

**FINAL**

**MARCH 2010**

# **FEASIBILITY STUDY**



## **NILE BASIN INITIATIVE**

### **NILE EQUATORIAL LAKES SUBSIDIARY ACTION PROGRAM (NELSAP)**



## **STUDY ON THE ELECTRICITY TRANSMISSION LINES LINKED TO THE RUSUMO FALLS HYDRO-ELECTRIC GENERATION PLANT**

### **VOLUME II**

**FICHTNER – RSWI**



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## List of Abbreviations

AAAC	All Aluminum Alloy Conductor
ACSR	Aluminium Conductor Steel Reinforced
ADF	African Development Fund
AEPE	Potable Water and Power Supply Programme
AfDB	African Development Bank
AFSEC	African Electrotechnical Standardization Commission
BAD	Banque Africaine de Développement = African Development Bank /
BD	Bid documents
BNR	National Bank of Rwanda
BUNEP	Bureau National d'Études de Projets (Rwanda)
c	person
CAPP	Central Africa Power Pool
CBO	Community Based Organizations/s
CEDAW	Convention of the Elimination of all Forms of Discrimination against Women
CEEAC	Communauté Economique des Etats de l'Afrique Centrale (ECCAS)
CEPGL	Communauté Economique des Pays des Grands Lacs = Economic Community of the Great Lakes Countries
cf	compare
CID	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
COMESA	Common Market for Eastern and Southern Africa
CONS	Consumers
CP	"Cash Power" Subscribers to the Prepayment Systems
CPD	Comprehensive Preliminary Design
CPIC	Country Planning and Implementation Committee
CSP	Average Specific Consumption per Consumer Category
CST	Constant
d	day
DAC	Development Assistance Committee of OECD
DD	Displaced Person
DED	District Executive Director
DGHER	Direction Générale de l'Hydraulique et des Energies Rurales

DIPL	Diplomats
DIT	Direct Intertrip
DP	Displaced Person
DPA	Direction Provinciale de l'Agriculture et d'Elevage
DRC	Democratic Republic of Congo
DRC / RDC	Democratic Republic of Congo / République Démocratique du Congo
DW	Deutsche Welle =German Radio Broadcast
e.g.	for example
EAC	East African Community
EAPP	East African Power Pool
ECCAS	Economic Community of Central African States
EDF / FED	European Development Fund / Fond Européen de Développement
EDPRS	Economic Development and Poverty Reduction Strategy
EDPRS	Economic Development and Poverty Reduction Strategy
EDSR	Demographic and Health Survey
EGL	Energie des pays des Grands Lacs = Great Lakes Energy (Agency / Burundi, RDC, Rwanda)
EIA	Environmental Impact Assessment
ELECTROGAZ	Water; Gas and Electricity Production, Transmission and Distribution Company, Rwanda
ELGZ	ELECTROGAZ: the public utility for production, transmission and distribution of water and electricity in Rwanda
EMA	Environmental Management Act (Tanzania)
EMF	Electromagnetic Fields
ENSAP	Eastern Nile Subsidiary Action Program
ERA	Electricity Regulatory Authority (Uganda)
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
et al.	and other authors
EU	European Community
EUR	Euro
EWURA	Energy and Water Utilities Regulatory Authority
FBU	Burundi Franc
FCO	Fuse Cut Out
FEA	Financial and Economic Analysis

FED	Fond Européen de Développement European Development Fund /
FRW	Rwandan Francs
FS	Feasibility Study
FUS	Fuse Switch / Sectionalizer
GBoT	Government of Tanzania
GDI	Gender Development Index
GDP	Gross Domestic Product
GHCN	Global Historical Climatology Network
GNI	Gross National Income
GNP	Gross National Product
GoR	Government of Rwanda
GOVT	Government
GROS	Large Consumers
GTZ	Deutsche Gesellschaft für Technische Zusammenar- beit (German Technical Cooperation)
GW	Ground Wire
GWh	Gigawatt hour
HAB.	Inhabitant
HDI	Human Development Index (UNDO)
HDR	Human Development Report (UNDP)
HEP	Hydro Electric Plant
Hh	household/s
HIPC	Heavily Indebted Poor Countries
HIV	human immunodeficiency virus
HRC	High Rupture Capacity
HV	High Voltage
HV t-line	High Voltage transmission line
HVL	High Voltage Line
ICHA	Turnover tax
IDA	International Development Association
IFC	International Finance Corporation
IFO	International Finance Organizations
ILFS	Integrated Labour Force Survey (Tanzania)
IMF	International Monetary Fund
INECN	Institute National pour l'Environnement et la Con- servation de la Nature (Burundi)
inh./HAB.	inhabitants/s
INSR	National Institute of Statistics of Rwanda
IPP	Independent Power Producer
ISF	Total Fertility Rate



