

REPUBLIC OF RWANDA



RWANDA ELECTRICITY CORPORATION

**REPORT OF THE INTERNATIONAL SEMINAR ON ACCESS TO ELECTRICITY
AND DEVELOPMENT OF LOCAL INDUSTRIES IN AFRICA**

Organized by Rwanda Electricity Corporation (RECO) in collaboration with Union des Producteurs et Distributeurs d'Electricité en Afrique(UPDEA)

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ABBREVIATIONS

ADB: African Development Bank

AFD: Agence Française de Développement

AfDB: African Development Bank

BADEA: Arab Bank for Economic Development in Africa

BTC: Belgian Technical Cooperation

CIDA: Canada International Development Agency

DFID: Department for International Development

EDCF: Economic Development Cooperation Fund

EDPRS: Economic Development and Poverty Reduction Strategy

EGL: European Gas Limited

HIV/AIDS: Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome

IDA: International Development Association

JBIC: Japan Bank for International Development

JICA: Japan International Cooperation Agency

KFAED: Kuwait Fund for Arab Economic Development

KPLC: Kenya Power and Lighting Co Ltd

MININFRA: (Rwanda) Ministry of Infrastructure

NELSAP: Nile Equatorial Lakes Subsidiary Action Program

NORAD: Norwegian Agency for Development Cooperation

NRECA: National Rural Electric Cooperative Association

OFID: OPEC Fund for International Development

OPEC: Organization of Petroleum Exporting Countries

RECO: Rwanda Electricity Corporation

RWASCO: Rwanda Water and Sanitation Corporation

SENELEC: Société National d'Electricité du Sénégal

STEG: Société Tunisienne d'Electricité et du Gaz

SWAP: Sector Wide Approach.

SWER: Single Wire Earth Return.

UPDEA: Union des Producteurs et Distributeurs d'Electricité en Afrique

USAID: United States Agency for International Development

SUMMARY

From 26 to 27 May, 2010, Laico hotel in Kigali hosted the International Seminar on Access to Electricity and Development of Local Industries. The seminar gathered officials from Ministries in charge of Energy in Africa, power utilities in the region, major manufacturers, some continental organizations as facilitators of the African power sector development, representatives of Financing institutions and sister power utilities. The seminar was organized by RECO in collaboration with UPDEA (Union des Producteurs et Distributeurs d'Electricité en Afrique). This seminar is in the spirit of the March 2009 conference which resulted in the roll out program financing pledges for the next 5 years.

In her opening speech, Honorable Minister of State in charge of Energy and Water declared that energy access rate is both a pillar and an indicator of development. She recommended the reinforcement of partnership in the energy sector on the continent and commended UDPEA and its partner associations for their efforts in the promotion of this sector. She deplored that Africa has the lowest per capita modern energy consumption in the world and that electricity is unavailable or costly on the continent, which is a serious impediment on development. Rwanda, she indicated, not only embarked in reversing the situation through an electricity access scale up program, but also believes that sustainability of the electricity supply and access can be achieved through collaboration, in particular south-south cooperation. In this spirit, the country has signed a protocol of cooperation with Tunisia. Last but not least, the Minister of State in charge of Energy and Water extended Rwanda's gratitude to development partners and donors for their unwavering support to the energy sector.

The seminar has been an opportunity not only to absorb lessons from various countries' success stories on grounds of rural electrification and energy efficiency but also to discuss ways to develop local industries and thereby achieve universal access to electricity in Africa.

The seminar was closed by Mr. Yves MUYANGE, the Managing Director of RECO&RWASCO who thanked participants for their valuable contribution to the seminar and noted that the seminar denotes the Government will to create a conducive environment to the flourishing of the energy sector. Specifically, the seminar is a milestone in setting clear energy policies, regulatory frameworks and initiating enterprises partnership with a view to increasing electricity access rates in sub Saharan Africa.

I.INTRODUCTION

I.1. GENERAL BACKGROUND

From 26 to 27 May, 2010, Laico hotel in Kigali hosted the International Seminar on Access to Electricity and Development of Local Industries. The seminar gathered officials from Ministries in charge of Energy in Africa, power utilities in the region, major manufacturers, some continental organizations as facilitators of the African power sector development, representatives of Financing institutions and sister power utilities. The seminar was organized by RECO in collaboration with UPDEA (Union des Producteurs et Distributeurs d'Electricité en Afrique). This seminar is in the spirit of the March 2009 conference which resulted in the roll out program financing pledges for the next 5 years.

In this seminar, energy sector stakeholders in Africa discussed the problem of inadequate access to electricity in the region, and basing on success stories from Tunisia, Bangladesh and Ghana, recommended strategies to reverse the situation.

I.2. OBJECTIVES OF THE SEMINAR

The main objective of the seminar was to bring together the power sector development stakeholders in Africa to discuss the problematic of lack of access to electricity in the Region and identify ways and means to improve the current situation.

