EAC Strategy to Scale-Up Access to Modern Energy Services

Burundi Country Baseline Report and Workplan

Godefroy HAKIZIMANA
Electromechanical Engineer
P.O.Box 745 Bujumbura
Tel : 00 257 22 25 3296
Mobile : 00 257 79 923 273
E-mail : godefroyhakiza@yahoo.fr

E-mail : godefroyhakiza@yahoo.fr

TABLE OF CONTENTS

CONTEXT OF THIS REPORT……5
EXPLANATORY NOTES……..7
***Preparation of this report*……7**
***Methodology*……..7**
***Structure of this report*……..8**
***Important notes*……9**
EXECUTIVE SUMMARY……10
1.0. Burundi Baseline Energy Access Data…….....12
1.1. Overall Economy Scenario……...12
1.2. Overall Energy Access Scenario**…….....16**
1.3. Overview of Energy Resources……17
1.3.1. *Biomass, Renewable Energy and Fossil Fuels—Demand, Supply and Source*……17
1.3.2. *Electrical Energy—Demand, Supply and Sources*……....18
1.4. Overall Cross Sectoral Management, Energy Institutional Issues and Regulatory…… Framework……..……27
1.4.1. *The Power Sub-ector*……27
1.4.2. *Petroleum Sub-ector*……..32
1.4.4. *The Renewable Energy Sub-ector*……33
1.4.5. *The Biomass-Based Energy subsector*……..34
1.5. Overall Energy Policy Framework Analysis……36
1.6. Overview of Financial Mechanisms in Burundi……41
1.7. Overview of Burundi's Energy-related Standards and Codes of Practice……42
1.8. Linking the Energy Baseline to EAC-EASUP Targets……..42
1.8.1. *Target 1: Modern Energy Services for cooking*……42
1.8.2. *Target 2: Modern Energy Services for all the Peri-Urban and Urban Poor*……..47
1.8.3. *Target 3: Modern Energy Services for Health, Educational and Social Institutions*……50
1.8.4. *Target 4: Access to mechanical power for heating and productive uses for all communities*...52
2. SWOT ANALYSIS……...54
3. KEY FINDINGS……62
4. DRAFT ACTIVITY IMPLEMENTATION WORKPLAN……64
4.1. *Implementation Plan by Target*……..64
4.2. *Outputs, activities, milestone, responsabilities, timetable and budgets*……67
5. ANNEXES……...71
Annex 1: Matrix……71
Annex2: Tables.....77
Annex 3: List of Individuals and Agencies Contacted……85
Annex 4: Key Reference Documents Used……...86

ABBREVIATIONS

ACVE	Green Belt Assopciation
AfDB	African Development Bank
AFREPREN/FWD	Africa Energy Policy Research Network
BTC	Belgian Technical Cooperation
EAC	East African Community
EAC-EASUP	EAC Energy Access Scale-Up Program
AMOCO	American Oil Company
CEBEA	Burundian Centre of Alternative Energies
CEPGL	Economic Community of Great Lakes
DGEE	Directorate General of Water and Energy
DGHER	Directorate General of Hydraulics and Rural Energies
EGL	Energy of Great Lakes
FCBN	Burundi Nile Basin Discourse (Civil Society)
FTC	French Technical Cooperation
GEF	Global Environment Facility
GoB	Government of Burundi
GTZ	German Technical Cooperation
ICS	Improved Cooking Stoves
IDA	International Development Association
IMF	International Monetary Fund
LCC	Life Cycle Cost
LPG	Liquefied Petroleum Gas
LV	Low Voltaga
MDGs	Millennium Development Goals
MWEM	Ministry of Water, Energy and Mines
MEFCP	Ministry of Economy, Finance and Development Cooperation
MT or T	Metric Ton
MV	Medium Voltage
MW	Megawatt
NBI	Nile Basin Initiative
NELSAP	Nile Equatorial Subsidiary Action Program
NGO	Non Government Organization
ONATEL	National Telecommunication Office
PV	Photovoltaic
RDC/DRC	Democratic Republic of Congo
RE	Renewable Energy
REGIDESO	National Electricity and Water Utility
RETs	Renewable Energy Technologies
RTNB	Burundi National Radio and Television
RSA	Aeronautic Service Office
SINELAC	Electricity International Society of Great Lakes
SHP	Solar Home Plant
SNEL	National Electricity Society (RDC)
SOSUMO	Sugar Society of Moso
SWG	Sector Working Group
SWOT	Strength Weakness Opportunities Threats
TV	Television

US $	USA Dollar
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
WB	World Bank

Exchange Rates as at 30 March 2008
1 US$ = BF 1190; 1 EUR = BF 1506

List of Figures

Figure 1: Electricity-Energy Resources Map of Burundi
Figure 2: EAC Regional Electrical Grid

List of Maps

Map 1: Provinces of Burundi
Map 2: Electrical Grid of Burundi
Map 3: EAC regional Electrical Map

List of Tables

Table 1: Structure of Gross Energy Suplly in Burundi/Burundi's Energy Balance
Table 2: Characteristics of Main Power Stations in Burundis
Table 3: External Hydropower Stations used by Burundi
Table 4: Hydropower Stations installed in Burundi
Table 5: Total production of Electricity (kWh)
Table 6: Electricity Consumption in urban and rural areas (kWh)
Table 7: Electrical energy needs for Burundi, up to 2020
Table 8: Electricity Tariff Structure, Operating Performance
Table 9: Electricity Key Financial ratios
Table 10: Burundi Energy Balance

List of Matrix

Matrix 1: Results Framework and Monitoring of the Burundian Electricity Projects
Matrix 2: Arrangements for Results Monitoring of World Bank Project

CONTEXT OF THIS REPORT

The East African Community (EAC) *Strategy on Scaling-up Access to Modern Energy Services* was conceptualized and developed with the aim of enabling the member states (Kenya, Uganda, Tanzania, Rwanda and Burundi) to achieve the Millennium Development Goals (MDGs). It was adopted in November 2006 by the EAC.

The EAC member countries acknowledge and recognize the fact that the current access to modern energy services for the majority of the population is not only low, but will remain a key barrier to attainment of MDGs in the region. Unless drastic measures are taken on energy access in terms of the level and speed of effort, over 80% of the inhabitants will still have no access to clean cooking fuels by 2015. According to WHO, the high percentage of traditional solid fuel use in Burundi is responsible for as much as 5.2% of Uganda's national burden of disease (2002).

Moreover, 50% of the urban population, 90% of rural populations and more than 90% of local schools, clinics and community centers will still have no access to electricity. Access to the motive power for mechanical loads, necessary to transform rural economies, will also still be largely lacking.

It is now universally acknowledged, and recognized in Burundi, that even though energy in itself is not part of the MDGs, its development, access and use will significantly determine the level of success in achievement of the MDGs.

Energy is a key input in:

- the fight against poverty, hunger and malnutrition (MDG1),
- achievement of universal education (MDG2),
- gender parity through emancipation and empowerment of women (MDG3),
- reduction of infant and child mortality (MDG4),
- reduction of maternal mortality (MDG5),
- halting and reversal of the spread and associated fatalities of diseases, especially malaria, HIV and AIDS (MDG6),
- improved access to water and sanitation and application of sustainable environmental policies and practices (MGD7).
- Energy partnerships and networks also exist to foster these goals, in accordance to MDG8.

The objectives of the *EAC Strategy on Scaling-up Access to Modern Energy Services* are segmented into four major and ambitious targets on energy access, to be fulfilled by 2015, in line with the MDG framework.

Target 1: ***Provide access to modern cooking practices for 50% of the population that currently uses traditional cooking fuel.***

Indicator: 55% of the total population in the region will have access to LPG, improved cooking stoves and to sustained biomass supply. (Linked to MDGs 3, 5 and 7).

Scale: Number of households to be reached is 2.7 million urban poor, 6.1 million rural poor and 0.9 million in nomadic and conflict regions. Result expected is 73% access to modern energy services by urban poor and 56% access by rural poor and nomadic and conflict region populations.

Target 2: ***Provide access to reliable electricity for all urban and peri-urban poor.***

Indicator: 100% of urban and peri-urban households will be provided with electricity service. (Linked to MDGs 1, 4, 5 and 6). Result expected is 56% access to modern energy services by this target population.

Scale: Number of households to be reached is 5.3 million urban poor and 2.2 million in urban slums.

Target 3: ***Provide access to modern energy services for all schools, clinics, hospitals and community centres***.

Indicator: 100% of the rural population will live in a locality where social service centres are equipped with modern energy services. (Linked to MDGs 1 through 6).

Scale: Number of institutions to be reached is 46,545 schools, 10,323 clinics and 750 hospitals.

Target 4: ***Provide access to mechanical power for heating and productive uses for all communities***.

Indicator: 100% of administrative headquarters and localities with more than 3,500 inhabitants will be equipped with mechanical power and heating technology. (Linked to MDGs 1 through 6).

Scale: Number of communities to be reached are 23,240.

To achieve these targets on a regional basis, it is estimated that a total of US$ 3.2 billion will be required, with half of this cost (US$ 1.6 billion) being contribution by the end users. Other sources will include US$ 1 billion in subsidies from Governments and donors, support from Government programs (US$ 217 million), loan guarantees from development banks (US$ 291 million), and regional support from EAC Secretariat (US$ 48 million). These targets and investment costs require a committed and sustained effort, as well as well coordinated and scheduled preparatory activities and investment programs.

In order to achieve the four Targets detailed above, the EAC has undertaken to operationalise the Scaling Up Strategy, thereby transforming it into a Program of Action. The key thrust of the *EAC Energy Access Scale-Up Program* (EAC-EASUP) is a paradigm shift from 'business-as-usual'.

This will be achieved though integration and mainstreaming of national planning on a sector-wide basis, policy and regulatory framework reviews and re-formulation, extensive awareness

creation, facilitation and implementation of energy access initiatives and investment programmes, with a specific bias towards interventions that can demonstrate conformity with a pro-poor and High-Impact Low-Cost and Scalable (HILCS) approach. It will be necessary for EAC-EASUP to be fast-tracked, adequately funded and supported strongly by Political Will and Appropriate Market Conditions.

The EAC recognizes that EAC-EASUP can only be implemented based on a Long Term Plan and adequate preparation for the multiple, simultaneous and massive programs that are necessary to achieve the objectives of EAC-EASUP. This document details the Short Term Implementation Plan for the BURUNDI component of EAC-EASUP. It focuses on the initial 24-month phase of the strategy (2008-2009).

The Work Plans proposed therefore largely involve preparatory work and actions that improve the policy and regulatory environment, as well as improving the information, capacity and knowledge platform that will form a firm foundation for the big push necessary to shift matters from business-as-usual to a scaling-up mode. Multilateral and Bilateral Development Partners, Funders and Government Agencies such as the UNDP and GTZ are strongly behind the EAC and its Member Countries as they begin implementation of EAC-EASUP.

EXPLANATORY NOTES

Preparation of this report

This report has been prepared by the National Consultant for BURUNDI, Mr. Godefroy HAKIZIMANA, Electromechanical Engineer, P.O.Box 745 Bujumbura, Advisor of the Minister of Water, Energy and Mines of the Republic of Burundi in collaboration with Engineer Dr. Mackay A.E. OKURE, National Consultant of UGANDA, MAKERERE UNIVERSITY, P.O.Box 7062, KAMPALA, UGANDA, and with the Regional Team Leader, Mr. Paul KIRAI. Relevant documents and other persons or organizations consulted are indicated in the appendices. This report is for discussion purposes and is therefore not publication-ready. Certain sections can be annexed and others further summarized. Editing and proof-reading is not final.

Methodology

To comprehensively gain relevant information and data within the short period of time availed for this assignment (14 days), it became necessary to consult with all national utilities in the sector of energy. Objectivity has meant an attempt to use data that is as accurate and as up-to-date as possible, based on the knowledge and best-estimate of the experts.[1]

The baseline analysis largely makes use of documented data, and there was no attempt to collect additional independent from the field. In light of this, the following approaches were agreed and adopted by the Burundi National Consultant and Mr. Mackay A.E. OKURE.

Literature review: A wide range of literature materials was collated and consulted to provide data and information that is authoritative. The study paid a lot of attention to the time frame

[1] *Some data may be in the knowledge and custody of various parties, but not necessarily documented in quotable media.*

covered by various publications and short-comings have been qualified in the SWOT analysis. The National Consultant quickly realized that the studies undertaken in energy are fragmented and the uniformity of time reference for an appropriate baseline was lacking.

***Expert opinion and multi-sectoral stakeholders consultative group review*:** This was sought to affirm certain issues that could not be verified through the literature review, or were otherwise clearly outdated in the literature, or not documented altogether.

Various experts in the key sectors under scrutiny (Energy, Education, Health, Habitat, Environment, Planning) were consulted to give their feedback on the current situation and what they think should be done in the near future to ensure that EAC-EASUP's objectives are met.

Accordingly, this document will be submitted to debate by a Consultative Group of key stakeholders, including[2] Production and Distribution of Water and Electricity Board (REGIDESO), the Directorate General of Hydraulics and Rural Energies (DGHER), the Directorate General of Water and Energy (DGEE), the Alternatives Energies Burundian Centre (CEBEA), Ministry of Health and in charge to Combat HIV/AIDS, Ministry of Water, Energy and Mines, Ministry of Environment, Territory Management and Public Works, Ministry of Economy, Finances and Development Cooperation, Deputy-Ministry of Planning, Ministry of Education, Professional Training and Scientific Research, UNDP-Burundi. Improvements suggested by the Work Group have largely been incorporated; even though there remains a need to update figures even further to reflect ongoing Government and private sector work. This is proposed as one of the key activities in the 24-month implementation plan in this report.

Structure of this report

An Executive Summary precedes the body of this report. The substantive report is segmented into five major sections comprising :

Part 1─Burundi Baseline Energy Access Data;
Part 2─SWOT Analysis;
Part 3─Key Findings;
Part 4─Draft Activity Implementation Work plan,
Part 5─Annexes.

Parts 1 to 3 deal with the current landscape out of which key conclusions are drawn with respect to Institutional and Capacity Challenges, necessary Actions and the Short Term Implementation Plan.

Contents comprise the baseline energy access data and indicators, multi-sectoral institutional frameworks, analysis of policies and the regulatory environment, including Codes and Standards, and Financial Mechanisms in Burundi. A detailed SWOT Analysis of the key components of energy access, such as Energy Resources, Institutional Capacity, Policy & Legal Frameworks and Financial Capacity are also contained in these parts.

[2] *See abbreviation list for the full names.*

The Draft Activity Implementation Work Plan, contained in Part 4, stipulates the Key Actions, Priorities, Time Schedules and Costs that will enable creation of a strong foundation, within the 24-month window, for the Mainstreaming and Integration of Energy Access in Development Planning, Developing or Enhancement of Pro-Poor Energy Policies & Regulatory Frameworks, Strengthening the Capacity of Institutions and the Market Players to deliver modern energy services, mapping, developing or enhancing innovative business models.

Important notes

The Implementation Plan proposed herein, for Burundi's component of EAC-EASUP, is for a limited time-span of 24 months, in conformity with the EAC's overall scheduling of EASUP plans and activities in all the member countries.

Accordingly, this document does not contain Plans and Actions related to the actual investment programmes. It is however acknowledged that some pilot projects will be necessary as part of the assessment of the level of preparedness, effort and resources required for the full scale, multiple and simultaneous projects.

The 24 month Plan focuses sharply on Capacity Building, Institutional, Regulatory and Policy re-alignments and enhancements necessary for the fulfillment of the absolute EAC-EASUP goals.

EXECUTIVE SUMMARY

This report concludes that Burundi needs to invest an estimated US$ 30 million over the next five years, in order to place the country on the launch pad that would enable achievement of EAC-EASUP objectives.

During a past Burundi energy workshops leading to Nile Basin Initiative (NBI), discussants agreed that enhancement of data and information management was crucial, as was the

development of an efficient energy market in Burundi. The importance of sustained political will was determined as necessary to shift energy access rate from business-as-usual. It was agreed that it will be necessary to mainstream and integrate energy planning and to prioritise energy initiatives across key sectors.

The importance of localized initiatives and needs-based interventions was amplified. Availability (or in some cases access) and affordability of energy supplies was noted as a major constraint. It was also agreed that energy delivery and business models need to be aligned with a pro-poor bias, starting with proven technologies and best practices that enable among, other objectives, rural households to switch to Improved Cook Stoves (ICS), urban households to switch to Peat, Biogas, LPG, distribution utilities to connect urban and peri-urban households, and grid extension for populations within existing grid transmission proximity.

The multi-sectoral approach was emphasized, especially collaboration of the Ministry of Water, Energy and Mines (MWEM) and other key line Ministries in charge of Planning, Finance, Agriculture, Health, Water, Education, and Environment, with MWEM playing a lead role in coordination and energy planning assistance.

The proposals in this report take all these recommendations into account. The Implementation Plan detailed herein will enable Burundi to harmonise its energy policies and regulations at both the national and regional levels, as well as formulate its up-scaled energy investment program aligned to EAC-EASUP. In the 24-month period, Burundi will start laying the requisite energy sector capacity foundation for both the private and public sectors and to build coordination and programme management frameworks, including relevant data, information and knowledge sharing and networking systems. All these are critical ingredients to success of the regional scaling-up strategy for access to modern energy services in order to fulfill the MDGs.

Burundi's 24-month Implementation Plan and Budget comprises the following:

- a total of US$ 30 million is required to implement the short term plan,
- the key thrust of the Plan is capacity building, policy and regulatory framework review,
- the budget is categorized by Target, from 1 to 4, and implemented over a 24 month period.

Major activities include mainstreaming EAC-EASUP into national development strategies, detailed update of energy access data; stakeholder workshops to sensitize them on the initiative; establishment and maintenance of an EAC-EASUP Burundi Task Force; design and mainstreaming of the policy framework, including lobbying and undertaking relevant regulatory re-alignments and cross-sectoral workshops. Partnerships and joint communication strategies set up by the Ministry of Energy and other Ministries such as the Ministry of Health,could offer opportunities to scale up the impact on stakeholders and affected population.

Capacity building to create the platform scaled up delivery of energy services to the poor will be done through training and organizing the supply chains; targeted market awareness campaigns; needs assessments; capacity building of institutions; training service providers, mainly off-grid and training community groups.

Identification and development of innovative business models and pilot-testing these models, as well as implementing at least one pilot project under each target, will be necessary. Administration and coordination of the plan is also included in the proposed budget, as is internal monitoring and evaluation.

1.0. BURUNDI BASELINE ENERGY ACCESS DATA

This part of the report focuses on a situational brief of energy resources and access in Burundi, and an analysis of the operating environment for energy planning and execution. The analysis is guided by the four EAC-EASUP targets, a multi-sectoral approach and a technology neutral perspective. The end result is identification of gaps and associated recommendations with respect to the energy policy, the national development strategy and position papers, and institutional frameworks. The baseline indicators also offer a reference point for future monitoring.

1.1. Overall Economy Scenario

1. Burundi is a landlocked country that straddles Central and East Africa, with a total area of 27,834 km² and approximately 7.3 million inhabitants. Burundi has one of the highest population densities in Africa: about 269 inhabitants per km², about 10.6 % of whom live in urban areas. Burundi's frontiers are formed by natural borders, particularly: Lake Tanganika, the Rusizi River in the West, and the Kagera and Kanyaru Rivers in the North.

