Consultant shall therefore study the requirements of the various Environmental Protection Agencies and also the requirements indicated in Appendix 4 and comply accordingly. Requirements by Funding Agencies shall be taken into consideration in the conduct of the ESIA and preparation of the EIS.

In Ghana, as part of the ESIA Study, the Consultant shall be required to undertake a scoping exercise and prepare a Scoping Report, detailing the "Terms of Reference" for review, in the form and format required by the Ghana EPA. The Ghana EPA requires that a presentation of the Scoping Study should be made prior to the submission of the Scoping Report. The Consultant shall make a presentation of the Scoping Study, on behalf of VRA, to the Ghana EPA. The approval of the Ghana EPA of the Scoping Study is required prior to the submission of the Environmental Impact Statement report.

In Burkina Faso, as part of the ESIA Study, the Consultant shall be required to undertake a scoping exercise and prepare a Scoping Report, detailing the "Terms of Reference" in line with the prevailing regulations in Burkina Faso. The Consultant shall carry out the assignment only upon receipt of approval of the Scoping Report by the Ministry in charge of the Environment in Burkina Faso, and present the results of the assignment for approval, in the form and format required. Prior to the approval of the results of the assignment, the Ministry shall engage independent auditors at the cost of the Consultant to verify the results of the study.

The scope of work of the Environmental and Social Impact Assessment shall include, but not be limited to the following:

- A description of the institutional and legal framework
- A description of the project
- Study of existing Environment
- Identification & Assessment of potential environmental and social impacts
- Mitigation measures
- Provisional Environmental & Social Management Plan (ESMP)
- Preparation and submission of an Environmental & Social Management Monitoring Programme.
- Public consultations and information.
- Compensation in respect of Acquisition of Right-of-Way
- Preparation of a Resettlement Action Plan

- Final Environmental & Social Management Plan
- Preparation of Illustrative Materials
- Recommend training programmes to be undertaken by the respective utilities

3.3.1. Study of Existing Environment

A detail study and description of the existing environment (physical, biological and socio-cultural/economy) within the ROW and substation vicinity shall be provided by the Consultant. These shall include, but not limited, to the following:

a. Physical Environment

i. Topography, geology and soils
ii. Climate and air quality
iii. Noise
iv. Ground and Surface water

b. Biological Environment

i. Terrestrial Vegetation
ii. Wildlife
iii. Ecologically sensitive sites (e.g. wetlands, forest reserves)

c. Socio-Cultural / Economic Environment

i. Population and Demographics
ii. Ethnic, Religious and Cultural Heritage
iii. Historical resources
iv. Aesthetics and Tourism
v. Infrastructure
vi. Education
vii. Land tenure and Land Ownership
viii. Land Use
ix. Employment/Manufacturing
x. Agriculture
xi. Public Health (including HIV/AIDS)

3.3.2. Identification & Assessment of Potential Environmental Impacts

Some environmental effects can occur during the pre-construction, constructional, operational and decommissioning phases of the project. The Consultant shall identify the major sources of these effects and describe the predicted impacts from these activities.

3.3.3. Mitigation Measures

The Consultant shall propose mitigation measures for the potential environmental effects that would occur from pre-construction, construction and operational activities.

3.3.4. Provisional Environmental & Social Management Plan (ESMP)

The Consultant shall identify personnel and environmental management and training requirements for each stage of the project development and develop a Provisional Environmental & Social Management Plan (ESMP) as part of the overall ESIA report.

The ESMP shall include an appropriate monitoring programme to determine impacts on the physical, biological and human environments. This programme will be used to verify whether predictions of environmental impacts, developed in the design phase, are accurate and that unforeseen impacts are detected at an early stage. This will allow corrective measures to be implemented before significant damage takes place. The monitoring plan should specify what will be monitored (indicators), when, by whom and the cost implications (investment cost and recurrent costs). The ESMP shall include a Vegetation Management Plan as well as a plan for the Management of Archaeological and Cultural Property.

The Consultant shall take into consideration lessons learnt from similar ESIA's done on similar projects and shall reflect such in the ESMP. It is hoped that the information gained from a well-designed monitoring programme will be useful in refining future designs to be more cost-effective and have fewer, and less serious, environmental impacts.

3.3.5. Public Consultations and Information

The Consultant shall undertake consultations with a number of relevant agencies including NGO's and the public regarding the proposed project.

The EIS shall include the attendants, dates, discussion/minutes and other records of such consultations.
The Consultant shall be required to prepare a non-technical summary report of the impact assessments in the local languages in the areas involved as mandated by the World Bank guidelines. The Consultant shall also be required to perform informative meetings with the communities impacted by the project after the Impact Assessment Study Final Report has been adopted.

3.3.6. Compensation from Acquisition of Right-of-Way

The utilities or other appropriate agency in the various countries shall acquire the Right-Of-Way (ROW) in the project area for the smooth implementation and operation of the line.

The acquisition of all new rights-of-way shall be aligned taking environmental factors into consideration. The land acquisition procedures shall be carried out in accordance with national and international regulations. The environmental

impact of the project shall also be minimised through measures such as impact consideration in siting and design, restricting right-of-way use by un-authorised persons, erosion and sediment control during and after construction, and use of low impact maintenance procedures.

The VRA currently has a Memorandum of Understanding with the Ghana Forest Services Division (FSD) of the Forestry Commission which provides guidelines to help the two (2) institutions collaborate effectively for the efficient management of electric power related activities in national forest reserves. The Consultant shall consult with the FSD in the event that the line route traverses any forest reserve to ensure that the line does not traverse any Globally Significant Biodiversity Area that contains rare tree species. In this respect the Consultant shall provide information on the management plan of the respective forest reserve as well as map showing the various forest compartments and their significance.

Following consultations, the EIS shall provide information regarding the acquisition of the rights-of-way, their lengths, general locations and the local and national / international policies regarding acquisition of these rights-of-way.

The Consultant shall undertake a detailed survey of the entire ROW and provide information on affected individual and community properties, forest reserves and compensation packages that may be required for the acquisition of the right-of-way in the EIS.

3.3.7. Preparation of a Resettlement Action Plan

The Consultant shall use information on compensation packages and prepare a separate Resettlement Action Plan (RAP) for the project, in accordance with required standard of the World Bank and other international funding agencies.

The RAP shall be prepared following acceptance of the Draft EIS and ESIA by the Ghana EPA and the Ministry in charge of Environment in Burkina Faso, and relevant funding agencies. The details of the requirements for the preparation of the RAP as required under the World Bank Operational Directive OP4.12 is included in the Appendix.

3.3.8. Environmental & Social Management Plan

The Consultant shall develop a separate Environmental & Social Management Plan (ESMP) for the 225 kV Bolgatanga - Ouagadougou Interconnection Project.

The ESMP to be developed shall include the following:

a. Composition and job description of project environmental and social management unit of the Project Implementation Team (PIT).
b. Structure of reporting for project environmental and social management unit and this should be linked with operational and administrative activities,

c. Training and development for capability building in the respective utilities
d. Parameters to be monitored, e.g., water quality, noise, electromagnetic force (EMF), etc.
e. Sampling sites,
f. Frequency of measurements,
g. Method of sampling and analysis,
h. Monitoring programme,
i. Proper and adequate record keeping,
j. Places to be restricted to unauthorised persons,
k. Environmental audit and review programme covering all activities to assess compliance with contract requirements and ensure meeting requirements of the EPA and other stakeholders including the general public. The programme should include:

- Internal review - undertaken by VRA and SONABEL staff reporting internally
- External audit - undertaken by independent consultants reporting to VRA and SONABEL respectively.

The ESMP should outline responsibilities for implementation, the time frame of implementation, and budget as required in the World Bank's format of the preparation of such documents. Specific requirements relating to ESMP's are set out in Annex C of the Bank OP 4.01 and the Consultant shall conform to these requirements.

The ESMP will ensure that environmental 'due diligence' is observed in the operational/maintenance activities of the 225 kV Bolgatanga - Ouagadougou Interconnection Project.

3.3.9. Preparation of Illustrative Materials

The Consultant shall include relevant maps, plans, tables, graphs, diagrams and any other illustrative material that would make easy appreciation of the content of the ESIA, RAP and ESMP. These materials shall show environmental sites/issues/risks and restoration / landscape of the study area. Examples of features that could be represented on the maps include:

a. Communities,
b. Ecological zones,
c. Natural resources (habitats, forests),
d. Places of cultural interest, and
e. Risky zones (floods, landslides, etc.).

3.3.10. Training Programme

In order to ensure that commitments made under the Environmental Permits are acted upon in a comprehensive and reasonable manner, there is the need for training of staff of VRA and SONABEL. The training would cover the issues as

outlined in the Provisional Environmental & Social Management Plan in the EIS and the Draft Resettlement Action Plan which could include the following:

- Management and monitoring of health, safety and environmental issues
- Management of the right-of-way acquisition process
- Management of the right-of-way during the maintenance phase of the project
- Social impact mitigations.

The Consultant shall design and propose the training programme, which should be approximately costed. This training shall be done in a workshop to be organized by the Consultant in each of the countries after receipt of Environmental Permit. The outcome of discussions at this training workshop would be an input to finalise the ESMP and RAP reports.

3.3.11. Public Information and Sensitisation Campaign

At the end of the study and elaboration of various reports approved by the relevant authorities in the two (2) countries, the Consultant shall prepare a non-technical summary report of the impact assessments in the official language of both countries and in the local languages prevailing in the areas crossed by the interconnection lines.

The Consultant shall carry out informative and sensitization campaigns to the populations, public and private entities within the areas traversed by the interconnection line. The campaigns shall be undertaken in the official languages of the two (2) countries and in the local languages within the areas traversed by the interconnection line. The public informative and sensitization campaigns shall contain issues related but not be limited to:

- Project Implementation,
- Project benefits for the two (2) countries and their populations,
- Environmental impacts of the project,
- Envisaged compensation measures
- Dangers and safety measures related to the interconnection line

The Consultant shall propose an appropriate approach and methodology that shall be approved by VRA and SONABEL. The Consultant shall prepare appropriate presentation material and propose a medium acceptable to VRA and SONABEL for the informative and sensitization campaign.

4. DURATION OF STUDY AND SCHEDULE

The duration for executing the Line survey and the Environmental and Social Impact Assessment shall not exceed 32 weeks. The Consultant shall propose in their offer, a detailed implementation schedule for the consultancy and should take into consideration that the Line Route Study Report shall be an input into the Feasibility Study Update.

In this regard, the following indicative schedule is proposed:

Milestone	Date
Contract Effectiveness	Wo
Submission of Inception Report	Wo + 3 weeks
Submission of Draft Scoping Report	Wo + 4 weeks
Submission of Draft Line Route Study Report	Wo + 5 weeks
Submission of Comments on Draft Scoping Report	Wo + 5 weeks
Submission of Comments on Draft Line Route Study Report	Wo + 6 weeks
Submission of Final Scoping Report	Wo + 6 weeks
Submission of Final Line Route Study Report	Wo + 7 weeks
Submission of Detail Survey Report	Wo + 11 weeks
Submission of Initial Draft Report EIS	Wo + 16 weeks
Submission of Comments on Initial Draft Report EIS	Wo + 20 weeks
Submission of Final Report EIS	Wo + 24 weeks
Submission of Initial Draft Report ESMP	Wo + 24 weeks
Submission of Comments on Initial Draft Report ESMP	Wo + 28 weeks
Submission of Final Report ESMP	Wo + 32 weeks
Submission of Initial Draft Report RAP	Wo + 24 weeks
Submission of Comments on Initial Draft Report RAP	Wo + 28 weeks
Submission of Final Report RAP	Wo + 32 weeks
Submission of non-technical local language Summary report	Wo + 32 weeks

5. DELIVERABLES

The Services include the preparation and submission to the Client in a timely manner of the reports, documents, maps and drawings in English and French. The reports shall be submitted by the Consultant simultaneously to the WAPP Secretariat and the utilities in each country. The reports shall be submitted under cover of official letter from the WAPP

Secretariat. The deliverables shall be consistent with the packaging of the assignments. The Consultant shall make provision for seminars to present all draft versions of reports to facilitate preparation of comments.

5.1. Reports, Presentation, Line Survey and Preparation of Maps

5.1.1. Reports and Presentation

➢ Inception Report

The Consultant shall present within three (3) weeks from the start of the work, an Inception Report that shall contain, inter alia, the work plan and methodology, work schedule, annotated comments of each report that shall be presented and delivered to the Client, WAPP Secretariat, VRA and SONABEL. The number of copies of the reports to be submitted shall be as follows:

- *Inception Report:*
  - *Three (3) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Three (3) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

➢ Monthly Reports

The Consultant shall provide Monthly Reports. The report shall summarise the Consultant's activities during the period under review. The reports shall be issued in English and French by the 10th calendar day *of each month* for the preceding month. The number of copies of the reports to be submitted shall be as follows:

- *Monthly Report:*
  - *Three (3) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Three (3) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

➢ Quarterly Reports

The Consultant shall provide Quarterly Reports. The report shall describe the

major tasks which have been undertaken in the performance of the studies, milestones towards the studies' completion, and the percentage complete of the studies as of the end of the quarter. Financial data will include photocopies of invoices from the Consultant as well as financial reports detailing expenditures of all funds and the daily rates for the staff of the Consultant, their hours worked and other direct costs. These reports will be based on the total estimated project cost for the studies and all activities needed to complete the scopes of the work for the studies. The title page of all Quarterly Reports shall include a descriptive title, the author's name, grant number, the project number and title, and the publication or issuance date of the report. The reports shall be issued in English and French by the 10th calendar day after the end of the Quarter under review. The number of copies of the reports to be submitted shall be as follows:

- *Quarterly Report:*
  - *Three (3) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Three (3) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Five (5) hard copies and one (1) electronic copy in English, and Five (5) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

➢ Project Master Schedule

Prepare and maintain a Schedule using software acceptable to the Client and effect monthly updating of the detail schedules demonstrating that the project is progressing in accordance with the contractual obligations. The updated schedule shall be submitted as part of the Monthly Report.