ISW	Insulated Shield Wire
IUCN	International Union for Conservation of Nature
IWGIA	International Working Group on Indigenous Affairs
JPDA	Joint Project Development Agreement
KBO	Kagera Basin Organization
KenGen	Kenya Electricity Generating Company Ltd
KfW	Kreditanstalt für Wiederaufbau (German Financial Cooperation)
KGL	Kigali
Km	Kilometre
KPLC	The Kenya Power and Lighting Co. Ltd
kV	kilovolt
kW	Kilowatt
kWh	Kilowatthour
LA	Lightning Arrestor
LBS	Load Break Sectionalizer
LCL	Low Consumption Lamp
LCP	Local Control Panel
LV	Low Voltage
m	meter
m	month
MEM	Ministère de l'Énergie et des Mines = Ministry of Energy and Mining
MINAGRI	Ministry of Agriculture (Rwanda)
MINATTE	Ministry of Land Planning, Tourism and Environment [Ministère de l'Aménagement du Territoire, du Tourisme et de l'Environnement (Burundi)]
MINECOFIN	Ministry of Finance and Economic Planning (Rwanda)
MINICOM	Ministry of Commerce
MININFRA	Ministry of Infrastructure (Rwanda)
MINITERE	Ministry of Lands, Environment, Forestry, Water and Mines (Rwanda)
Mio	million
MNT	Modèle numérique de terrain
MoI	Ministry of Infrastructures
MPD	Management of Power Demand
MPD	Management of Power Demand
MT	Medium Voltage
MV	Medium Voltage
MVL	Medium Voltage Line
MW	Megawatt
NBI	Nile Basin Initiative

NBTF	Nile Basin Trust Fund
NEL	Nile Equatorial Lakes
NEL-CU	NELSAP Coordination Unit
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NEMC	National Environment Management Council (Tanzania)
NEP	National Environment Policy (Tanzania)
NEPAD	New Partnership for African Development
NERC	North American Electric Reliability Corporation
NGO	Non-governmental Organization
NISR	National Institute of Statistics of Rwanda
NLS	No Load Switch / Sectionalizer
O.M.	Subscribers of Ordinary Counters
O+M	Operation and Maintenance
OECD	Organization for Economic Cooperation and Development
OHL	Overhead Line
OP	Operational Policy
OPGW	Optical Ground Wire
OPPC	Optical Phase Conductor
ORDI	Ordinary Consumers
ORTPN	Rwanda Office for Tourism and National Parks (Office Rwandais du Tourisme et des Parcs Nationaux)
p./pp.	page/s
p.a.	per year
p.c.	per head
p.d.	per day
p.m.	per month
PAP	Project Affected People
PARS	Private Sector – Individual people
PART	Parastatals
PFS	Pre-Feasibility Study
PHDR	Poverty and Human Development Report (Tanzania)
PIC	Project Implementation Committee
PIP	Priority Projects
PMC	Project Monitoring Committee
PNA	Akagera National Park (Rwanda)
PNR	Ruvubu National Park (Burundi)
pop	population
PPA	Power Purchase Agreement
ppp	Purchasing Power Parity
PREBU	Programme of Rehabilitation of Burundi

