

## Rusumo Falls: water for power generation and multi-purpose use, Burundi, Rwanda, Tanzania

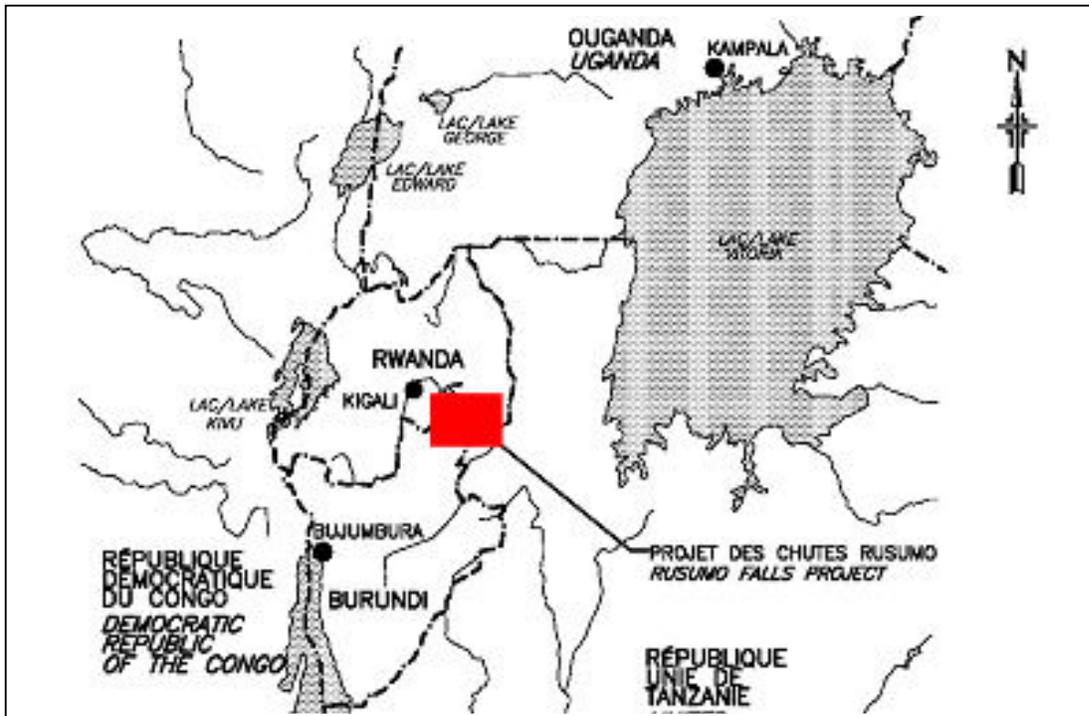
### Summary

The Regional Rusumo Falls Hydroelectric and Multipurpose Project is a multi-purpose hydropower project under joint development by Burundi, Rwanda and Tanzania. The Rusumo Falls are approximately 30 metres high, located on the Kagera River that forms the border between Tanzania and Rwanda, and are around 2 kilometres downstream of the Burundi. The main road connecting Rwanda and Tanzania passes over the Project site. The Kagera river basin, which covers an area of about 58,000 km<sup>2</sup>, is a sub-basin of the Nile river system. The catchment at the falls drains from the territories of Tanzania, Rwanda and Burundi.

The Regional Rusumo Falls Hydroelectric Project is being developed within the overall Kagera Basin Integrated Development Framework, which is part of the Nile Basin Initiative (“NBI”) and its Nile Equatorial Lakes investment program, NELSAP.

### The project

#### Description and opportunity of the



### project:

The Project includes the following main elements:

A hydroelectric power station over the Rusumo Falls of ca. 60-75 MW (optimisation is being done by the consultant) to be shared between the three countries, and the multi-purpose Project area development;

Transmission facilities connecting the hydroelectric power plant of Rusumo Falls to the national grids of Burundi and Rwanda and supply electricity to the western provinces of Tanzania, which are currently not connected to the country’s national grid. Rural electrification for selected centres along the transmission lines corridors will be implemented.