Specifically, the seminar was set to:

1. Learn from other countries' experiences with regard to rural electrification programs: capacity building, financing, technologies and techniques used, involvement of stakeholders(government and private);
2. Facilitate public- private partnership/investment for the establishment of electrical material manufactures and services providers to stimulate the development of local and regional industry. The main idea is to attract investors in Rwanda and facilitate their interaction with the private sector federation in Rwanda;
3. Identify initiatives to promote energy efficiency practices;
4. Create a sort of awareness for the electricity access program with a possibility to increase the competition on supply of materials and installation that would result, in the end, in the reduction of the connection cost.

I.3. SEMINAR'S AGENDA

Presentations and discussions centered on the following topics:

- Access to electricity: technical and financial aspects
- Strategies to reduce non technical losses
- Development of local industries in Africa;
- Energy efficiency.

After presentations and interesting discussions, participants formulated sound recommendations, among others development of sound energy policies allowing the reduction of non technical losses through replacement of incandescent bulbs by energy saving ones and reinforcement of public-private partnership.

This report succinctly documents the seminar.

II. SEMINAR PROCEEDINGS

II.1. OPENING SESSION

II. 1.1. INTRODUCTION TO THE SEMINAR

The international seminar on access to electricity and development of local industries in Africa was introduced by Eng. Abel Didier TELLA, the Secretary General of UPDEA, who on behalf of the President of UPDEA, Mr. Eddy NJOROGÉ wished a warm welcome to participants. He pointed out that Africa has a lot of energy resources such as hydroelectricity, biomass, solar system, wind energy and geothermal energy which need to be developed for the common good of all African populations. Eng. Abel Didier TELLA made it clear that the seminar on access to electricity and development of local industries is in line with the seminar on African Electrification Initiative held in Maputo and that it is a framework for participants to reflect on means to promote access to electricity, accelerate the development of local industries and meet energy needs of the African populations.

II.1.2. REMARKS BY THE DIRECTOR GENERAL OF RECO-RWASCO

In his remarks, the Director General of RECO, Yves MUYANGE, welcomed and thanked all guests who have come from different corners of the World to participate in the seminar. He asserted that the organization of such a seminar is a crucial event as energy is the pillar of the world development. He pointed out that Rwanda went through the energy crisis that hit Africa a few years ago. The crisis was a result of under investment and non integration of the access to electricity into national development plans. The good news is that Rwanda embarked on the resolution of the problem by aligning access to electricity with the EDPRS and the Vision 2020.

As for the Rwanda Electricity Corporation's (RECO) achievements, it has done a lot and achieved consistent strong results from a very low base. For example, they increased the number of customers from 50,000 customers in 2004 to 148,000 by the end of March 2010. Besides, the company evolved from a 12 billion Rwanda Francs turnover to a 60 billion Rwanda Francs in just the last 6 years and they are projecting to reach the 100 billion of turnover in the next 5 years; not to mention the awards they won for innovations and the fact that they are more than ever well positioned to meet the needs of their customers.

The Managing Director of RECO& RWASCO believes that though African countries face a number of challenges, including lack of strategic partnership between governments and private sector, some of them have made significant strides in terms of access to electricity. Therefore, he invited participants to draw lessons from success stories so as to join their efforts in fighting the common negative reference of being the “Dark Continent”.

II.1.3. REMARKS BY THE WORLD BANK COUNTRY REPRESENTATIVE

In her remarks, the World Bank Country Representative, Ms. Mimi LADIPO emphasized that only 24% of sub Saharan Africa’s population has access to electricity. In 2008, the population without access to electricity was 590 million and this number is projected to rise to 700 million if access rates fail to keep pace with population growth. Moreover, more than 30 countries of this region of Africa face regular power outage and shortage engendering production loss of 2,1% of the global production of the Region. Not to mention that the electricity capacity is very low with 39 MW by a population of one million, i.e. 1/10 of electrification level in comparison with other low income parts of the world.

Nowadays, 12 billion US dollars is being invested per year in the energy sector. Yet, this leaves a huge gap as in order to achieve universal access in 2030, 42 billion must be invested in the sector every year. The World Bank Country Representative made it clear that on basis of experience from countries such as Vietnam, Laos and Tunisia which increased rural electrification rate from 16% to 90% in a period of 30 years, Africa is capable to mitigate challenges in power sector and boost the development of local industries on the continent.

As for Rwanda, Ms. Mimi LADIPO pointed out that the World Bank attaches critical importance to increasing energy in the country and both parties are partnering in the further achievement of the country’s energy sector objectives. More, specifically, the World Bank provides investment climate advisory services to enhance private sector participation in the achievement of its development goals, supports private sector providers of energy solutions and has accepted to contribute US\$ 370 million to make possible the achievement of 35% access by 2020.

To close her remarks, the World Bank Country Representative observed that Africa has made remarkable progress with regard to access to energy, yet a lot is still to be done. As the World Bank partnered with African countries in developing the energy sector, a number of lessons were drawn: universal access takes time to achieve, requires sustained commitment of governments, adequate resources as well as technical and managerial innovation. She believes that Africa will only succeed in achieving universal access to electricity if these lessons are absorbed.