PREBU	Programme de réhabilitation du Burundi = Rehabilitation Program of Burundi
PRS	Poverty Reduction Strategy
PRSP	Poverty Reduction Strategy Paper (as national poverty alleviation strategies)
PUSE	Public Services
RADA	Rwanda Agriculture Development Authority
RAP	Resettlement Action Plan
RCC	Resettlement and Compensation Committee
RCP	Remote Control Panel
RDC	République Démocratique du Congo =Democratic Republic of Congo
REA	Rural Energy Agency
REF	Rural Energy Fund
REGISEDO	National Electricity Production and Distribution Company - Burundi
REMA	Rwanda Environment Management Agency
RGPH	General Census of the Population and Housing
RN	Route National
RoR	Republic of Rwanda
RoW	Right of Way
RR	Republique Rwandaise
RRFP	Regional Rusumo Falls Hydropower and Multipur- pose Project
RTU	Remote Terminal Unit
RURA	Rwanda Utility Regulatory Agency
RWF	Rwandan Francs
s.a.	see above
s.b.	see below
SADC	Southern Africa Development Community
SAP	Subsidiary Action Program
SAPP	South African Power Pool
SC	Steering Committee of the Study
SINELAC	Société internationale d'électricité des pays des grands lacs = Great Lakes Electricity International
SiWER	Single (1) Wire Earth Return
SME	Small and Middle Enterprises
SNEB	National Environment Strategy in Burundi (Straté- gie nationale en matière d'environnement au Bu- rundi)
SNEL	Société National d'Electricité (RDC) = National Electricity Company (DRC)
sqkm	square kilometre/s

sqm	square meters
SSEA	Strategic/Sectoral, Social and Environmental Assessment of Power Development Options in the Nile Equatorial Lakes Region
STD	Sexually Transmitted Diseases
SVP	Shared Vision Program
SW	Shield Wire
SWER	Single Wire Earth Return
SWGR	Single Wire Ground Return
TAC	Technical Advisor Committee
TANESCO	Tanzania National Electricity Supply Company
TCR	Annual increase rate for consumers, specific consumption and total consumption
T-lines	transmission lines
ToR	Terms of Reference
TSh	Tanzanian Shilling
TWCM	Tanzania Wildlife Conservation Monitoring
TWER	Two (2) Wire Earth Return
UEGCL	Uganda Electricity Generation Company Ltd
UETCL	Uganda Electricity Transmission Company Ltd
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Emergency Fund
UPDEA	Union of Producers, Transporters and Distributors of Electric Power in Africa
UPEGAZ	Lake Kivu Gas Promotion and Utilization Unit
URoT	United Republic of Tanzania
US\$	American Dollar
USAID	Aid Organization in the United States
USc	American Cent
VAT	Value Added Tax
VEO	Village Executive Officer
W	Watt
WAPP	West African Power Pool
WB	World Bank
WDR	World Development Report (by the World Bank)
WFP	World Food Program
WHO	World Health Organization
WTP	Willingness to Pay

## Measures

GWh	Gigawatt-hour (billion Wh)
kV	Kilovolt (thousand volts)
kW	Kilo Watt (thousand watts)
kWh	Kilowatt hours
M\$	US Dollar Million
MW	Megawatt (Million W)
MWh	Megawatt-hour (million Wh)
sqkm.	square kilometer
TOE	Ton oil equivalent
V	Volt (unit of measure of potential difference)
W	Watt (unit of measure of active energy)
Wh	Watt-hour (unit of measure of electric energy)

## Exchange Rates

1 US \$	1 250 FBU
1 US \$	568 FRW
1 US \$	1 315 TSh

## List of Participants and Visited Persons

<b>RWANDA</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
Pierre DJAÏGBE	Financial Analyst <i>Analyste financier</i>	African Development Bank <i>Banque Africaine de Développement</i>
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Hans VON SCHOEDER	Counselor <i>Conseiller</i>	Embassy of Germany <i>(Rwanda / Kigali)</i> <i>Ambassade d'Allemagne (Rwanda / Kigali)</i>
Cedric SUNDAY	Commanding Officer <i>Commandant</i>	Gashora
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Elimasia MNGUMI	Development Communication Officer <i>Responsable du développement de la communication</i>	NELSAP
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Viateur NDAYISABYE	Executive Secretary <i>Secrétaire exécutif</i>	Sector / Secteur Gashora/Bugesera
Charles KAZADI	Administration Office <i>Service administratif</i>	Sector / Secteur Kukumberi, Rubona
Hakizamungu ARDELERTE	Social Affairs <i>Chargé des affaires sociales</i>	Sector / Secteur Kukumberi, Rubona
Robert NSANZIMANA	Social Affairs <i>Charge des affaires sociales</i>	Sector / Secteur Rilima
Maburuki B. TEMBO	Resident Economist <i>Economiste resident</i>	World Bank Banque mondiale
Various village representatives in the project area, e.g. district managers, craftsmen, shop owners, mill owners, etc.  <i>Différents représentants de villages dans la zone du projet, par exemple chefs de districts, artisans, propriétaires des magasins et des mines, etc.</i>		