➢ Line Route Study Report

The time for the submission and the number of copies of the draft Line Route Study reports shall be as follows:

- *Shall be submitted within five (5) weeks from the date of Contract Effectiveness.*
  - *Five (5) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Five (5) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

The time for the submission and the number of copies of the Final Line Route Study reports shall be as follows:

- *Shall be submitted within seven (7) weeks from the date of Contract Effectiveness.*
    - *Ten (10) hard copies and one (1) electronic copy in English to be delivered to VRA.*
    - *Ten (10) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
    - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

➢ Detail Survey Report

The time for the submission and the number of copies of the Detail Survey reports and the submission of all computation works, field books, drawings, maps etc shall be as follows:

- *Shall be submitted within eleven (11) weeks from the date of Contract Effectiveness.*
    - *Ten (10) hard copies and one (1) electronic copy in English to be delivered to VRA.*
    - *Ten (10) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
    - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

5.1.2. Survey Maps and Drawings

In addition to the above requirements, one (1) hard copy as well as three (3) re-writeable CDs in AUTOCAD 2006 Version of each map and drawing shall be submitted. The hard copy should be on Unotrace drafting film - 75 micron - 0.003" paper (transler paper).

5.2. Environmental and Social Impact Assessment

5.2.1. Reports and Presentation

➢ Scoping Report

The time for the submission of the draft Scoping Report shall be within four (4) weeks from date of Contract Effectiveness. The number of copies of the draft Scoping Report to be submitted shall be as follows:

- *Five (5) hard copies and one (1) electronic copy in English to be delivered to VRA.*
- *Five (5) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*

- *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

The time for the submission of the Final Scoping Report and the presentation of its results to the Ghana EPA and the Burkina Faso Ministry of Environment shall be within six (6) weeks from date of Contract Effectiveness. The number of copies of the Scoping Report to be submitted shall be as follows:

- *Ten (10) hard copies and one (1) electronic copy in English to be delivered to VRA.*
- *Ten (10) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
- *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

➢ Environmental Impact Statement

The report should contain an Executive Summary of not more than 10 pages.

The final document should be delivered in a form (with cover page(s) and formatting) acceptable to the Client and the Funding Agency.

The time for the submission and the number of copies of the reports shall be as follows:

- *Draft Report: Shall be submitted within sixteen (16) weeks from the date of Contract Effectiveness.*
  - *Five (5) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Five (5) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

- *Final Report: Shall be submitted within twenty-four (24) weeks from the date of Contract Effectiveness.*
  - *Ten (10) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Ten (10) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1)*

electronic in French, to be delivered to the WAPP Secretariat.

5.2.2. Environmental & Social Management Plan (ESMP)

The report should contain an Executive Summary.

The final document should incorporate comments made during the training programme and should be delivered in a form (with cover page(s) and formatting) acceptable to the Client and the Funding Agency.

The time for the submission and the number of copies of the reports shall be as follows:

- *Draft Report: Shall be submitted within twenty-four (24) weeks from the date of Contract Effectiveness.*
  - *Five (5) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Five (5) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

- *Final Report: Shall be submitted within thirty-two (32) weeks from the date of Contract Effectiveness.*
  - *Ten (10) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Ten (10) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

5.2.3. Resettlement Action Plan (RAP)

The final report should incorporate comments made at the workshop; it should have an executive summary and an appendix recording the sessions of consultation that have been held with affected people and other stakeholders during the preparation of the report. The final document should be delivered in a form (with cover page(s) and formatting) acceptable to the Client and funding agency.

The time for the submission and the number of copies of the reports shall be as follows:

- *Draft Report: Shall be submitted twenty-four (24) weeks from the date of Contract Effectiveness.*

- *Five (5) hard copies and one (1) electronic copy in English to be delivered to VRA.*
- *Five (5) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
- *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

- *Final Report: Shall be submitted within thirty-two (32) weeks from the date of Contract Effectiveness.*
  - *Ten (10) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Ten (10) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

5.2.4. Non-technical Summary Report in Local Language.

The Consultant shall be required to prepare a non-technical summary report of the impact assessments in the local languages in the areas involved as mandated by the World Bank guidelines. The report shall contain a separate section on the EIS, a separate section on the ESMP, and a separate section on the RAP.

The Consultant shall also be required to perform informative meetings with the communities impacted by the project after the Impact Assessment Study Final Report has been adopted.

The informative meetings with the communities shall be held within thirty-two (32) weeks from the date of Contract Effectiveness. The time for the submission and the number of copies of the reports shall be as follows:

- *Final Report: Shall be submitted within thirty-two (32) weeks from the date of Contract Effectiveness.*
  - *Three (3) hard copies and one (1) electronic copy in English to be delivered to VRA.*
  - *Three (3) hard copies and one (1) electronic copy in French to be delivered to SONABEL.*
  - *Three (3) hard copies and one (1) electronic copy in English, and Three (3) hard copies and one (1) electronic in French, to be delivered to the WAPP Secretariat.*

6. INFORMATION TO BE PROVIDED BY THE CLIENT

The following will be provided by the Client:

- Environmental and Social Impact Assessment Study by Tractebel Energy Engineering, 1997
- All available relevant documents that would facilitate the realization of the study.

7. REPORTING REQUIREMENTS

The Consultant will report to the WAPP Secretariat. However, each of the two utilities involved, VRA & SONABEL, will appoint a Project Manager who will co-ordinate the activities of the Consultant in Ghana and Burkina Faso respectively.

All correspondences on the project from the Consultant addressed to any party should be copied to the other parties for their information.

8. CONDUCT OF WORK

The Consultant shall provide overall management of all aspects of the work / services. The Consultant shall nominate a Project Manager and a Deputy Project Manager (during all times of unavailability of the Project Manager) to liaise with the Client, WAPP Secretariat, VRA and SONABEL.

The Consultant shall work closely with the designated staff of the Client, WAPP Secretariat, VRA and SONABEL.

Close coordination among the Consultant, WAPP, VRA, SONABEL and the Consultant implementing the Feasibility Study shall be required.

The Consultant shall participate in meetings with the Client, WAPP Secretariat, VRA and SONABEL.

The Consultant shall implement its internal quality control and assurance procedures during the execution of the Contract, and shall demonstrate that they are being applied.

9. PARTICIPATION OF WAPP, VRA AND SONABEL

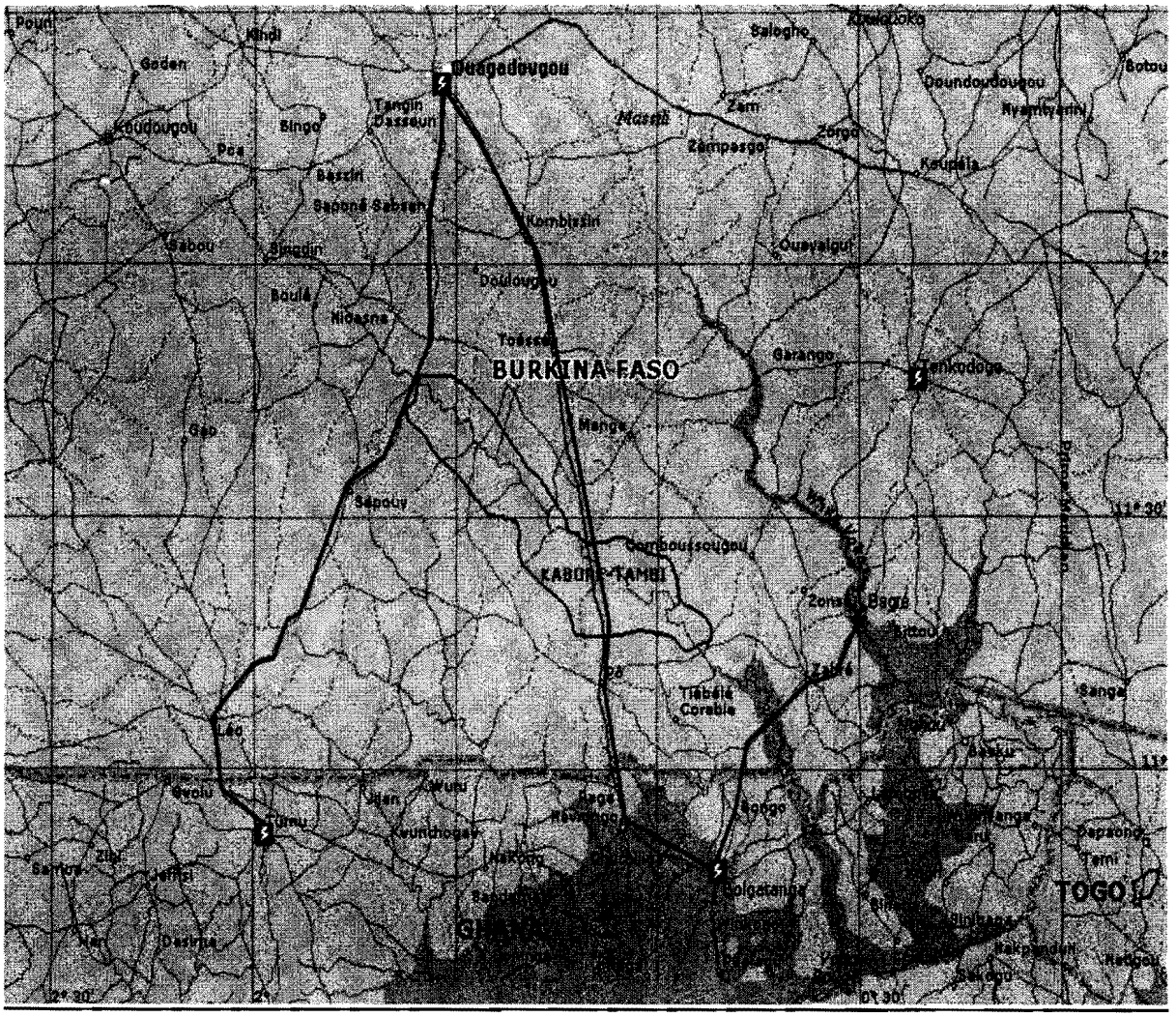
The Client, WAPP Secretariat, VRA and SONABEL will provide to the contracted Consultant;

- Office space as required, suitably furnished and with air conditioning, telephone connections.
- Staff from WAPP, VRA and SONABEL as required at their expense.
- Arrangements for meetings with representatives of WAPP, VRA and SONABEL.

The Consultant shall make his own arrangements in coordination with the WAPP Secretariat for whatever services that the WAPP Secretariat cannot provide.

APPENDICES

APPENDIX 1: MAP OF PROPOSED INTERCONNECTION



APPENDIX 2: SAFETY RULES FOR THE FELLING TREES

The following precautions shall be observed while felling trees:

- In locations where ordinary felling operations might cause damage to property including transmission lines, trees shall be suitably dismembered and felled using block and tackle when necessary.

- Whenever practicable, trees shall be felled directly away from a power or telephone line after having removed all limbs that might contact the line or cause damage to other trees or property. If the tree must be felled toward a line it shall be topped low enough to clear all conductors, etc.

- Pulling down trees or lowering limbs by means of attachment ropes connected to a moving motor vehicles is prohibited. The tackle must be anchored to a fixed object such as a suitable tree, a truck with its wheels blocked or a stake holdfast.

- Guy ropes shall be used on all trees that are sufficiently large to cause damage should they fall in any direction other than that intended. The guy ropes shall be able to stand well outside the striking distance of the tree.

- Anchors for guy ropes shall be installed in such a position that person handling the guy ropes shall be able to stand well outside the striking distance of the tree.

- Before a tree is felled, men other than those actually engaged in cutting the tree shall keep clear of any area within the possible striking distance of the tree. Men shall not be allowed to remain in nearby trees if there is any doubt as their safety.

- Ample warning shall always be given before a tree is expected to fall and the workmen must stand clear in case the tree springs from the stump while falling.

- Brush and other debris or equipment that would hamper free movement when using sharp tools or when getting clear in case of emergency shall always be cleared away.

- Ordinary, trees shall be notched in the direction towards which they are to fall and sufficient holding wood shall be left to provide control.

- Under no circumstances shall a partially cut tree be left standing during a lunch hour or overnight.

- Before commencing the backcut on a tree, one or more pieces of log chain or guy cable shall be placed tightly around the tree if the tree is split, leaning or has a twin trunk that is likely to split. One chain or cable shall be placed above and as close as practical to the backcut to prevent separation of the trunk.

- The Consultant shall satisfy himself that any employee permitted to operate a power chain saw is qualified to do so.

- Before the felling of any tree which may get into contact with the conductors on the existing lines, the nearest manned substation shall be advised. This substation should be contacted in the event of any mishap or problem during the felling.

APPENDIX 3: PREPARATION OF RESETTLEMENT ACTION PLAN (RAP)

GUIDELINES

1.0 STUDY AREA

The study area will be the proposed corridor approved by the ESIA and approved by the utility companies in the various countries.

2.0 TASKS

The tasks involved in the preparation of the RAP, shall, among others, include:

- Task 1. Review of Existing Project Documents

  The firm shall be expected to use existing relevant information available with the utilities of the various countries to help prepare the RAP. Some of the information includes, Project Feasibility Report, Project Environmental Impact Statement (EIS) and Environmental Management Plan.

  The Firm will be expected to ascertain the veracity of all relevant information available for the preparation of the RAP, through site visits and consultations with local inhabitants, governmental and non-governmental agencies.