A Project institutional mechanism for the co-management of power generation and distribution to national utilities.

The Power Utilities Companies in the 3 countries are facing a generation capacity power shortage which

not only causes immediate concerns but also presents a risk for the region's future growth.

The project also presents a major opportunity to develop irrigation projects in the vicinity.

### Technical features

Preliminary characteristics for the power plant are as follows:

Full Supply Level:	1325 m
Installed Capacity: (three Kaplan turbine sets)	60 – 75 MW
Average Annual Production: GWh	443.8 – 475.4
Reservoir capacity at FSL:	495.9 hm <sup>3</sup>
Reservoir area at FSL:	313 km <sup>2</sup>

Power for the Rusumo Falls will be transmitted to the National grids via three 220 kV transmission lines: Rusumo Falls – Gitega (Burundi), 158 km; Rusumo Falls – Birembo/Kigali (Rwanda); 115 km and Rusumo Falls – Nyakanazi (Tanzania), 95 km.

A joint utility/institutional mechanism for the co-management of power generation and distribution to national utilities will be defined.

### Social impact assessment

With regards to social impacts, the socio economic baseline description confirmed that the population in the Study zone is very young and has a very high population density. There are also a very large number of female-headed households, as well as orphan headed households. The presence of these vulnerable groups will be taken into consideration in subsequent phases of the Project, particularly when designing the Resettlement Action Plan.

The vast majority of the population in the Study zone practices subsistence agriculture, and this activity is sometimes supplemented by fishing in the area. The entire region also suffers from an acute lack of electricity, with no electrical production facilities found in the region. These results were reconfirmed by surveys carried out and the main conclusion that can be drawn is that there is a strong need for development in the Study area, and electricity is highly desired.

The impact of electrical services on poverty reduction is well known. It includes the productivity increases which the use of electrical machinery and lighting bring, the reduction in time required for

household chores, the benefits of good lighting for students, allowing them to achieve better results as well as the safety and security aspects of electrical lighting in both public and private spaces.

Several socioeconomic aspects will be affected: the demographic and social structure, land tenure, infrastructure and utilities, agriculture, fishing and logging, health and security, and quality of life among other things. Most of the impacts have now been identified, but they will be more thoroughly analyzed in the subsequent stage of the Study, for the selected alternative and within the final affected territory.

The results of the stakeholder opinion survey, confirmed both the desire for local development in the Study area, as well as the complexities and challenges which, without doubt, will be faced in the resettlement process. Stakeholders revealed important challenges encountered in past resettlement programs including lack of infrastructure, poor sanitary conditions, proliferation of disease and land tenure conflicts, which will have to be adequately accounted for in a future resettlement plan. It has been observed that both Rwanda and Burundi have considerable experience with resettlement in a variety of contexts; however appropriate institutional strengthening and careful implementation and monitoring will be required to overcome the considerable challenges encountered in the past.

To enhance project area development, and to mitigate or compensate for negative impacts, measures to be included in the PADP (Project Area Development Programme) include:

**Public infrastructure** – upgrading of main roads and existing school buildings, improving access to clean water, rural electrification to selected villages in the project neighbourhood, recreational/tourism facilities, refurbishing health dispensaries, construction of pit latrines in villages and at market places and establishment of demonstration reforestation and programs for the promotion of soil and water conservation measures.

**Public health services** – STD/HIV control, improvement of environmental sanitation, improvement of reproductive health, social work and substance abuse, prevention, enhancement of occupational health and traffic safety and water borne diseases control such as malaria and bilharzias.

**Socio-economic interventions** – development of a broad network of various stakeholders on the local

level, maintenance of close liaison with the residents of the RRF direct impact zone, outlining mitigation effort proposals related to indirect impacts of the RRF for donor funding and for implementation by local government, non-government organizations, communities and other agencies through for example micro-credit facilities; programs and activities for enhancing livelihoods through training and capacity building; agricultural intensification through irrigation, and support to SMEs and agro-processing.