The Republic of Burundi is bordered by Rwanda on the North, Tanzania on the South and East, and the Democratic Republic of the Congo on the West. Although the country is landlocked, much of its western border is adjacent to Lake Tanganyika. The country's modern name is derived from its language, Kirundi. Burundi is a mountainous country and has a climate favorable to agriculture, with precipitation ranging from 1000 to 2000 mm/year and temperatures from 12° to 25° C.

The country is divided into seventeen provinces, with Bujumbura Mayor hosting the capital city, Bujumbura. The other provinces are Bubanza, Bujumbura Rural, Bururi, Cankuzo, Cibitoke, Gitega, Karuzi, Kayanza, Kirundo, Makamba, Muramvya, Muyinga, Mwaro, Rutana and Ruyigi. Of the 7.5 million people, about half million live in Bujumbura and overall, 8% live in urban and peri-urban areas, including informal urban settlements.

Burundi emerged from a cycle of politico-ethnic conflicts that lasted more than 12 years and claimed the lives of about 300,000 people while displacing about 1,200,000 people, or about 16 percent of the population. The effects of regional economic embargo between 1996 and 1999 and the negative consequences of the war on the economy resulted in a ten-year period of economic decline. By 2004, GDP per capita had fallen from US $ 180 in 1993 to US $ 83, one of the lowest in the world. Life expectancy at birth fell from 51 years in 1993 to less than 42 in 2005. The war and the economic decline took a heavy toll on the country's infrastructure, which was either destroyed or has seriously deteriorated due to poor maintenance and lack of investments, and particularly affected the hydro electricity facilities, and solar and biogas equipments.

Map 1: Provinces of Burundi

Source : UNOCHA, 2005

2. Poverty, which was widespread before the conflict, has increased significantly since 1993 in both rural and urban areas. There has been a sharp deterioration in all social indicators, which have become among the worst in Africa. The odds of Burundi reaching the Millenium Development Goals (MDGs) by 2015 are slim. In 1998, the poverty rate for the whole country was 81% (compared to the MDG target of 30 %), registering 41 % in Bujumbura and 83% in the rest of the country. Infant mortality rates are as high as 114 per 1,000 (2004), compared to African averages of 103.1 per 1,000, and to the MDG target of 36 par 1,000) and maternal mortality rates average 990 (2000) per 100,000 (compared to African averages of 916.8 per 100,000 by 2015). Major causes of morbidity and mortality include malaria, acute respiratory infections, diarrhea, tuberculosis, and malnutrition.

Overall, there was been a sharp deterioration in all social indicators, which have become among the worst in Africa. The Poverty Reduction Strategy for Burundi is built around four main axes:

- Improving governance and security,
- Promoting sustainable and equitable economic growth,
- Developing human capital,
- Combating HIV/AIDS.

With regard to developing capital, the government's objectives are to establish quality social services in partnership with the very communities that will be the beneficiaries. To this end, priority actions targeting the health and education sectors, water supply and sanitation, urban planning and decent housing for all have been identified. Indeed, the absence of the most basic services such as water supply and electricity, combined with housing scarcity, is a major threat to the consolidation of peace and needs to be reversed.

Burundi's largest industry is agriculture, which accounted for 58% of GDP in 1997. Coffee is the nation's biggest revenue earner with 78% of all exported goods. Other agriculture products include cotton, tea, maize, sorghum, sweet potatoes, bananas (of which Burundi is one of the world's ten largest producers), manioc (tapioca); beef, milk, and hides. Besides agriculture, other industries include light consumer goods such as blankets, shoes, soap; assembly of imported components; public works construction; food processing. The currency is the Burundian franc (BIF). The economy is essentially agricultural, coffee exports accounting for 90 % of Burundi's export earnings. The heavy population pressure is causing fragmentation of farm holdings and persistently low productivity. In addition, overuse of the land is resulting in soil degradation and erosion.

Burundi is one of the poorest countries in the world, in terms of GDP per capita: US$739 as of 2003. The economy is supported by foreign aid from Western Europe and other parts of the world. In 2000 this amount reached US$92.7 million. 68% of the population lived below the poverty line in 2002. The country's estimated gross domestic product (GDP) was US$700 million in 2001. According to the World Food Program, the majority of children aged under 5 (56.8%) suffer from chronic malnutrition.

3. Since 2000, the Government has implemented a program of financial and structural reforms to stabilize the economy and revive economic activity. These have included:

- prudent monetary policy implemented by a more independent central bank in the context of a liberalized foreign exchange regime,
- prudent fiscal policy with poverty-focused expenditure priorities,
- computerization of public financial management to improve transparency,
- reforms of cash crop sectors (coffee, tea, cotton) and public enterprises.

This program, supported by IDA and the IMF, has been implemented in a satisfactory manner, despite very adverse circumstances, and reflects the Government's commitment to recovery and reform. The Government has also engaged in an ambitions program to improve economic governance and fiscal management, and to strengthen the implementation capacity for pro-poor programs.

4. Between 2001 and 2006, GDP grew by 2.7% per annum, while inflation was maintained in the single digits. With the exception of 2003 and 2005 – during which bad weather in both severely impacted agriculture production- the past few years have seen annual growth rates between 2 and 6 percent. Reforms and parallel political programs have resulted in an increase in agricultural production and construction, as private confidence has returned and donors have re-engaged. Successful implementation of the IMF and IDA supported economic program

opened the way for Burundi to reach the HIPC decision point in August 2005 for a total debt relief of approximately US $ 826 million in NPV terms, equivalent to 91.5% of which helped outline a detailed plan of action for implementation by Government..

5. An indispensable condition for achieving sustainable economic development is to rationalize natural resource management and environmental protection. In a country like Burundi, where demographic growth is high, policies originally designed to support economic activity or increase output can deplete natural resources and disrupt ecological conditions, and ultimately undermine efforts to preserve the balance of ecosystems.

A number of damaging practices have been identified: repeated clearing of land, cultivation of marginal lands, clearing of forests for various uses, haphazard use of lands. These practices have been compounded by new phenomena related to the social and political crisis, such as arson, and the spread of refugee camps throughout the country. In order to strengthen the necessary link between environmental protection and development, the Government introduced a strategy based on the following components:

- an Ongoing Program of Environmental Awareness and Education;
- a Strategy for Preserving Biodiversity, through Protection and Restoration of Vegetation Cover, the Creation of Natural Forest Reserves and the Expansion of Artificial Reforestation;
- an Action Program to combat land degradation and desertification;
- a Strategy for Implementing the United Nations Framework Convention on Climate Change, Protection and Conservation of Water and Aquatic Resources, and Maintenance of a Healthy Environment, as well as the Prevention of Natural Disasters, through an Integrated Program that includes an Assessment of Resources, the Preparation of Regional Maps and Operational Plans, Databases;
- a Preparation and Implementation of a Master Plan for Water, covering both rural and urban areas.
- a Preparation and Implementation of a Master Plan for New and Renewable Energies, covering peri urban and isolated areas from interconnected electrical grid.

In fact, Burundi has a great many advantages from the climatic viewpoint, of which it does not yet take full advantage. This is particularly the case with its abundant water resources, which could be used to offset climatic fluctuations and seasonal droughts. Consequently, a Program for Water Collection and Management should be adopted. Appropriate institutional mechanisms and incentives will be introduced to encourage involvement by the private sector and other non-governmental agencies in the management and exploitation of the forestry sector. Natural sites will be identified for protection and legislation will be adopted to delimit protected areas in order to safeguard their integrity and ensure their long-term survival.

1.2. Overall Energy Access Scenario

Burundi's energy sector and its problems have to be understood in light of the special conditions of this small, landlocked country. Energy consumption in Burundi is very low. The demand and use of energy is based on location (relative to energy resources), as well as the types of economic activities and local habitat. In general energy needs and uses are for heating, lighting, commercial, agricultural and industrial purposes. Overall, 96% of all energy needs in

Burundi are met by traditional biomass, comprising mainly of wood fuel, solid wastes, charcoal and bagasse.

The biomass energy is composed by 70.8 % of fuel wood, 18.35 % of agricultural residues, 5.82 % of charcoal and 0.978 % of bagasse.

The other energy sources participating in energy balance are 2.5% of petroleum products (crude oil, liquefied petroleum gas), 2.5 % of flowing water (hydropower), 0.04 % of Peat, and 0.01 % of Solar Radiation and Biogas Energy.

Per capita, consumption of commercial energy is only 219 kg oil equivalent per year, one of the lowest in the world. About 77 % of Burundi's supply of commercial energy is imported (petroleum products and electricity), the other 23 % being domestically produced in the form of hydroelectric power and peat.

Table 1: Structure of Gross Energy Supply in Burundi

N°	Type of Energy	Quantity	Toe	%
1	**Biomass**			
1.1.	Fuel wood	6,400,000 m³	1,216,000	70.8
1.2.	Agricultural residues	900,000 tons	315,000	18.35
1.3.	Charcoal	346,617 tons	100,000	5.82
1.4.	Bagasse	48,000 tons	16,800	0.978
2.	**Petroleum Products**	(40,500 tons)	(42,000)	2.5
3.	**Hydroelectricity**	180 GWh	45,580	2.5
4.	**Peat**	8,000 tons	2.276	0.04
5.	**Solar and biogas**	n.a.	n.a.	0.01
	TOTAL			100

Source : Report on the Project Profiles prepared for the Round Table on External Aid held at Bujumbura on May 2007

1.3. Overview of Energy Resources

1.3.1. Biomass, Renewable Energy and Fossil Fuels—Demand, Supply and Sources

In the context of EAC-EASUP, biomass, renewable energy and fossil fuel energy sources are most relevant to **Target 1** (Provide access to modern cooking practices for 50% of the

population that currently uses traditional cooking fuel) and **Target 2** (Provide access to reliable electricity for all urban and peri-urban poor).

Traditional biomass-based fuels for cooking and heating are currently the most important source of primary energy in Burundi with wood fuel and charcoal consumption accounting for 96 % of total consumption (rural—76 %; urban—24%; DGEE, 2006). The total sustainable biomass supply from all the sources is estimated at 6,400,00 m³. Firewood comes from three main areas, as the rangelands, Government forests and small farmlands. Before the civil war, the rangelands were about 131,636 ha and the government forests are 74,024 ha, but now they are together about 188,000 ha, what it means that Burundi lost about 17,660 ha. The role of agro forestry on small farms in providing firewood has increased while showing a decline in the other categories.

Currently the common system used for cooking is the traditional open fire (3-stone) system, using in the interior of the houses and which is still dominant in most of the rural households. It has very low efficiency, meaning 85-90% of the energy is lost in the atmosphere. There is need for improved biomass technology due to accelerated deforestation, but it needs to ameliorate the system of Burundian habitat.

Use of charcoal stands at about 2.0 % at the national level, representing, respectively, 92% and 8% of urban and rural households. All households that use charcoal purchase it from market. Most of the charcoal consumed in Burundi, about 346,617 tons comes from rangelands, government forests and small farmlands. The consumption of charcoal is about 0.67 kg per person and per day. These include rangelands targeted for re-settlement particularly in the Kibira Forest, Bururi Forest, National Parc of Ruvubu and Kigwena and Rumonge Reserves. The degradation and deforestation of rangelands, particularly around urban areas such as Bujumbura, Gitega, Ngozi is attributed to charcoal production.

Improved stove research started in the 1980s, resulting in the DUB Project (DUB 10), one of the most successful stoves programs in Bujumbura. Initially reduction of fuel consumption was the key objective, but improved health and socio-economic issues have since come strongly to the fore, locally and internationally, calling for a multisectoral engagement supported by all relevant Ministries (Health, Education, Agriculture, etc.). The *maendeleo* and *rocket* stoves, which are appreciated in the EAC, are among others must be introduced subsequently in Burundi.

Modern biomass technology in Burundi takes the form of biogas for cooking and lighting (much lesser application). According to a survey carried out by DGEE (2004), 320 biogas plants were in operation in Burundi, in the end of 1993. Most of these systems are between 4-16 m^3 with a maximum gas capacity of $3m^3$ which is considered sufficient to meet the cooking and lighting needs of a family of 5 persons.
The operational status of most of these digesters is believed to be average to poor, even though data on the same is incomplete.[3] The small biogas plants are primary candidates for up-scaling due to their modular sizes and applications in rural areas.

[3] *The Ministry of Water, Energy and Mines is going to undertake censuses in certain parts of the Country.*

Fossil fuel-based domestic energy in Burundi is not important, with kerosene and LPG being crucial carriers used in peri urban homes and some regions. Petroleum fuels are the most important source of commercial energy in Burundi and are mainly used in the transport, commercial and industrial sectors. Burundi has not yet discovered any significant fossil deposits although exploration is ongoing. Kerosene is popular for lighting in the rural areas, and in the urban areas.

Other sources of domestic energy

Other sources fulfilling the domestic demand for cooking, heating and drying needs in Burundi are solar thermal and biofuels (which have since 2006 received increasing attention).

Solar thermal applications have also been in use in some urban households, although the largest applications have been in the hospitality sector. It is estimated that by 2003, a total of 140,000 m² of solar heat collectors were place.

Burundi has no experience in bio-fuels. Alcohol produced can be blended to fuel vehicles. The country sugar belt in MOSO with SOSUMO, eastern Burundi and coast holds promise in sizeable production of this fuel.

1.3.2. Electricity Sector Issues

In the context of EAC-EASUP, electrical energy sources are most relevant to:

- **Target 2:** Provide access to reliable electricity for all urban and peri-urban poor.
- **Target 3:** Provide access to modern energy services for all schools, clinics, hospitals and community centres,
- **Target 4:** Provide access to mechanical power for heating and productive uses for all communities.

National grid electrification levels

1. Burundi relies traditionally on hydroelectric power generation. In 1959 electrification began with a 70 kV overhead electrical line from Rusizi I Small Hydropower Plant (SHP) of Congo for the supply of the capital Bujumbura. In 1982 the first national SHP plant (Mugere 8 MW) constructed with support of China resumed supply for Bujumbura. Since that date, eight additional SHP have been constructed to supply the main centers inside the country.

In 2002 the electrical network was supplied by 9 national SHP with a total installed capacity of 30.9 MW and 2 foreign SHP plants (one of SNEL-Congo with 4 MW, another of SINELAC-CEPGL 13.3 MW). All of these 11 SHP feed into the Burundi electricity supply system by HV electrical lines operated at 110 kV, 70 kV, 35 kV, 30 kV and 10 kV levels. There is additionally an installed capacity of thermal power of 5.5 MW (2x1.5 MW, 2x1.25 MW) which has been put in place in 1996 for auxiliary supply services of Bujumbura.

2. 27 small hydro plants, defined as plants up to 1 MW, are currently in operation in Burundi with a total capacity of 2,93 MW. In 2003, recorded electricity production was about 131 GWh, 99% of which was hydroelectric. Total electricity imports accounted for 35 GWh, losses for 9 GWh. There is around two thousands of megawatt (300 MW) capacity which could be economically installed. The challenges are, however, enormous:

- Large dams are in many cases environmentally not sustainable,
- Locations are often far away from existing grids,
- Hydropower is very capital intensive and has very long lead times.

3. During the years of civil conflict, the electricity access rate in connected areas halved as the urban population doubled while the number of REGIDESO's customers barely increased to 41.000, by end 2007. Less than two percent (2%) of the country's households currently have electricity service in their homes. The average consumption of electricity in Burundi is among the lowest in Africa at 23 kWh/cap/year.

4. Gap between energy supply and demand. Burundi faces severe constraints in electricity supply, either national or imported. The supply deficit currently varies between 12.9 MW during the wet season and 23.5 MW during the dry season, when the country's main hydropower plants are running et reduced capacity. Assuming that the economic growth continues at the current pace, the supply deficit may reach 22 MW and 34 MW (during the wet and dry seasons, respectively) by 2014, at which point substantial generation capacity could be added through the commissioning of the Kabu 16 (Burundi), Rusumo-Falls and Rusizi III (regional) hydropower plants. The impact of power cuts was identified in the Interim Strategy Note (ISN, 2006 – 2007) as one of the important hurdles to economic growth. Recently Load shedding has been reduced due to improved rainfall leading to increased output from both National and Regional Hydro Power Plants and the closing of some state owned companies that in turn led to a reduction in peak demand and energy supply deficit. Demand for electricity is expected to continue to rise steadily as the economy improves, returning refugees re-establish themselves, and standards of living increase. Peak demand occurs during the evening hours and emanates mainly from household lighting needs.

Supply and sources of electrical energy in Burundi

5. Electricity is generated almost exclusively through 7 REGIDESO hydroelectric plants with a combined installed capacity of 30.6 MW (equivalent of 95% of the total capacity of 32.2 MW among 27 existing hydro plants).

In addition, DGHER operates eight small and micro hydro plants in rural areas while NGOs and some non-profit organizations operate another twelve micro hydro plants. 85 % of the National supply is delivered by two plants : Rwegura (18 MW) and Mugere (8 MW). REGIDESO produced 87 GWh in 2004 and imported 73 GWh from the regional hydro plants of Rusizi I and II, which are operated by SINELAC and Société Nationale d'Electricité (SNEL), respectively the hydropower plants built downstream of Lake Kivu on the border between RDC and Rwanda.

The total annual supply of electricity was 188.8 GWh in 2007, a 28% increase from 2006 due to considerably higher rainfall than experienced during the regional drought between 2004 and 2006 that nearly depleted the reservoirs. The reliability of the hydroelectric supply is affected by lack of available funding for maintenance and the need for replacement capacity to allow for extend outages. Supply reliability is further hampered by a severely dilapidated electricity grid in urgent need of repair. The absence of the key system protection and control functions make outages more frequent and take longer time to address. The operation of these plants has been problematic due to complex ownership issues surrounding the maintenance and payments for power delivery times of unrest.

4. REGIDESO also owns a 5.5 MW diesel power plant acquired in 1995, which has been mostly idle (only 1,000 hours) due to the lack of funds to pay for the fuel. The average cost of thermal (diesel) electricity is approximately UScents 33/kWh, while the average sale price was 88.5 Fbu/kWh (UScents 7.5) in 2005. The thermal plant has been used as back-up in case of hydropower production failure. More recently, and in the face of the increasing supply deficit, the government has decided to operate the thermal plant as a complement to sufficient hydropower supply, and to assist REGIDESO in meeting the plant's high operating expenses.

At the end of 2006, and in the face of recurrent and serious power shortages, the government decided to operate the thermal plant as a complement to insufficient hydropower supply and adopted a number of measures to assist REGIDESO in meeting the plant's high operating expenses.

Measures included the exemption of taxes on fuel purchases, an overage 27 % increase in electricity tariffs and a budget subsidy of 3 months of fuel purchases for 2007 during the highest shortage season. Unfortunately the latter budget allocation was not used for the intended purposes and the diesel power plant remained idle, apart from short maintenance operations, as the low tariff levels and high diesel prices do not allow the utility to finance fuel payments.