- Task 2. Preparation of RAP

  The RAP shall be expected to be prepared in line with the World Bank Group Operational Directives OD 4.30 Involuntary Resettlement (attached).

  a. Detailed provision should be made for the following:

     i. Identification of Affected People

     The primary task of the firm is to identify all those people who are affected in any way by the construction and maintenance of the Transmission Line in question, i.e. the numbers of people by type and seriousness of impact (temporary loss of strips of land, permanent loss of land, loss of residence and land, etc.). In collaboration with the utilities of the various countries, the firm shall mark or photograph all properties affected in such a way that a record can be made and any later opportunistic encroachment into the right of way can be identified and rejected for compensation.

     ii. Organizational Responsibilities

     The responsibility for implementing the resettlement plan rests with the utilities of the various countries. The firm shall be expected to develop an organizational framework for managing the resettlement and outline the necessary resources that must be provided to the responsible institutions.

     iii. Community Participation

To obtain cooperation, participation, and feedback, resettlers need to be systematically informed and consulted during preparation of the resettlement plan about their options and rights.

The Firm shall be expected to develop a plan, involving formal and informal leaders and representatives, to ensure active participation to help address and mitigate resettlement's impact. Particular attention must be given to ensure that vulnerable groups such as indigenous people, ethnic minorities, the landless, and women are represented adequately in such arrangements. Schemes for complaint and dispute resolution should be devised for the resettlement plan. Such a scheme should, as far as possible, take into account existing procedures for settling disputes in the country or area concerned.

iv. Socioeconomic Survey

Resettlement plans should be based on recent information about the scale and impact of resettlement on the displaced population, supplementing such work where necessary with any additional data that may be critically relevant to the action plan.

The Firm is expected to review and include the relevant information on all documented socioeconomic surveys that have been undertaken for the project. In addition to describing standard household characteristics, the socioeconomic survey should describe (a) the magnitude of displacement; (b) information on the full resource base of the affected population, including income derived from informal sector and non-farm activities, and from common property; (c) the extent to which groups will experience total or partial loss of assets; (d) public infrastructure and social services that will be affected; (e) formal and informal institutions (such as community organizations, ritual groups, etc.) that can assist with designing and implementing the resettlement programs; and (f) attitudes on resettlement options.

v. Legal Framework

A clear understanding of the legal issues involved in resettlement is needed to design a feasible resettlement plan

The Firm shall be expected to make an analysis to determine the nature of the legal framework for the resettlement envisaged, including (a) the scope of the power of eminent domain, the nature of compensation associated with it, both in terms of the valuation methodology and the timing of payment; (b) the legal and administrative procedures applicable, including the appeals process and the normal time frame for such procedures; (c) land titling and registration procedures; and (d) laws and regulations relating to the agencies responsible for implementing resettlement and those related to land compensation, consolidation, land use, environment, water use, and social welfare. Identify differences between Ghanaian laws, regulations, and procedures and those called for under OD 4.30 of the World Bank, and show how those gaps will be filled so that both sets of rules will be fully addressed.

vi. Resettlement Sites

The identification of sites for resettlement of any affected people, who may have to move their residences, is a critical step.

The Firm shall be expected to provide recommendations on possible relocation sites to ensure that the new site's productive potential and locational advantages are at least equivalent to those of the old site.

vii. Valuation of and Compensation for Lost Assets

The Firm shall be expected to identify a method for inventorying and evaluating all assets lost, or to be lost, because of the project. Assets include land and crops, outbuildings and other structures, access to non-owned (common) resources that form part of the income or sustain the living standards of the affected people (these could include loss of access to water sources or to fuelwood supplies), loss of tenancy rights, or loss of commerce. Losses to be identified and valued include those lost temporarily or permanently. Peaceful enjoyment of assets and resources should be identified and compensatory mechanisms developed, whether or not holders of those rights have claims sustainable in either modern or customary law. The Consultant should devise a matrix that shows the types of loss and the mechanisms and values to be used to compensate for each type.

viii. Land Tenure, Acquisition, and Transfer

Where relevant, the Firm shall be expected to review the main land tenure and transfer systems, including common property and non-title based usufruct systems governed by locally recognized land allocation mechanisms. The objective is to treat customary and formal rights as equally as possible in devising compensation rules and procedures. The plan should address the issues raised by the different tenure systems found in the project area, including (a) the compensation eligibility of land-dependent populations; (b) the valuation procedures applicable to different tenure types; and (c) the grievance procedures available for disputes over land acquisition. The planning should also anticipate the approximate time needed to acquire and transfer land.

ix. Access to Training, Employment, and Credit

When agriculturalists lose significant parts of their holdings or income, the preferential treatment for compensation should be the replacement of land lost with land of equal accessibility and productive value. If such land cannot be found, alternative employment strategies may be needed.

The Firm shall be expected to provide information on how new economic activities made possible by the main investment requiring the displacement can be exploited, where feasible. Vocational training, employment counseling, transportation to jobs, employment in the main investment project or in resettlement activities, establishment of industries, incentives for firms to locate in the area, credit and extension for small businesses or reservoir aquaculture, and preference in public sector employment should all be considered where appropriate.

x. Shelter, Infrastructure, and Social Services

To ensure the economic and social viability of any households who may need to move away from their current residences, adequate resources should be allocated to provide shelter, infrastructure (e.g., water supply, feeder roads), and any foregone social services (e.g., schools, health care centers).

The Firm should provide information on areas where site development, engineering, and architectural designs should be prepared for shelter, infrastructure, and social services. Consideration should be given to the provision of a building site with suitable infrastructure, model plans, building materials, technical assistance, and "construction allowances" (for income foregone while resettlers build their houses) as an option communities should be offered. Planning for shelter, infrastructure, and services should take into account population growth.

xi. Implementation Schedule, Monitoring, and Evaluation

The timing of resettlement should be coordinated with the implementation of the main investment component of the project requiring the resettlement.

The Firm shall be expected to include an implementation schedule for each activity covering initial baseline and preparation, actual relocation, and post-relocation economic and social activities. The plan should include a target date when the expected benefits to resettlers and hosts would be achieved. Arrangements for monitoring implementation of resettlement and evaluating its impact should be developed during project preparation and used during supervision.

xii. Preparation of Cost Estimates

The Firm shall be expected to provide cost estimates for the activities involved in the implementation of the RAP and they should be budgeted and scheduled in coordination with the physical works of the main investment project.

xiii. Further Information on World Bank Requirements

In addition to the documents cited above, the Firm should refer to the World Bank Operational Policy OP 4.12 and the attached World Bank Operational directive (OD 4.30 Involuntary Resettlement) for further information on World Bank requirements.

This directive was prepared for the guidance of staff of the World Bank and is not necessarily a complete treatment of the subjects covered.

OD 4.30-----June 1990

Involuntary Resettlement

Introduction

1. This directive describes Bank[1] policy and procedures on involuntary resettlement, as well as the conditions that borrowers are expected to meet in operations involving involuntary resettlement.[2] Planning and financing resettlement components or free-standing projects are an integral part of preparation for projects that cause involuntary displacement. Any operation that involves land acquisition or is screened as a Category A or B project for environmental assessment purposes[3] should be reviewed for potential resettlement requirements early in the project cycle (para. 20).

2. Development projects that displace people involuntarily[4] generally give rise to severe economic, social, and environmental problems: production systems are dismantled; productive assets and income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community structures and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished. Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out.[5]

Policy Objectives

3. The objective of the Bank's resettlement policy is to ensure that the population displaced by a project receives benefits from it. Involuntary resettlement is an integral part of project design and should be dealt with from the earliest stages of project preparation (para. 28), taking into account the following policy considerations:

(a) Involuntary resettlement should be avoided or minimized where feasible, exploring all viable alternative project designs. For example, realignment of roads or reductions in dam height may significantly reduce resettlement needs.

(b) Where displacement is unavoidable, resettlement plans should be developed. All involuntary resettlement should be conceived and executed as development programs, with resettlers provided sufficient investment resources and opportunities to share in project benefits. Displaced persons should be (i) compensated for their losses at full replacement cost prior to the actual move; (ii) assisted with the move and supported during the transition period in the resettlement site; and (iii) assisted in their efforts to improve their former living standards, income earning capacity, and production levels, or at least to restore them. Particular attention should be paid to the needs of the poorest groups to be resettled.

(c) Community participation in planning and implementing resettlement should be encouraged. Appropriate patterns of social organization should be established, and existing social and cultural institutions of resettlers and their hosts6 should be supported and used to the greatest extent possible.
(d) Resettlers should be integrated socially and economically into host communities so that adverse impacts on host communities are minimized. The best way of achieving this integration is for resettlement to be planned in areas benefiting from the project and through consultation with the future hosts.
(e) Land, housing, infrastructure, and other compensation should be provided to the adversely affected population, indigenous groups,7 ethnic minorities, and pastoralists who may have usufruct or customary rights to the land or other resources taken for the project. The absence of legal title to land by such groups should not be a bar to compensation.

Resettlement Planning

4. Where large-scale8 population displacement is unavoidable, a detailed resettlement plan, timetable, and budget are required. Resettlement plans should be built around a development strategy and package aimed at improving or at least restoring the economic base for those relocated. Experience indicates that cash compensation alone is normally inadequate. Voluntary settlement may form part of a resettlement plan, provided measures to address the special circumstances of involuntary resettlers are included. Preference should be given to land-based resettlement strategies for people dislocated from agricultural settings. If suitable land is unavailable, nonland-based strategies built around opportunities for employment or self-employment may be used.

Plan Content

5. The content and level of detail of resettlement plans, which will vary with circumstances, especially the magnitude of resettlement, should normally include a statement of objectives and policies, an executive summary, and provision for the following:
(a) organizational responsibilities (para. 6);
(b) community participation and integration with host populations (paras. 7-10);
(c) socioeconomic survey (para. 11);
(d) legal framework (para. 12);
(e) alternative sites and selection (para. 13);
(f) valuation of and compensation for lost assets (paras. 14-16);
(g) land tenure, acquisition, and transfer (para. 17);
(h) access to training, employment, and credit (para. 18);
(i) shelter, infrastructure, and social services (para. 19);
(j) environmental protection and management (para. 20); and
(k) implementation schedule, monitoring, and evaluation (paras. 21-22).

Cost estimates should be prepared for these activities, and they should be budgeted and scheduled in coordination with the physical works of the main investment project.

Organizational Responsibilities

6. The responsibility for resettlement rests with the borrower. The organizational framework for managing resettlement must be developed during preparation and adequate resources

provided to the responsible institutions. The organization responsible for resettlement should be strengthened when entities executing infrastructure or other sector- specific projects lack the experience and outlook needed to design and implement resettlement. One alternative is to create a special resettlement unit within the project entity: this can facilitate the involvement of other line agencies. Another alternative is to entrust resettlement to the regional or town administration that knows the population and area, can mobilize local expertise, speaks the resettlers' language, and will ultimately be responsible for the integration of resettlers into the host population and area. There also may be considerable scope for involving nongovernmental organizations (NGOs) in planning, implementing, and monitoring resettlement.9

Community Participation and Integration with Host Population

7. Most displaced people prefer to move as part of a preexisting community, neighborhood, or kinship group. The acceptability of a resettlement plan can be increased and the disruption caused by resettlement can be cushioned by moving people in groups, reducing dispersion, sustaining existing patterns of group organization, and retaining access to cultural property10 (temples, pilgrimage centers, etc.), if necessary, through the relocation of the property.

8. The involvement of involuntary resettlers and hosts in planning prior to the move is critical. Initial resistance to the idea of involuntary resettlement is to be expected. To obtain cooperation, participation, and feedback, the affected hosts and resettlers need to be systematically informed and consulted during preparation of the resettlement plan about their options and rights. They should also be able to choose from a number of acceptable resettlement alternatives. These steps can be taken directly or through formal and informal leaders and representatives. Experience has shown that local NGOs can often provide valuable assistance and ensure viable community participation. Moreover, institutionalized arrangements, such as regular meetings between project officials and communities, should be provided for resettlers and hosts to communicate their concerns about the resettlement program to project staff throughout planning and implementation.11 Particular attention must be given to ensure that vulnerable groups such as indigenous people, ethnic minorities, the landless, and women are represented adequately in such arrangements.

9. The plan should address and mitigate resettlement's impact on host populations. Host communities and local governments should be informed and consulted. Any payment due the hosts for land or other assets provided to resettlers should be promptly rendered. Conflicts between hosts and resettlers may develop as increased demands are placed on land, water, forests, services, etc., or if the resettlers are provided services and housing superior to that of the hosts. Conditions and services in host communities should improve, or at least not deteriorate. Providing improved education, water, health, and production services to both groups fosters a better social climate for their integration. In the long run, the extra investment will help prevent conflicts and secure the project's aims.

10. Successful resettlement requires a timely transfer of responsibility from settlement agencies to the settlers themselves. Otherwise, a dependency relationship may arise, and agency resources may become tied up in a limited number of continually supervised schemes. Local leadership must be encouraged to assume responsibility for environmental management and infrastructure maintenance.

Socioeconomic Survey

11. Resettlement plans should be based on recent information about the scale and impact of resettlement on the displaced population. In addition to describing standard household characteristics, socioeconomic surveys should describe (a) the magnitude of displacement; (b) information on the full resource base of the affected population, including income derived from informal sector and nonfarm activities, and from common property; (c) the extent to which groups will experience total or partial loss of assets; (d) public infrastructure and social services that will be affected; (e) formal and informal institutions (such as community organizations, ritual groups, etc.) that can assist with designing and implementing the resettlement programs; and (f) attitudes on resettlement options. Socioeconomic surveys, recording the names of affected families, should be conducted as early as possible to prevent inflows of population ineligible for compensation.

Legal Framework

12. A clear understanding of the legal issues involved in resettlement is needed to design a feasible resettlement plan. An analysis should be made to determine the nature of the legal framework for the resettlement envisaged, including (a) the scope of the power of eminent domain, the nature of compensation associated with it, both in terms of the valuation methodology and the timing of payment; (b) the legal and administrative procedures applicable, including the appeals process and the normal time-frame for such procedures; (c) land titling and registration procedures; and (d) laws and regulations relating to the agencies responsible for implementing resettlement and those related to land compensation, consolidation, land use, environment, water use, and social welfare.