II.1.4. OPENING SPEECH BY THE MINISTER OF STATE FOR ENERGY AND WATER IN THE MINISTRY OF INFRASTRUCTURE

In her opening speech, the Minister of State for Energy and Water in the Ministry of Infrastructure Mrs. Colette U. RUHAMYA appreciated the idea of organizing a seminar on electricity access in Africa because this remains a challenge that the continent has to surmount. She declared that energy access is both a pillar and an indicator of development. She recommended the reinforcement of partnership in the energy sector on the continent and saluted UDPEA and its partner associations for their efforts in the promotion of this sector. She deplored that Africa has the lowest per capita modern energy consumption in the world and that electricity is unavailable or costly on the continent, which is a serious impediment on development. Rwanda, she indicated, has embarked in reversing the situation through an electricity access scale up program. The latter involves all stakeholders and 370 million have been guaranteed by various funding agencies. In the same spirit, an energy policy is soon to be approved by the Cabinet.

The Minister of State pointed out that Rwanda believes that sustainability of the electricity supply and access can be achieved through collaboration, in particular south-south cooperation and interconnections between countries. In this regard, the country has signed a protocol of cooperation with Tunisia and is in interconnections with neighboring countries through regional organizations such as EGL, NELSAP, East African Power Pool, etc.

To close her speech, the Minister of State for Energy and Water extended Rwanda's gratitude to development partners and donors for their continued support to the energy sector; she also observed that deliberations from the seminar will serve as a guide in the development of the energy sector.

II.2. PRESENTATIONS

II. 2.1. THE RWANDA NATIONAL ELECTRICITY ACCESS SCALE UP PROGRAMME: 2009-2012

In his presentation, Engineer Yussuf UWAMAHORO, Coordinator of the Energy Sector within the Ministry of Infrastructure pointed out that this program is in line with the Vision 2020, the National Energy Policy, other national policies and the EDPRS. The program aims at increased access to electricity, cost reflective tariffs and reduction of costs, diversified energy sources, security of energy supply, conducive institutional, legal and regulatory framework, capacity building and interconnection with neighboring countries including Uganda, Burundi, Tanzania and Kenya. In terms of sector wide approach, planned activities include harmonization of donor interventions and alignment to Government Priorities, development of a credible prospectus for investments in the Electricity Scale Up Programme and establishment of financing mechanisms allowing contributions by Government, Development Partners, Power Utility and Customers. In concrete terms, the program set out to reach 820,000 of total connections in 2012. By this year, 36% of the population, 50% of schools, 100% of health centers and 100% of administrative offices will be connected.

As for the progress so far made, the Coordinator of the Energy Sector noted the creation of the Program Implementation Directorate- EARP, bulk supply of equipments and material and service contracts and institutional capacity building (strengthening SWAP secretariat, RECO, etc). Besides, a number of grid initiatives have been undertaken, notably 26 Micro and pico hydropower initiatives to serve local communities, solar photovoltaic systems for public institutions, studies for wind energy and market development for solar home systems.

With regard to the funding of the program, apart from the Government and RECO, the Dutch Government, the World Bank, OFID, BADEA and Saudi Fund, JICA, AFD and AFDB pledged to support the program.

II. 2.2. THE TUNISIAN TECHNOLOGY AND EXPERIENCE IN RURAL ELECTRIFICATION

Mr. Jamil KORKED pointed out that STEG (Société Tunisienne d'Electricité et du Gaz) is a public utility established in 1962 for the production, the transportation and distribution of electricity and gas. STEG, as he mentioned, has 9300 employees with an electrification rate of 99.5% and a turnover of 1500 millions of US dollars. The utility has 3, 100,000 customers for electricity and 480,000 for gas.

The production of electricity was 100 MW in 1962. In 2009, it rose to 3465 MW and essentially relies on thermal energy (48%). Other energy sources include hydraulic (1%), the gas turbine (16%) and the combined cycle (35%). As for renewable energy, between 1956 and 2003 Tunisia has built 7 hydropower stations with a capacity of 66MW; developed 55 MW of wind energy and 150 are to be released soon.

In regard to energy transportation, Mr. Jamil KORKED explained that Tunisia is in interconnection with Algeria, Libya and the Europe through the Maghreb with a distribution line of 5660km; a study on interconnection with Italy is underway. The voltage level is 90kv, 150kv and 400kv. In terms of electricity distribution; the electricity line has 150,000km and the gas line is 8,300km with 80,000 new connections to electricity every year and 70,000 to gas.

Rural electrification in Tunisia begun in 1970 and in 1973 the country achieved a rate of 6%. STEG approach relied on master plan for distribution. STEG utilized MALT system which allows for a single phase distribution without using insulation transformers. This system which combines the three- phase and single phase was used in urban as well as in rural areas and is cost effective and less time consuming. The reduction of cost and time boosted the development of local industries notably the manufacturing of transformers, circuit breakers, cables and pylons.

To set up a rural electrification sound system, Tunisia proceeded by four stages: adaptation of the then distribution line, standardization of procedures, planning, studies and implementation. To optimize cost reduction, in 1990 the country introduced the single wire earth return (SWER) technique which engendered 25 to 30% of additional cost reduction in comparison with the single phase technique. Moreover, rigid insulators were utilized and they resulted in a reduction of 20% in the cost of equipment standardization. All in all, the cost reduction endeavors, resulted in reduction of 30 to 50% depending on zones. Since 2007 the evolution rate is stabilized to 70% and the country has 38,000 single phase posts and 54,000 aerial posts; this caused saturation.