5. In order to address the rapidly increasing demand for electricity, the government has opted to rapidly develop the country's domestic hydro potential and to launch a loss reduction and fraud prevention campaign in the system and the launch of demand side management measures including installation of compact fluorescent lights (CFL) on a large scale to limit peak demand. This year, the government is planning the construction of the MPANDA Plant (10.4 MW) and in medium and long term, the construction of KABU 16 (20 MW) and MULE 34 (15 MW) by 2015.
6. In parallel, Burundi is participating in the RUSUMO-FALLS (60 MW) and RUSIZI III (205 MW) regional hydropower development. Finally, given the extremely low service coverage rate (less than 2% of the population), the government is planning a large electrification program in order to reach nearly 25%of the population by 2020. The rate of access expansion will remain severely constrained in the short term, in order not to further deteriorate the quality of supply, as the system is expected to continue to be energy constrained until new large scale Hydro Power generation is in place.

The KABU 16 hydropower station has been identified in the Nile Basin SSEA study of regional power generation options to be among the most suitable sites to meat the region's medium term energy needs. The site has been designed for run-of-river operation/

Transmission and distribution Issues

6. During the years of conflict much of the 110 and 70 kV switchgear equipment was damaged by technical malfunction and in some cases direct hostilities. Spare parts are not available for much of the installed equipment, as much of the switchgear is of a product generation that has since long been phased out from manufacturing. Repairs of key Switchgear have instead been made by stripping parts from stand-by equipment for needed seals, gaskets, etc. This move has enabled the Utility to re-establish the needed functionality but will not be able to sustain the system for than a short period of time.

The distribution system is equally in poor state with much of the essential switch gear beyond repair due to limited availability of spare parts and lack of resources for maintenance. Key load centers such as Bujumbura are already heavily saturated, resulting in increased technical losses for the utility and poor quality of supply. As an indication of state of the network, the amount of unplanned power outages in the main grid (Medium Voltage) increased by nearly 200 % in 2007 to 200 hours, compared to earlier years (2005, 2006). Some of outages are due to the complete lack of spinning reserve and the high dependence on regional generation that offer little flexibility to bridge sudden supply interruptions.

7. The control, protection and communication equipment is severely dilapidated and does not permit the utility to operate even the simplest maneuvers without manual intervention. Lack of adequate system earthing and protection functions are causing occasional high over-voltages (up to 1.73 times nominal voltage) with destroyed consumer equipment and appliances as a result. The limited functionality of key relays result in more frequent and longer lasting outages and damage to transformers and other equipment.

Regional Transmission Links

8. In the long term, Burundi will rely on regional Power Generation to supply the domestic market. The Nile Basin Equatorial Lakes Subsidiary (NELSAP) has recently commissioned a study to strengthen the supply from DRC and Rwanda through the following projects :

- Voltage upgrade from 70 kV to 11O kV for the Burundi-DRC-Rwanda Transmission Line that would enable Burundi to benefit from Power trade and regional transmission integration with the neighboring countries (including Uganda an Kenya when the planned transmission links completed). The area around Kivu Lake represent a potential regional source of Power Generation both through the hydro potential on the Risizi River and the significant methane Gas deposits in the Kivu Lake, currently being developed on a pilot basis for Power Generation by Rwanda.
- Rusumo-Falls Transmission Links : the transmission line from the proposed Rusumo Falls hydro power station would, in addition to delivering the Burundi's share of the

generated capacity (estimated to 20 + MW), interconnect it with the national networks of Rwanda and Tanzania to enable further resource sharing and optimization..

Services Issues

Due to the lack of maintenance and the supply deficit described above, the quality of service and operations is currently insufficient, with an estimated 48 GWh in combined technical and non technical losses for 2007, representing 24.4 % of total supply. Technical losses are deemed to make up a large portion of these losses given the poor condition of the network. The quality of the electricity, delivered suffer from frequently and significant voltage deviations estimated to be in excess of the normal 10% below and above 220 Volts.

National off-grid electrification levels

The most notable off-grid electricity solution in Burundi is solar photovoltaic (solar PV) systems, mainly solar home systems (SHS). In Burundi, solar PV is commonly used for lighting, refrigeration, telecommunications and water pumping for social institutions as schools, hospitals, clinics and telecommunication systems. Due to its strategic location near the equator, where insulation (energy available/unit area/unit time) is high.

Mainly small (12Wp to 30Wp) SHS, are sold annually in the commercial marke. Others are the small thermal diesel generating sets operated by REGIDESO and private. These are for towns located far from the national grid network. There also exist mini hydro power stations for communities and missionaries. Standalone diesel generator sets and inverters are also in use, but are mainly limited to hotels and lodges.

Burundi's electricity comes also from co-generation (SOSUMO -5 MW). Cogeneration potential mainly rests with bagasse, a SOSUMO waste product of the cane milling process. Annual bagasse production is roughly 48,000 tons (SOSUMO, 2006), a gross oil equivalent of 16,800 tons and with an estimated capacity to feed the grid with 77 GWh of energy. Total installed cogeneration capacity is 5 MW, used as captive power within the industry while.
The negotiations are going on between REGIDESO, SOSUMO and World Bank to analyze how SOSUMO can feed energy into the national grid during the period of non production. Other cogeneration potential exists from wood and paper industries, crop residue (rice husks, maize cobs, coffee residues and spent process grain).

Renewable Energies

The extent to which modern equipment for renewable energy use available is widely unknown. From literature research very little knowledge about such systems in Burundi is available. The role of the African Regional Center which was located in Bujumbura did'nt help Burundi.

- ***Solar energy***

Burundi has an estimated insolation of about **4-5 Wh/m²/day**. Solar radiation has been used traditionally in the drying of crops and animal produce as well as other domestic purposes like

drying of clothes. There is a large potential for photovoltaic electricity generation in rural parts of Burundi, as many regions are not connected with the grid. But application of PV in these areas is not very common. Until 1993, 1,678 PV kits were installed, with 72,354 WP, respectively 56% for telecommunication systems (ONATEL, RTNB, RSA, EGL, CARITAS), 30% water pumping, 13% lighting (DGHER, DGEE), 1% refrigeration of medicine and vaccine (Ministry of Health), but 60% wee destroyed during the civil war. According to the ENESCO Report, 17% were functional in 2002. Actually, the Ministry in charge of Energy is installing solar PV equipment in more 60 health centres and college in rural areas. That program will be done each year. During those next 2 years, 180 clinics and schools will be electrified (90 clinics and 90 schools).

The health centres provide basic health services and are equipped with waiting rooms, consultation units, laboratories, administration and registration areas, family planning and maternity facilities, store rooms, sanitary facilities and housing for staff. The primary schools, community colleges, markets, churches and administration buildings can also be connected to the local solar grid.

The health centers and community colleges now have lighting and sterilization facilities; a refrigerator will be added after their performance has been tested at the laboratories. Personnel working at the centre now have access to TV and lighting in their residences and, at the nearby community college, examination results have improved since students have had electric lighting by which to study. There is a lack of PV equipment in local markets. This meant that everything had to be imported and transported into land-locked Burundi, which is already suffering from a scarcity of hard currency as a result of the Burundian Franc devaluation.

An intensive awareness-raising campaign is needed to gain support for the project from stakeholders who were initially reluctant to participate owing to their unfamiliarity with PV systems. This is a people-oriented project that did not aim to benefit the implementing body in any way. Because of this, the Government sought to lift taxes on the imported materials and equipment that were needed for the PV systems.

- ***Peat***

Burundi has immense forest and agricultural resources that can be converted into energy. In addition, as an agricultural country, Burundi generates a lot of agricultural residues which can be converted into energy as well.
Wood and peat account for 96% of energy consumption in Burundi. Peat offers an alternative to increasingly scarce firewood and charcoal as a domestic energy source. The government is promoting peat production.

- **Biogas Energy**

700,000 household livestock

In 1993, 320 biogas units were installed but 70% wre destroyed during the war

- ***Wind energy***

For Wind power generation, no measurements have been made at appropriate heights (over 10 m) for wind turbine design.

- ***Mini-Hydro Electric***

Hydropower provides about 99% of the country's utility power supply. The resource however is not yet fully exploited. There is, therefore, considerable potential for further development, including micro-, mini and small hydropower.

- ***Geothermal Energy***

Geothermal resources have been identified in the Rift Valley region in neighbouring Western Uganda. Several geothermal indicators exist also in Burundi, but very little useful data are available to assess their commercial viability. There is however need to carry out detailed exploration to quantify the available resource capacity.

Electricity Consumption Patterns

REGIDESO is Burundi's integrated water and electricity utility. As of December 2007, REGIDESO had 41 074 electricity connections, corresponding to population coverage of 0.53%fo electricity, one of the lowest in Africa. Annual growth in connections has averaged 8.5% in electricity, driven by a significant uptake in connection rates in 2006 and 2007.
The majority of electricity connections are concentrated in Bujumbura, which accounts for 60% of electricity connections. At the same time, electricity produced in 2006 decreased following due to reduced electricity imports from SINELAC and SNEL, following poor hydrology. Due to improved hydrology, produced electricity increased to 189 GWh at the end of 2007, of which imports from SINELAC and SNEL, accounted for 28% and 14% respectively.
In the electricity sector, REGIDESO's technical and non technical losses have deteriorated in 2005 to 28% but improved since to 24% in 2007. This can partly be attributed to the growing number of prepaid meters being installed as well as REGIDESO's fraud prevention and meter supervision programs.

Electricity sold through prepaid meters accounted for 10.5% of electricity sold in 2007, up from 7.1% in 2006 and 3.8% in 2005. For 2008, REGIDESO has 7,500 prepaid meters ready for installation. REGIDESO started installing prepaid meters in 2004.

There has been loss of energy in transport and distribution of electricity consumption in the country in the last three years. This has been 24.4 % in 2007 and in this last five years has been average 25 % per annum. It is why the Government of Burundi needs to rehabilitate the national electric grid. Like many countries in the sub-Saharan African, Burundi electricity per capital consumption is considered low, at around 23 kWh per year and per inhabitant. On average, household electricity consumption was very low, with rural areas registering 30 kWh and urban areas consuming 220 kWh per year (REGIDESO/DGHER, 2006). Electricity at household level is largely used for lighting, entertainment e.g. television, radios and provision of other services such as ironing, refrigeration and micro enterprises.

Map **2: Electricity Grid Map of Burundi**

Source : REGIDESO, 2005

Financial analysis

REGIDESO is technically bankrupt and a financial restructuring plan is required to :

- in the short term, restructure its balance sheet to provide an adequate capitalization of the company's operations,
- in the medium term, ensure the financial sustainability of REGIDESO through cost-reflective tariffs, combined with efforts to improve its operating efficiency.

While REGIDESO underwent a financial restructuring already in 1996, its effects were undermined by the resurfacing of REGIDESO's structural problems, significant arrears by government entities to REGIDESO, causing significant arrears by REGIDESO to its suppliers and preventing the company from carrying out necessary rehabilitation and maintenance of its network to reduce technical and non technical losses.

Government is REGIDESO's largest debtor as it pays bills with a significant delay. Total arrears amounted to US $ 17.3 million in 2007, 60% of which is due from government, local communities, other administration and state-owned enterprises. In 2007, arrears averaged 302% of sales for government, 485% of sales for local communities and about 160% of sales for other administrations and state-owned enterprises.

By 2005, REGIDESO's selt-financing capacity was eroded and the small investments undertaken were financed from government subsidies through door grants or loans.

Given its cash flow problems, REGIDESO maintained its liquidity mainly through the following measures :

- Non-payment of suppliers, in particular significant accrual of arrears to SINELAC which amounted to US $ 31 million at the end of 2007 (agreed tariff of 55 DTS/Kwh), accounting for 59% of REGIDESO's total liabilities and equity. This position is the main reason behind REGIDESO's extreme accounts receivable days of 1 248 in 2007.
- Absence of necessary rehabilitation and maintenance expenditure,
- Reliance on government subsidies from donor funds for investments.

The proposed financial restructuring plan foresees the following operations to rebalance REGIDESO's balance sheet :

- Compensation of cross-debt and arrears between REGIDESO and Government, including :

- cancellation of arrears of REGIDESO,
- cancellation of REGIDESO's debt to government.

- Recapitalization of REGIDESO and settlement of arrears with SINELAC :

- cancellation of arrears of REGIDESO towards SINELAC,
- capital increase in the amount of the debt towards SINALAC taken over by government,
- cancellation of debt repayment for government subsidies financed by donor grants and loans,
- capital increase in the same amount.

- Reduction of capital in the amount of cumulate net losses.

1.4. Overall Cross Sectoral Management, Energy Institutional Issues and Regulatory Framework

The Burundi energy sector is still dominated by largely by Government in electricity sub sector and private sector in petroleum sub sector and household energy sector dominated by the rural communities and to an extent the private sector. The development/bilateral partner have been instrumental in supporting the Government in developing energy resources and increasing transmission network. The Chinese, French, World Bank and AfDB are supporting the hydro electric energy assessment.

Currently, the power sub-sector comprises generation, transmission and distribution utilities. Electricity production, transmission and distribution in urban and peri urban areas is still the exclusive function of REGIDESO. Electricity production, transmission and distribution in rural areas is still the exclusive function of DGHER.

1.4.1. The Power Sub-sector

Weak Operational and Financial Performances of electricity utility

The operational performance of REGIDESO is inadequate with high technical and non-technical losses and low productivity (20 staff per 1,000 customers). REGIDESO's financial position is extremely weak, mainly due to the accumulation of losses over the past decade.
Its own capital stock and working capital are both negative. REGIDESO's revenues (about 70 percent from electricity and 30 percent from water) increased from 3.7 billion Fbu in 2006 to 17.0 billion Fbu in 2007 due to higher electricity sales and the increase in tariffs. The rate of bill recovery was 82% in 2007. Unpaid bills amount to 19.2 billion Fbu, of which about 70% correspond to public customers (the State, Municipalities, Public Agencies, Autonomous Public Entities and State Enterprises). REGIDESO offsets this critical financial situation by deferring payments of 24 billion Fbu to its major supplier, SINELAC (about six years of SINELAC billings to REGIDESO, which exceeds 30 months of REGIDESO revenues).

In summary, given the widely negative flow of funds from its current operations, REGIDESO would be unable to operate without the financing of the State, the assistance from development partners and the accumulation of debt with its principal suppliers such as SINELAC and .SNEL, but this situation is not sustainable.
The Utility's net income has become positive since January 2005, due to decline of energy prices charged by SINELAC from 55.29 DTS/mWh to 13.33 DTS/mWh (the SINELAC tariff has recently been increased to 22 DTS/mWh to reflect the need for additional resources for maintenance of the plants), and REGIDESO's increase of electricity tariffs by 27% in April 2007. In addition the collected rate has improved with an increased effort to recover outstaying debt, faster action against non-playing customers and the installation of prepaid meters in government ministries. Nevertheless, the overall insolvency of REGIDESO cannot be cannot be resolved without a major financial restructuring.

Despite the 2007 tariff revision, the tariff structure remains inadequate to address issues of efficiency, financial viability, and social equity among services users. A revised tariff regime is needed to adjust both the tariff structure and its levels. The household electricity tariff currently in place include a subsidized pricing for up to 750 kWh per 2-month billing cycle, starting at 41 Fbu or 3.5 US cents/kWh for the first 150 units (for comparison purposes, a tariff of 20.7

US cents/kWh is applied in neighboring Rwanda to domestic clients with the same consumption).

In order to return to financial and operational viability, REGIDESO will need to :

- carry out a financial restructuring to consolidate its current liabilities,
- revise the tariff structure so that it is efficient, covers a least operation and maintenance costs, and is fair and equitable,
- improve its technical and commercial performance through the establishment of a performance contrast between REGIDESO and the State.

REGIDESO, with the government's support, has already taken a number of steps in these directions. As indicated above tariffs were recently increased and the government has authorized REGIDESO to apply a 4% surcharge to electricity tariffs when the thermal generation plant is in use. In April 2007, the Ministry of Finance and REGIDESO also signed an agreement for the settlement of approximately 50% of the State's debt toward the utility.

In improving technical performance in electricity will require the rehabilitation of production facilities and networks, energetic measures and maintenance practices with appropriate and efficient use of human resources and equipment. Existing unused electricity production capacity will need to be fully used and demand-side management measures taken in order to reduce the supply deficit.

Institutional Issues

The Burundian government, with support from its development partners, has been considering institutional reform of the electricity sector for several years, in order to improve service quality and financial sustainability. In 2000 the government adopted a Law N° 1/014 of August 11st, 2000, liberalizing and regulating public electricity. This Law defines the principles, forms and conditions for private sector intervention in the sector.

It allows for the establishment of a regulatory and control entity for energy and a development fund for the sector. It also abrogates the Order in Council that granted REGIDESO the monopoly over public electricity supply, back in 1968. Along with the DGHER, REGIDESO became a delegated public service provider operating under the control and authority of the regulatory body to be established. Today, the Law has yet to be fully applied in the absence of a corresponding regulatory framework.

A comprehensive study in 2003 of REGIDESO's performance and of its institutional environment, done by Régie, Inc. (Reforms of drinking water and electricity, restructure of REGIDESO and establishment of Regulatory and Control Authority) recommended that the private sector be called to play a progressively important role in the management of the utility, first through a management contract and later transitioning to a concession.

However, in the ensuing years as the conflicts and crisis remained latent, the reform did not take place as planned and REGIDESO's situation continued to deteriorate. Today, the immediate participation of the private sector in the management of these services, either as a

service-provider and/or as a shareholder, appears unlikely, due mainly to enduring country risk; the lack of a adequate regulatory framework and to the dilapidated state of the utility's infrastructure. The Government and IDA have agreed that a Performance Contract between the State and REGIDESO would :

- foment an opportunity to develop a culture of performance within the utility,
- allow the two parties to enter into a public-private partnership to leave behind a pattern of dependency and lack of accountability.

Past performance contracts have yielded lessons that will be taken into consideration for the new one. This would pave the way for possible deeper changes in management and/or asset ownership in the medium to long term, if deemed desirable at that time. In the short term and in the absence of a Regulatory and Control Body, the compliance with the Performance Contract will be evaluated by an independent International technical Auditor that will be financed by the IDA Multisectoral Infrastructure Water and Electricity Project. The results of the performance evaluation will be disseminated to the public in general in order to generate and promote a social accountability in regard to the provision of electricity services.

Government commitment to develop energy services

The Government of Burundi has given a high priority to rehabilitating and developing electricity services. The Ministry of Water, Energy and Mines (MWEM) recognizes that electricity constitutes a critical factor for economic development of the country, while simultaneously reducing the country's considerable burden of disease caused by indoor air pollution from solid fuel use. However, developing and sustaining services requires considerable investments and timely bill payments. Regarding the production of electricity, the MWEM favors options based on renewable energy, such as hydroelectricity, while acknowledging that thermal power plants constitute the least cost option for the short term, to bridge the gap between demand and supply.
If no short-term solutions were implemented, economic agents would have to turn to individual power generating units, with even higher costs, resulting in reduced competitiveness for business and adding to the burden on the Burundian economy and the environment.

In addition, the MWEM would like to :

- restructure the energy sector by merging the electricity activities of DGHER with REGIDESO,
- encourage private sector participation in electricity production,
- establish a Regulator and Control Authority.