Alternative Sites and Selection

13. The identification of several possible relocation sites and the demarcation of selected sites is a critical step for both rural and urban resettlement. For land-based resettlement, the new site's productive potential and locational advantages should be at least equivalent to those of the old site. The Bank encourages "land for land" approaches, providing replacement land at least equivalent to the lost land. For rural settlers, irrigation, land reclamation, tree crop development, intensification of production, and other innovations often can provide adequate production potential on limited amounts of land to resettle agriculturalists, even in countries with high population densities. In selecting sites, attention must be paid to the availability of sources of off-farm income (fishing, gathering forest products, seasonal wage employment) to complement farm income. For urban resettlers, the new site should ensure comparable access to employment, infrastructure, services, and production opportunities. For both rural and urban resettlement, the borrower needs to (a) develop institutional and technical arrangements for identifying and preparing relocation sites, e.g., pooling together small plots, wasteland reclamation, land leveling, and terracing; (b) draw up timetables and budgets for site preparation and transfer; (c) make legal arrangements for transferring titles to resettlers; and (d) consider, when necessary, a temporary freeze on land transactions within the relocation area to prevent land speculation. Though the Bank does not normally disburse against land acquisition, it can finance land improvement to accommodate resettlers.

Valuation of and Compensation for Lost Assets

14. Valuation of lost assets should be made at their replacement cost. Compensation is facilitated by (a) paying special attention to the adequacy of the legal arrangements concerning land title, registration, and site occupation; (b) publicizing among people to be displaced the laws and regulations on valuation and compensation; (c) establishing criteria for determining the resettlement eligibility of affected households, e.g., households that have only partially lost their assets but are no longer economically viable should be entitled to full resettlement; and (d) developing mechanisms to prevent illegal encroachers and squatters, including an influx of nonresidents entering to take advantage of such benefits, from participating in the compensation arrangements, by an early recording of the numbers and names of affected populations entitled to compensation/rehabilitation.

15. Some types of loss, such as access to (a) public services; (b) customers and suppliers; and (c) fishing, grazing, or forest areas, cannot easily be evaluated or compensated for in monetary terms. Attempts must therefore be made to establish access to equivalent and culturally acceptable resources and earning opportunities.

16. Vulnerable groups at particular risk are indigenous people, the landless and semilandless, and households headed by females who, though displaced, may not be protected through national land compensation legislation. The resettlement plan must include land allocation or culturally acceptable alternative income-earning strategies to protect the livelihood of these people.

Land Tenure, Acquisition, and Transfer

17. Resettlement plans should review the main land tenure and transfer systems, including common property and nontitle-based usufruct systems governed by locally recognized land allocation mechanisms. The objective is to treat customary and formal rights as equally as possible in devising compensation rules and procedures. The plan should address the issues raised by the different tenure systems found in a project area, including (a) the compensation eligibility of land-dependent populations; (b) the valuation procedures applicable to different tenure types; and (c) the grievance procedures available for disputes over land acquisition. Plans should contain provisions for conducting land surveys and regularizing land tenure in the earliest stages of project development. Planning should also anticipate the approximate time needed to acquire and transfer land.

Access to Training, Employment, and Credit

18. Normally, general economic growth cannot be relied upon to protect the welfare of the project-affected population. Thus, alternative employment strategies are needed for nonagricultural displaced people, or where the land that can be made available is not sufficient to accommodate all the displaced farmers. The resettlement plan should, where feasible, exploit new economic activities made possible by the main investment requiring the displacement. Vocational training, employment counseling, transportation to jobs, employment in the main investment project or in resettlement activities, establishment of industries, incentives for firms to locate in the area, credit and extension for small businesses

or reservoir aquaculture, and preference in public sector employment should all be considered where appropriate.

Shelter, Infrastructure, and Social Services

19. To ensure the economic and social viability of the relocated communities, adequate resources should be allocated to provide shelter, infrastructure (e.g., water supply, feeder roads), and social services (e.g., schools, health care centers).12 Site development, engineering, and architectural designs should be prepared for shelter, infrastructure, and social services. Since community or self-built houses are often better accepted and more tailored to the resettlers' needs than contractor-built housing, provision of a building site with suitable infrastructure, model plans, building materials, technical assistance, and "construction allowances" (for income foregone while resettlers build their houses) is an option communities should be offered. Planning for shelter, infrastructure, and services should take into account population growth.

Environmental Protection and Management

20. The screening process for an environmental assessment (EA) normally classifies projects involving involuntary resettlement as Category A.13 The EA of the main investment requiring the resettlement should thus cover the potential environmental impacts of the resettlement. The resettlement plan must be developed in coordination with the EA and define the boundaries of the relocation area, and calculate incremental population density per land unit. In agricultural projects (involving, for example, relocation to the catchment surrounding a reservoir, or to a downstream command area), if the incoming resettled population is large in relation to the host population, such environmental issues as deforestation, overgrazing, soil erosion, sanitation, and pollution are likely to become serious and plans should either include appropriate mitigating measures, including training of oustees, or else should allow for alternative sites to be selected. Urban resettlement raises other density-related issues (e.g., transportation capacity, access to potable water, sanitation systems, health facilities, etc.). Constructive environmental management, provided through the EA's mitigation plan,14 may provide good opportunities and benefits to resettlers and host populations alike (e.g., project-financed compensatory afforestation not only replaces the forests submerged by reservoirs but also offers gainful employment). If the likely consequences on the environment are unacceptable, alternative and/or additional relocation sites must be found.

Implementation Schedule, Monitoring, and Evaluation

21. The timing of resettlement should be coordinated with the implementation of the main investment component of the project requiring the resettlement. All resettlement plans should include an implementation schedule for each activity covering initial baseline and preparation, actual relocation, and post-relocation economic and social activities. The plan should include a target date when the expected benefits to resettlers and hosts would be achieved.

22. Arrangements for monitoring implementation of resettlement and evaluating its impact should be developed by the borrower during project preparation and used during supervision.15 Monitoring provides both a warning system for project managers and a channel for the resettlers to make known their needs and their reactions to resettlement execution. Monitoring and evaluation units should be adequately funded and staffed by

specialists in resettlement. In-house monitoring by the implementing agency may need to be supplemented by independent monitors to ensure complete and objective information. Annual and midterm reviews are desirable for large-scale resettlement. The borrower should be required to continue impact evaluation for a reasonable period after all resettlement and related development activities have been completed. The borrower should also be required to inform the Bank about the findings.

Bank Role and Project Options

23. The Bank supports borrowers' efforts through (a) assistance in designing and assessing resettlement policy, strategies, laws, regulations, and specific plans; (b) financing technical assistance to strengthen the capacity of agencies responsible for resettlement; and (c) direct financing of the investment costs of resettlement. The Bank may sometimes finance resettlement even though it has not financed the main investment that made displacement and resettlement necessary (para. 26).

24. The task manager (TM) should inform the borrower of the Bank's resettlement policy. Starting early in the project cycle, the TM with the support of Bank operational, research, and legal staff should assess government policies, experiences, institutions, and the legal framework covering resettlement. In particular, the TM needs to ensure that involuntary resettlement is avoided or minimized, that laws and regulations concerning displaced people provide compensation sufficient to replace all lost assets, and that displaced persons are assisted to improve, or at least restore, their former living standards, income earning capacity, and production levels.

25. The adequacy of the resettlement plan should be reviewed by appropriate social, technical, and legal experts. Resettlement specialists should visit the possible resettlement sites and review their suitability. In the case of large-scale relocation, such experts should be included in independent technical or environmental review boards.16

26. Bank financing of resettlement can be provided as follows: (a) As a component of the main investment project causing displacement and requiring resettlement. (b) If large enough, as a free-standing resettlement project with appropriate cross-conditionalities, processed and implemented in parallel with the investment project that causes the displacement. The latter approach may better focus country and Bank attention on the effective resolution of resettlement issues. (c) As a sector investment loan.17 Where the specific resettlement needs of each subproject are not known in advance, the borrower would need to agree to resettlement policies, planning principles, institutional arrangements, and design criteria that meet Bank policy and requirements as a condition of the loan. An estimate should be provided of total population to be displaced and overall resettlement costs, as well as an evaluation of proposed resettlement sites. Subprojects in sector investment loans should be screened by the implementing agency to ensure consistency with this directive, and approved individually by the Bank. For countries with a series of operations requiring resettlement, efforts to improve the policy, institutional, and legal framework for resettlement should form part of the Bank's ongoing country and sector dialogue with the government. These efforts should be appropriately reflected in economic and sector work and in country strategy papers and briefs.

Processing and Documentation

27. The Regional Vice President (RVP) should be kept informed of major resettlement issues, and his guidance sought where necessary. The Regional Environment Division (RED), the Legal Department (LEG), and settlement specialists in Sector Policy and Research (PRS) should be consulted or included as necessary in peer reviews on involuntary resettlement issues throughout the project cycle.

Identification

28. The possibility of involuntary resettlement should be determined as early as possible and described in all project documents. The TM should (a) briefly summarize in the Initial Executive Project Summary (Initial EPS)18 the magnitude, strategy, and timing of the resettlement; (b) inform borrowers of the Bank's resettlement policy; (c) review past borrower experience with similar operations; (d) invite agencies responsible for resettlement to discuss their policies, plans, and institutional, consultative, and legal arrangements for resettlement; and (e) where appropriate, ensure that technical assistance is provided early to borrowers. Such assistance should include the use of project preparation facility (PPF) resources19 for planning resettlement and building institutional capacity.

Preparation

29. During project preparation, the feasibility of resettlement must be established, a strategy agreed upon, the resettlement plan drafted, and budget estimates prepared.20 The full costs of resettlement should be identified and included in the total cost of the main investment project, regardless of financing source. The costs of resettlement should also be treated as a charge against the economic benefits of the investment project that causes the relocation. Any net benefits to resettlers (as compared to the "without project" circumstances) should be added to the benefit stream of the main investment. While the resettlement component or free-standing project need not be economically viable on its own, it should be the least- cost approach consistent with the policies laid out above.

Appraisal and Negotiation

30. Submission to the Bank of a time-bound resettlement plan and budget that conforms to Bank policy is a condition of appraisal for projects involving resettlement, except for sector investment loans as discussed in para. 26. All final EPSs should confirm that this requirement has been met. The appraisal mission should ascertain (a) the extent that involuntary resettlement and human hardship will be minimized and whether borrowers can manage the process; (b) the adequacy of the plan, including the timetable and budget for resettlement and compensation; (c) the soundness of the economic and financial analysis; (d) the availability and adequacy of sites and funding for all resettlement activities; (e) the feasibility of the implementation arrangements; and (f) the extent of involvement of beneficiaries. At negotiations, the borrower and the Bank should agree on the resettlement plan. The resettlement plan and the borrower's obligation to carry it out should be reflected in the legal documents. Other necessary resettlement-related actions must be covenanted. The Staff Appraisal Report and the Memorandum and Recommendation of the President should summarize the plan and state that it meets Bank policy requirements.

Implementation and Supervision

31. Resettlement components should be supervised throughout implementation.21 Supervision that is sporadic or left until late in implementation invariably jeopardizes the success of resettlement. Bank supervision missions should be staffed with the requisite social, economic, and technical expertise. Annual reviews of large-scale resettlement and in-depth Bank reviews of midterm progress are highly desirable. These reviews should be planned from the outset to allow the Bank and the borrower to make necessary adjustments in project implementation. Complete recovery from resettlement can be protracted and can often make it necessary to continue Bank supervision until well after populations have been relocated, sometimes even after a project has been closed.

Ex Post Evaluation

32. The project completion report22 submitted to the Operations Evaluation Department should evaluate resettlement and its impact on the standards of living of the resettlers and the host population.

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1. "Bank" includes IDA, and "loans" includes credits.

2. See also *Involuntary Resettlement in Development Projects,* World Bank Technical Paper No. 80 (Washington, D.C.: The World Bank, 1988).

3. OD 4.00, Annex A, *Environmental Assessment,* para. 18.

4.Such projects may include construction or establishment of (a) dams, (b) new towns or ports, (c) housing and urban infrastructure, (d) mines, (e) large industrial plants, (f) railways or highways, (g) irrigation canals, and (h) national parks or protected areas. Refugees from natural disasters, war, or civil strife are also involuntary resettlers, but they are not discussed in this directive (see OP/ BP/ GP 8.50, *Emergency Recovery Assistance).*

5. OD 4.00, Annex A, *Environmental Assessment,* para. 2, and Annex A3.

6. Host communities are those receiving resettlers.

7. See OD 4.20, *Indigenous Peoples*

8. Where only a few people (e.g., less than 100-200 individuals) are to be relocated, appropriate compensation for assets, logistical support for moving, and a relocation grant may be the only requirements. However, the principles on which compensation is to be based are the same as for larger groups.

9. See OD 14.70, *Involving Nongovernmental Organizations in Bank-Supported Activities.*

10. See OPN 11.03, *Management of Cultural Property in Bank-Financed Projects,* to be reissued as OD 4.50, *Cultural Property.*

11. Disputes of varying kinds may arise in the process of implementation of the agreed resettlement plan. These conflicts could take the form of appeals related to the compensation payable to affected persons, conflicts between the displaced persons and the host population, appeals to the agency charged with the implementation of the resettlement with regard to services promised, etc. It is therefore important to devise schemes for conflict resolution for

all resettlement plans. Such schemes should, as far as possible, take into account existing procedures for settling disputes in the country or area concerned.

12. Health care services, particularly for pregnant women, infants, and the elderly, may be important during and after relocation to prevent increases in morbidity and mortality due to malnutrition, the stress of being uprooted, and the usually increased risk of water-borne diseases.

13. See OD 4.00, Annex A, *Environmental Assessment*, and Annex B, *Environmental Policy for Dam and Reservoir Projects*. The environmental implications of involuntary resettlement will be further discussed under para 6.0, "Special Issues in Environmental Assessment," in *Environmental Assessment Sourcebook*, (Washington, D.C.: The World Bank, to be issued).