<b>BURUNDI</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
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n.n.	Administration Office <i>Service administratif</i>	Commune Mubuga
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Salomé MUKERAGABIRO	Administration Office <i>Service administratif</i>	Commune Muyinga
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Vernante NGENDABANGA	Administration Office <i>Service administratif</i>	Commune Mutumba
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Lazare NZISABIRA	Head of administration <i>Chef d'administration</i>	Hospital / Hôpital Mukenke, Bwambarangwe
Adelin NTUNGUMBURANYE	General Director <i>Directeur Général</i>	INECN Institut National pour l'Environnement et la Conservation de la Nature  (Institute for environmental affairs)

<b>BURUNDI</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
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Noé NDUWABIKE	Economist <i>Econome</i>	ISTEEBU
Cyprien SIMBANANIYE	Counselor <i>Conseiller du Directeur Gé- néral d'Hydraulique et des Energies Rurales (DGHER)</i>	Ministry of Energy and Mines <i>Ministère de l'Energie et Mines</i>
Idi Buhanga PRESSADI	General Director <i>Directeur Général</i>	Ministry of Energy and Mines <i>Ministère de l'Energie et Mines</i>
Pierre BARAMPANZE	Director of Energy <i>Directeur de l'Energie</i>	Ministry of Energy and Mines <i>Ministère de l'Energie et Mines</i>
Ildephonse RWASAMANGA	Executive Vice-President <i>Vice Président chargé de la Planification</i>	Ministry of Planning <i>Ministère de la Planification</i>
Reverien NIVYAYO	Counselor of Vice Minister <i>Conseiller du Vice-Ministre</i>	Ministry of Labour <i>Ministère des Travaux Pu- blic</i>
Lazare GAHUNGU	Executive Secretary <i>Secrétaire Executif</i>	Projet d'appui au dévelop- pement communautaire et social (PRADECS)  Association for communal projects
Domitien BAVAKURE	Counselor <i>Conseiller Economique du Gouverneur</i>	Province Karuzi
Sylvestre NDAYIZEYE	Governor <i>Gouverneur</i>	Province Karuzi
Pascal MISAGO BLAISE	Counselor of Main Gover- nor <i>Conseiller du Gouverneur principal</i>	Province Muyinga
Bernard NZOBANDABA	Hydraulic Engineer <i>Ingénieur hydraulicien</i>	REGIDESO

<b>BURUNDI</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
n.n.	Local Authority <i>Chef local</i>	REGIDESO / Bugenyuzi
Audace SUNZU	Director <i>Directeur</i>	REGIDESO / Bujumbura
Augustin BARUVURA	Engineer <i>Ingénieur</i>	REGIDESO / Bujumbura
Déogratias HUREGE	Engineer <i>Ingénieur</i>	REGIDESO / Bujumbura
Jean-Floribert KANYARUSHATSI	Counselor <i>Conseil spécial du Directeur Général de la REGIDESO</i>	REGIDESO / Bujumbura
Richard NKURUNZIZA	Electrical Engineer <i>Expert Technique en Electricité</i>	REGIDESO / Bujumbura
Joseph NIYIBIZI	Head of Department (East) <i>Chef du service est</i>	REGIDESO / Gitega
Dieudonne NDIKURIYO	Local Authority <i>Chef local</i>	REGIDESO / Karuzi
Tharcisse MISITANTERI	Local Authority <i>Chef local</i>	REGIDESO / Muyinga
Rémy NDIKURIYO	Engineer <i>Ingénieur</i>	REGISESO
Jean Pierre NDAYISABA	Local Authority <i>Chef local</i>	Commune Rugari
Hilaire NTAKARUTIMANA	Local Authority <i>Chef local</i>	Commune Rusi
Déo Marcel NIYUNGEKO	Engineer for Water Sanitation and Urban Development <i>Ingénieur eau et assainissement et développement urbain</i>	World Bank Banque mondiale
Various village representatives in the project area, e.g. district managers, craftsmen, shop owners, mill owners, etc.  Différents représentants de villages dans la zone du projet, par exemple chefs des districts, artisans, propriétaires des magasins et des mines, etc.		