As for the impact of rural electrification on lives of Tunisians, Mr. Jamil KORKED noted the reduction of rural exodus and the improvement of living conditions of the rural population. To wrap up his presentation, he recommended the use of MALT system because it is cost effective; he also recommended the use of SWER in rural areas. He believes that a strong political

commitment to rural development is a sine qua non for rural electrification to become a reality in Africa.

II.2.3. THE FINANCING OF RURAL ELECTRIFICATION PROGRAMMES

In his presentation, Mr Orison M. Amu, representative of AfDB, pointed out that in many countries rural electrification is a national program carried out by line Ministries, power utility or a dedicated rural electrification agency. In general public financing is the practice in many countries involving a usually large multi-year rural electrification program and a large capital financing. However, examples of successful private financing exist and involve small private concessions and single project for a small town or area. Sources of finances for this activity include multilateral Development Banks and Bilateral Agencies & Banks which normally finance national programs with lower interest and longer maturities, hence suitable for rural electrification projects; Private Non Profit Organizations which often provide capital in the form of grants or soft loans that are suitable for small projects; Private Equity Funds which are an important source of private capital for rural electrification; Government Budget; Private Investors; Commercial banks which normally finance private stand alone projects but with higher interests; and beneficiaries.

As for challenges, rural electrification requires high capital cost because of dispersed settlements, it is not a very profitable activity because sales and financial returns are low, many projects require significant subsidies to be commercially viable and commercial banks prefer more familiar sectors.

To close his presentation, Mr Orison M. Amu suggested a number of solutions to surmount these challenges: contribution of consumers to rural electrification programs, utilization of risk mitigation products and other credit enhancement mechanisms to encourage private financing for rural electrification.

II.2.4. FINANCING MECHANISMS: REVOLVING FUND: CASE STUDY OF KPLC

In this presentation Engineer Vincent NDWIGA and Ms Grace OMWENGA made a brief description of KPLC (Kenya Power and Lighting Co Ltd). The company was created in 1922 and the Government owns 48% of its total shares. The company currently provides electricity service to 1.5 million customers over transmission and distribution lines totaling over 45,000km. As for electrification in Kenya, the peak demand is 1,106 MW with an installed capacity of 1,526MW, and an effective capacity of 1,392MW, thus a distribution efficiency of 83.7%. Consumers are mainly industries (50%), trade 24,7% and households (25,3%). Electrification in Kenya relies on hydraulic and thermal energy.

In 2006 a socio-economic survey carried out by a consortium of consultants; Electricité de France (EDF), Axenne and Aberdare Engineering Ltd recommended the creation of a National Revolving Fund for KPLC. The fund is set out to provide the target customers who could not afford to pay the connection fee of 34,980 KShs with electricity. It is in this framework that KPLC launched a pilot project known as “KPLC StimaLoan” which will allow connecting more than 250,000 customers every year and reaching 40% of electricity access rate by 2020. The loan is specifically meant for customers who would ordinarily not approach a commercial bank since they find the terms and conditions of these institutions stringent. For the smooth running of the project, a committee has been put in place. The maximum amount to be advanced should do not exceed KShs. 100,000 (US \$1300) and the repayment period allowable shall not exceed 24 months. Marketing strategies for the facility include telemarketing which has so far touched 70,000 customers, meetings in targeted localities, door-to-door campaigns. Performance indicators for the project are the rate of uptake, rate of repayment and customer satisfaction.

In regard to the social economic impact of StimaLoan, the Kenyan delegation noted the enhancement of the country’s connectivity and electricity access rate; mushrooming of small and medium enterprises, hence employment creation, GDP increase and wealth creation; and security enhancement through powering of localities. Moreover, the project will contribute to the attainment of 2030 objectives and the Millennium Development Goals.

II.2.5. INVESTING IN RWANDA: PRIVILEGES AND TAX INCENTIVES

In her presentation, the Deputy CEO of RDB, Ms Clare AKAMANZI pointed out 5 reasons for investing in Rwanda, namely sustained high growth characterized by stable inflation and exchange rate as well as the highest GDP growth rate in neighboring countries; robust governance: the country is politically stable with well functioning institutions, rule of law and zero tolerance for corruption; investor friendly climate; access to markets and untapped investment opportunities. In addition, the country is a hub for investors to access the rapidly integrating East African Market, offers a simple business taxation system for investors, is ranked 11th in world for ease of starting business, i.e. it takes 2steps in less than days to register a company and was labeled as the fastest global reformer basing on the World Bank’s Doing Business survey. Other advantages include the stock exchange market established in January 2008 with OTC transactions in bonds and equities, a clean and green city with the lowest crime of any capital city in the region and access to reliable infrastructure and commercial services.