14. See Annex A1, para. 2, in OD 4.00, Annex A, *Environmental Assessment.*

15. See OD 10.70, *Project Monitoring and Evaluation.*

16. See OD 4.00, Annex B, *Environmental Policy for Dam and Reservoir Projects.*

17. See OP 1.00, *Bank Lending Instruments*, and OD 8.20, *Sector Investment and Maintenance Loans*, both to be issued.

18. See OP/ BP 10.00, *Investment Lending: Identification to Board Presentation*

19. See OP/ BP 8.10, *Project Preparation Facility.*

20. Detailed guidelines for preparing and appraising resettlement plans are provided in *Involuntary Resettlement in Development Projects*, World Bank Technical Paper No. 80, Annex 1 (Washington, D.C.: The World Bank, 1988). Pro forma cost tables and guidelines for economic and financial analysis are provided in Annex 2.

21. See OD 13.05, *Project Supervision*, particularly paras. 44-47.

22. See OP/ BP/ GP 13.55, *Implementation Completion Reporting.*

APPENDIX 4: GUIDELINES FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF ELECTRIC POWER GENERATION AND TRANSMISSION SYSTEMS IN WEST AFRICA

Annex 2: Scoping Report Review Comment

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Environmental Protection Agency
P. O. Box M 326
Ministries Post Office
Accra, Ghana

Our Ref: CE: 1826/01/02

March 18, 2009

VOLTA RIVER AUTHORITY
Deputy Chief Executive (E&D)
RECEIVED
DATE 23/3/09

DATE 24/3/09

23/3/09

The Chief Executive
Volta River Authority
P. O. Box MB 77
Accra

Dear Sir,

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
PROPOSED BOLGATANGA-OUAGADOUGOU INTERCONNECTION PROJECT

We refer to the scoping report on the above proposal submitted to the Agency, in accordance with the Environmental Assessment Regulations 1999 (LI 1652).

The report has been duly reviewed. The report is found to be satisfactory however, the scoping report seem to have paid very little attention to extensive consultation with communities. This is required under the Ghana EIA procedures and Environmental Assessment Regulations 1999, LI 1652.

This is also essential to identify key issues on the grounds that are relevant to the implementation of the project. It is expected that the EIS study would pay particular attention to this issue.

In line with the Agency's administrative procedures, you are requested to pay a non refundable processing fee of **One Thousand and Fifty Ghana Cedis (GH¢1,050.00)** by bank draft made payable to the Environmental Protection Agency.

You will be required also to pay an Environmental Permit fee if the proposal is approved in accordance with the Environmental Assessment (Amendment) Regulations 2002 (LI 1703).

You are advised to produce the invoice letter (ie. attach invoice letter to bank draft) at the time of payment.

Yours faithfully,

E. Appah-Sampong
Deputy DirectorEAA Dept.
for: Executive Director

DCE(E&D) 23/3

Ag. Dir E&SD 24/3

Mgr Env 23/3

Annex 3: Definition of Environmentally Sensitive Areas under the Environmental Assessment Regulations, 1999, LI 1652

Annex 3: ENVIRONMENTALLY SENSITIVE AREAS

1. Areas declared by law as national parks, watershed reserves and sanctuaries including sacred groves.
2. Habitat of endangered or threatened species of indigenous wildlife (flora and fauna)
3. Potential tourist value.
4. Unique historic, archaeological or scientific interests
5. Indigenous inhabited homelands
6. Areas prone to natural disasters such as floods, rainstorms, earthquakes, landslides, volcanic activity
7. Areas prone to bush fires.
8. Areas classified as prime agricultural lands.
9. Recharge areas of aquifers.
10. Freshwater bodies characterised by one or any combination of the following conditions:
    - Water tapped for domestic purposes
    - Water within the controlled and/or protected areas
    - Water which support wildlife and fishery activities
11. Mangrove areas characterised by one or any combination of the following conditions:
    - Areas near or adjacent to traditional fishing grounds,
    - Areas adjoining mouth of major river system,
    - As natural buffers against soil erosion.
12. Areas with low or poor pH buffering capacities such as granite bedrock'
13. Mining areas and communities.
14. Ramsar sites.
15. Residential areas.

Annex 4: Extract from GHANA EPA'S ENERGY SECTOR-SPECIFIC GUIDELINES FOR EIA (VOLUME 1)

SCREENING GUIDELINES FOR ELECTRICAL POWER PROJECTS
4.1 SCREENING SCHEDULES

The Screening schedules have been grouped into FOUR categories:

Category A: This undertaking or development requires that the proponent fill out Form EA1. It suggests that the undertaking/development is unlikely to have significant[1] negative environmental impacts. No Environmental Impact Assessment (EIA) is required.

Category B: This undertaking or development requires that the proponent carry out a preliminary Environmental Assessment (PEA) after completing Form EA1, as the undertaking/development may have specific negative environmental impacts.

Category C: This undertaking or development requires that the proponent fill out Form EA2. It suggests that the undertaking/development is likely to have diverse and significant negative environmental impacts and for that matter EIA is mandatory.

Category D: Strategic Environmental Assessment (SEA). This is environmental assessment process applied to national policies, plans and programmes by providing a framework within which some important matters such as cumulative effects, greenhouse policies, conservation of resources and issue of sustainability are at least partially taken into account. SEA is a two-stage EIA; the first is the over all environmental impact on the country whilst the second is a site-specific enquiry.

For grey areas, i.e. if one is unsure of a category or schedule of an undertaking after the initial registration, the following procedure is pursued:

i. Examine features of Undertaking regarding
   - Technology
   - Raw material type, quantities and sources
   - Size, scale and output
   - Waste type and characteristics.

ii. Examine location/site characteristics regarding
   - Site and neighbourhood survey
   - Land use, cover type and zoning
   - Resource in the area and uses
   - Infrastructure and utilities.

iii. Examine location and undertaking interaction regarding
   - Health and safety
   - Job creation and displacement
   - Concerns of residence at or near the proposed site and the general public.

[1] The concept of 'significance' is subjective since it has not been defined by any international forum or grouping. To arrive at a fair assessment, it is up to the proponent to provide as much information as possible based upon the EIA checklist and guidelines. Significance is thus in the end, a collective professional judgement of the experienced vetting committee based upon the information made available.

CATEGORY A: ONLY REGISTRATION REQUIRED

4.1.1 RENEWABLE ENERGY TECHNOLOGIES

Wind power plants

- Wind farm equal or exceeding one (1) hectare but below 10 hectares.
    - Wind mast height between 10 metres and 20 metres inclusive, either for mounting of generator or measuring/recording sensors.
- Wind generator system of installed capacity equal or exceeding 500 kilowatt peak (kWp) either single or cumulative (farm) but less than 1000 kWp.

Solar thermal power plants

- Total solar collecting surface area exceeding one (1) hectare but less than 10 hectares. Either flat-plate, concentrators (parabolic trough, dish or mirrors), or chimney to generate process heat for drying (for instance crops) or transformation for electricity.
- Solar Water Heating system with total installed capacity equal or exceeding 1000 litres of hot water generation in a single facility such as hotel, school, a health centre and capable of substituting for electric heating system.

Micro - to Mini- Hydro power plants

- Construction of all Run-of-river micro- and pico- hydroelectric power plants.
- Construction of Run-of-river low-head mini-hydro electric plants without pondage or impoundment with installed capacity not exceeding 500 kWp.

Solar Photovoltaic

- Central Solar Photovoltaic (PV) power plant/system equal or exceeding 10 kilowatt peak (kWp) but less than 500 kWp, either rooftop or ground mounted. Either stand-alone, hybrid or grid-tied.
- Ground mounted PV power plant/system exceeding one (1) hectare but below 10 hectares, either stand-alone, hybrid or grid-tied.
- All distributed off-grid solar PV units popularly called solar home systems and of total capacity equal or more than 10 kWp within a radius of one kilometre (1 km).

Fuel Cell

- All industrial central fuel cell power plants of total installed capacity equal or exceeding 50 kVA but less than 100 kVA.
- All distributed fuel cell power units of total installed capacity equal or exceeding 50 kVA but less than 100 kVA and within a radius of 1 km.

Biomass

All energy crop or forest plantations exceeding 10 hectares but less than 20 hectares.

4.1.2 FOSSIL FUELS THERMAL PLANTS

- Oil-fired (distillate oil) electric power plant with installed capacity equal or exceeding 500 kVA but less than 1000 kVA.
- LPG-fired electric power plant with installed capacity equal or exceeding 100 kVA but less than 500 kVA.
- Co-generation or Combined Heat and Power (CHP) plant with installed capacity equal or exceeding 500 kVA but less than 1000 kVA.

4.1.3 TRANSMISSION LINES AND DISTRIBUTION SYSTEMS

- Medium voltage lines between 11 kilovolt (kV) and 33 kV inclusive. The right of way should include all area lying at least 10 metres on either side of the centre line of the power lines.
- All commercial dealers, importers and manufacturers of heavy-duty electrical distribution equipment and accessories, namely transformers (25 kVA and above), insulators, contactors, circuit breakers, etc.

4.1.4 DEMAND SIDE MANAGEMENT

All commercial importers of electrical appliances, comprising refrigerators and freezers, laundry washing and drying machines, electric cookers, water heaters, electric irons, lighting systems, etc.

All commercial importers, manufacturers' representatives of industrial plant and equipment such as electric motors, or equipment that are fitted with electric motor, electric heater, magnetizing devices, electric furnaces and kilns, electric boilers.

CATEGORY BPEA REQUIRED

4.1.5 RENEWABLE ENERGY TECHNOLOGIES

Wind power plants

Wind farm between 10 and 20 hectares inclusive[2].

Wind mast exceeding 20 metre[3] height.

- Wind generator system of installed capacity between one (1) and 15 MW(e) inclusive.

Solar thermal power plants

- Total solar collecting surface area between 10 and 20 hectares inclusive. Either flat-plate, concentrators (parabolic trough, dish or mirrors), or chimney to generate process heat for drying (for instance crops) or transformation for electricity.
- Solar thermal power system, either concentrator or chimney with installed capacity between one (1) and 15 MW inclusive.

Micro - to Small- Hydro power plants

- Construction of all pondage, storage and pumped storage, cascade pico-, micro- and mini- hydroelectric power plants with capacities below 1 MW peak.
- Construction of Run-of–river, low- to medium-head small hydroelectric plant with or without pondage, with or without cascade, with installed capacity between 500 kW (0.5 MW) and 15,000 kW (15 MW) inclusive.

Solar Photovoltaic

- Ground mounted PV power plant/system, either stand-alone, hybrid or grid-tied with total surface area of array exceeding 10 hectares but below 20 hectares.
- Installation of central PV power system with installed capacity above 500 kWp.

Fuel cell

- All industrial central fuel cell power plants of total installed capacity equal or exceeding 100 kVA and where the hydrogen fuel is obtained from fossil fuel sources like coal, natural gas and petroleum products.

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[2] The Mining sector and the Forest & Wood Industries sector require EIS if the area to be worked on exceeds 10 and 20 hectares respectively.

[3] Department of Town and Country Planning requires EIS for structures of height 20 metres or more.

- All distributed fuel cell power units of total installed capacity equal or exceeding 100 kVA within 100 metre radius and where the hydrogen fuel is obtained from fossil fuel sources like natural gas and petroleum products.

Biomass and Waste Power

- Wood or sawdust fired electric power plants equal or exceeding 500 kVA but less than 15 MVA.
- Biogas fired electric power plants equal or exceeding 10 kVA but less than 100 kVA.
- Construction of all wastes (excluding old vehicular tyres[4]) fired incinerators and power plants, either wood, municipal/urban solid or liquid waste with installed capacity not exceeding one (1) MW.
- All landfill power plants between 100 kVA and one (1) MVA inclusive.
- All energy crop plantations exceeding 20 hectares.

Sea and other Water Power[5]

Wave, Tidal and Ocean Thermal Energy Conversion (OTEC).
Energy from Salinity Gradients otherwise referred to as Solar Pond.

4.1.6 FOSSIL FUELS THERMAL PLANTS

- All coal -, coke- fired power plants with installed capacity equal or exceeding 100 kVA but less than 1000 kVA.
- Distributed or array of coal, or coke or both fired power plants within 100 metre radius with total installed capacity equal or exceeding 100 kVA but less than 1000 kVA.
- Oil-fired (crude oil, diesel, fuel oil, etc) electric power plant with installed capacity between one (1) and 15 MVA inclusive.
- Distributed or array of oil-fired power plants within 100 metre radius with total installed capacity equal or exceeding one (1) MVA but less than 15 MVA.
- Combined Heat and Power (CHP) plant with minimum electrical output equal or exceeding one (1) MW but less than 15 MVA.
- Liquefied Petroleum Gas (LPG) fired electric power plant with installed capacity equal or exceeding 100 kVA but less than 500 kVA.
- Distributed or array of LPG power plants within 100 metre radius with total installed capacity equal or exceeding 200 kVA but less than 500 kVA.
- Natural gas fired electric power plant with installed capacity equal or exceeding 50 kVA but less than 500 kVA.
- Distributed or array of natural gas power plants within 100 metre radius with total installed capacity equal or exceeding 100 kVA but less than 500 kVA.

4.1.7 TRANSMISSION LINES AND DISTRIBUTION SYSTEM

- Medium to High voltage lines above 33 kV but below 66 kV, either underground or overhead. For overhead lines, the right of way should include all areas lying at least 15 metres but not exceeding 60 metres wide on either side of the centre line of the power lines.
- Decommissioning of old transformers with specific reference to handling of polychlorinated bi-phenyl (PCB) additives in transformer oil.[6]

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[4] See Section 3.3.1.4

[5] Even though, the potential resource of the country is not known, large-scale power stations have started to emerge elsewhere in the world since mid 1990s. *Mandatory EIA is required should there be a commercial development in the nearest future.*

- Storage, recycling and disposal of transformer oils.
- Storage and disposal of chemically treated wooden poles with specific reference to the use of Copper Chrome Arsenic (CCA).