<b>TANZANIA / TANZANIE</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
Peter NGHONELA	Executive Officer <i>Fonctionnaire exécutif</i>	Districtf Biharamulo Nyabusozzi
Renatus POLINI	Executive Officer <i>Fonctionnaire exécutif</i>	District Biharamulo Runazi
n.n.	District Commissioner <i>Responsable de district</i>	District Biharamulo Administration
Majaliwa SUKUSILANDA	District Planning Officer <i>Fonctionnaire de planification du district</i>	District Biharamulo Administration
Dr. NTANGA	District Agricultural Officer <i>Fonctionnaire agricole du district</i>	District Biharamulo Administration
n.n.	District Executive Officer <i>Fonctionnaire exécutif du district</i>	District Biharamulo Administration
n.n.	District Economic Officer <i>Fonctionnaire executive du district</i>	District of Biharamulo Administration
n.n.	Village Executive Officer <i>Fonctionnaire exécutif du village</i>	District Biharamulo Nyakanazi
n.n.	Village Executive Director <i>Directeur exécutive du village</i>	District of Biharamulo Nyakantara
n.n.	Village Executive Director <i>Directeur exécutive du village</i>	District Biharamulo Nyakahura
Albert MUSHEMA	Government Valuer Expert gouvernemental	District Bukoba Bukoba
n.n.	Executive Officer <i>Fonctionnaire exécutif</i>	District of Nagara Kabanga
Peter KAFALADE	Village Executive Officer <i>Fonctionnaire executive du village</i>	District Ngara Rulenge
Sardi SOUDI	Counselor Conseiller	District Ngara Kabanga
n.n.	District Commissioner Chef de district	District Ngara Administration
n.n.	District Executive Director <i>Directeur exécutif du district</i>	District Ngara Administration
n.n.	District Planning Officer <i>Fonctionnaire de la planification du district</i>	District Ngara Administration

<b>TANZANIA / TANZANIE</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
n.n.	Executive Officer <i>Fonctionnaire exécutif</i>	District Ngara Rulenge
n.n.	Village Executive Officer <i>Fonctionnaire executive du village</i>	District Ngara Benaco
Mr. TINGIRAWANYUMA	Executive Director <i>Directeur exécutif</i>	District Town Council Ngara
Juma F. MKOBYA	Senior Energy Engineer <i>Ingénieur senior en énergie</i>	Ministry Energy and Minerals
Bashir J. MRINDOKO	Commissioner for Energy and Petroleum <i>Chef du service Energie et Pétrol</i>	Ministry Energy and Minerals
Bonaventure Thobias BAYA	General Director <i>Directeur Général</i>	National Environment Council Administration de l'environnement national
Ignace A.J. MCHALLO	Director Environmental Impact Assessment <i>Directeur de l'environnement Etudes d'impact</i>	National Environment Council Administration de l'environnement national
Kamugenyi P. LUTEGANYA	Environmental Consultant Expert de l'environnement	National Environment Council Administration de l'environnement national
Decklan MHAIKI	General Manager Transmission <i>Directeur Général Transmission</i>	TANESCO
Abdulla R. KABIRUDDIN	Senior Manager Strategic Planning and Projects <i>Directeur planification stratégique et projets</i>	TANESCO
Ahmed H. MMINGWA	Regional Office, Kagera <i>Bureau régional, Kagera</i>	TANESCO
Said B. CHILIMA	Executive Director <i>Directeur exécutif</i>	TANESCO / Ubungo Umeme Park
Hamdur R. MANSUR	Executive Director <i>Directeur exécutif</i>	TANESCO Ubungo Umeme Park
Isaac KWIGIZILE	District Manager <i>Chef du district</i>	TANESCO
n.n.	District Representative <i>Représentant du district</i>	TANESCO / Biharamulo