### Environmental impact assessment

Each element of the Project was examined in terms of its potential direct and indirect impacts, whether positive or negative, on each component of the environment during construction and operation phases. The analysis revealed that the most important impacts on the physical environment will be related to raising the water level upstream the dam and drastically reducing the water flow in the falls and downstream rapids for about one kilometre (between dam site and outlet of discharge channel). However, the preliminary results of the evolution of the water



The site

Right: plan of the dam

quality, following the impoundment of the reservoir, show that the overall water quality will not be greatly affected by the Project compared to the current situation.

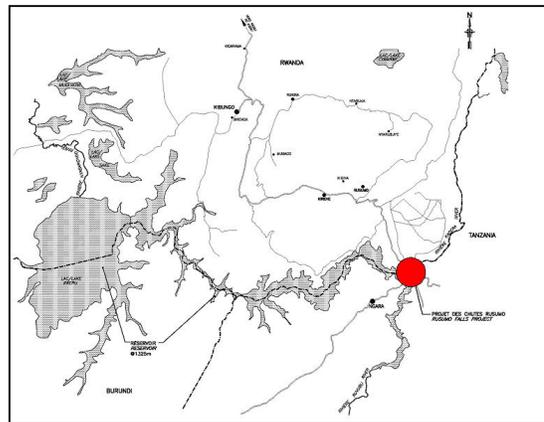
With the reservoir at 1325 masl, the level of Lake Rweru is increased by 0.5 m in comparison to the natural conditions for a flood of centenary frequency..

The major impacts on the components of the biological environment are related to the habitat loss for flora and fauna. In addition, following the creation of a reservoir, slower speeds could lead to proliferation of pests such as water hyacinth and these impacts will increase with the size of the reservoir.

The increase in fish biomass will likely be positively correlated to the increase of the water level in the reservoir. Several species with conservation concern are found in the Study area and the impact of habitat change on each of these species will be assessed in the final study.

The surface area for the projected reservoir was delimited, and the land use was identified based on the results of field surveys and Ikonos satellite images. This analysis allowed the establishment of the flooded areas for each class of land use. It can be concluded that the classes that would be mostly affected by the impoundment of the reservoir are the marshland and cultivated food crops in the marshes.

To enhance project area development, and to mitigate or compensate for negative impacts, measures to be included in the PADP include the management of watershed and fishery resources. This includes developing a procedure which adequately monitors, describes and quantifies the impact of climatic variations, water resources uses, agricultural practices and land use on sediment load and water balance in the catchment, identify institutional structures and functions, and decision- making procedures pertinent to land use, agricultural irrigation, fish farming, natural resources exploitation, development of procedures for the evaluation of socio-economic, cultural and environmental consequences of alternative land use and agricultural practices in the Kagera catchment.



Plan of the Dam

**Area (in Ha) of Land use classes inundated by the Dam-Reservoir**

Marshland	12,180 Ha
Tree & shrub savannah	190 Ha
Agriculture (subsistence crops, bananas, plantations)	5,280 Ha
Built area	20 Ha
Water	14,240 Ha
<b>Total</b>	<b>31,910 Ha</b>

## Feasibility

### Legal, institutional and regulatory environment

The three countries have legal frameworks that encourage private investors to develop power projects: in Tanzania this is addressed in the National Energy Policy, in Rwanda in the Investment code and in Burundi in the “Loi n°1/014 du 11 août 2000”. The authorities of the electric sector in the three countries are the Ministries of energy and Minerals in Tanzania, Ministry of Infrastructure in Rwanda and Ministry of Water, Energy and Mines in Burundi.

In addition to the Ministries in charge of energy in Tanzania and in Rwanda there are Regulatory Agencies. The power utilities in the three countries are vertically integrated and the governments are the sole shareholders. The companies are responsible both for generation and transmission.

The project is being prepared under the Nile basin Initiative, Nile Equatorial Lakes Subsidiary Action Program (NELSAP) for which the three countries are members. To start the preparation of the Project the three Governments signed a Joint Project Development Agreement (JPDA) in which they committed to jointly seek financing and develop the project.