4.1.8 DEMAND SIDE MANAGEMENT

- All industrial, commercial and building facilities whose peak power demand exceed 150 kVA.

CATEGORY C EIA IS MANDATORY

4.1.9 RENEWABLE ENERGY TECHNOLOGIES

Wind
- All off- shore installations for wind power or farm.
- All wind farms exceeding 20 hectares.
- Wind farm exceeding a total installed capacity of 15 MW(e).

Solar thermal power plants
- Solar thermal plants of installed capacity exceeding 15 MW(e).
- Solar thermal plants of land size exceeding 20 hectares.

Solar Photovoltaic
- Ground mounted PV power plant/system, either stand-alone, hybrid or grid-tied with total surface area of array exceeding 20 hectares.

Biomass and Wastes[7]
- Wood or sawdust fired electric power plants exceeding 15 MW(e).
- Biogas fired electric power plants exceeding 100 kVA.
- Construction of all waste fired incinerators and power plants, either municipal/urban solid or liquid waste with installed capacity exceeding 1 MW(e).
- Construction of all anaerobic waste power plants, either bacteria induced or enhanced, exceeding 1 MW(e).
- Construction of waste fired power plants using old vehicular tyres as feedstock with installed capacity exceeding 500 kVA.
- Construction of landfill plants exceeding 1 MW(e).
- Construction of peat-fired generating plants exceeding 1 MW(e). Such plants must have a form of cleaning (scrubbing) technology.

4.1.10 HYDRO POWER PLANTS (Mainly Small to Large)

- Construction of pondage, storage and pumped storage, diversion canal small-hydroelectric power plants with installed capacity exceeding 1 MW.
- Construction of medium to large hydro dams of installed capacity exceeding 15 MW.

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[6] [6] PCB even though, useful fire-retardant additive is a persistent organic pollutant (POP). Ghana is a signatory to the Stockholm Convention on POPs, a UNEP convention banning or restricting worldwide use of POPs (May 21 – 23, 2001). UNEP is United Nations Environment Program.

[7] All wastes plants must employ a form of cleaning (scrubbing) technology with emphasis on reducing emissions of oxides of nitrogen and sulphur, carbon monoxides, dioxins and other potential carcinogenic substances to acceptable minimal levels (Refer to Appendix...)

4.1.11 FOSSIL FUELS[8]

- All direct and indirect coal based power plants, including coal solid; gasification and liquefaction generation plants. Also, lignite power plants, Coal power plants (CPP) with clean technology, Coal fired plants with carbon dioxide removal and disposal, all pulverized coal power plant, Coal integrated gasification (IGCC) Combined cycle, with installed capacity equal or exceeding one (1) MVA.
- All coke fired power plants with installed capacity equal or exceeding one (1) MVA.
- All oil fired power plants with installed capacity equal or exceeding 15 MVA.
- Distributed or array of oil-fired power plants within 100 metre radius with total installed capacity equal or exceeding 15 MVA.
- All natural gas fired gas turbine power plants with installed capacity exceeding 500 kVA.
- Combined Heat and Power (CHP) plant with minimum electrical output equal or exceeding 15 MVA.
- Liquefied Petroleum Gas (LPG) fired electric power plant with installed capacity equal or exceeding 500 kVA.
- Distributed or array of LPG power plants within 100 metre radius with total installed capacity equal or exceeding 500 kVA.
- Natural gas fired electric power plant with installed capacity equal or exceeding 500 kVA.
- Distributed or array of natural gas power plants within 100 metre radius with total installed capacity equal or exceeding 500 kVA.

4.1.12 NUCLEAR

- Construction of all nuclear fuelled power plants.
- Construction and upgrading of research reactors of power rating exceeding 500 kW(e)[9].

4.1.13 TRANSMISSION LINES

- High voltage transmission lines, either HVDC (High Voltage Direct Current) or HVAC (High Voltage Alternating Current), overhead or underground, equal or exceeding 66 kV. For overhead lines, the right-of-way should not exceed a total width of 120 metres.

CATEGORY D STRATEGIC EA REQUIRED

Potential programmes and policies for assessment include:

- National Electrification Programme
- Self-Help Electrification Programme
- National grid extension network
- National Biomass Programme
- National Photovoltaic Programme
- Promotion of energy savings or energy efficiency/conservation in Industries, Public Buildings, Schools, etc. programmes.

[8] All fossil fuel based plants must have a form of cleaning (scrubbing) technology to reduce emissions of nitrogen, sulphur, carbon to acceptable levels.

[9] In order not to inhibit the research drive and capacity of Ghana Atomic Energy Commission, reactors of power rating below 500 kWp are being left in their discretion.

Annex 5: Summary of Property Impact Report

VALUATION REPORT ON PROPERTIES SITUATE WITHIN THE RIGHT OF WAY OF BOLGATANAGA – OUAGADOUGA ELECTRICITY POWER PROJECT, THE GHANA SECTION - UPPER EAST REGION

REQUESTED BY
THE ADMINISTRATOR,
CABINET D'INGÉNIERIE ET DE RECHERCHE APPLIQUÉE (CabIRA)
AVENUE HOUDAILLE – IMMEUBLE
EQUIP-HOUDAILLE 1 ÉTAGE
ABIDJAN – PLATEAU,
COTE D'IVOIRE

PREPARED BY:

Charles Agana
B.Sc Land Economy, MGHIS

CERTIFIED BY:

Edmund Bertino Baabereyir
B.Sc Land Economy, MGHIS

March, 2009

The Administrator,
CabIRA
Abidjan- Plateau
Ivory Coast

Dear Sir,

VALUATION REPORT ON PROPERTIES SITUATE WITHIN THE RIGHT OF WAY OF BOLGATANGA – OUAGADOUGU ELECTRICITY POWER PROJECT, THE GHANA SECTION - UPPER EAST REGION

Pursuant to your request for valuation of the houses and crops situate within the right of way of the above-named project, I submit herewith the report on the exercise to you.

We are pleased to inform you that the appraisal was carefully conducted with adequate consideration of all the relevant factors that commensurate with value in the Ghanaian Open Market. The values arrived at for the properties and the crops as indicated below, is therefore based on our critical survey preceding this write up.

It is our carefully considered professional opinion that the Open Market Value of the subject properties is in the sum of **Eight Hundred and Twenty Six Thousand, Two Hundred and Forty Three Ghana Cedis, Eighty Pesewas (GH¢826,243.80), that is, Eight Hundred and Fifteen Thousand, Eight Hundred and Thirty Ghana cedis (GH¢815,830.00) for the houses and Ten Thousand, Four Hundred and Thirteen Ghana Cedis, Eighty Pesewas (GH¢ 10,413.80)** for the economic trees as at 20th March, 2009

Prepared By.

Charles Agana
B.Sc Land Economy, MGHIS

Certified By.

Edmund Bertino Baabereyir
B.Sc Land Economy. MGHIS

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Annex 6: Record of Consultations

Records of Consultations

Bolgatanga Municipality

Sokabisi Community

Attendance

1. Akake Patrick - Elder
2. Abuwi Adaliba - Elder
3. Apam Aduko - Elder
4. Akuliba Atrira - Elder
5. Ayiruo Abrika - Elder
6. Awosi Charles - Elder
7. David Asaaya - Elder
8. Asabila Atuigu - Elder
9. Atikriro Adongo -Tindana
10. Akologo Alomi - Elder
11. Atwugu Atrobila - Comm. member
12. Atanga Ayarima - Comm. member
13. Peter A. Aluriba - Comm. member
14. Anaba Abagana - Comm. member
15. Adakuwa A. - Comm. member
16. Apana Anoga - Comm. member
17. Ayara Akagrai - Comm. member
18. Adobira Agabila - Comm. member
19. Ayraba Abriro – Comm. member

Group photograph of Sokabisi community members

In discussion with community members

Contact Persons

1. Patrick Akake (Cell phone # 0209328454)
2. Zorbisi Tindana

Concerns Raised

1. Would compensation be paid for an individual's private plot?
   Response: *Compensation would be paid for every property be it crop, economic tree, land and houses affected by the construction of the line.*

2. On what basis would compensation for crops be made?
   Response: *Compensation would be based on cropped area and prevailing market value of crop.*

3. Where would people who receive compensation for their houses be located? What time would be given them to move?
   Response: *Those whose houses are to be demolished would be paid compensation for both land and the house and given time to reconstruct their homes and relocate for the old one to be demolished.*

4. In a case where one has given land to a person as a gift and the person is being compensated would the original owner be considered?

Response: *NO, the compensation would be paid to only one person and that person whose property has been affected directly. Even in the case of a house with many households the payment would be made to the heads of the households and not every member of a household.*

5. Would those with multiple plots that are affected be also considered for each of the plot?

   Response: *Any property affected would be paid for, so if you have more than one affected property they will all be valued separately and paid for.*

Zorbisi community

Attendance

1. Avole Adoganga - Tindana
2. Ayine Akugira - Comm. Member
3. Apana Ayambila - Comm. Member
4. Ayamga Apenri - Elder
5. Atobira Anaguroi - Elder
6. Asanbana Aduko - Elder
7. Ayamga Akologo - Elder
8. Atiriga Avisiya - Elder
9. Abobiya Aduko - Elder
10. Abrira Akabib - Comm. Member
11. Babila Aba - Comm. member
12. Abrigubilla Nsoh - Comm. member
13. Baba Abiraya - Comm. member
14. Adokogo Ayenogo - Comm. member
15. Ananzo Aputi -Comm. member
16. Adobili David -Comm. member
17. Aba Aniya - Comm. member
18. Abagena Anataga -Comm. member
19. Adongo Asakubokere- Comm. member
20. Akasoba Abane - Comm. member
21. Abaa Atanga - Comm. member
22. Azaria Ayinlabina- Comm. member
23. Akolgo Adongo - Comm. member
24. Nbale Akuvni - Comm. member
25. Apikiya Atindana - Comm. member
26. Adongo Nsoh - Comm. member
27. Azena Akolgo - Comm. member
28. Aniniah Ndaale - Comm. member
29. Johnson Avol

Group picture of Zorbisi community members

Contact Persons

1. Johnson Avole (Cell Phone# 0203141515)
2. Avole Adoganga - Tindana
3. Baba Ayebillah - (Cell phone # 024 6156804)

Concerns Raised

1. Community complained that in previous construction activities by the VRA, a lot of parcels of land have been taken. Conflicts have arisen between the VRA and the community concerning acquisition of land for the Sub-station under the erstwhile ECG. They therefore asked that the matter of payment for compensation be treated as urgent and crucial.
2. Also the community raised the issue of land scarcity for even farming and settlement. They claimed that if even compensation is pad to affected households they may still not have any land in the community and would have to relocate to elsewhere. This

affects the cohesion of their community as the whole community has been relocated in the past because of government programmes.

3. Furthermore the community complained on why they were not informed and involved when the consultants were placing the survey pillars for the line route. They stressed that those who did the work were foreigners who could not speak any local language and address their concerns.
4. Lastly, they raised the issue of employment of labourers from the community. They asked that the contractor dong the work must engage the services of some local people who would also liaise with community on mutual concerns for both parties.

The issues raised above were thoroughly discussed and they were assured that all their grievances would be addressed where they are possible. The VRA member on the team; Mr. Ben A. Sackey apologised for the past activities of the authority which has brought about some disaffection to them. He stressed that the consultation was an attempt to forestall such occurrences in the future.

Yikene Community

Attendance

1. Akayire Francis
2. Ayinebila Ayine
3. Nsoh Awila
4. Adongo Asaara
5. Abongo Evans
6. Issa Anigizora
7. Ayamga Baba
8. Ayambila Atidana
9. Apuko Ayaymo
10. Ronald Azure
11. David Aidoo
12. Adongo Ayane
15. Awafo Azure
16. Abana Atuila
17. David Akubira
18. Atawo Ayinamariba
19. Anabila Aguriba (Leader)
20. Apanga Alobila
21. Akolgo Aguiu
22. Atanbira Akiwo
23. Ayine Aperika
24. Nsobila Akologo
25. Akolibira Aboyine
26. Bukire Aduko

13. Abuwah Atubiga
14. Ayine Ayirira
29. Akolgo Atabuniyi
30. Atiya Anaba
31. Ataribo Azare
27. Abigibila Akolgo
28. Baba Afiyiba
32. Baba Akurigu
33. Ayinbira Abotineriba

** The Chief of the community was not available

Group picture with community members at Yikene

Community discussions at Yikene

Contact Persons

1. Michael Adoor (Cell Phone # 0242950664)
2. Asoka Mustapha (Cell Phone # 0248275166)

Concerns Raised

1. Why there is no electricity in parts of the community yet VRA is exporting power to Burkina Faso?

   It was explained that this is an external project and that the 265KV power cannot be used in the community. The VRA team member however greed to contact the regional VRA offices for clarification on the matter and asked the assemblyman for the area to contact the district assembly on the issue.
2. How are plots that have been affected to be compensated for?
3. Road construction made along the existing line and no compensation Paid?
4. How plots that are within the RoW but are not registered going to be treated?

5. Construction of these high tension lies makes adjacent parcels of line less expensive
6. The 40 metre Right of Way(RoW) must be marked to avoid any boundary problems

Anateem Community

Attendance

1. Peter Abenyuure
2. Apusaba Norbert
3. John Asaah
4. Akampirike Aseke
5. Ben Amole
6. Anaba Michael
7. Aferigo Jonathan
8. Amole Desmond
9. Richmond Ayenga
10. Amos Akaalima
11. Asaah Animieya
12. Gilbert Apena
13. Apasore Amoleka
14. Raymond Ayelah
15. Ayoka Animieya
16. Stephen Amaya
17. Akamole Apellekiba
18. Asake Anthony
19. Isaiah Anaba
20. Alageyuure Asaah
21. Aloweni Abayase
22. Azure Amagsiya
23. Asesiya Adula
24. Amasa Adongo

Group picture of participants in the Anateem community forum

Contact Persons

1. John Asaah (Cell # 0246259154)
2. Abingyuure Peter (Cell # 0542568973)

Concerns Raised

1. The community wanted to know whether the transmission would benefit them. They bemoaned the fact that while they are not connected to the national grid, yet power was being exported to Burkina Faso.
2. They also wanted to know as to the basis for payment of compensation to affected households? Would the money be paid to the head of the house or the individual household heads? They expressed their opinion that individual households must be captured and compensation paid and not only the house head.