<b>TANZANIA / TANZANIE</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
John KABADI	Senior Planning Engineer <i>Ingénieur en chef planification</i>	TANESCO / Ngara
Ernest MILYANGO	District Planning Officer <i>Fonctionnaire du district planification</i>	TANESCO / Ngara
<p>Various village representatives in the project area, e.g. district managers, craftsmen, shop owners, mill owners, etc.</p> <p>Différents représentants des villages dans la zone du projet, par exemple chefs des districts, artisans, propriétaires des magasins et des mines, etc.</p>		

<b>WORLD BANK BANQUE MONDIALE</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
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Paul BARINGANIRE	Power Engineer <i>Ingénieur électricien</i>	World Bank Banque Mondiale
Brooke YAMAKOSHI	Operations Analyst <i>Analyste d'opération</i>	World Bank Banque Mondiale
Martin FODOR	Senior Environmental Specialist <i>Spécialiste environnemental</i>	World Bank Banque Mondiale
Erik FERNSTROM	Energy Specialist <i>Expert de l'énergie</i>	World Bank Banque Mondiale

<b>CONSULTANTS AT SITE CONSULTANTS SUR SITE</b>		
<b>NAME / NOM</b>	<b>POSITION</b>	<b>ORGANISATION</b>
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Ulrich ERTL	Project Engineer Rusumo Falls Transmission Lines <i>Ingénieur de projet</i>	FICHTNER
Dr. Helfried UNGER	Economist <i>Econome</i>	FICHTNER
Bertrand FORTIN	Project Engineer Rusumo Falls Transmission Lines <i>Ingénieur de projet</i>	RSWI
Jean-Marc EVENAT	Environmental Expert <i>Expert de l'Environnement</i>	RSWI
Thierry TURQ	Project Manager Rusumo Falls Hydro-Electric Power Plant <i>Directeur de projet</i>	SNC Lavallin
Prof. Dr. BLISS	Sociologist <i>Sociologue</i>	FICHTNER
Rainer STRÖWER	Sociologist <i>Sociologue</i>	FICHTNER
Jens ROTHE	Topographic Engineer <i>Ingénieur topographe</i>	TRIGIS
Niels OBERHAUSER	Topographic Engineer <i>Ingénieur topographe</i>	TRIGIS

## 2. Introduction

The Nile Basin Initiative is based on the shared vision “to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin Resource”. The riparian countries of the Nile opted to translate their vision into action through a Strategic Action Program (SAP) which involves projects both at the basin level and at the sub-regions level. In addition to the Shared Vision Program (SVP), two Subsidiary Action Programs (SAP) were established, namely the Eastern Nile Subsidiary Action Program for Eastern Nile (ENSAP) which comprises Egypt, Ethiopia and Sudan with the head office in Addis Ababa (Ethiopia), and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) consisting of Burundi, DR Congo, Egypt, Kenya, Rwanda, Sudan, Tanzania and Uganda. It should be noted that Egypt and Sudan belong to both groupings.

The area of the three countries (Burundi, Rwanda and Tanzania) covered by this study is characterized by economies which are dependent on rain fed subsistence agriculture (non-irrigated), limited industrialization, poorly developed infrastructure, high population growth and great poverty. The population of the three countries adds up to some 50.9 million inhabitants. These countries' per capita GNP is below 300US\$, with 83 US\$, 220 US\$ and 270 US\$ respectively for Burundi, Rwanda and Tanzania.

In the region covered by the study, less than 10% of the population has access to electricity, and yet the area has a vast reservoir of energy resources, including hydroelectricity which is still untapped. The access rate varies between 2% for Rwanda and Burundi and 9-10% for Tanzania. On the other hand, the region is characterized by small electrical power grids/networks which are far from one another. Some trade has been taking place (at bilateral level), but on a quite modest level. This low level of development of national power grids hampers the utilization of these resources at affordable cost at the national level.

Based in Kigali, Rwanda since December 2003, the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) was established in Tanzania on December 3, 1999 by the Council of Ministers of the Nile Basin Initiative. Under the Nile Basin Initiative, NELSAP intends to develop actions on the ground to fight against poverty, enhance economic growth and reverse the process of environmental degradation in the region. In this connection, twelve multinational projects in different sectors were identified, including power development.

## **Multipurpose Development**

Beside the feasibility study of connecting the Rusumo Falls power plant to several terminal stations in Tanzania, Rwanda and Burundi, there is a sub-component relating to multipurpose development.