A Project Implementation Committee composed of Managing Director of power utilities and the Directors of Energy in the three countries was set up to oversee the whole preparation process. The preparation phase is coordinated by a Project Manager.

### Business environment

The three countries encourage participation of private sector in development of power generation plants. In case of the Rusumo project, in the JPDA it is stated that the three countries will explore all financial options including the private public partnership. In Tanzania the generation is fully open to private and public investors. In Rwanda the Law N°39/2001 of 13/09/2001 is stated that the Regulatory Agency will ensure that private sector involvement will be facilitated. In Burundi, the “Loi n°1/014 du 11 août 2000” states that the state may delegate the provision of electricity to either public or private concerns.

The security and political situation in the three countries is stable to facilitate investment activities.

The power market is huge: there is big demand (about 50 MW) in the Western part of Tanzania to supply mines and the towns are currently supplied by diesel plants at the high cost. Rwanda is currently using a rented thermal power station. Burundi is also facing power shortages.

### Economic and Financial analysis

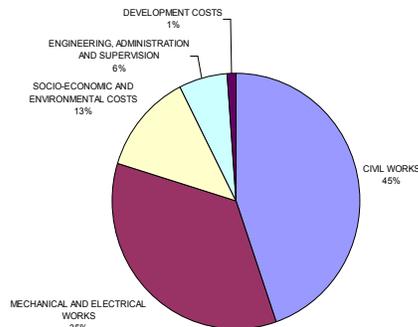
The figures below are very preliminary and will be confirmed or modified by the ongoing Final Feasibility Design study phase.

Capital costs: Power generation plant: \$257 million (mid-2008 prices).

Transmission lines and sub stations: \$98 million.

The total investment costs for the Power Generation Plant are estimated at \$256.89 million. From those costs, the civil works are estimated to take 44.76%, the mechanical and electrical works 35.04%, the socio-economic and environmental costs 12.61% and the engineering, administration, supervision and development costs 7.59%.

The capital expenditure for the 3 transmission lines is estimated at \$86.31 million and the substations \$11.40 million.



*Breakdown of estimated costs for 60 MW – total \$256.9 million USD*

The operating costs for the power generation plant have not been finalised.

The cost of operating and maintaining the transmission lines and sub stations is expected to be about \$3.00 million per year.

### Rate of return

EIRR Power generation plant: 30.44%

Payback period: 2.9 years

Transmission lines and Sub stations: Calculations for this have not been undertaken as yet.

### Development status

We are currently at the beginning of the Feasibility phase of the two studies.

### Power Generation study

The Power Generation study was contracted to SNC Lavalin in August 2007. It is financed for MUSD 4.850 by the Nile Basin Trust Fund comprising the World Bank, SIDA (Sweden) and NORAD (Norway). The study is planned to be achieved at the end of March 2009, with the Final Feasibility Report. The Preliminary Design Report was delivered on 15<sup>th</sup> July 08. Multipurpose development of the centres around the Project area is included in the project.

### Transmission lines study

The Study on Transmission Lines Related to Rusumo Falls Hydroelectric Plant was contracted to the Joint Venture Fichtner and RSW also in August 2007. It is financed for MUSD 4.20 by the African Development Fund. The detailed design of the study and Tender Documents will be delivered in July

2009. Electrification of rural growth centers and multipurpose development of centers along the lines corridors are included in the project.

### Risk factors

We still are looking for interested private sector for co financing with the public sector. If there is no interested private sector the financing may be purely public. The uncertainty is on the financing finding.

### Next steps

The Power Generation study is planned to be achieved at the end of March 2009, with the Final Feasibility Report.

The Final Feasibility, Detailed Design Report and Tender Documents for the Study on Transmission Lines Related to Rusumo Falls Hydroelectric Plant will be delivered in July 2009.

The target date of commissioning of Rusumo Power Plant 2013-2014, but this is approximate since we are still at mid-phase of the studies. We still are looking for interested private sector for co financing with the public sector or the financing may be purely public.

### Project contacts

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*Below: aerial photo of site with proposed installations*