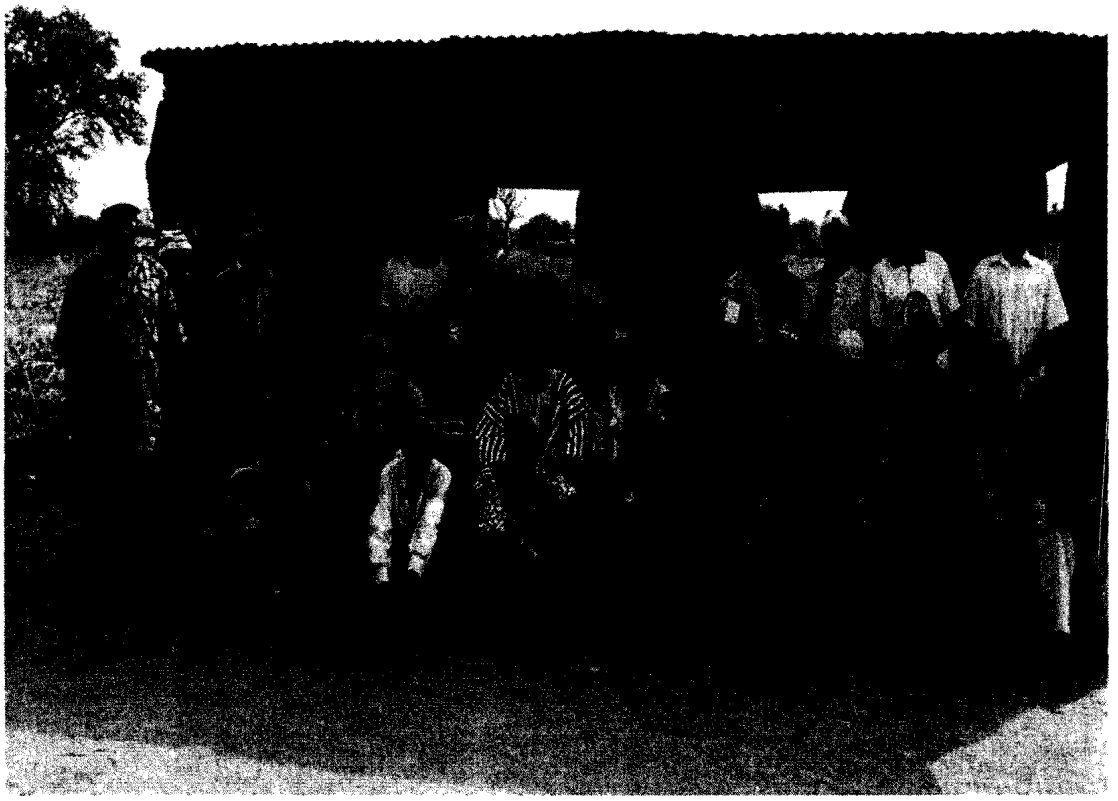
Sumbrungu Community

Attendance

1. Aboudaa Charles
2. AdongoAdezama
3. Anaba Kolga
4. Adongo Azoko
5. Atugyire Abagna
6. Atubika Aloore
7. Ayuure Ali-ine
8. Atanga Edward
9. Mathew Aniah
10. Amanjara Akolgo
11. Atua Akasoba
12. Desmond Aboyinga
13. Atingane Akunpule
14. Samuel Anofie
15. John Alungya
16. Nbona Akunaba
17. Azagpusum Anama
18. Atigyelsum Anama
19. Kwesi Anonteem
20. Anondeera Adongo
21. Nyaaba Akunpuldongo
22. Ameriba Peter
23. Naba Clement Aberise
24. Asackiya Aberise
25. Asiraboya Apusaama
26. Pastor Paul Atule
27. Amalba David

Contact Persons

1. Desmond Aboyaga (Cell # 0246771396)
2. Adongo Adesana



Group picture with Sumbrungu community

Concerns Raised

1. When is actual construction going to be paid?
2. There are houses in the right of way (RoW) but whose occupants have deserted them and gone to Kumasi but would be back one day. Those houses must be compensated for although nobody lives there now.
3. There is a shrine which is a baobab tree called Asakuutoah within the RoW, also they have the following shrines in some houses;
    - Abutoah shrine in Adongo Azuko House
    - Asegdamma shrine
    - Family cemetery outside the RoW but close to it.

KASSENA-NANKANA EAST DISTRICT

In the above district, the team met the Deputy District Coordinating Director, Ben Awine (Cell phone # 0242569607). He was briefed about the project and was glad the consultation would involve the communities affected. He asked that the issue about compensation be handled with care to avoid any confrontations that may slow down progress of work.

Consultation with Kassena-Nankana East Deputy District Coordinating Director

Pungu and Pinyoro Communities

Pinyoro is a new section of Pungu comprising a cluster of new houses. Consultations with the two communities were therefore held together and are presented here as such.

Attendance

1. Lalepayire Kwotega
2. Paul Piodam Akwotigah
3. Ategirebuga Alara
4. Kwame Adongo
5. Achagebatam Yaredaga
6. Kaba Damwadaam
7. Bamlaa Biatio
8. Atero Tagadia
9. Kujam Awedaga
10. Amomang Agenai
11. Akwodare Akita
12. Achana Ajongba
13. Edward Bugase
14. David Kwotega

Participants at the stakeholder forum in Pungu

Contact Persons

1. Welepayire Kwotega (Cell phone # 054 1484038)
2. Atigbuna Abalari (Cell phone # 024 7805950)

Concerns Raised

1. They said that t here is land scarcity in the community and affected persons must be adequately compensated
2. Also, they argued that compensation should be given for family gods in people's homes. This is because moving those things to a new location involve some rituals and pacification which comes at a cost. Secondly there is the god of the community (Senya-Tengana) which is in the area and although his shrine is outside the Right of way must be pacified.
3. During the discussion, it was evident that the surveying team of the consultants had begun their work without the appropriate community entry. This had created some disaffection towards the team which was worsened by their inability to communicate any local language. The community asked that at every stage of the work they should be properly notified to avoid any confrontation.

Contact Persons

3. Welepayire Kwotega (Cell phone # 054 1484038)
4. Atigbuna Abalari (Cell phone # 024 7805950)

Concerns Raised

1. They said that t here is land scarcity in the community and affected persons must be adequately compensated
2. Also, they argued that compensation should be given for family gods in people's homes. This is because moving those things to a new location involve some rituals and pacification which comes at a cost. Secondly there is the god of the community (Senya-Tengana) which is in the area and although his shrine is outside the Right of way must be pacified.
3. During the discussion, it was evident that the surveying team of the consultants had begun their work without the appropriate community entry. This had created some disaffection towards the team which was worsened by their inability to communicate

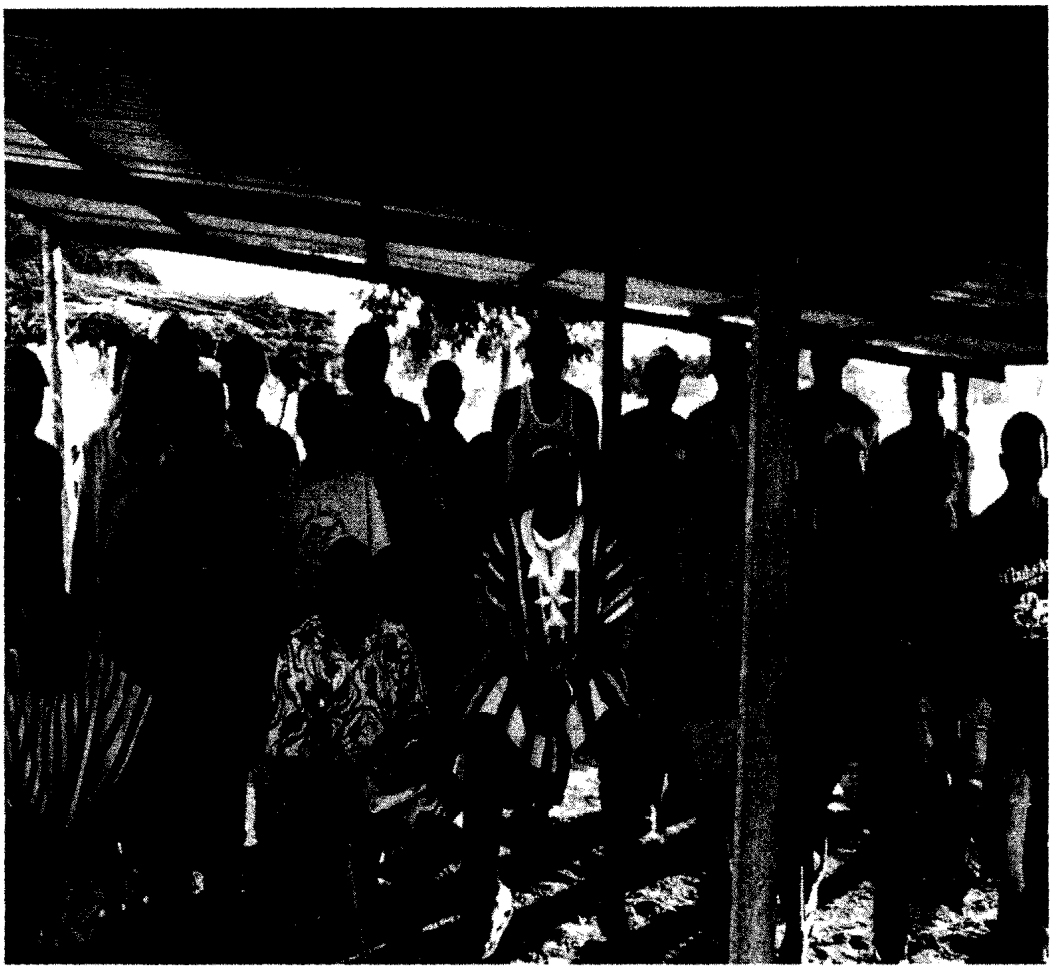
any local language. The community asked that at every stage of the work they should be properly notified to avoid any confrontation.

Doba Community

The meeting took place at the Chief's palace and had representation with all segments of the population including the affected persons whose properties would be affected. Prominent among issues raised were o compensation for properties and pacification for shrines and cemetery's affected

Attendance

1. Aloa Anontara
2. Ajorie Ajeraba
3. Apabe Alou
4. Akamlobe Asekidia
5. Kwaku Adaloa
6. James Apare
7. Atogamgura Akomaya
8. Adagewine Afaabo
9. Bamabag Achana
10. Albert Agamu
11. Maaua Abazagre
12. Kubapere Wejeung
13. Awiah Wejeung
14. Moses Akelezea
15. Ajorie Atia
16. Alroyom Agouraka
17. Ajabesine Abanni
18. Agoaka Atinjoa
19. Nchor Anompoe
20. Adoko kabore
21. Apaleya Akakore
22. Akanmise Ajembisera
23. Asilba Anopoe



Participants at the stakeholder forum in Doba

Contact Persons

1. Albert Agamu (Cell phone # 054 2990674)
2. Hon. Eugene Afodeo, Assemblyman (Cell phone # 0249033573)

Concerns Raised

1. There was no consultation prior to the placement of the survey pillars, this coupled by the inability of the surveyor to speak English and any local language created tension within the community.
2. The Tindana (Priest of the Land: Aloua Anontara) complained that his sacred grove which is the abode of his gods is affected by the project since he has seen some pillars on his plot. He also indicated that his entire house is affected by the project.

This information is confirmed by the team leader of the property valuation team (Charles).

3. Some of the people complained that they have their family gods in their households and compensation has to be paid for the land o which the house sits, the house itself and the movement of the gods. These complainants are; Albert Agamu (# 0542990674),and Apalbem Aloor
4. Other questions asked was as to whether compensation would be paid to all the economic trees found within the RoW and uncompleted houses which are continued with construction after the valuation.

The questions were addressed and both parties were satisfied with the deliberations. They agreed not to continue with construction after the valuation since the house would be destroyed anyway when construction begins. Also compensation package would be paid according to estimates made by the values estimated by the consultants and not individual assessment.

Nayagnia Community

Attendance

1. Wewona Banchogo
2. Apugeba Addi
3. Daniel Pwamang
4. Charles Agedum
5. Olivia Karewe
6. Azupwah Francis Hon.
7. Andrew Pwamang (Chief)
8. Senam Abem
9. Tampuri Anegwena
10. Mame Vitus
11. Kwotua Lugu Chira
12. Peter Kwogena Tooda
13. Lugutoa Chiragie
14. Awosege Abem
15. George Lomitera
16. Aditorem Abajam
17. Bengwoah Kwotu
18. Deda Kwogena
19. Asuti Zangwe
20. Kunewo Abem
21. Akanuti Ayirewura

Participants at the stakeholder forum in Nayagnia

Contact Persons

1. Andrew Pwamang (Cell# 024 2212394)
2. Hon. Azupwah Francis (Cell # 024 2863936)

Concerns Raised

1. Would an affected house be compensated for together with the land?
2. Why would VRA not construct a house for affected people before project commences?
3. There is a shrine in the area (Tawtiga shrine) and some pacification rites must be performed before work commences.