The MWEM considers the direct subsidy of Operation & Maintenance (O&P) costs as inadequate and inefficient and adheres to a tariff policy of fully covering at least O&M costs.

Rationale for IDA , AfDB & Dutch Ministry of Foreign Affairs Involvement

The IDA Multisectoral Infrastructure Project and the AfDB Rehabilitation and Extension of Electrical Infrastructures are in line with Banks's country strategy and the PRSP, and carries

strategic importance in light of the Banks's focus on poverty reduction and post-conflict assistance. The important aspects of the Banks's assistance strategy for Burundi, as emphasized in the Interim Note (ISN) are :

- improved security, social stability and service delivery,
- debt relief, economic growth and diversification.

The proposed multi-sector projects contributes to both aspects by improving and sustained growth performance. These goals also coincide with the PRSP's which aims to promote sustainable economic growth and to develop human capital. The scope of the projects takes into account the current activities of the external support agencies, which are mainly focusing on rural electricity supply. The projects also will contribute to bringing the country on the path to achieving the Millennium Development Goals on energy supply.

The two Banks are well positioned to support the projects strategy of financing high-impact activities that address urgent unmet needs with quick return on investment for the utility while providing planning and policy assistance for the mid- to long term horizons. In the short term, the projects aim to improve the reliability of and access to electricity services. The medium to long-term objective is to establish the strategy and the corresponding capacity to ensure the sustainability of the electricity sector. The projects also seek to improve Burundi's capacity to participate in a regional integrated network as well as to explore alternatives sources that would be less costly and more environmentally sustainable.

Electricity will play a crucial role towards accelerating industrial and commercial activity and hence contribute to the country's economic growth. The IDA and AfDB Projects are complementary and fully coordinated. The AfDB operation will focus primarily on the rehabilitation of the hydropower generators, the construction of 2 new MV/LV transformer plants in Bujumbura and the rehabilitation and extension of the MV/LV electricity networks. The IDA investments are primarily geared towards the rehabilitation of the main grid infrastructure back-bone as well as financial support to allow current thermal generation capacity to be fully used, balanced with energetic demand-side management measures.

The electricity sector investment components have also been discussed with representatives of Dutch Ministry of Foreign Affairs to explore possibilities of co-financing in the areas of sustainable energy development with special emphasis on the development of small hydro power plants.

The Proposed Monitoring Indicators are :

- Electricity
- Increased electricity generation (GWh),
- Minutes of unplanned supply interruptions (Min/quarter in MV system),
- Percent of voltage and frequency fluctuations,
- Number of HV and MV substations rehabilitated,
- Technical and non-technical losses (Energy Billed/Energy Produced),
- Number of incandescent light bulbs replaced with compact fluorescent bulbs is X in year Y,

- Number of pre-payment electricity meters installed.

- Institutional component
- Collection efficiency of REGIDESO (calculated as billing revenues/amount billed),
- Accounts receivables in days of public customers,
- Coverage of O&M costs through revenues,
- Preparation of a strategic sector plan for electricity.

Urgent unmet need to expand electricity to the urban poor

The return of formerly exiled and displaced populations, combined with rural-to-urban migration, is creating strong pressures on the capital's and other cities's already deficient electricity infrastructure. There are 150,000 inhabitants in the city's periphery, the vast majority of whom are currently inadequately supplied with electricity. This poses serious problems while negatively affecting well-being, children education and productivity. Given that the existing aid financing by other donors focuses on improving electricity to rural and peri urban areas, this operation will provide the necessary financing to address urgent electricity supply needs in per urban settlements of Bujumbura.

Higher level objectives to which the Projects contribute

As noted above, the projects will contribute to higher level objectives described in the ISN. Indeed, better electricity service will prompt economic growth and diversification by allowing current commercial and industrial users to function better and prospective entrants (domestic and foreign) to establish themselves in Burundi more readly.

Electrification of peri urban and urban poor will contribute to public and social stability, where the population is predominantly of low- and very low-income. The improvement of service coverage will indeed contribute to long term human resources enrichment and economic growth by allowing children to attend school, and adults (especially women) to engage in additional productive activities (handcraft activities).

1.4.2. Petroleum Sub-sector

Procurement of petroleum products is Burundi's second major energy problem from two point of view:

- prices,
- security of supply.

Because petroleum products are transported by a long and complicated route, they reach Burundi at a cost of about 2 US $/liter. Moreover, the length of the journey increases the risk of supply interruption. The some complete cut-off in supplies, due to external causes, caused serious difficulties in Burundi. To prevent such a situation from recurring, the Government has decided to build very large storage capacities, on the order of nine months worth of consumption. However, maintaining such a level of stocks is in itself very costly, not only in

terms of storage tank maintenance, but also of financial cost of trying up large quantities of oil products.

Given Burundi's geologic structure, the presence of large petroleum reserves is unlikely. However, according to recent geophysical exploration, there is a reasonable chance for oil to have accumulated in producible quantities. An International Oil Company –AMOCO- made an exploration contract. The contract covered a greater part of the area of interest in the country. Given the high cost of imported oil, even a small production refined in a topping init for the local and regional market could be profitable. However, domestic oil can be considered as a longer-term possibility. Burundi will have to define its very long-range development policy in light of need to use imported resources as well as its domestic energy resources, in addition to petroleum products, with the problems of access to external sources mentioned above. One of the solutions recommended is to diversify oil supply sources and transportation routes.

The Draft Report of Feasibility study for Kenya-Uganda-Rwanda-Burundi Oil Products Pipeline intended to analyze the refined petroleum products market in Rwanda, Burundi, and Southwest Uganda to determine the economic viability of extending the proposed Eldoret to Kampala petroleum products pipeline to Kigali, Rwanda and then on to Bujumbura.

The Study presents bottom up forecasts of potential petroleum products demand in Rwanda, Burundi, and Southwest Uganda. A High Case scenario consists of higher projected economic growth. Potential demand from Northwest Tanzania and the planned Isaka – Rusumo-Gitega-Bujumbura railroad are also added in the High Case scenario. A Low Case scenario is determined by the minimum demand required to ensure the economic viability of extension of the E-K pipeline to Kigali. The Study also compares the projected demand levels with historical consumption in other countries to assess the reasonableness of the projections.
Specific steps in the Study include:

- Develop a likely general pipeline route focusing on reaching major demand centers and avoiding key geographical obstacles.
- Assessment of macroeconomic conditions such as economic and population growth,
- Surveys of existing and potential distributors and consumers,
- Alternative fuel price scenarios,
- Development of potential market demand scenarios and key factors driving each scenario,
- Comparison of demand scenarios and available capacity on the E-K pipeline to determine the capacity of extensions from Kampala to Kigali to Bujumbura a "Best Practices" case.

1.4.3. The Renewable Energy Sub-sector

Renewable energy plays a significant role in delivery of modern energy services especially in houses, communities and institutions remote to the grid. It is anticipated that renewable energy will provide HILC and scalable interventions. The challenge is to increase the level of consumption of often low valorization fuels while protecting the environment. Although ERC is expected to come up with regulatory framework for renewable, their range and diversity remains a challenge. Burundian Centre of Renewable Energies (CEBEA) is the institution,

which is currently involved in specific renewable often under diverse policy instruments or guidelines and there is need to harmonize and organize the various activities to contribute effectively to national energy access agenda.

The exploitable mini hydro sites in Burundi are found within the major drainage system in the country. Small hydro systems have been demonstrated to be capable of meeting local demand for electricity where the grid is remote. At the moment MWEM is reorganizing efforts towards a greater utilization with participation of NGOs and donor community. The policy and the Act allow wider use of this resource and in effect allowing development and use of up to 1MW without licensing. Some of the challenges include limited skills to plan, implement, operate and maintain the schemes; lack of standards, site specific data and the local capacity to manufacture equipments. It is also important to note that some safety and environmental requirements will be necessary to regulate the development of this resource.

The production of bio-fuel crops is governed by several policies and regulatory frameworks – agriculture, sugar, trade and industry. It will be interesting to see how ERC will address the regulation with this scenario. The country must develop a national strategy for production of bio-diesel. Some of the challenges that need to be addressed include land and land use issues, the secondary processing of the primary fuel and the cost of the product and consumer education. Some private actors from private sector are organizing themselves to implement Vanilla-Jatropha Development Project, which is going to establish out grower farming activities of the Jatropha crop, with the aim of producing bio-diesel, essentially for domestic processing and use. Biogas technology was introduced in the country in the early 1980s with GTZ, BTC, FTC and Chinese Cooperation.
Although by 1993, it is believed that over 320 biogas digesters were installed in the country, a number of them fell into in disuse due to a conflict socio-politic crisis in Burundi, lack of skills in management of the plant and poor development of the milk industry. Biogas technology is a clean cooking technology and provides modern cooking services while improving health and agricultural productivity.

1.4.4. .The Biomass-Based Energy Sub-sector

The Ministry of Water, Energy and Mines, undertakes strategic planning and financing of biomass energy development programmes. While most of the biomass in the country is produced by the private farmers on their land and from trust land, various policies govern its production and use. The Government forests are increasingly becoming of secondary value in production of biomass energy but still play an important role in supplying institutions and wood based industries especially in the rural areas. MWEM an elaborate outreach program through a number of strategically located field energy centers where technology development testing and demonstration is done. Other agencies involved include Ministry of Agriculture whose extension arm provide the front line extension services to MWEM both collaborate through a long standing Memorandum of Understanding.

The Burundi Forest Service which manages forest development in Burundi has traditionally been a key actor in tree planting program particularly through rural a forestation extension service. The Directorate General of forest in Burundi provides the country with quality germ plasm and is the leading authority in species trials, introduction and sylviculture.

Development partners played an active role in the development and management of biomass sub-sector through financial and technical support; e.g. World Bank, French Cooperation, individual farmers and local private sector were engaged, 20 years ago, in farming and management activities with reasonable success. The biomass sub-sector is faced with various challenges amongst them conflicting policies, land and land use issues, lack of clear mandates and inadequate budgetary support.

Map 3: EAC Regional Electrical Grid

1.5. Overall Energy Policy Framework Analysis

Analysis of Burundi Government energy sector policy approach

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
1. ELECTRICITY		
1.1 Hydropower	High costs associated with undertaking pre-feasibility and feasibility studies of potential hydropower projects Dwindling large sites and environmental impacts	Government will set aside funds for carrying out resource reconnaissance survey, pre-feasibility and feasibility studies Government will seek external assistance to augment its resources (AfDB, World Bank, Dutch, European Commission, China Popular's Republic). Unattractive sites to the private sector will be implemented by Government as multipurpose projects (South African Private Enterprises, Sweden Private Enterprises). Communities and private sector will be encouraged to develop potential sites to generate electricity for their own consumption and for export of surplus electrical power to the national grid (Missionaries). The Government is to undertake environmental rehabilitation Increasing use of small hydro sites (with help of the Dutch Kingdom)

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
1.2 Rural Electrification	Ineffective institutional framework Low electrification access Low private sector investment Current isolated electricity generating systems have limited financial capacity for expansion Lack of resources	Government has established a rural electrification Authority (DGHER) to manage rural electrification Government's goal is to provide electricity service connections to 20% of the rural population by 2010, increasing to at least 40% by 2020. Government to fund rural electrification activities on a cost-sharing basis with communities Government will establish a Conducive Regulatory Framework including cost reflective tariff structures for small power utilities. Consideration will be given to supporting either community or private sector managed national grid interconnected rural electrification projects through a one-off financial subsidy Introduction of rural levy and committed budgetary support.

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
1.3 Transmission & Distribution.	Closed power transmission system Prudent management of the transmission, distribution network	Power transmission system will be transformed into an open access system that would allow large electric power consumers to contract with generators of their choice Unbundling of the transmission, distribution network
1.4. Electricity Accessibility and Consumer Connections	Inadequate financial resources for investment	Government will assist where necessary REGIDESO and DGHER to mobilize financial resources for establishment of revolving funds, to finance financially viable extensions.
1.5. Cogeneration	Cogeneration potential in SOSUMO Sugar Industry is underexploited	Promote cogeneration to generate 5 MW by the year 2015 in the SOSUMO Sugar Industry and other commercial establishments where opportunities exist; and, Undertake appropriate studies on co-generation including standardization
2. PETROLEUM		
2.1 Petroleum Fuels	Regional imbalances in supply of petroleum fuels	Government is to ensure provision of adequate supply and distribution of petroleum products in all parts of the country at least cost. Address non-tariff barriers, incentives to private investors in petroleum refining

		Promotion of kerosene and LPG by rural households
2.2 Hydrocarbon Exploration	Perceived risks associated with prospecting	Government will continue to enhance an enabling environment through which petroleum exploration and resource development can be undertaken Government will carry out pre-exploration works in Lake Tanganika and in Rusizi Plain, including collection and analysis of primary data and introducing service contracts to enhance exploration in areas designated for licensing

Energy Sub-Sector/Issue	**Identified Challenges**	**Policies to address the challenges**
3. PEAT		
3.1. Sod Peat	Assess the technical and economic viability of the social institutions market of peat	Promote a large use of peat in social institutions as schools, clinics, army barracks and in commercial sector (bakeries, handcraft)
3.2. Carbonization of Peat	Assess the technical and economic viability of the household market of peat	Promote a large use of peat in domestic sector to reduce consumption of wood and charcoal.
3.3. Conversion of an industry to peat (optimal boiler)	Assess the technical and economic viability of the industrial market of peat	Promote a use of peat in industry with appropriate boilers.
4. BIOMASS		
4.1. Wood fuel	Unsustainable supply to meet rising demand Poor coordination of biomass related R&D	Promote private sector participation in biomass energy production, distribution and marketing Promote of fast maturing trees for energy production; promote establishment of commercial woodlots including peri-urban plantations Formulate a National Strategy for Coordinating Energy Research; Regulate charcoal market to encourage sustainability; Increase the rate of adoption of efficient charcoal stoves from 47% currently to 80% by 2010 and to

		100% by 2020 in urban areas; and to 40% by 2010 and 60% by 2020 respectively in rural areas; Increase the rate of adoption of efficient fuel wood (firewood) stoves from 8% currently to 26% by 2020; Promote inter-fuel substitution especially peat, kerosene, biogas and LPG; Raise awareness among the affected population through networks of different sectors (education, health, etc) to inform on the impact of solid fuel use on health and preventive measures.
4.2. Charcoal	Unregulated charcoal industry Inefficient utilization of wood fuel Lack of clear mandates for the charcoal governing institutions	Increase the efficiency of the improved charcoal stove from the current 12% to 25 % by 2020; Promote introduction of efficient charcoal kilns in charcoal production Offer training opportunities for DUB 10 artisans at the village level for the manufacture, installation and maintenance of renewable energy technologies including efficient cook stoves Address the issues of clear mandates of institutions dealing with charcoal

Energy Sub-Sector/Issue	**Identified Challenges**	**Policies to address the challenges**
5. Other Renewables		
5.1 Solar, Wind, Biogas & Small Hydro	Inadequate data for effective planning Low exploitation of various renewable energy resources High upfront costs Lack of standards and code of practice for several RETs	Continue to collect data renewable energy and undertaking of pre-feasibility and feasibility studies Formulate and enforce standards and codes of practice on renewable technologies to safeguard consumer interests; Package and disseminate information on renewable energy systems to create investor and consumer awareness on economic potential offered by these alternative sources of energy. Promote research in, and development and demonstration of the manufacture of cost effective RETs; Promote development of appropriate local capacity for manufacture, installation, maintenance and operation of basic RETs; Promote development for RETs which are yet to reach commercialization Allow duty free importation of renewable energy

		hardware to promote widespread usage; Provide tax incentives to producers of renewable energy technologies and related accessories to promote their widespread use; Provide fiscal incentives to financial institutions to provide credit facilities; Support community based water lifting and pumping, using renewable energy technologies through cost sharing arrangements and fiscal incentives
5.2 Municipal Waste	Energy recovery potential from municipal waste not exploited	Promote feasibility studies on the utilization of municipal waste as a source of energy
5.3. Agricultural Waste	Energy recovery potential from agricultural sector	Promote feasibility studies on the utilization of agricultural waste as a source of energy

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
5. Rural Energy		
	Dependence on unsustainably produced traditional biomass by rural households Low access of LPG by rural households Lack of interest in rural energy by private sector	Government will encourage and promote private sector initiatives to enter clean biomass and other renewable technologies energy market. Government will allocate resources for R&D and promote mature alternative technologies. Government will encourage cooperations between relevant ministries (energy, health, education, etc) to integrate programmatic actions on household energy and health into rural initiatives to improve fuel use. Government will continue to promote distribution of petroleum fuels including LPG as part of the energy infrastructure.
6. Cross-Cutting Issues		
	Weak energy regulatory framework Poor Institutional support Appropriate energy pricing Gender parity in energy production and consumption	The Government has already transformed Electricity Regulatory Board (ERB) into the Energy Regulatory Commission (ERC) with an elaborate regulatory mandate for the entire energy sector. The Government has already established the REA to manage rural electrification

	Enhancing energy conservation and efficiency	Make the ERC a one-stop office for facilitating permitting and licensing by different Governmental authorities Provide for a long term dual or multiple licenses for generating, distribution, combined generation and distribute on, wholesale and retail of electrical energy, but with an obligation to extend network as appropriate; Provide for establishment of a competitive market structure and power market pool in Kenya and within the region. Mainstreaming gender issues in policy formulation and in energy planning, production and use The Government will remove barriers and constraints to adoption of energy efficiency and conservation technologies

1.6. Appropriate Financial Mechanisms in Burundi

The Ministry of Economy, Finances and Development Cooperation and donors are sharing responsibility for financial resources mobilization and the Ministry of water, Energy and Mines (MWEM) is the lead implementing agency in coordinating all activities through other line ministries or public agencies. A SWAp is being prepared by MWEM to harmonize the efforts of the government, donor agencies and private sector. In the same point of view, a sector working group (SWG) is already operational to increase the stakeholder's consultations in energy sector. The private sector finances and executes energy projects trough direct investments or public private partnership but the government continues to drive the energy development despite stated privatization goals.

The uptake of alternative renewable energy has greatly been hampered by a number of barriers that why the Government of Burundi (GOB) introduced the law to facilitate the purchase of solar equipments. The focus of Government of Burundi's energy strategy is to promote activities that will increase access to electricity and modern energy in general and hence improve the quality of life in the country in an environmental friendly manner. The analyzing of the Law establishing exemption on import duties on solar equipments is a good strategy for promoting solar energy financing in Burundi.

Burundi is financial supported by development partners like World Bank, European Union, AfDB, etc.

There exists no simple explicit local biomass energy financing mechanisms. Some of international mechanisms that have benefited Burundian communities include GTZ, Chinese Cooperation, Belgian Cooperation for biogas. Local Banks are still skeptical to involving in cooking services except if linked to LPG through a petroleum company. One should note that these are mainly dealers financing and not consumer financing.

Limited budgets of actors and institutions of ongoing initiatives is also challenge.

1.7. Overview of Burundi's Energy related Standards and Code Practice

The Government of Burundi has not created Utility Regulation, Environment Management and Norms and Standards Regulations.