Priority sectors for investment in Rwanda are Infrastructure, Agriculture, Energy, Tourism, Information and Communication Technology, Real estate and construction, financial services and Mining. Opportunities in the energy sector, include power generation (a total of 235 needed MW), power distribution so as to reach EDPRS and Vision 2020 targets, manufacturing of electricity equipment, rehabilitation and construction of sub-stations.

To wrap up her presentation, Ms Clare AKAMANZI invited companies to register and operate in Rwanda because with the introduction of one stop centre registration is easier than ever; not to mention that investors get red carpet treatment in Rwanda.

II.2.6. DEVELOPMENT OF LOCAL INDUSTRIES IN AFRICA: THE TUNISIAN EXPERIENCE

In this presentation, Mr. Hichem Elloumi, President of the National Federation of Electricity and Electronics in Tunisia observed that the Tunisian electricity industry which had in 2009 a total production of 2,5 billion Euros is open to international markets as 83% of the production is exported toward the UE, AFRICA and Arab countries. The industry includes 360 industrial companies and has generated 65,000 jobs. The industry is totally integrated in worldwide economy as several worldwide leaders are implemented in Tunisia and a number of Tunisian groups are internationally represented.

On the chapter of Tunisian experience in electrical industry, 3 phases characterize this experience. The first phase corresponds to the launching of the industry (in 1960). As the private sector was not sufficiently developed, STEG created subsidiaries for manufacturing transformers, electrical counters and installation of electrical networks. The second phase corresponds to the development of a robust private sector which invested in the manufacturing various electrical equipments and materials as well as in the installation of electrical networks. The third phase links with the emergence of sufficient competition industry. As a result, STEG has disengaged from its subsidiaries for the benefit of the private sector.

Mr. Hichem Elloumi observed that the success of the industry in Tunisia relies on three essential steps, namely coverage of local market needs, development of exportations and internationalization. He noted that today, Tunisia is a partner of choice for electrification in Africa and this results from an industrial culture based on the total control of quality, competitiveness, logistics and innovation, to mention a few.

Discussions

After presentations, participants had time to ask questions and/or give views on presentation topics. This has been an opportunity to exchange mainly on the success story of Tunisia, methods of payment of electricity bills for administrative offices in Rwanda, KPLC pilot project of revolving fund, possible partnership between STEG and Rwandan companies and the state of infrastructure in Rwanda.

As for the Tunisian success, it resulted from the fact that the country put the energy sector among its top priorities. With the creation of STEG, transportation and distribution equipments and

material are manufactured in the country by a local manpower. Consultants are supervised by STEG technicians who intervene as soon as possible in the event of power outage or shortage.

With regard to the payment of electricity bills for administrative offices in Rwanda, it was explained that half of those bills are paid by RECO and the office pays the other half. The Government allocates energy budget to all public institutions and pre-paid meters have been introduced to reduce abuse in energy consumption.

Concerning KPLC revolving fund project, the Kenyan delegation noted that it is still in its early phase as it was launched in the past two weeks.

In regard to the partnership between STEG and energy Rwandan companies, it was made clear that apart from the Nyagatare pilot project executed in collaboration with RECO, STEG is ready to work with any interested company. Moreover, it intends to train RECO engineers who will work on the other four projects that are to be started in Rwanda.

As for the state of roads and telecommunication infrastructure, it was explained that thanks to a huge budget allocated to infrastructure sector, roads are in good state, that three mobile telephony companies and a land telephony company work in the country. Optical fibers have been installed in Kigali and at the end of this year they will be installed in the whole country.

II.2.7. DEVELOPMENT OF LOCAL INDUSTRIES IN AFRICA: PUBLIC PRIVATE PARTNERSHIP

In this presentation, Mr. Robert BAYIGAMBA the chairman of the Private Sector Federation pointed out that 1.6 billion people, i.e. more than ¼ of the world population worldwide do not have access to electricity in their homes; and that 4/5 of people without electricity live in rural areas of the developing world especially in peripheral urban and isolated country side areas. He observed that there is huge investment gap and an urgent need to finance electricity supply sector in developing countries. The good news is that Private actors active in the field of Renewable Energies Sources (RES) are often a source of technological solutions and innovations, especially in supplying electricity in fragmented areas. Unfortunately, investments required to provide the capacity to deliver quality service in the power sector remain inadequate. Therefore, there is a need to reform the sector so as to foster the financial viability of electricity service providers and attract on a sustainable basis for public and private financing needed over time to expand services.

As for the current situation in Rwanda, the country suffers from a huge deficit with only 5 % of the population connected to the electricity network, mainly in the capital, Kigali and other towns and RECO & RWASCO, the national electricity provider cannot satisfy even this limited demand. However, the country has substantial hydroelectric resources, as well as natural gas deposits in

Lake Kivu which could make Rwanda self-sufficient in electricity and contribute to the attainment of 35% connections set in the 2020 vision.

Taking into consideration the current situation, there is urgent need to accelerate the electrification rate through public private industrial partnership. Efforts are underway to develop this embryonic partnership and include the implementation of a public private partnership project that aims at increasing energy in Rwanda. Moreover, through MININFRA several private companies have submitted their proposals to construct Mini hydro electric power plants, especially in rural areas, the Rwanda Association of Sustainable Energy is working hard in developing renewable energy, 3 mini hydro electric power plants are to be constructed by private operators and private dealers (resellers) assist RECO RWASCO in distributing electricity to the Rwandan population.