Regarding the project area the new high voltage transmission line shall imply rural electrification of the rural growth centres along the lines corridors and promote the use of electricity in smaller development centres. The project will also consist in promoting small economic activities as electric pumps for water supply and irrigation as well as processing of agricultural produce in the project area.

The aim of the transmission lines component is, on one hand:

- to study the technical, financial, economic, environmental and social feasibility of the electricity transmission lines project from the Rusumo Falls Hydroelectric plant to the national networks of Burundi, Rwanda and Tanzania and rural electrification along the corridors of the three lines, and, on the other hand,
- to prepare the investment documents for this purpose.

### **2.1 Project objectives**

The main objectives of the study of the transmission lines for the provided electricity by the Rusumo Falls hydro-electric generation plant to the Burundi, Rwanda and Tanzania networks are:

- to examine the technical, financial, economic, social and environmental feasibility
- to describe possibilities of the electrification of rural growths centers located along the transmission lines; and
- to prepare basic data and information for the investment documents (bidding documents ) for transmission lines and rural electrification.

The new transmission lines shall connect the generation power plant of Rusumo Falls to the terminal station of

- Gitega in Burundi (161 km)
- Birembo near Kigali in Rwanda (109 km) and
- Nyakanazi/Biharamulo in Tanzania (98 km).

The layouts and voltage levels shall be analyzed and determined by the studies. In the medium term, these transmission lines shall constitute the main backbone of the interconnection with East Africa.

The study can be carried out in three phases:

1. the first phase will consider succinctly the pre-feasibility and feasibility study of the new transmission lines: special attention shall be devoted to the aspect of electrification of rural growth centers along the corridors of the lines. Several layout options will be considered before any choice is made for the selection of line layouts that will be considered for more comprehensive studies;
2. the second phase will be devoted to technical, economic, financial, social and environmental feasibility studies of all the transmission lines in question. The findings of pre-feasibility studies will be refined and the technical options (layouts, voltage levels, structures) will be optimized; rural electrification as well as the small economic projects using this electricity (water supply by electric pumping, electric pumping for irrigated farming, small electric mills or others) will be defined in details;
3. the third phase will consist in comprehensive preliminary design studies and bid documents for all the selected transmission lines and distribution lines for electrification of rural growth centers.

Based on long-term considerations, the stability, security and flexibility of the inter-connected network linking power supply and transmission of Rwanda, the Eastern territory of the Democratic Republic of Congo, Burundi and Tanzania shall be improved as well as access of the local population to electricity.

## **2.2 Services of the Consultants**

### **Activities in phase 1**

- Data collection
- Data analysis
- Demand study
- Definition of alternative routings
- Definition of rural electrification
- Definition of characteristics of network structures (studies of power systems)
- Environmental and social impact assessment
- Economic and financial analysis
- Workout of selection criteria for the line routings
- Report drafting

### **Activities in phase 2**

- Demand detailed study
- Detailed line Routing study
- Detailed technical analysis and characteristics of network structures (study of power system)
- Detailed study of rural electrification
- Environmental and social impact detailed assessment
- Cost estimate and economic and financial analysis
- Institutional and commercial aspects
- Risks related to the transmission lines project
- Implementation schedule for transmission lines and rural electrification
- Report draft.

### **Activities in phase 3**

- Geological investigations and topographical works
- Detailed engineering of structures and detailed design
- Preparation of documentation and tender documents

## **2.3 Data Collection**

For the methodology the following approach has been chosen :

### **Data collection in three countries**

Within four weeks after award of the contract, the consultant has mobilized the project team. Before travelling to the region, the consultant has prepared a work program which details the various activities for the project.

It has been assumed that IBN/NELSAP has arranged a kick-off meeting to be held with all parties involved in the project. During this first meeting the consultant has been introduced to the project teams of the participating countries.

The following topics have been discussed:

- Project structure plan and time schedule
- Procedures of the course of the project
- Coordination and decisions on deadlines for mutual exchange of data, documents and information as well as coordination meetings
- Strategy for the collection of all documents, drawings, reports, schedules, etc. concerning this project

The consultant has been travelling to the region to collect all necessary data and relevant information for the project.

The details of phase 2 are presented in the following chapters.