That Utility Regulation should guidelines for hydropower plant location for example, management of water rights and protect the environment trough par example encouragement of the population in massive trees planting.

The Government is planning to create that Utility Regulation which will review and approve detailed reports regarding system operations and states required regulatory authority for grid and commercial code, and other system operating or technical rules and procedures, etc. The Utility will report violations of ISO system operating rules, and impose penalties for non-compliance. At the same time, it will be responsible for quality of all local and import solar equipments or materials.

1.8. Linking the Energy Baseline to EAC-EASUP Targets

1.8.1. Target 1: Modern Energy Services for Cooking

a) Energy Resources

In Burundi, energy access for cooking and heating at the domestic level involves biomass energy (hence traditional, improved and modern biomass use practices and technologies) and fossil fuels (kerosene and LPG). Five distinct uses of firewood have been documented: cooking, water heating, house heating, lighting, and home business. The demand for fuel wood and other biomass is estimated over 6 million tons.

Nationally about 96% of households use biomass, farm residues and charcoal. Biomass and farm residues are mainly in rural areas with 94% of the households as compared to 2% of urban households. Farm residue is mainly used for cooking, water heating, ironing, lighting, and home business. Rural households reported using wood waste comprising of wood shavings, sawdust, timber rejects, and off-cuts.

In Burundi, **biomass energy** will likely persist as the primary source of energy for the rural population and urban poor. Increasing awareness and education is expected to impact on biomass use shifting from traditional use to adoption of modern practices and technologies.

The demand side practices display poor energy and energy resource management, which has led to severe fuel wood deficits. Fuel wood in the rural areas is collected freely from farms and rangelands; only a small percentage is commercially traded. Urban average fuel wood consumption is 1.2kg per person per day while the national figure stands at 1.5kg.

A 2006 report indicates that close to 89% of rural and 7% of urban households reported regular use of firewood, giving a national average of 67% of all households. The average annual per capita consumption was approximately 741 kg and 691 kg for rural and urban households respectively. For urban areas, it is the lowest income households who depend on firewood the most. Trends showed that per capita consumption dropped, the main reason being that wood resources have become scarcer.

Charcoal production is principally commercial and most of the resource emanates from rangelands and trust lands. Production, despite the high consumption, is illegal; hence the production kilns used are traditional, with very low efficiency. Prices vary wildly according to production zone, season and location of demand. Urbanites use more charcoal than rural folk; 30.2% and 7.7% of households, respectively (nationally—13.3%). Among the demand drivers in urban areas are domestic cooking and ‘mushikake’ (charcoal-grilled) meat eateries. On average, the urban charcoal consumption was 156kg and 152 kg per capita (year 2000) for rural and urban dwellers respectively. Contrary to the popular view that charcoal is a fuel for the low income urban dwellers, 83% of high income groups regularly use charcoal.

Modern biomass technologies such as biogas have the potential to provide improved energy services based on available biomass resources and agricultural residues. The availability of low

cost biomass power in rural areas could help provide cleaner, more efficient energy services to support local development, promote environmental protection, provide improved domestic fuels and improved rural livelihoods.

Development of a vibrant biogas market has however been elusive. The mean daily consumption of biogas works out to be $0.6m^3$ which translates to an annual per capita of $219m^3$ of biogas. Research shows that out of the currently estimated 1100 systems installed in Burundi, about 70% are not in working condition (ENESCO, 2002). The notable causes are civil war. The most notable biogas promotion effort was in the 1980s by GTZ, Belgian Cooperation, Chinese Cooperation and MWEM.

Kerosene is also domestic lighting fuel in Burundi. The need for cleaner fuel and broadening of the energy mix has led to the promotion of LPG as an alternative fuel for cooking both in the rural and urban areas. The low use of LPG in rural and low income areas is attributed to the high cost of the LPG as well as its appliances coupled with poor delivery infrastructure. LPG is used along with firewood and charcoal in rural areas while in urban areas it is used along with kerosene, charcoal and electricity.

The private sector has an extensive network for distribution and marketing of oil products in different parts of the country and accounts for about 2.5% of national energy balance and 25% of the total commercial energy market. Main oil companies are ENGEN, BARRIL and several small companies. Most oil companies are affiliated to multi-nationals who control the lion's share of the oil trade.

The improved stoves are an other system to access to modern energy. It has been demonstrated on a pilot basis that :

- a stove exists which saves wood in actual use,
- there is a local capacity for self-sustained production, quality control, marketing, and after-sales service, should investment in the subsequent phase of large-scale dissemination be considered.

The MWEM target of 25 000 stoves/year, building up to 100 000 stoves/year represents, in energy terms, a saving in wood of 10 000 – 25 000 stacked m^3 a year, equal to the productivity of a forest of 1 000 -2 000 hectares.

Much of this groundwork has been completed in the case of an improved charcoal stove in Bujumbura. Under IDA Urban Development Project (DUB), a stove was designed which provides fuel savings of over 30%, with respect to the traditional stove (DUB 10).

Over 1,700 of the stoves were sold before the stove component of the project ended. Stove production and sales subsequently stopped, essentially because :

- producing the traditional stove was more profitable to local artisans,
- an extensive marketing effort was still required to reach more of the urban population.

A subsequent ESMAP mission modified the improved stove to make it cheaper for artisans to produce, and recommended a dissemination campaign. The ESMAP work has been shown the profitability to artisans of producing and selling the improved stove. It therefore would seem more sensible to build on this existing system of production and sales rather than to establish a new one on an industrial scale, as it was proposed in the project.

In contrast to the work on urban stoves, there has been little progress on improved woodstoves for rural areas in Burundi. The rural stove market will indeed be more difficult to develop than the urban one because :

- the rural population is not already accustomed to cooking with stoves,
- there is no well-established artisanal production and dissemination system for stoves in rural areas,
- finally, cash savings incentive as urban ones to use a fuel-efficient stove.

Furthermore, in some parts of the country fires serve not just for cooking but also for space heating, lighting and warming. However, since people in rural areas make up about 92% of the country's total population and account for most of the wood fuel consumption, wood fuel conservation must be pursued there.

Some other important features of cooking services include overdependence on biomass resource which has resulted into fast dwindling of biomass reserves (forests) in the country. The National Forest Policy estimates deforestation at 35,000 hectares per annum, which calls for harmonization or explanations on assumptions and methodologies used to establish such figures.

b) Institutional framework analysis

The institutional infrastructure to deliver energy and devices for modern cooking practices may be clustered into several categories including: Government agencies, national and regional NGOs, research and training institutions, consultants, financial institutions, international organizations, multilateral and bilateral development partners, private sector, civil society organizations (CSOs) and community based organizations (CBOs). Each of these has a vital role to play in the scale up of access to modern cooking practices.

CBOs are numerous, diverse and range in size from small-village based groups to regional organizations such as dioceses of the Catholic Churches in Burundi. Research and Training institutions are critical in the development and promotion of modern cooking devices and practices. While energy research is not yet effectively mainstreamed and utilized to inform energy planning and management, a few energy research institutions currently exist. They include public and private Universities, CEBEA, Forest Department, National Office of Peat (ONATOUR). These institutions play an important role in the provision of access to modern energy services to the people who are currently using traditional energy and will be instrumental to success of EAC-EASUP.
There is a nascent CEBEA and ONATOUR that is expected to assist in improving modern services access in rural and urban areas in Burundi. However, budgets constraints at the start could result in a limited impact on the ground.

Financial institutions to support the scaling-up initiative for modern energy services in the rural areas must include commercial banks, microfinance institutions and co-operative societies, among others. Local institutions are not involved in specific energy financing programs fitting within Target 1 of EAC-EASUP.

Bilateral Cooperation which was supporting Target 1 type of transactions in Burundi included, before the civil war, bilateral development partners such as GTZ, Chinese Cooperation, Belgian Cooperation. They have played and are able to continue playing key roles in providing financial resources to facilitate implementation of projects and programmes for scaling-up access to modern cooking devices, consistent with their respective functional mandates.

Private Sector Players are key in the provision of modern energy services for cooking and heating. Examples include oil marketing companies, modern energy technology hardware importers/manufactures and distributors; improved efficient stove fabricators and energy consultants, among others.

Civil Society and Community based Organizations (CSOs and CBOs) play a vital role in the promotion of access to modern cooking services. These organizations comprise of women groups, energy service associations—examples ise Burundian Forum of Civil Society of the Nile Basin.

The Burundi Forest Department (BFD) under the Ministry of Environment, Management of Territory and Public Works (MEMT&PW), is charged with overseeing all aspects of forestry development in Burundi. Traditionally this is the key actor in many planting programmes. With assistance from donor agencies, the BFD developed the Burundi Forestry Master Plan in the early 1990s to take stock of Burundi's forestry status compared to demand for products and services.

Other Government agencies such as the Ministry of Agriculture (involved in agricultural extension work), Ministry of Regional Development, Ministry of Transport and Communication, and the Ministry of Local Government have programmes that routinely cover similar energy issues addressed by the Forest Department. This leads to some overlap in the mandate of some ministries. For instance the bulk of charcoal consumed in Burundi is sourced in range-lands currently held in trust by County Councils that fall under the Ministry of Interior Government.
Non-Governmental Organizations active in the biomass sector include the Burundian Forum of Civil Society of Nile Basin (FCBN), Green Belt Association (ACVE) and other Associations, currently undertaking advocacy, capacity building, fund raising and project implementation in the field of biomass initiatives (as well as other RETs).

Strategic Partners also play a major role in this sub-sector. Last years, the World Bank, FAO was the most active donor in the energy sector.

c) Policy and legal framework analysis

There is a promising National Energy Policy of 1998. A number of Acts and Study reports and findings are available at both the MWEM and with other players including development partners.

However, some challenges such as non existence of documented implementation strategy of the policy and unrealistic budgets hinders sustainable implementation of the policy. Cooperation between the MWEM and other Ministries that could contribute to scaling up efforts, such as the Ministry of Health, could offer value is not yet elaborated. Also, no concerted communication strategy or multisectoral approach is in place in the respective Ministries. Knowledge on policies and awareness is limited to few at national level and not known to infrastructure for common people to benefit from energy policy opportunities.

Other challenges lack of charcoal and firewood policy with implantation strategies, legal frameworks and realistic budgets to meet set targets. It is unbelievable to note that an energy source contribution more than 96% of basic energy in the country is informal and has no policy.

d) Financial mechanism analysis

There exists no simple explicit local biomass energy financing mechanisms. Some of international mechanisms that have benefited Burundian communities include GTZ, Chinese Cooperation, Belgian Cooperation for biogas. Local Banks are still skeptical to involving in cooking services except if linked to LPG through a petroleum company. One should note that these are mainly dealers financing and not consumer financing.

Limited budgets of actors and institutions of ongoing initiatives is also challenge.

One major observation is that biomass and biomass appliances are considered a poor man territory and do not excite financial institutions with only a few CSOs working with communities to improve access. There is also the issue of frequent replacement of the cookstoves which overburden the production capacity, often reducing the urge of continued use and requiring a financial arrangement.

e) Standards and Codes of Conduct analysis

Due to subsequent awareness campaign by various organizations promoting the ICS, the DUB 10 improved design was adopted in Bujumbura. Widespread adoption has been hampered by lack of standards and enforcement to protect the consumers. There is also need to teach the standards in professional training centres for easier understanding by the future artisans. National standards for commercial charcoal kilns have not been developed. Existing traditional charcoal making techniques are not efficient and with diminishing charcoal sources, there is need to develop such standards to improve the techniques. Standards for uniform LPG regulators were developed and the process for biogas standards must be undertaken.

1.8.2. Target 2: Modern Energy Services for all the Peri-Urban and Urban Poor

Energy Resources

Modern energy for the peri-urban and urban poor can include electricity from the grid, diesel generating sets, electricity from renewable energy, petroleum products like kerosene, gasoline, and diesel. The energy is used for various services like domestic lighting, powering electronic gadgets, running equipments and machines for productive end-uses. Electricity is a modern and clean form of energy associated with development and increased standard of living. If grid extension is expedited to the peri-urban and urban poor it has profound benefits.

Electricity consumption patterns

The return of formerly exiled and displaced populations, combined with rural-to-urban migration, is creating strong pressures on the capital's and other cities's already deficient electricity infrastructure. There are 150,000 inhabitants in the city's periphery, the vast majority of whom are currently inadequately supplied with electricity. This poses serious problems while negatively affecting well-being, children education and productivity. Given that the existing aid financing by other donors focuses on improving electricity to rural and peri urban areas, this operation will provide the necessary financing to address urgent electricity supply needs in per urban settlements of Bujumbura.

Local availability of energy resources for electricity services including hydropower, petroleum have the potential to benefit extension of grid connections to urban and peri urban communities. Current hydropower resource exploitation (30 MW) is put at less than 1% of available proven resources (1,700 MW). From the survey REGIDESO, 2007, 51% of urban population and 0.002% of the rural are served by electricity translating into 25,000 households in urban and 16,000 households in rural areas (REGIDESO, 2006/07 Report). For the urban households, majority of the consumers are from the high and middle income groups with only 26% of the low income urban household having access to electricity. Annual connections are still limited only 2,288 connections per annum which is equivalent to 190 connections per month. Assuming equal distribution of the installations per month in provinces, only about 11 connections are made in each province per month.

The low number of the rural households connected has led to a low national per capita consumption of 23kWh. Most of the electricity in peri-urban and urban areas is used for lighting and powering productive end-uses and service sector. Cooking is not a major user of electricity.

The major challenge with the urban and peri-urban areas is lack of data especially for the poor. The classification peri-urban denotes proximity to urban neighborhood with most of them reflecting a rural outlook. The other problem is the low per-capita consumption of electricity especially for productive end-uses for the urban and peri-urban poor considering the relative high cost of electricity and the slow pace for connection.

Another challenge worth recognizing is most of the urban poor live in informal settlement and connecting them to electricity is handicapped by lack of plans, legal ownership of land and the temporal nature and the temporal nature of the consumers. Recognizing the pro-active lifestyles in urban and peri-urban areas in use of electricity, there is need to address the generation capacity especially in remote areas with isolated networks.

Other important features of resources for modern energy services for peri urban and urban include limited exploitation and distribution capacity, whether dependence of hydro resource, overdependence on biomass resource for energy services. On the other side, high cost of grid extension and connections and hiking petroleum products adversity

Institutional framework analysis

The Burundian government, with support from its development partners, has been considering institutional reform of the electricity sector for several years, in order to improve service quality and financial sustainability. In 2000 the government adopted a Law N° 1/014 of August 11st, 2000, liberalizing and regulating public electricity. This Law defines the principles, forms and conditions for private sector intervention in the sector.

It allows for the establishment of a regulatory and control entity for energy and a development fund for the sector. It also abrogates the Order in Council that granted REGIDESO the monopoly over public electricity supply, back in 1968. Along with the DGHER, REGIDESO became a delegated public service provider operating under the control and authority of the regulatory body to be established. Today, the Law has yet to be fully applied in the absence of a corresponding regulatory framework.

A comprehensive study in 2003 of REGIDESO's performance and of its institutional environment, done by Régie, Inc. (Reforms of drinking water and electricity, restructure of REGIDESO and establishment of Regulatory and Control Authority) recommended that the private sector be called to play a progressively important role in the management of the utility, first through a management contract and later transitioning to a concession.

Policy and legal framework analysis

The National Energy Policy supports electrification of Burundians including those in peri urban areas. The legal framework supports private sector participation although the old electricity act gives monopoly to REGIDESO to generate, transmit and distribute electricity to customers. The 1962 Act is outdated and MWEM is working on a new Law for liberalizing and regulating public electricity, which will allow for Independent Power Producers (IPPs) who could as well transmit and distribute power to customers.

The new Energy Law n° 1/014 of August 11st, 2000 offers a conducive legal framework for generation and supply of electricity to consumers.

The future Electricity Regulatory Board (ERB) will expect to advise the Government on tariff setting which currently is one of the major obstacles faced by the poor. One major policy need is undertaking an analysis of the effect in power sector on urban and peri-urban poor (lifeline tariff). One major challenge is electrifying informal settlements, there is need for all key players to adequately address connection to informal settlements.

Financial mechanism analysis

There exist programmes to electrify peri urban and urban areas under MWEM. Existence of interested development partners including World Bank, AfDB, Dutch Kingdom, European Union, has been so strategic to electrification of most provinces and communes headquarters under rural electrification programme of REGIDESO and DGHER.

DGHER is one among other initiatives that will stabilize electricity in some regions which allow for more connections. Millenium Challenge Cooperation, is another programme where all communes which are not yet connected to national grid will benefit with water power supply which will allow for more connections.

Realistic energy budgets should take care of the size of the country and level of the size of the problem and potential benefits to address poverty bondages in such peri urban communities.

Standards and Codes of Practice analysis

REGIDESO electricity transmission and distribution in the country is governed by the grid IEC Code. The co-existence of DGHER, which is connecting its electrical lines to the REGIDESO grid pose a challenge.

The future Energy Regulatory must formulate and launch a National Grid Code. There will also be a need to raise awareness among the consumers on the needed of the code. A project for development of standards and labelling of energy consuming equipment is in the development stage. The Government can address to UNDP and Global Environment Facility (GEF) for funding.

1.8.3. Target 3: Modern Energy Services for Health, Educational and Social Institutions

Demand and supply framework analysis

Target 3 focuses on the social and institutional facilities serving the rural communities (educational facilities, dispensaries, clinics and health centres and community centres) and rural market centres. The target aims to meet the modern energy service needs (such as

lighting, refrigeration, information and communication technologies, water treatment and supply) for all of them.

MDG 2 aims at achieving universal primary education and building the capacity of this sub-sector. The majority of schools in Burundi, particularly those located in the rural areas, have no access to modern energy services—be it for cooking or lighting.
.
Availability of solar energy, grid electricity and isolated mini hydro and thermal grids can be used for electricity supply in rural public institutions of Burundi.

As of April 2008, all registered 1948 government secondary schools, only 407 had some sort of supply of electricity; hardly 1% of community government secondary schools (communal colleges) totaling 1541 is estimated to have electricity in rural areas (solar energy. Non government secondary schools including private and seminaries have some form of electricity supply.

On the other hand, Burundi has more than 493 health facilities (462 dispensaries and 31 hospitals) in rural communities, most of which (about 87%) do not have any form of electricity. There exist ongoing initiatives on awareness creation about alternative energy resources for rural electrification by solar energy.

Some important features of electrification using available energy resources include limited energy resource exploitation capacity, limited applications of such isolated systems, limited capacity and capital base for equipment procurement to translate solar energy to electricity, limited capacity and awareness to calculate Life Cycle Cost (LCC) for energy options.

Institutional framework analysis

Rural electrification is spearheaded by MWEM, through the DGEE and DGHER. DGEE and DGHER are slowly becoming operational and will effectively deal with increasing access of modern power in rural areas including education and health facilities. However, trace studies are needed to establish sites that will be electrified through grid electricity and those which will go for other technologies including solar.

In order to make significant impact, the budget subsidy from the government and other development partners must be increased as the starting subsidy of :

- US $ 15 million is able to install about 1,530 solar systems costing US$ 10,000 each for schools,
- US 4 million is able to install about 430 solar systems costing US $ 10,000 each for clinics.