A number of challenges hinder the public - private industrial partnership. They include financial constraint, i.e. lack of collaterals and high interest rate in Rwandan banks for private sector operators; regulatory framework, i.e. absence of laws putting in place incentives and other investment facilities for private sectors operation in the energy sector; high cost of technical equipments and inadequate technical capacity.

To end his presentation Mr. BAYIGAMBA noted a number of solutions to mitigate the above challenges. They include the establishment of a permanent Task Force made by public and public operators in the energy sector to discuss energy challenges affecting Rwanda in order to come up with adequate solutions, a sustainable public private planning process to ensure that the benefits of electrification reach the rural communities and reinforcement of public private partnership in the energy sector as the latter has an important role to play in addressing the concerns of both public and private entities engaged in financially viable electrification projects for the rural communities.

II.2.8. COOPERATION PROGRAMME AND PERSPECTIVES OF THE BELGIAN TECHNICAL COOPERATION IN THE ENERGY SECTOR IN RWANDA

Mr. Naceur HAMMAMI observed that the Government of Rwanda is highly committed to the development of the energy sector. The Government injections into this sector are equivalent to 6.1% of the total budget for all sectors and to 30.6% of the infrastructure budget. He saluted the efforts made to overcome severe power shortages that hit the country in 2004. The government hired emergency power solutions and invested in increasing generation capacity through adoption of sound strategies that are in line with the EDPRS and 2020 vision. He observed that even though 4.5% of the national population has access to electricity due to high cost, the government is coherent and transparent in terms of implementation of strategies, plans and all along the

budgeting process. To solve the energy shortage problem in Rwanda, various partners, the government and consumers joined their efforts in a five year program (2008-2012).

Sectorial task forces and SWAP worked hard and an evaluation was carried out every six months. Thanks to SWAP, the World Bank, African Development Bank, the Netherlands Government, European Community, JEICA, Belgium committed to fund the energy sector. However, the country still face challenges in terms of capacity building and experience sharing and these have to be solved as soon as possible because the energy sector development impacts on various aspects of the country's life including gender, environment, child rights, HIV/AIDS, etc.

As for the contribution of BTC to the development of the energy sector in Rwanda, in line with national and sectorial strategies the institution finances capacity building projects. It contributes 19% of the total bilateral aid which is equivalent to 50 millions of US dollars. As for future prospects, BTC intends to reinforce its cooperation with Rwanda through institutional and individual capacity building, development of a regional approach, and establishment a national agency for implementation of the country's energy and renewable energies policy. All in all, by the year 2014 BTC will finance 5 projects in the sector of energy and renewable energies in Rwanda.

Discussions

After his presentation Mr. Naceur HAMMAMI, was asked whether BTC has financed the Rwanda private sector. The answer was that the support to the private sector goes through local companies, notably in regrouping settlement villages, commonly known as *Imidugudu* (by 2020 15.000 villages will be built) and in the elaboration and implementation of a vast renewable energies project.

II.2.9. ELECTRIFICATION EXPERIENCE OF BANGLADESH

In his presentation, Bhuiyan Shafiqul Islam chairman of Bangladesh Rural Electrification Board pointed out that in Bangladesh, a country of 162 221 000 of population and GDP of 573 \$ per capita, rural electrification is enshrined in the 1972 Constitution, hence becoming an obligation and a priority for the country. To embark on this priority, in 1977 NRECA International Ltd. & Commonwealth Association Inc. (Gilbert Commonwealth) of USA carried out a comprehensive feasibility study on Rural Electrification (RE) in Bangladesh. In 1977 The Government of Bangladesh accepted the report and established the Bangladesh Rural Electrification Utility. The utility's functions include electricity generation, transformation and distribution system in the rural and semi urban area of Bangladesh, take measures for effective use of electricity to foster rural development such as development of agriculture and establishment of rural industries, conduct surveys and feasibility studies and prepare schemes for establishment of electrical

system in the rural areas; to mention a few. The feasibility study recommended that Rural Electrification Board should work hand in hand with rural electrification cooperatives (PBS); the latter are consumer cooperatives with 30 to 200 thousand of members each. Main functions of these cooperatives include establishing and maintaining a conducive legal framework, acting as trustee of member's interests, planning in accordance with members' needs and national policies, providing operating requirements, control and evaluation.

As for capability of the Bangladesh rural electrification utility, Mr Bhuiyan Shafiqul Islam pointed out that every day every day 42 Kms of electric line can be added in the system, 5 new villages can be added in the electric distribution network and 2000 new consumers can get electricity. Since the adoption of rural electrification program up to March 2010, 70 rural electrification utilities have been created, 48,320 villages out of 84,323 have access to electricity. The country's peak demand is 2 509 MW while the supply is 1224 MW. The rural electrification program is supported by various development partners and donor agencies, mainly IDA, USAID, ADB, JBIC, KFAED, Netherlands, CIDA, NORAD, IDB, OPEC, SFD, EDCF, DFID, Finland, China Barter, JDRG, Saudi Government and France. Investment of US\$ 1.2 billion so far has been made in the program over the last three decades, 43% of which is foreign aid.