Nyangua Community

Attendance

1. Caesar Ayirike
2. Awosage Alorekwgu
3. Akamapaba Aneworie
7. Apuri Kwotega

4. Katageyire Ayedang
5. Robert Akeyadam
6. Awiah Kuloebugu
8. Wemowolore Alugukale
9. Wedam Azuuogo
10. Bagadewo Alagukade

Participants at the stakeholder forum in Nyangua

Contact Persons

1. Robert Akeyalem (Cell # 0248 994219)
2. Wemowolore Aluguiale (Cell # 0248 990506)
3. Madewe Awieyam (Assemblyman)

Concerns Raised

1. Community member raised the issue of compensation for his house and the plot on which the house sits and the shrine in his house.

2. Another member said that the surveying team of the consultants entered the community without any information for the community and started cutting down trees. This led to some confrontation. They asked why there was no initial consultation of the community before the work begun.
3. Another issue was how compensation would be done for economic trees? To this it was explained that the expected life (years) would be multiplied the value obtained per tree.
4. Also some affected members complained that if even compensation is paid it would still be difficult to obtain land since landlords would be interested in their money.
5. The last issue raised was whether a person whose uncompleted house if affected can go ahead and complete the project. To this some community members answered in the negative because that house would be pulled down eventually. Again compensation would be paid for only the state at which the evaluation of property was done.

KASSENA-NANKANA WEST DISTRICT

Paga-Zenga Community

Attendance

1. Peter King Aloah
2. Asalora Asayire
3. Apuri bampare
4. Kwara Addi
5. Karim Adzua
6. Kojo Adzua
7. Adjediwe Samivoye
8. Nabaare Kiyori
9. Kojo Abazang
10. Jiralogo Yikimpa
11. Baclizizo Dimata
12. Haruna Atatia
13. Mahamadu Tanje
14. Kwabena Kuyunri
15. Adama Amadu
16. Kubomchoga Kuse
17. Nabari Kujori
18. Charles Atelua
19. Sgewura Ayisolah
20. Tanimu Yahaya
21. Kojo Aaab
23. Apuri Boniface Jack Afo

22. Kwasa Adi

24. Chegutira Jati

Participants at the stakeholder forum in Paga-Zenga

Contact Persons

1. Solomon Bagase (Cell # 024 6031986)
2. Peter Aluah (Cell # 024 4812895)

Concerns Raised

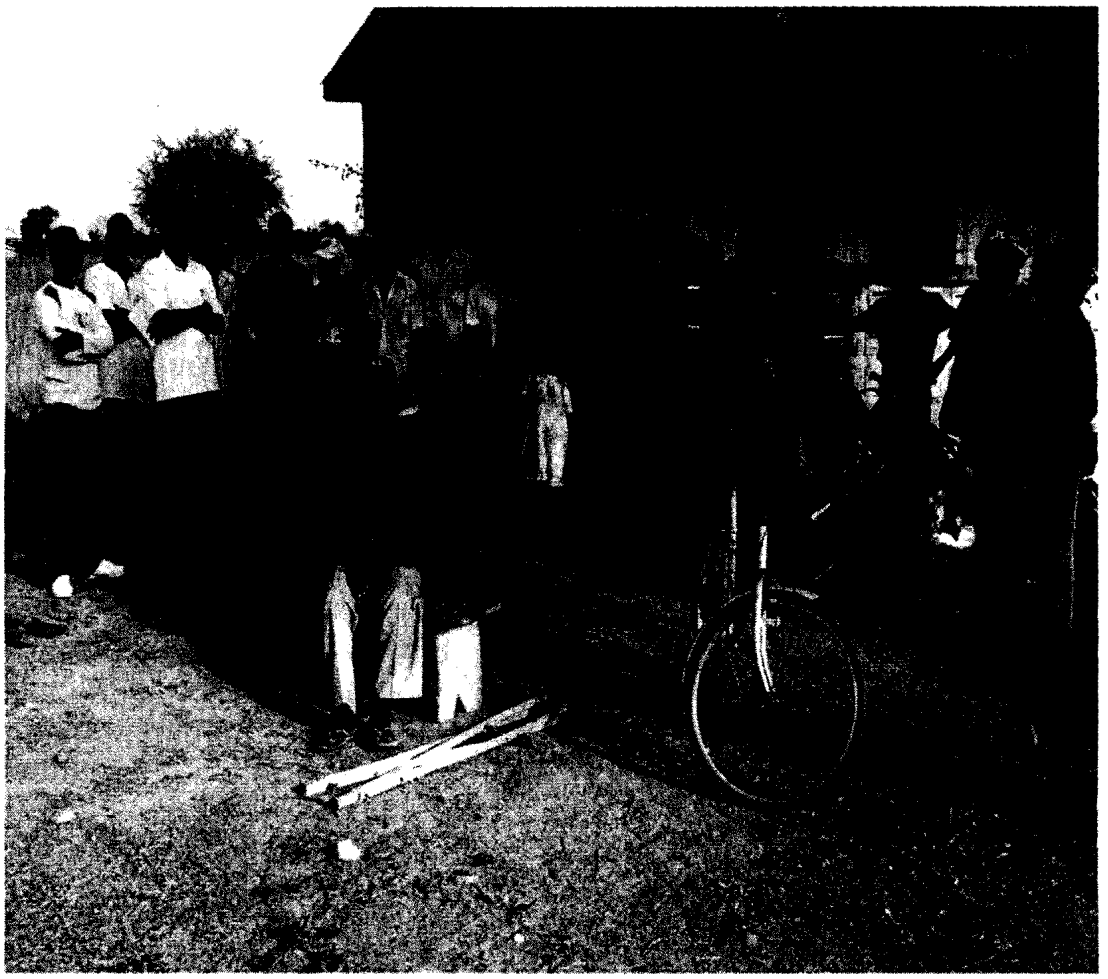
1. Concern was raised that compensation for affected houses must be done in time for those involved to be moved before the rainy season.
2. The community also asked that delineating and valuing farmlands must be done in the wet season to see which farms are affected and their spatial extent.
3. Lastly, they claimed that compensation should not only be paid for lands covered by leases, since there are lands properly bought and paid for which there is no

documentation. There are others also which were acquired through inheritance for which there is no lease covering them.

Nyania Community

Attendance

1. Ramatu Apareba
2. Roland A. Wudunu
3. Awarewe Ayarekukru
4. Apuri Bareja
5. Wumukamm Aweh
6. Kuwulu Nagantera
7. Babugeyire Aduah
8. James Asopaga
9. Awiah Apedibe Eric
10. Awiah James
11. Awupugue Damyoyem
12. Ayipio Pwazaga
13. Kasie Wuwiatase
14. Kudadam Pwazaga
15. Adekumole Sondag
16. Ayikutu Navioyire
17. Alou Aduah
18. Wisdom Demodame
19. Berince Awiah
20. Rebbecca Nabala
21. Kachana Toombabana
22. Ajamba Atongde
23. Yaya Maradam



Participants at the stakeholder forum in Nyania

Contact Persons

1. Albert Achana (Cell # 020 7540532)
2. Awiah Apedibe Eric (Cell # 024 5794752)

Concerns Raised

1. Community concerns were basically with regards to timely payment of right compensation.
2. A question asked was with regards to the project start date and employment opportunity for community members. Also the members of the community asked what other benefits they would obtain from the project. They asked were the they would be connected to the grid.

Baduno Community

The community visit coincided with a market day at Paga so participation was very low in this community. The Chief however promised to send the issues discussed to the various segments of his community.

Attendance

1. Wemutagang Tegana
2. Aberap Abevarepe
3. Robert Atabere
4. Perwudigana Awabi

Group picture with Chief and Elders of Baduno

Contact Persons

1. Chief Atudichiga (Community Chief)
2. Robert Atabere

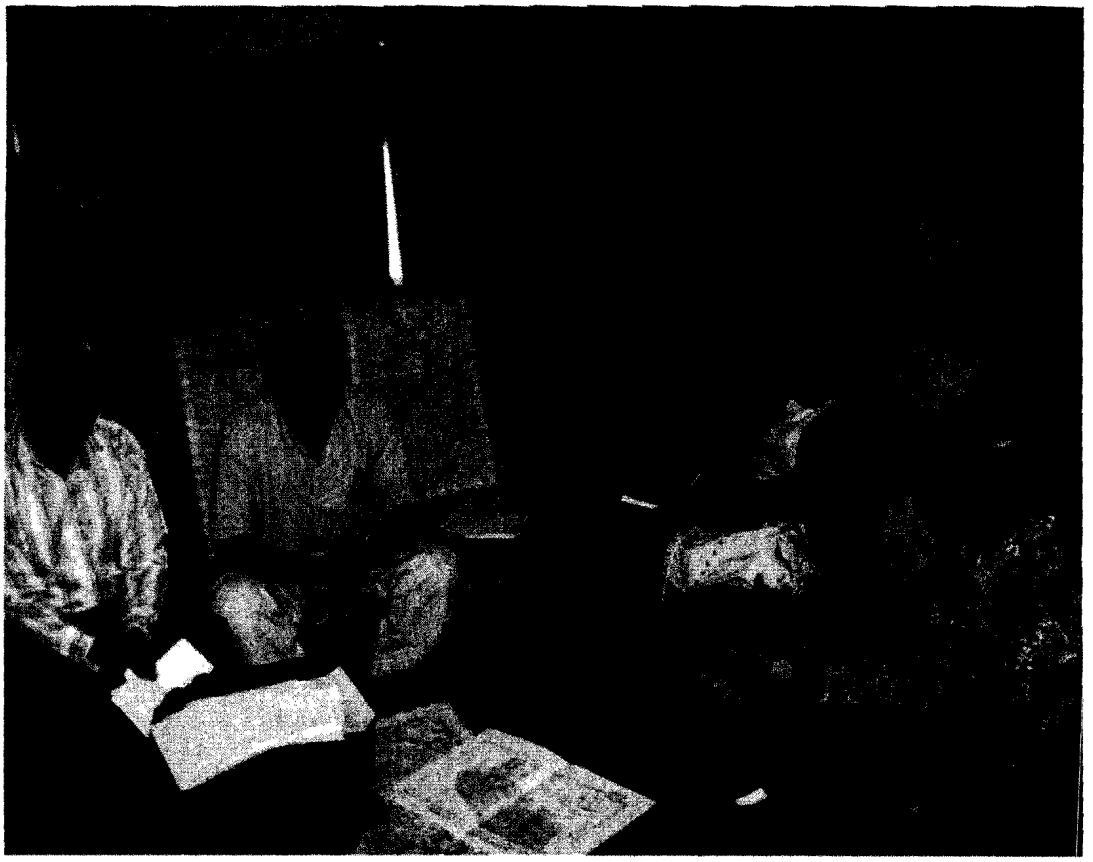
3. Wentagana Abavarepe

Concerns Raised

1. Community indicated that there is a sacred grove; Zintane Akwgu shrine within the area but outside the RoW. They claimed that the shrine can't be moved so it was good that the line does not affect it.
2. Furthermore, the Chief claimed that compensation paid to house heads does not normally reach other households and is usually misapplied. He asked that where a house is affected, the heads of the households must be identified and be given their due instead of bulk payment to an individual.

Consultation at the Regional Coordinating Council (RCC)

The team started the series of consultation by briefing the Regional Coordinating Director and the Regional Minister of the Upper East Region at separate meetings. They were informed of the West Africa Power pool project and the construction of this line in particular from Bolga to Paga and subsequently from Paga to Burkina Faso. The Chief Director of the R.C.C., Mr Samuel N'lary was very much appreciative of the project and intimated that the supply of electricity was an issue that came up during a tripartite meeting between three (3) neighbouring regions of the three (3) countries Ghana, Togo and Burkina Faso In Tenkodogo in the Central-East District Of Burkina Faso. He said that at the meeting SONABEL complained that the Ghanaian Counterparts were not doing enough to help power transfer to Burkina and was very happy at this development.



The Chief Director, Regional Coordinating Council emgages team members

Members of the team interacting with Regional Minister

The Regional Minister; Mark O. Woyongo was also happy at this new development but wanted to know how the country and the region would benefit from the project. He said any time there was a break in the transmission line on the Techiman line power to the whole north is curtailed and wondered if this cannot help curb the problem. It was explained to him that this line was solely for supply to Burkina Faso but there was a project on the drawing board to deal with that problem. He again asked that the consultations be done properly to avoid any future misunderstandings and confrontations.

Annex 7: Copy of Correspondence to NCA and Telecom Companies

CabIRA **Cabinet d'Ingénierie et de Recherche Appliquée**

Abidjan, le 18 AOUT 2010

V/Réf.:

N/Réf.: 079/A/BM/10

Objet : Bolgatanga-Ouagadougou Interconnection Project: Update of Line Route and Environmental and Social Impact Assessment Study **Stakeholders Consultation exercise**

THE DIRECTOR GENERAL,
NATIONAL COMMUNICATIONS AUTHORITY,
ACCRA, GHANA.

Dear Sir,

Our company has been engaged as Consultant for the Environmental and Social Impact Assessment study for the 225 kV Bolgatanga (Ghana) - Ouagadougou (Burkina Faso) Electric Power Interconnection Project from Bolgatanga in Ghana to Ouagadougou, Burkina Faso. Find attached please; herewith, a map showing the proposed location of the transmission line and a letter of introduction of Volta River Authority (VRA).

As part of the consultation process, we have contacted the local offices (in Bolgatanga) of telecommunication companies that operate in Ghana since December 8th, 2009 with reference to the possible effects of interference between the transmission lines and telecommunication masts. However, to date, we have not received any response yet from any of the companies. Find attached also a copy of the earlier correspondence to the telecommunication companies.

In view of the delayed responses, we wish to contact your office to comment on any potential effects of the proposed transmission line on radio telecommunication. Specifically, the closest telecommunication mast is about 400 meters away from the line at a place near Bolgatanga.

We look forward to an expedited response from your office that will facilitate the expeditious completion of our studies.

Counting on your support, and best regards.

M.- D. BAH
Administrator, CabIRA

Cabinet d'Ingénierie et de Recherche Appliquée CabIRA SARL 11 B P 1571 Abj 11

cc. Vodafone Ghana
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Zain Ghana
Tigo Ghana
Kasapa
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