Hiking petrol products as an alternative power option is an advantage to the solar PV systems market in rural electrification. Some challenges to the rural electrification include exorbitant grid extension and distribution costs, high initial cost of solar equipment and appliances, equipment not locally made, and low initial cost of alternative energy power transformation options such as gen-sets. Lack of consideration of LCC in customers choice for energy options

suggest for awareness raising campaigns and capacity building so that decision should not be on initial cost consideration only.

Policy and Regulatory framework analysis

The National Energy Policy supports rural electrification. The framework currently allows legally private sector participation in modern services activities.

Some challenges in consideration of the budgets constraints, limited awareness on energy as a necessary input in development activities. Others include limited awareness and documentation on rural electrification best practices to rural decision and policy makers.

Planners and budgeters need to be willing to bear the high cost of creating awareness on policies and infrastructure development to rural communities in order to benefit such rural institutions and the general public.

Appropriate Financial Mechanisms

Most development partners (World Babk, AfDB, European Union, China, DFID) are willing and already supports improvement of the education, health and water sectors in rural Burundi, as such, they stand to financially support electrification of such facilities. Existence of some ongoing rural electrification projects and activities includes MWEM/PPTE solar PV projects positively impact on rural electrification initiative in Burundi.

Challenges include limited capital base of most current implementing actors, limited awareness of local financial institutions to support such activities, limited energy credit facilities and financing schemes, bureaucracy in financing institutions, lack of good governance.

Standards and Codes of Practice analysis

Already standards for conventional electricity exist. The main challenge remains most of renewable energy technologies do not have national standards. The other challenge is keeping the cost of energy services low considering some of the conventional standards.
It is important to note the absence of national standards, international standards and prudent practice applies.

It is felt that, to ensure quality services, certification of operators, installers, maintenance and manufactures need to be addressed. Considering the wide range of energy services required by this target (lighting, cooking, refrigeration, ICT, water pumping etc), a major challenge remains in enforcement of the rules and standards, capacity and expertise both at the standard bodies and the consumer organisations.

1.8.4. Target 4: Access to mechanical power for heating and productive uses for all communities

Demand and supply framework analysis

In Burundi, only petroleum products have been used in motive power provision in rural communities. Easy availability of equipment required for transforming of energy resource to motive power is an advantage to the sector.
Strong demand of motive power from potential productive activities (agro processing, livestock, wood, fishing, mining) in rural areas is a push to the need of ensuring sustainable availability of same to majority.

EAC-EASUP recognizes the need to introduce energy services for productive end uses (including motive power and water heating) to reduce human drudgery, addressing gender specifics issues (women pounding grains, manual sawing timber etc) and provides services on grand scale compared to the traditional methods, e.g. water supply.

Actually, sources of this power can include animals, hydropower, wind, biomass (bio-diesel, bio-ethanol, producer gas, biogas) and fossil fuel (gasoline and diesel). The power can be used for water pumping/lifting, agro-processing activities, de-husking, flour milling, stone crushing, ploughing, saw milling, jaggeries, etc). Equipments and technologies for transforming the energy resources to motive power are easily available.

The challenge is to configure motive power systems that address local needs at least cost. The other challenge is the high upfront costs associated with the primary technologies driving the motive power like hydropower or wind compared to diesel engines or grid electric motors. Another challenge is coming up with appropriate innovation in applying motive power to meet the target considering target three.

Solar water heating applications in the country have been mainly applied in the hospitality sector. A few health institutions and a limited number of households also utilize this energy source. Apart from the World Bank Study of 1987, there is need to assess the demand for water heating outside major urban centres. For productive end uses, the target market for efficient heating technologies such as efficient driers, boiler and kilns, is small rural-based restaurants, small service establishments and agro-processing.

Institutional framework analysis

The MWEM is interested in promotion and dissemination of motive power for productive uses in rural areas although it is only available at the national level lacking follow up offices and strategies at the commune level.

Operational Burundian Centre of Alternative Energies (CEBEA) will significantly impact positively on the use of motive power for productive uses in rural areas communities if supported with adequate realistic budgets and frameworks to meet the set targets.

There is a least a use of motive power for productive uses funded by the private actors in most rural centres where there is electricity, even oil products uses.

However, high initial and running costs of such investments adversely influence their adoption rates.

A key need that can be addressed by EAC-EASUP is to map the productive uses in the rural areas requiring heating applications, sizing and costing them. Another challenge is to coordinate service delivery including prioritization; infrastructure for the promotion and scaling-up of motive power provision and adequate site specific data for decision making.

Policy and legal framework analysis

The fact is that most of the service provision in the rural areas is driven by specific sector policies (such as water, agriculture, livestock, fisheries, etc.); hence the challenge for EAC-EASUP is to enable integration and coordination of these policies.

Financial mechanism analysis

Experience has shown that owner of motive power for productive uses are realized though cash sale purchases and or hire purchase arrangements. Rarely rural private sector get loans from banking institutions.

Most applications for motive power are movables and durables that easily qualify for cash purchase or hire purchase (HP), which is readily available in Burundi. However, the HP sector is known to be expensive, with consumers paying as much as 200% price for goods procured through HP outlets.

Standards and Codes of Practice analysis

No standards are available in Burundi for motive power supply. Lack of national experts and capacity contributes to the slow development of these standards.

2. STRENGTH WEAKNESS OPPORTUNITIES THREATS (SWOT) ANALYSIS

Some constraints to accelerated market penetration

2.1. Target 1: Access to modern cooking practices for 30% of traditional biomass users

Biomass fuels are the most important source of primary energy in Burundi with wood fuel consumption accounting for over 96% of the total primary energy consumption. About 7% of Burundi's land area is covered by forests, which produce about 96% of the biomass energy resources including wood wastes. The balance is derived from farmlands in the form of woody biomass as well as crop and animal residues. There is widening gap between supply and demand for wood fuel and recommended policy interventions to redress this challenge.

Lack of a favourable legal framework for charcoal production, distribution and marketing presents a threat to Target I. In addition, there is low awareness of tree growing as a

commercially viable business enterprise. Lack of close harmonization of the policies and activities of the various ministries responsible for biomass energy issues e.g. the Ministry of Water, Energy and Mines and the Ministry of Environment, Territory Management & Public Works also pose a threat. An opportunity is presented through promotion of sustainable biomass harvesting achieved by innovative and efficient exploitation and utilisation technologies while at the same time providing policy triggers to shift rural energy consumption to cleaner fuels like Liquefied Petroleum Gas (LPG) and kerosene. According to a WHO study, the use of LPG, despite initial investment costs could result in a 7-fold return on investment.

The country is endowed with significant amounts of other renewable energy sources which include solar, wind and small hydropower. Others include power alcohol, biogas and municipal waste energy. However, only solar, and small hydropower are currently harnessed for use in Burundi.

Although biogas technology provides an alternative to ordinary biomass use, its penetration rate was still to growth in 1993, before the civil war. Research has shown that about 70% of the 320 biogas digesters introduced in the1980s were destroyed. The main problems are poor management, high initial capital costs, high maintenance costs, limited water supply and weak technical support. There is need to increase the level of awareness so as to enhance wider acceptance and adoption of the technology.

Having a good policy is good, but implementation of the policy is another thing. MWEM is lacking a documented implementation strategy and programme for the entire policy. As such programmes have been prepared to address the policy in piece meal. When this is combined with budget constraints, for sure no significant impact reaches the poor man on the ground. The presence of existing structures in other sectors, such as the education or health sector might be an opportunity to bypass lack of public sector personnel involved in energy access issues.

Strengths	**Weakness**
▪ Available of various energy resources for cooking, ▪ Strong demand of modern cooking services (commercial sector households), ▪ Ongoing experience on the use of charcoal in Burundi, ▪ Availability of local expertise for construction of various modern biomass stoves, ▪ High acceptance and wide use of ICS ▪ Low initial cost of ICS make it a viable option	▪ Overdependence on biomass resource, ▪ Dwindling biomass reserves (forests) ▪ No energy sector representation at provincial, communal levels, ▪ No biomass policy and negligible budget, if any, ▪ Lack of local financiers, ▪ Limited budgets of responsible participating parties, ▪ Limited storage and distribution infrastructures for modern biomass stoves, LPG, ▪ Inefficient charcoal kilns widely used ▪ Reduced soil fertility as residuals are used as energy source ▪ Lack of adequate and reliable data on biomass consumption and

▪ Ease of replication of the ICS technology ▪ Policy intention of increasing adoption rate of improved cookstoves in rural and urban areas ▪ Good will of the Ministry of Water, Energy and Mines and policy support, ▪ Government intention to promote fast maturing trees, establishment of commercial woodlots, peri-urban plantations ▪ Promotion of ICS for domestic and institutional use by artisans	production ▪ Over reliance on biomass as the cheapest source of energy by majority of citizens ▪ Lack of awareness on harmful effects of traditional cook stoves ▪ Lack of capacity building initiatives for stove and kiln artisans ▪ High incidence of poverty as a constraint to shifting from traditional biomass to modern energy ▪ Weak capacity for agro forestry and farm woodlot development among communities
Opportunities	**Threats**
▪ Free education is reducing availability of 'free labour' for biomass collection ▪ Strong self help groups can be used as avenue of promoting ICS ▪ Increased conservation measures by Government to protect forests ▪ Existence of several energy resources as solar, small hydro, wind, ▪ Potential cooperation between MWEM, Ministry of Health and Ministry of Education, to leverage programmatic actions on household energy and health especially regarding awareness raising through the health sector and capacity building. ▪ Review building code to make ventilation a requirement for housing.	▪ Increasing population surpasses biomass availability ▪ Degradation and deforestation of rangelands on rise ▪ High cost of developing energy resources into useful forms, ▪ Lack of prerequisite awareness for local technicians on need for ICS standards ▪ Lack of proper regulatory mechanism for charcoal business increases illegal charcoal production ▪ Lack of harmonization of the policies and activities of the various ministries responsible for biomass energy issues ▪ No specific law to regulate the management of biomass ▪ Low awareness among the ICS consumers and manufacturers on need for efficient cooking stoves ▪ High cost of procuring an ICS as compared to ordinary CS ▪ High mark-up on kerosene prices especially in rural areas discourages change of energy source.

Target 2: Access t reliable modern energy services for all urban and peri urban poor

More than 90% of the 8% Burundians connected to the grid live in urban areas. Improved national economic outlook in Burundi has resulted to increased demand for reliable modern energy services as compared to available supply.

Electricity is generated almost exclusively through 7 REGIDESO hydroelectric plants with a combined installed capacity of 30.6 MW (equivalent of 95% of the total capacity of 32.2 MW among 27 existing hydro plants). In addition, DGHER operates eight small and micro hydro plants in rural areas while NGOs and some non-profit organizations operate another twelve micro hydro plants. 85 % of the National supply is delivered by two plants : Rwegura (18 MW) and Mugere (8 MW). REGIDESO produced 87 GWh in 2004 and imported 73 GWh from the regional hydro plants of Rusizi I and II, which are operated by SINELAC and Société Nationale d'Electricité (SNEL), respectively the hydropower plants built downstream of Lake Kivu on the border between RDC and Rwanda.

The total annual supply of electricity was 188.8 GWh in 2007, a 28% increase from 2006 due to considerably higher rainfall than experienced during the regional drought between 2004 and 2006 that nearly depleted the reservoirs.

Energy (electricity) is important input in most development and economic activities. However, it is not explicitly featuring in priority documents with adequate budgets to make difference on the ground. If all relevant sectors in need of electricity for implementation of their programmes and activities would indicate their energy sources and needs and allocate adequate budgets, it would make a difference. Energy budget would increase and speed up electrification.

There is a possibility of generating electricity from municipal waste using different technologies. Now in Burundi, private sector begun to use waste for electricity generation (SOSUMO Sugar Industry) and for cooking (BRICOOP, ADLP) and it can help REGIDESO as solution to frequent revenue shortages. The threat to this option is lack of adequate waste management that includes sorting to identify waste suitable for electricity generation. There is need for research to identify appropriate technologies with potential for electricity production using municipal waste as feedstock

Strengths	**Weakness**
▪ Local availability of various energy resources for modern energy services including hydro electric, solar and wind for grid connection, ▪ Availability of local expertise and experience for hydro power generation, transmission and distribution, ▪ Government policy support of upgrading slum settlements includes provision of clean energy services ▪ Provision by World Bank, AfDB and Dutch Kingdom to provide funds for strengthening electricity grid will ensure power reliability ▪ Expanding economy has increased	▪ Limited local exploitation and distribution capacity, ▪ Limited installed capacity to suffice urban and peri urban requirements, ▪ Electrification of urban and peri urban budgeting not realistic in planning, ▪ Limited capital base of the local private sector to participate, ▪ Limited energy financing schemes, ▪ Lack of security thus fear of installing expensive energy system like solar ▪ Inability of energy supplier to meet the real energy demand of the poor ▪ Inability of many urban poor to pay market rates for energy services ▪ Concentration of local authorities on street lighting programmes

energy demand and created a ready market ▪ Increasing the lifeline tariffs on domestic consumers of up to 150 kWh per month ▪ Existence of some ongoing activities (electrification of communes headquarters), ▪ Standardized power purchase agreements, .	compared to provision of clean energy services in council residences ▪ Lack of prepaid metering to cater for low income people with unstable incomes ▪ Lack of legal and regulatory framework and institutional support to promote widespread use of solar energy and protect consumer interests; • High capital costs of the systems relative to consumer incomes. Despite gradual reduction of the indirect taxes by the Government over the years, the cost of solar home systems has remained beyond the reach of many potential consumers.
Opportunities	**Threats**
▪ Existence of several energy resources such as wind, solar, bagasse for electricity generation, ▪ Legal participation of the private sector, ▪ Interested development partners, ▪ Standardized power purchase and tariffs, ▪ Plans for regional power interconnection ▪ Legal disposition to create the Regulator Authority of the energy sector and serving as one stop shop for energy matters ▪ Single source for use by multiple consumers ▪ Contracting of private sector to undertake installation work for REGIDESO ▪ Adoption of Grid code developing by the future Regulatory Authority, which will increase safety and system reliability ▪ Possibility of utilising municipal waste in power generation ▪ Increasing population in these areas imply a potential market ready to be exploited.	▪ High cost of grid extension and connections, ▪ Policies and awareness limited to few potential players at national and international level and not known to majority local beneficiaries, ▪ High cost of creating awareness on policies and infrastructure for common people to benefit from energy policy opportunities, ▪ High cost involved in financing such initiative, ▪ Lack of adequate national hydro generation capacity ▪ Increased theft of power infrastructure equipment which could discourage private energy providers ▪ Growing population will outstretch supply ▪ Unattractiveness of other energy sources due to adequate areas ▪ Lack of adequate capacity at the ERC to ensure proper adherence to set standards ▪ Lack of Government subsidies for initial connections in these areas as compared to rural areas ▪ Lack of incentives for private sector to engage in power development ▪ Existing poverty and thus reduced purchasing power ▪ High initial/upfront connection charges

Target 3: Access to modern energy for all schools, clinics, hospitals and community centres

The Government of Burundi initiated the rural electrification programme in 1985 to stimulate socio-economic growth, stem rural-urban migration through creation of social amenities and employment opportunities at close proximities to the rural population and thus uplift the quality of life in the rural areas. However, the rate of penetration has been slow with only 41,074 directly metered consumers having benefited from the programme by January 2007.

As of April 2008, all registered 1948 government secondary schools, only 407 had some sort of supply of electricity; hardly 1% of community government secondary schools (communal colleges) totaling 1541 is estimated to have electricity in rural areas (solar energy. Non government secondary schools including private and seminaries have some form of electricity supply.

On the other hand, Burundi has more than 493 health facilities (462 dispensaries and 31 hospitals) in rural communities, most of which (about 87%) do not have any form of electricity. There exist ongoing initiatives on awareness creation about alternative energy resources for rural electrification by solar energy.

Some important features of electrification using available energy resources include limited energy resource exploitation capacity, limited applications of such isolated systems, limited capacity and capital base for equipment procurement to translate solar energy to electricity, limited capacity and awareness to calculate Life Cycle Cost (LCC) for energy options.

The Government subsidizes rural electrification through collection of Renewable Energy (RE) levy from other consumers. By the January 2008, a total of 40 schools and 40 clinics were electrified with solar PV energy. However, the initial connection is still out of reach of many of the targeted beneficiaries. An opportunity arises in the innovative schemes where many consumers are pooling resources together to apply for single connection.

Due to high maintenance costs of rural electric supply, high cost of network extension, low consumer densities and the scattered nature of the human settlements in rural Burundi there are limited funds for system expansion.

Despite the efforts to increase connection in the rural areas, only a few have made productive use of electricity.
This has been attributed to poor entrepreneurship, high poverty incidence, lack of awareness on the potential for electricity to stimulate income generating activities and lack of innovative and appropriate financing schemes to promote commercial and industrial enterprises including irrigated agriculture and fisheries.

Strengths	**Weakness**
▪ Possibility of generating power (5 MW) from bagasse in SOSUMO Sugar Plant which can be sold to grid supplier ▪ Local availability of various resources for electricity including solar energy, ▪ Operational DGEE, DGHER, ▪ Interested MWEM, ▪ Effective legal participation of private sector in rural electrification, ▪ Policy support on rural electrification, ▪ Policy changes now allows private power producers to sell to KPLC	▪ Isolated institutions located far way from main grids ▪ High initial cost of installation as previous building design did not include necessary supply installations ▪ Lack of adequate finance to install necessary energy systems ▪ Lack of harmonisation on energy issues for policies on energy, water, education, agriculture, health and rural development ▪ Initial installations are made expensive by lack of building designs that would allow cheap energy installation. ▪ No legal enforcement to ensure building designs include energy distribution ▪ Lack of appropriate credit and financing mechanisms to

▪ Existing potential in harnessing the small rivers for mini-hydro in electricity generation.	facilitate acquisition of solar, ▪ Limited technological and resources capacity for exploitation of energy resources;
Opportunities	**Threats**
▪ Promotion of mini hydro as an alternative will utilise the existing small but viable river sources ▪ Government policy on ICT to accelerate access to energy ▪ Policy intention to privatise or concession isolated power stations to reduce operating costs ▪ Poverty reduction programme by Government has identified need to develop rural areas to reduce poverty levels and rural-urban migration ▪ Expansion of horticultural industry that is leading to new community centres in rural areas requiring energy supply, ▪ High cost grid extension to rural communities, ▪ High running costs of some conventional rural electricity supply options, ▪ Strong demand, ▪ Hiking petrol products as an alternative power options..	▪ Many of the institutions are isolated and located far away from each other and from the main grid ▪ Lack of capacity and resources at the Ministry of Energy to undertake feasibility studies on existing rivers for mini hydro ▪ Lack of policy incentive for private operators to set up isolated generating stations ▪ Environmental concerns are hampering the cheap construction of rural electric lines due to the mitigation measures that have to be put in place ▪ Lack of alternative innovative mechanisms for funding the Rural Electrification Programme ▪ Rigid land laws hampers acquisition of land for mini-hydro development and way leaves, ▪ High cost of building delivery networks and maintenance infrastructure, ▪ High cost of creating awareness on policies and infrastructure for rural institutions and the general public, ▪ High cost involved in financing such initiative.