To wrap up his presentation, Mr. BHUIYAN SHAFIQL ISLAM pointed out that the 2021 vision of the rural electrification program includes construction of additional lines of 250,000 KM which requires the construction of 23,000 Km of lines each year up to 2021 and an investment of US\$ 5.43 billion. He also noted that the program had a positive impact on agriculture, industry development and poverty reduction.

II.2.10. SENELEC STRATEGIES FOR REDUCTION OF NON-TECHNICAL LOSSES

Mr. Mussa Diagne, SENELEC (Senegalese Public Electricity Utility) Director General for customer care, pointed out that the Utility has a capability of 694 MW and a peak capacity of 424MW with 834,332 customers. As for non technical losses, the company yield increased from 77, 8% in 2005 to 88% in 2009. Losses for auxiliary consumers, for transportation networks and for distribution networks, respectively increased from 3% to 2.25%, from 3.1% to 1.6% and 16.1% to 16.2%.

Figures show that since 2005 non technical losses are always above 20% and cause an additional demand of 20MW. Moreover, frauds represent 75% of non technical losses while commercial internal losses represent 25%. Causes of commercial losses include defective meters, delayed or nonpayment of bills and internal frauds. Non technical losses engender an additional demand of 20MW and a loss of more than CFA 20 billion per annum.

Strategies have been devised to reduce non technical losses and they are centered on legal and regulatory framework, sensitization/education, organizational level and technical level. In concrete terms, in 2009 an anti-non technical losses program was adopted and aims at 7.5% of reduction by the year 2011. Results of the program included, by the end of 2009, 2% turnover increase, increase of 9% in sales forecast, discovery of frauds and a net benefit of CFA 3.6 billion.

II.2.11. INTRODUCTION OF ENERGY SAVING BULBS: GHANA'S EXPERIENCE

In his presentation, Engineer Bukari M. Danladi, Manager of VRA (Volta River Authority) explained that power supply in Ghana, depends on two main generating facilities, namely Akosombo and Kpong with a firm production of 4,800 GWh/year. At the end of 2006, the installed generation capacity was 1,730 MW. The country's transmission system relies on 4,000 km lines with a capacity of 161 kV, 74 km lines with a capacity of 225 kV, 133km lines with a capacity of 69 kV, 43 transformer and switching Stations and interconnections with Benin, Ivory Coast and Togo. The country's electricity access is 67%.

Engineer Bukari M. Danladi noted that in 2007 Ghana suffered from an acute shortfall in energy supply resulting from low inflows into the Akosombo Dam from 2004-2006. At that time, the projected demand was 7,557 GWh against 6,692 GWh of available generation capacity, leaving a supply shortfall of 865 GWh. The shortfall has for consequences alternate power supply, enterprises shut down, surge in generator purchase, fire outbreak increase, workers laying off and increase in robbery.

To reverse the situation, the country made several interventions including the installation of 400 MW thermal capacity, improvements in reliability of 330 MW Takoradi Thermal Plant, free distribution of 6 million energy saving lamps to replace to replace existing incandescent lamps and reduce peak demand and energy efficient equipment labelling and intensive education on conservation initiative.

On the chapter of the utilization of low consumption lamps project, Engineer Bukari M. Danladi explained that VRA setup a task force in charge of collecting and analyzing data on end-use lighting load profile for residential customers, determining the quantity, types and total cost of the energy saving lamps required, developing a program for the project implementation, monitoring and evaluating the outcome of the project and making recommendations for the subsequent phases of the project. The project impacts include estimated gains of 124 MW, new culture of use of energy saving lamps, energy saving and reduction of greenhouse gases.

To conclude his presentation, Engineer Bukari M. Danladi recommended countries to invest more efforts in replacing incandescent lamps by energy saving lamps and undertake careful planning and analysis of energy saving projects.

II.2.12. INTRODUCTION OF PREPAID METERS AND ENERGY SAVING BULBS: RWANDA'S EXPERIENCE

In his presentation, Mr. Lucien RUTERANA, Commercial Director in RECO pointed out that in a bid to offer quality services to customers, RECO introduced two products, namely the prepaid meters and energy saving bulbs. He noted that the current supply is 78,7 MW against a total annual demand of 320,000,000kwh. RECO has 150,000 electricity customers, of which 135,000 use prepaid meters. The prepayment metering was introduced in Rwanda not only to satisfy customers' needs but also to improve the utility commercial viability. The system was introduced in the country in 1996 and is not only viable but also beneficial to clients, RECO and the population in general because it has proven effective in reducing non technical losses, especially frauds.

As regards the energy saving bulbs, in 2006 with a view to reducing electricity consumption, the Government approved the procurement and distribution of 400,000 bulbs, of which 50.000 were free of charge while the rest of bulbs were given out in exchange with incandescent bulbs or sold at 200 RWF each. The replacement project was done in three phases; the two first phases aimed at 92MGW of energy saving in four years which is equivalent to a gain of 2.576.000.000 Rwf per annum. The project will also result in greenhouse gases reduction.