Target 4: Access to mechanical power within the community for heating and productive use

Rural communities are endowed with processing activities that have been benefiting from modern energy services. Many milling and de-husking machines are employed in peri urban and rural Burundian communities. However, human energy has remained to be the sole energy source for rural communities. Peasants have been forced to sell their raw produce at cheaper prices in fear of destruction by time, rodents or weather.

Solar PV is widely used for provision of electricity in off-grid rural and urban slum areas for low power application. In Burundi, the country receives good all year round solar insolation coupled with moderate to high temperatures estimated at 4-6 kWh/m²/day. This can be harnessed for water heating, cost effective crop drying and electricity generation for households and telecommunications facilities in isolated locations.

Diverse application of solar energy include solar thermal for heating and drying and solar photovoltaic (PV) for lighting, water pumping, refrigeration and telecommunications.

It is estimated that less 100 kWp of PV power is currently installed in Burundi. There is need to develop fiscal and regulatory frameworks to create an enabling environment to accelerate the development and utilization of the technology.

There exists a substantial potential for power generation using forestry and agro-industry residues including bagasse from the SOSUMO Sugar Industry for own consumption and supply to the REGIDESO grid. Change of policy to allow private power producers to sell to the grid company will act as an incentive for electricity cogeneration in sugar production.

Although wind energy is using in the region (Kenya) for water lifting, its popularity has been limited due to its low reliability as compared to the conventional diesel engines. However, with the rising cost of oil, the exploitation of wind energy in Burundi must be done particularly in areas remote from the grid and oil supply outlets.

To promote investment in wind energy generation, the Ministry of Water, Energy and Mines must also complete preparation of a broad National Wind Atlas. In addition, the Government must promote the development of wind-diesel hybrid systems for electricity generation under rural electrification programme in areas remote from the national grid in order to attract substantial private sector investments in the fabrication of wind power systems and in wind energy generation, and with a view to significantly increasing the role of wind energy in rural communities. The Ministry of Water, Energy and Mines is also exploring the potential use of bio diesel from locally grown trees and crops.

Strengths	**Weakness**
▪ Availability of all year round solar insolation that can be easily harnessed ▪ Availability of cheap bagasse for power generation ▪ Promotion of cogeneration in the country's sugar belt through an attractive bulk tariff regime ▪ Existence of some ongoing initiatives by the private sector, ▪ Interested of Ministry of Water, Energy and Mines, ▪ Strong demand from potential productive activities (agro processing, livestock, wood, fishing, mining), ▪ Availability of equipment of energy resource to motive power.	▪ Lack of incentives to develop biotechnologies for production of crops suitable for production of bio-diesel in low and medium potential lands ▪ Inadequate data on wind regimes ▪ Lack of awareness about the economic opportunities offered by the wind technology ▪ High costs of undertaking feasibility studies for mini-hydro projects ▪ High capital costs, which make wind energy less attractive relative to diesel fired alternatives for applications such as small scale commercial farming ▪ Limited access to micro-credit to the rural and urban poor ▪ Inability to develop energy conversion equipment manufactured locally ▪ Erosion of consumer confidence because of inappropriate system standards, faulty installations, importation of sub-standard systems and poor after sales service.

Opportunities	Threats
▪ Policy support, ▪ Existence of some energy resources such as wind, solar, hydro for motive power generation, ▪ Rising oil prices makes other sources like wind attractive ▪ Dwindling biomass availability will make other options more attractive ▪ Accelerated mobile telephony reach creating demand for energy in rural areas for mobile base stations and charging ▪ Environmental concerns nationally and worldwide will discourage inefficient biomass utilisation ▪ Possibility of extracting bio fuels from local trees ▪ Policy intention of promoting private or community owned vertically integrated entities operating either renewable energy power plants or hybrid systems to exist with licensed electricity distributors.	▪ Lack of incentive packages to promote private sector investments in renewable energy and other off-grid generation ▪ Lack of tax waivers and tariff adjustments to make clean energy affordable ▪ Lack of system standards for wind systems ▪ Limited after sales service for wind energy systems ▪ Lack of finance for research and development on the potential for the exploitation of bio-diesel from local trees and crops ▪ Lack of appropriate credit schemes and financing mechanisms for establishing wind energy systems ▪ High capital costs, which make it less attractive relative to diesel fired alternatives for applications such as small scale commercial farming; ▪ Lack of awareness about the economic opportunities offered by the existing technology like wind; ▪ Inadequate data on wind regimes; ▪ Limited after sales service on wind energy systems.

3. KEY FINDINGS

Institutional issues

- Whereas the energy policy is very clear on mandates and responsibilities of the present energy infrastructures, there is need to address the institutional arrangements necessary delivery non-energy services critical in meeting the targets or facilitating delivery of services to meet the target. There is need for coordination between various institutions and relevant sectoral ministries (energy, health, education, finance) addressing target related outputs.

Capacity issues

- There is need for requisite capacity building in human, technological, scientific, organizational, and institutional and resource capabilities in meeting all the targets. It is instructive to note that capacity building is necessary for all the players- public, private including the consumers In addressing capacity building, it is important to critically review the needs for effective delivery of services and meeting the targets. There is a need for capacity building need to address both software and hardware to be effective

in addressing the targets. Cooperations between the Ministry of Energy and other Ministries that could contribute to scaling up efforts, such as the Ministry of Health, could offer added value in the future.

Integrated Energy Planning

- Integrated energy planning is critical in addressing all the targets given the cross-sectoral linkages and sub-sectoral issues within the energy sector.

Data and information

- Lack of adequate and updated data and information for effective decision making. Most of the target related data and information require more data, segregation and deeper analysis to inform the planning processes, system sizing. A number of baseline data are based on outdated studies and there is need to update the studies and harmonize findings from some of them.

Policy issues

- There is lack of effective incentive policies, strategies, frameworks for energy actors in Burundi. There is again need to harmonize cross-sectoral policies and mainstream energy into non-energy sectors in delivering the targets. EAC-EASUP by virtue of it wide spectrum may require a specific policy agenda in the country and its regional level.

Legal issues

- Various products identified by the target are often addressed by various regulations which are often conflicting to effectively deliver the targets. For example the biomass industry.

Standards and codes of practice

- Unavailability of standards for some of the products and services being promoted for the targets,
- Lack of enforcements ,
- There is need for harmonization of standards and codes of practices between countries,
- There is need for information, education and consumer awareness.

Financial issues

- Low income earners and rural subsistence farmers form the largest potential market for energy products, because they are the most affected by low levels of modern energy access. Ironically, they are faced with low disposable income and a multitude of priorities—and modern energy is rarely among the top three, which are reserved for shelter, health, education and food.
- The challenge for EAC-EASUP is to engage the all-inclusive financial sector (including the "alternative financial services providers" in development of financial products that will support access to modern energy services.
- Numerous donor agencies and international project financiers operate in Burundi. However, focus on energy financing has not been as strong as in other sectors, with generic micro credit,
- Enterprise development in energy is still largely supported by donors and projects.
- Relative to other funding initiatives, only a few funds focus specifically on financing energy projects, unless they are in the multi million dollar range. Even then, bilaterals and multi laterals are the main actors.
- Locally, banks remain reluctant to consider energy as a viable product line, mainly due to low levels of sensitization and understanding of the sector.

4. DRAFT IMPLEMENTATION WORK PLAN FOR 24 MONTHS

4.1. Implementation Plan by Target

Needed action	Mainstreming of Energy Acces into national development strategies	Development of pro-poor energy policies and regulatory framework	Capacity building to deliver modern energy services for the poor	Identifying high potential business models
Target 1 **Modern Cooking Practices for 30% of Traditional Biomass Users (Clean Cooking)**	• Implement Habitat integrated Clean Energy Cooking , • Clean Energy Needs to be integrated in Sectoral Policies of Ministries of Health and other relevant Ministries , • Multistakeholders Consultation and harmonization energy and sanitation sectors,	• Reforestation Political Support Strengthened, • Encourage the Integration of Mainstreaming Energy issues in Communitarian Development Communal Plan (PCDC), • Stimulate Sufficient incentives faster to adapt Modern Cooking Practices, through Women Associations and others Civil Associations (CSOs) in charge of Environment and Sustainable Development. •	• Create sector working group with focal points of other Ministries (Ministry of Health, Ministry of Environment, Ministry of Finance, Ministry of Education, Ministry of Agriculture etc) to coordinate efforts and concerted contributions of all sectors. • Training and Sensitising of Improved Cooking Stoves and Charcoal Producers, • Awareness raising for civil society, about health and socio-economic benefits, training and demonstration • Technical Capacity Advisory and Support Services are available in implementation of Projects,	• Business Models available to facilitate Clean Energy for Cooking : Set Up Design and Standards ICS for commercial purpose • Strategic public sector investment through provision of loans, subsidies, grants for production of stoves (which are highly cost-effective, given health benefits, increased economic output and positive environmental impacts)
Target 2 **Modern Energy Services for All Urban and Peri-Urban**	• Allocate Rural Electrification Programmes to Peri Urban Poor Population,	• Set Up Electrification Policy Framework, • Policy Framework for	• Technical Capacity Building enhanced through AfDB and World	• Continue to support credit schemes for users of electricity in urban and peri urban (micro

Poor : **- Improved Cooking Stoves for Charcoal, Peat and Densified Solid Wastes,** **- Urban & Peri Urban Electrification**	• Make Affirmative Action on Budgetary Allocation for Peri Urban Poor Population, • Engage the Government in Urban Handcraft to promote production,	Public-Private Partnership (PPP) for Urban and Peri Urban and Poor • Continue to Implement in Urban and Urban Social Tariff in Electricity Sector,	Bank Projects, • Awareness of others appropriate alternative	fiancé), • Involving Electric Utilities in Pro-Poor Modern Energy Access, • Promoting Energy Efficiency "Compact fluorecence Lamp – CFL"
Needed action	**Mainstreming of Energy Acces into national development strategies**	**Development of pro-poor energy policies and regulatory framework**	**Capacity building to deliver modern energy services for the poor**	**Identifying high potential business models**
Target 3 **Social Service Institutions Modern Energy Access: Electricity for All Schools, Clinics, Hospitals and Community Centers.**	• Mainstream Energy Needs of Social Service Institutions (Education, Health) into their Sectoral Plans, • Energy access to social centers through grid extension and PV, • Engage local authorities in Electrification of Schools and Clinics (refrigeration, sterilization).	• Harmonize Plans and Implementation Framework • Energy issues are incorporated in Education and Health Policies,	• Technical training & support (Off-grid Systems), • Capacity building in modern energy access for users and technicians of social institutions	• Support private contractors for distribution electricity to Social Institutions
Target 4 **Mechanical Power for Productive uses for All Communities : Motive Power**	• Allocation of budget to stimulate production sector in relation to energy, • Ministry in charge of Handcraft to formulate policy framework on Motive Power. • Energy for productive uses : - Contributes to gender balance, - Boosts socio-economic development and poverty alleviation, - Stimulate local investment, job creation and revenue	• Proactive planning tools to mainstream productive energy use designed & developed across various sector & players.	• Multi sectoral & Multilevel approach in entrepreneurial capacity development for productive use of energy.	• Encourage multifunctional platforms for income generating & services delivery • Micro-financing approach put in place

	generation			

Needed action	Mainstreming of Energy Acces into national development strategies	Development of pro-poor energy policies and regulatory framework	Capacity building to deliver modern energy services for the poor	Identifying high potential business models
∑ **Outputs**	• National and Local Political Authorities are implicated in Strategies Access to Modern Energies	• National Consultation and Harmonization of Energy sector: Legal Framework adapted or Updated to facilitate access to Modern Energy for poor. • An Appropriate Investment Framework for Energy Access is set up	• An Appropriate Public Planning and Institutional Framework is set up • Multistakeholders capacity & Database put in place at all level on access to energy for poor, • Include Energy in Training Curriculum, • Involving the Media in Public Awareness Creation	• Experiences in the Area of Energy Access Are identified to be Scaling Up, • Transfer of technologies as ideas models for best practices.
Regional Outputs	• Regional Energy Policy to Preserve the Environment and Natural Resources	• Regional Regulatory Agency, •	• Identify Regional Successful Stories and Documentation and Publication, • Create Awarded System	• Set Up Transfer Mechanism.

4.2. Outputs, activities, milestone, responsibilities, timetable and budget

	Outputs	Activities	Milestone	Responsabilities	Timetable	Budget
1.	National and Local Political Authorities implicated in Strategies Access to Modern	• Review and Update National Energy Policy, • Set Up Multistakeholders Mechanism On Access • Mainstream Energy Access into Sectoral Policies (Health, Education, Public Works, Etc..), • Validating a National Strategy of Access to Energy Services, • Revising Budget Allocations to increase Access to energy for Social and Productive Uses.	• Energy Policy Report, • Priority Actions Program of PRSP	• Ministry in Charge of Water and Energy,	2008 – 2009	
2.	National Consultation and Harmonization of Energy Sector : Legal Framework adopted	• Implement the Energy Regulatory Agency, • Review existing Codes and Standards in EAC and adapt them to National Context, • Set Up Affordable Tariffs, PPP Framework to promote Energy	• Regulatory Agency operational,	• Ministry in charge of Energy,	2008 – 2009	

		Access				

	Outputs	Activities	Milestone	Responsabilities	Timetable	Budget
3.	An Appropriate Investment Framework for Energy Access is set up,	• Develop Projects Proposal for each target, • Resources Allocation,	• Resources Mobilization and Allocation are done	• Different Stakeholders, • Ministry of Planning	2008 – 2009	
4.	An Appropriate Planning/Institutional Framework is set up	• Training Needs Assessment • Develop Projects Proposal to address Training Needs Assessment • Involve existing training Facilities (Public Administration Training Facility)	• Number of people trained,	• Ministry in charge of Energy,	2008 – 2009	
5.	Multistaholders Capacity & Database put in place,	• Identification of Staholders, • Set Up a Forum of Multistakeholders and its Steering Committee, • Energy Needs Assessment, and On Going Energy Projects, • Capacity Building.	• Workshop and Exhibitions,	• Ministry in charge of Energy,	2008 – 2009	

	Outputs	Activities	Milestone	Responsabilities	Timetable	Budget
6.	Include Energy in Training Curriculum	• Involve Ministry of Education and Professional Training and the Multistakeholders, • Develop the Curricula needed for the 4 Targets,	• School Books include Energy Issues,	• Ministry of education and Ministry of energy,	2008 – 2009	
7.	Involving the Media in Public Awareness Creation,	• The Media Should be involved in all steps, • Strengthen existing Public Relations Office, • Prepare Press Brief for each activity, • Document successful Studies/Projects and Disseminate them (TV and Press),	• Press Clip and, • TV/Radio Documentaries, • Adverts.	• Ministry of Energy, • Ministry of Communication.	2008 – 2009	
8.	Experiences in the Area of Energy Access are identified to be scaled up	• Assess on Ongoing National activities, • Visit Regional and Abroad on Ongoing Activities, • Identification Successful Stories	• Number of Successful Stories	• Ministry of Energy	2008 – 2009	

	Outputs	Activities	Milestone	Responsabilities	Timetable	Budget
9.	Transfer of	• Needs Assessment and	• Technologies	• Ministry of	2008 – 2009	

	Technologies as ideas models for best practices	**Prioritizing,** • **Identify Sustainable technologies,** • **Set Up Transfer Mechanism,** • **Seeking Technical Assistance from Developing Partners.**	**identified,** • **Transfer of Know-How (Vocation Trainings)**	**Energy,** • **Ministry of Communication**		

4.3.Activities of Regional Framework

	Needed Actions	**Mainstreming of Energy Acces into national development strategies**	**Development of pro-poor energy policies and regulatory framework**	**Capacity building to deliver modern energy services for the poor**	**Identifying high potential business models**
1.	**Regional Outputs**	• **Regional Energy Policy to Preserve the Environment and Natural Resources**	• **Regional Regularory Agency,**	• **Identify Regional Successful Stories and Documentation and Publication,** • **Create Award System**	• **Set Up Transfer Mechanism.**

5.0 ANNEXES

Annex 1: Matrix

Matrix 1: Results Framework and Monitoring of the Burundian Electricity Projects

PDO	Projects Outcome Indicators	Use of Projects Outcome Information
1.Increase access and reliability and quality of electricity 2. Strengthen REGIDESO's financial sustainability	1. Incremental number of people connected to the electricity distribution network in peri urban poor of Bujumbura, 3. Unplanned power interruptions (measures as minutes of unplanned MV interruptions per quarter) 4. O&M costs of REGIDESO are fully covered through revenues by 2013.	YR 5 : To inform on: (i) project results, (ii) impact of performance contract as a tool to improve overall sector performance. YR 1-3 gauge improvement in sector performance. YR 3 determine if performance agreements need to be adjusted.
Intermediate outcomes	Intermediate Outcome Indicators	Use of Intermediate Outcome Monitoring
Component 1 : Electricity 1. Increased transmission and distribution network reliability 2. Increased electricity production to reduce the existing supply deficit 3. Reduction of technical and commercial losses in the network	1. Number of HV and MV substations rehabilitated 2. Increased power generation (GWh/year) by 11 GWh per year (from additional sources), 3. Reduction of technical and non technical losses (calculated as kWh billed/kWh produced) 24% to 18%.	YR 3 – Feedback from different types of consumers on the quality and availability of services to realign investment priorities as needed.

Component 2 : Strengthen of REGIDESO and MWEM 1. Improved financial and commercial performance 2. Improve performance of MWEM	(a) Collection efficiency of REGIDESO increases from 82 % in 2009 to 95% in year Y(calculated as billing revenues/amount billed) (b) Accounts recevables in days of public customers reduced from XX days to less than YY days on (Date 1) and to less than ZZ days on (Date 2) 2. Preparation of strategic sector plans for electricity	YR 3Evaluation of compliance with the performance contact by REGIDESO as well as Government and of the return to financial viability of REGIDESO.

Matrix 2: World Bank Project Components up to 2013

N°	Component	Amount (million US$)	Remarks
I.	**ELECTRICITY**	**29.7**	
1.	Operational subsidy for thermal generation of electricity	8	
2.	Rehabilitation of transmission and distribution network	17.1	
3.	Pre-feasibility and feasibility studies of Small sized hydropower plants	1.9	
4.	Improved revenue Collection	1.8	
5.	Demand Side Management Program	0.9	
	Distribution and promotion of Compact Fluorescent Lights (CFL)		
	Utility energy Audit		
	Promotion of Energy Efficiency (EE) Investment to large consumers		
II.	**INSTITUTIONAL STRENGHTHENING OF REGIDESO AND MWEM**	**3.3**	
1.	Technical Assistance to monitor the REGIDESO performance contract	0.4	
2.	Institutional Strengthening REGIDSO	1	
3.	Institutional Strengthening, MWEM		
4.	Public Information and Consultation	0.3	
5.	Support to the Project Implementation Unit within REGIDESO		

Matrix 3: Arrangements for Results Monitoring of World Bank Project

		Target Values					Data Collection and Reporting		
	Baseline	**YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsability for Data Collection**
Project Outcome Indicators	**April 2008**	**Dec 2009**	**Dec 2010**	**Dec 2011**	**Dec 2012**	**Dec 2013**			
1. (a) Incremental number of people served in peri urban areas in Bujumbura	0	9 460	21 670	92 070	102 190	114 950			REGIDESO PIU
1. (b) Incremental number of people served in peri urban areas in other areas	0	6 000	12 000	18 000	24 000	30 000			REGIDESO
2. Unplanned power interruptions (measures as minutes of unplanned MV interruptions per quarter)	3 100	3 000	2 000	1 500	1 000	800			REGIDESO PIU
3. % of O & M costs of REGIDESO covered through revenues	Tbc					100%	Annual	Performance monitoring reports (IBNET)	REGIDESO PIU

		Target Values					Data Collection and Reporting		
	Baseline	**YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency**	**Data Collection**	**Responsability**

							and Reports	**Instruments**	**for Data Collection**
Project Outcome Indicators	**April 2008**	**Dec 2009**	**Dec 2010**	**Dec 2011**	**Dec 2012**	**Dec 2013**			
Intermediate Outcome Indicators									
Component 1 – Electricity									
Number of HV and MV substations rehabilitated	0	0	10	20	20	20	Quarterly	Project Implementation Monitoring (Quarterly Financial Management Report)	REGIDESO
Increased Power Generation (from additional sources) GWh/year)	2006 – 149 GWh 2007 – 187 GWh	11	11	11	11	11	Quarterly	Management Information System	REGIDESO
Reduction of technical and non-technical losses from 24% to 18% (calculated as kWh billed/kWh produced)	24.4%	24%	23%	21%	19%	18%	Semi-annual	Management Information System	REGIDESO

		Target Values					**Data Collection and Reporting**		
	Baseline	**YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsability for Data Collection**

Project Outcome Indicators	**April 2008**	**Dec 2009**	**Dec 2010**	**Dec 2011**	**Dec 2012**	**Dec 2013**			
Component 2 – Strengthening of REGIDESO and MWEM									
1. (a) Collection efficiency of REGIDESO increases from X % in year X to Y % in year Y (calculated as billing revenues/amount billed)	82%	85%	88%	91%	93%	95%	Annual	Annual technical review	Independent Auditor
1. (b) Accounts receivables in days of public customers reduced from XX days to less than YY days on (Date1) and to less than ZZ days on (Date 2)								Management Information System	REGIDESO
2. Preparation of strategic sector plan for electricity				By March 31th, 2011			Semi-Annual	Baseline survey, semi-annual monitoring survey	REGIDESO

		Target Values					**Data Collection and Reporting**		
	Baseline	**YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsability for Data Collection**
Project Outcome	**April 2008**	**Dec 2009**	**Dec 2010**	**Dec 2011**	**Dec 2012**	**Dec 2013**			

Indicators									
Intermediate Output Indicators									
Number of HV and MV substations rehabilitated	0	0	10	20	20	20	Quarterly	Projects Implementation Monitoring (Quarterly Financial Management Report)	REGIDESO
Number of pre-payment electricity meters installed	5 100	10 000	15 000	25 000	35 000	40 000			REGIDESO
Number of incandescent light bulbs replaced with compact fluorescent lights (CFL)	0	100 000	150 000	200 000	200 000	200 000			REGIDESO

World Bank, Multisectoral Infrastructure Project, Project Appraisal Document on a Proposed Loan, April 2008.

Matrix 4: AfDB Project Components up to 2013

The Loan of AfDB, with an amount of 7,45 millions d'UC, will permit to cover 16% of the cost of World Bank and AfDB projets.

The timetable of spendings, by component, from 2007 to 2010 is the following :

Timetable of Spending by component (millions UC)						
N°	Component	2007	2008	2009	2010	Total
1.	Rehabilitation and strengthening of the production	3,04	4,05	2,02	1,01	10,12
2.	Rehabilitation and extension of power stations and network	2,11	2,81	1,41	0,70	7,03
3.	Control of the demand and improvement of revenues	0,42	0,57	0,28	0,14	1,42
4.	Logistic Equipments and exploitation	0,25	0,34	0,17	0,08	0,85
5.	Strengthening capacity and management system	0,66	0,88	0,44	0,22	2,19
6.	Studies, supervision and training	0,58	0,78	0,39	0,19	1,95
7.	Administration and project management	0,28	0,37	0,19	0,09	0,93
	Total	7,35	9,80	4,90	2,45	24,49
	Pourcen (%)	0,30	0,40	0,20	0,10	1,00

Annex 2: Tables

Table 2: Characteristics of main power stations in Burundi

Power Station	Type of turbine	Number of group	Electric Power (MW)	Installed Power (MW)	Guaranteed Power (MW)	Guaranteed Energy (GWh)	Produced Energy (GWh)
MUGERE	Pelton	4	2	8	2.17	19	40
RWEGURA	Pelton	3	6	18	4.08	35.7	55
NYEMANGA	Pelton	2	0.85	1.7	1.39	12.2	12.2
RUVYIRONZA	Kaplan	3	0.5	1.5	1		
GIKONGE	Kaplan	2	0.5	1	0.8		

Source : REGIDESO

Table 3: External Hydropower Stations

Name	Type of turbine	Number of groups	Electric Power (MW)	Installed Power (MW)	Guaranteed Power (MW)	Guaranteed Energy (GWh)	Medium Energy (GWh)
RUZIZI I	Kaplan	4	2 x 6.3 2 x 7.8	29.8	11.9	105	165
RUZIZI II	Francis	3	14.4	43.2	18	141	220
TOTAL				73.0	29.9	246	385

Source: REGIDESO

Table 4: Hydropower stations installed in au Burundi (public and private)

Power Station	Utility	River	Year of working	Installed Power (MW)
Rwegura	REGIDESO	Gitenge	1986	3x6 = 18
Mugere	REGIDESO	Mugere	1982	2x4 = 8
Ruvyironza	REGIDESO	Ruvyironza	1980/1984	3x0,5 = 1,5
Nyemanga	REGIDESO	Siguvyaye	1988	2x0,72 = 1,4
Gikonge	REGIDESO	Mubarazi	1982	2x0,5 = 1,0
Kayenzi	REGIDESO	Kavuruga	1984	2x0,425 = 0,850
Marangara	REGIDESO	Ndurumu	1986	2x0,120 = 0,240
Buhiga	REGIDESO	Ndurumu	1984	0,240
Sanzu	REGIDESO	Sanzu	1983	0,072
Kigwena	D.G.H.E.R.	Nzibwe	1984	0,05
Butezi	D.G.H.E.R.	Sanzu	1990	0,24
Ryarusera	D.G.H.E.R.	Kagogo	1984	0,02
Nyabikere	D.G.H.E.R.	Nyabisi	1990	0,139
Murore	D.G.H.E.R.	Rusumo	1987	0,024
Mugera	Parish	Ruvyironza	1962	0,030
Kiremba	Parish	Buyongwe	1981	0,064
Masango	Parish	Kitenge	1979	0,025
Power Station	**Utility**	**River**	**Year of working**	**Installed Power (MW)**
Musongati	Parish	Nyamabuye	1981	0,006

Mutumba	Parish	Kirasa	1982	0,045
Mpinga	Parish	Mukanda	1983	0,016
Teza	Office of Tea	Nyabigondo	1971	0,360
Kiganda	Parish	Mucece	1984	0,044
Gisozi	Parish	Kayokwe	1983	0,015
Burasira	Seminary	Ruvubu	1961	0,025
TOTAL				32,400

Source : National Electrification Master Plan, SOGREAH, 1995

Table 5: Total Production of Electricity (kWh)

Year / HYDRO POWER STATIONS		2003	2004	2005	2006
RWEGURA	Total	48.710.800	43.874.700	49.616.600	36.380.827
	Subsidiaries Serv.	254.830	398.850	406.900	439.467
	Send to network	**48.273.280**	**43.475.850**	**49.209.700**	**36.005.328**
Mugere	Total	44.474.292	39.643.236	41.787.720	49.599.006
	Subsidiaries Serv.	91.743	85.029	1.236.623	74.777
	Send to network	**44.382.549**	**39.558.207**	**40.551097**	**49.537.963**
Ruvyironza	Total	16.080	9.720	0	0
	Send to network	**3.610.055**	**1.204.757**	0	0
Ruzizi II (SINELAC)	Imported	**30.893.000**	**42.329.000**	**50.920.000**	**41.218.000**
	Exported	1.019.000	211.000	46.000	39.000
Ruzizi I (SNEL)	Send to network	**26.132.205**	**30.277.106**	**20.284.165**	**16.940.413**
Total Production on interconnected network		**153.820.352**	**157.328.799**	**165.279.620**	**145.865.065**
ISOLATED POWER STATIONS					
Nyemanga (total)		4.470.141	3.845.874	3.415.031	4.390.706
Gikonge (total)		1.052.264	966.088	0	0
Kayenzi (total)		1.048.630	956.541	593.155	619.646
Marangara (total)		1.079.104	731.270	630.486	981.252
Buhiga (total)				623.300	184.816
C. Th Kirundo et Muyinga					15.069
Total production of isolated power stations		**7.650.139**	**6.499.773**	**6.079.858**	**6.191.489**
Total Production/ National Network		**161.480.491**	**163.828.572**	**171.411.778**	**152.056.554**
Total Production		**169.130.630**	**170.328.345**	**177.491.636**	**158.248.043**
Increase Rate		-3,5%	1,45%	4,6%	-11,3%

REGIDESO, Annual Report, 2006

Table 6: Electricity Consumption in Urban and Rural Areas, (kWh)

Year	2002	2003	2004	2005	2006
LV MV	68.928.955 49.947.924	81.813.536 42.279.938	80.587.727 44.179.997	75.899.987 43.891.697	64.052.262 41.025.357
Total	**118.876.879**	**124.093.474**	**124.767.724**	**119.791.684**	**105.077.619**
Technical and non technical losses	**37.800.000**	**35.900.000**	**38.400.000**	**52.400.000**	**31.523.285**
Total demand	**156.676.879**	**159.993.474**	**163.167.724**	**172.191.684**	**136.600.905**
Rate of distribution losses	**24 %**	**22 %**	**24 %**	**30 %**	**30 %**

Source : REGIDESO, Annual Report 2006,

Tableau 7: Electrical energy needs for Burundi, up to 2020

Needs	2005	2010	2015	2020	Rate
NELSAP Study, SNC LAVALAIN (2005) Energy Demand (GWh) Peak Power (MW)	 200 40	 235 60	 430 85	 680 140	 8,5 %
EGL Study (2005) Energy Demand (GWh) Peak Power (MW)	 198 41	 253 52	 355 73	 498 101	 6,4 %
NELSAP Study, SOGREAH (2005) Energy Demand (GWh) Peak Power (MW)	 180 **35**	 264 **51**	 389 **75**	 570 **111**	 8 %

Source : NELSAP Study, SOGREAH, 2005

Table 8: Electricity Tariff structure, Operating Performance

	REGIDESO – OPERATING PERFORMANCE	**2003**	**2004**	**2005**	**2006**	**2007**
1.	Total connections	31 915	32 889	32 848	35 136	
	Of which in Bujumbura	20 754	21 025	20 576	21 510	
	Connections p.a.	Na	974	41	2 288	
	% growth p.a.	Na	3.1%	-0.1%	7.0%	
2.	Total electricity produced (kWh)	161 303 881	164 039 572	171 359 478	152 056 554	
	% growth p a	Na	1.7%	4.5%	-11.3%	
	Of which electricity purchased SINELAC	29 874 000	42 118 000	50 874 000	41 179 000	
	Of which electricity SNEL	Na	31 005 923	20 409 204	17 341 915	
3.	Electricity sold (kWh)	124 093 474	125 769 197	123 708 474	112 606 265	
	Of which prepaid	0	1 001 473	4 724 726	7 964 720	
4.	Technical + non technical losses	23%	23%	28%	26%	
5.	Average electricity revenue (Fbu/kWh)	57.37	71.26	77.60	77.39	
6.	Average electricity revenue (US$ cents/kWh)	5.30	6.47	7.18	7.52	
7.	Growth in electricity sold (%)	Na	1.4%	-1.6%	-9.0%	
8.	Growth in average electricity revenue '%)	Na	34.2%	9.0%	-0.4%	
9.	Number of employees	1 792	1 540	1 646	1 880	
10.	Number of clients/employees	18	21	20	19	
12.	Recovery rate arrears	44.1%	45.7%	37.5%	38/5%	

REGIDESO, Annual Report 2007

Table 9: Key Financial ratios

N°	(in million US $)	2002	2003	2004	2005	2006
1.	**Income statement**					
	EBITDA	49.3%	34.5%	29.3%	13.1%	3.7%
	Operating income % revenues	35.9%	18.8%	11.3%	-20.3%	-17.6%
	Net income % revenues	-4.5%	-7.6%	-3.9%	-21.9%	-39.2%
	Working ratio	50.7%	65.5%	70.7%	86.9%	96.3%
	Personal cost % operating expenses	44.6%	29.4%	25.7%	24.1%	27.7%
2.	**Balance sheet**	0.0%	0.0%	0.0%	0.0%	0.0%
	Current ratio	0.56	0.61	0.67	0.62	0.54
	Debt/(Debt + Equity)	55.1%	57.2%	53.3%	52.4%	54.4%
	Return on assets (%)	2.4%	1.5%	1.0%	-1.6%	-1.2%
	Customer receivables (days)	348.82	363.18	355.35	449.45	513.47
	Government receivables % total assets	10.3%	12.2%	13.8%	18.5%	19.6%
	Accounts payable (days)	2 606.2	1 360.0	1 306.2	1 045.3	1 247.7
3.	**Cash flow statement**					
	Accounts service coverage	4.0	1.7	3.7	1.5	0.8
	Self financing ratio (of investments)	51%	55%	24%	-12%	0.0%

REGIDESO, Annual Report 2007

Table 10: Burundi Energy Balance

	Biomass	Petroleum	Electricity	Total

Type of Energy	Charcoal	Wood	Peat	S/Total			
1	2	3	4	5		11	12
Specific Equivalence	***0,67 toe/t***	***0,33 toe/t***	***0,28 toe/t***	***Toe***			***Toe***
1. Energetic representation							
1.1. Production		**3 007 945**	**1 282**	**3 009 227**		**8 948**	**3 018 175**
1.2. Imports					**57 797**	**4 904**	**62 701**
1.3. Storage variations					**2 050**		**2 050**
1.4. Internal Supply (brute)		**3 007 945**	**1 282**	**3 009 227**	**59 647**	**13 852**	**3 082 726**
1.5. Conversions		**1 110 519**		**1 110 519**			**1 110 519**
1.5.1. Charbonneries (1)		1 110 519		1 110 519			**1 110 519**
1.5.2. Power Stations							
1.5.3. Losses/Profits						**-3 068**	**-3 068**
1.6. Internal Supply (net)	**225 469**	**1 897 426**	**1 282**	**2 124 177**	**59 647**	**10 784**	**2 194 608**
1.7. Statistic (Ecarts)			**-487**	**-487**	**-4 097**		**-4 584**
1.8. Final total consumption	**225 469**	**1 897 426**	**795**	**2 123 690**	**55 550**	**10 784**	**2 190 024**
1.8.1. Industry		5 372		5 372	6 292	2 911	14 575
1.8.2. Transport					46 917		46 917
1.8.3. Households	225 469	1 892 054		2 117 523	1 321	6 289	2 125 133
1.8.4. Institutional Commerce	na	na	795	795	813	1 476	3 084
1.8.5. Fishing, construction et Mining					207	108	315
2. Representation of the total consumption		96 %	0,04 %	**96,04%**	2,5 %	0,5 %	**100 %**
4. Representation of commercialized Energies		77 %	0,3 %	**77,3 %**	19 %	3,7 %	**100 %**

Directorate General of Water and Energy, Annual Report, 2006

Annex 3: List of Individuals and agencies contacted and particulars

N°	Name of Individuals contacted	Organization/Agency	Particulars
1.	Paul Kirai	GTZ	EAC Consultant
2.	Eng. Dr. Mackay A.E. Okure	University of Makerere, Uganda	Uganda Consultant
3.	Idi Buhanga	Directorate General of Water and Energy	General Director
4.	Pierre Barampanze	Directorate of Energy	Director
5.	Joseph Ndayikeza	Ministry of Economy, Finances and Development Cooperation	Chief of Cabinet of the Minister
6.	Louis Barampanze	Ministry of Economy, Finances and Development Cooperation	Technical advisor
7.	Benoit Sindayikengera	Public Enterprises Service	Economist
8.	Ildephonse Rwasamanga	Vice-Ministry of Planning	Technical Advisor
9.	Baudoin Butoyi	Directorate of Hydraulics and Rural electrification	Chief of service
10.	Fabrice Ntwari	Ministry of Health and Against HIV/AIDS	Advisor in Infrastructure and Equipments
11.	Celestin Nduwamungu	REGIDESO	Managing Director
12.	Audace Sunzu	REGIDESO	Electricity Director
13.	Sarah Biha	REGIDESO	Director of Finance and Administration
14.	Daniel Sejiji	REGIDESO	Chief of Service Investments Planning
15.	Richard Nkurunziza	REGIDESO	Chief of Service Electricity Production
16.	Sylvère Nzoyihera	REGIDESO	Chief of service Electricity equipment
17.	Ventura Bengoechea	International Development association (IDA)	Chief of the Multisector Infrastructure Project
18.	Déo-Marcel Niyungeko	IDA	Municipal Engineer
19.	Dismas Nditabiriye	Green Belt Action	Project Coordinator
20.	Venant Barindogo	Forest Office	Chief of Service

Annexe 4: Key Reference Documents

1. Strategic Framework Accelerating for Economic and Reducing Poverty (PRSP), Burundi, November 2003,

2. Priority Action Programme for the Implementation of the Burundi PRSP 2007-210, www.cslpminiplan.bi, Partner Round Table, Bujumbura, 24-25 May, 2007,

3. Sectoral Policy of Ministry of Water, Energy and Mines of Republic of Burundi, March 2006,

4. Sectoral Policy of Ministry of Environment, Territory Management & Public Works, March 2006,

5. Multi sector Infrastructure Project, IDA, Appraisal Document on a Proposed Loan, January, 2008,

6. Regional Strategy for Scaling Up Access to Modern Energy Services, Regional Workshop to Develop National and Regional Workplans, Report of the Workshop, Ref:EAC/TF/30/2008,

7. Ecological and Economic Comparative Study of Used Energies in Burundi, Godefroy HAKIZIMANA, Dismas NDITABIRIYE, Marie Claire KIGEME, February 2008,

8. Joint UNDP/World Bank Energy Management Assistance Program, Activity Completion Report, N°036/85, Report on the Project Profiles prepared for the Round Table on external aid, Bujumbura, May 1985,

9. Renewable Energy Technologies in Africa. Zed Books, London, Karekezi, S. and Ranja, T., 1997,

10. Law n° 1/21 of 30 December 2007 regarding General Budget of the Republic of Burundi for 2008,

11. Terms of reference for an National Consultant to Facilitate Country Level Activities in Support of EAC Member States to Implement the EAC Energy Scale Up Study, March 2008.