At the end of his presentation, Mr. Lucien RUETRANA, noted a number of challenges impeding the distribution of energy saving bulbs. They include delayed distribution, poor quality and high price of lamps on the market. To mitigate these challenges, RECO Commercial Director recommended involvement of the private sector in the distribution and extension of energy saving lamps policy and practices to other electrical equipments.

II.2.13. STRATEGIES FOR REDUCTION OF NON TECHNICAL LOSSES IN RWANDA: THE OPTICAL FIBRE CABLE TRANSMISSION AND SCADA/EM SYSTEM PROJECT

In this presentation, Mr. Anderson G. Pereira the Managing Director of DRAKA explained that DRAKA is a company that develops engineers and manufactures all kinds of cable solutions and has 65 factories and sales/support offices in 26 countries.

The presentation centered on the contract signed between DRAKA and the Government of Rwanda in the framework of the implementation of optical fiber cable transmission and SCADA/EM system project. The project is in line with RECO's project of restructuration and expansion of the Rwandan electrical system with the goal to better balance production and consumption, increase system reliability and reduce losses in the transmission and distribution network. The project will be executed in three main phases: OFC (Optic Fibers Cable Network),

SDH (Synchronous Digital Hierarchy System), and SCADA/EM (Supervisory Control and Data Acquisition/Energy Management System). The project main objective is connecting 51 sites of RECO including substations, power stations and town offices and ensuring connectivity between all sites of RECO.

More precisely, OFC will be made of 800km of cables and 19,200 km of fibers and will allow connecting the National Control Center at Gikondo to 52 RECO sites including power plants, substations and town offices. SDH installations will result in full connectivity between RECO sites to extend communication coverage and enable full control over the network, real-time availability of data information with ability to enhance the network to support future services, scalability and possibility of extensive future growth using the same platforms in order to serve more users or support new services and connecting 50 sites including power plants, substations and town services. The role of SCADA/EM is to enable supervision of high and mid voltage grid of RECO, full supervisory control and data acquisition functionalities over the remote control equipment of RECO, supervision and monitoring of electric network including switching, connection of 33 sites, full upgradability and scalability of the system and tele-controllability of switching and control devices.

The impact of the project includes improved supervision, control and energy management of the power network, accurate diagnosis and network calculations allowing reliable preventive and corrective actions, real-time events monitoring allowing switching operations to be performed timely and effectively, reduction of power failure and improvement in the quality of services to customers, strengthening of market position in the region by delivering efficient services, opportunity of leasing individual dark fibers to other network operators in the region, connectivity and scalability to universal access; not to mention fast technological development and know-how for RECO and socio economic development for the whole country.

II.2.14.INTRODUCTION OF ENERGY SAVING BULBS IN SENEGAL

Mr. Ousmane DIOP, explained that not only energy saving bulbs use five times less energy than incandescent bulbs but also have longer lifespan, i.e. 8 to 12 years and contribute to environment protection by releasing less greenhouse gases/CO₂. In view of this, Senegal embarked on replacement of incandescent bulbs by energy saving ones. The objective of this replacement is to reduce the cost of electricity and optimize electricity production. The project is set to replace 3,500,000 incandescent bulbs by 11W energy saving bulbs in four phases. The first phase is installing 500,000 energy saving bulbs in the suburbs of Dakar, the second one corresponds to the installation of 50,000 bulbs in churches, the third one is the creation in collaboration with the private sector of a bulb manufacturing plant and the last one is extending the project in throughout Dakar and other regions.

The success of the project relies on the consumers will : figures from the project feasibility study assert that 98% of the population are willing to use energy saving bulbs ; regular communication between project team and customers ; project personnel training and destruction of incandescent bulbs formerly used by customers and payment of the installation cost in 24 installments.

The project has positive impact on lives of the population as it engendered a reduction of 500 CFA from a two-month electricity bill for a middle customer and an annual energy saving of 100.6Mw.

Discussions

After presentations, participants had time to ask questions and/or give views on presentation topics. This has been an opportunity to exchange mainly on:

- The success story of Bangladesh (the country's priorities in terms of electrification and the possibility of adding 42 km of electric line every day)
- The role of computerization in reducing electrical frauds in Rwanda
- Measures to boost the replacement of incandescent bulbs by energy saving bulbs
- Destruction of incandescent bulbs no longer used in a bid to protect the environment

For Bangladesh success story, the electrification project is in line with the national electrification master plan. According to the plan electrification process was to begin by constructing a principal line to ensure the network reliability. Connections were to begin with customers who are able to pay their bills without delay. The country consumes huge quantities of electricity, especially in some areas where it is used in irrigation. For such areas the country cannot meet the demand and alternate power supply is used as a solution. In a view to meeting the national demand by 2014, there is plan to restructure and extend the network. As for the installation system, in rural areas where people do not need huge quantities of energy, single phase is used while in cities, especially industrial parks, three-phase is used.

As for the role of computerization of electrical data in reducing electrical frauds in Rwanda, RECO explained that the whole system is computerized which allows supervision and control of any data, including meters, customers consumption, etc. Computerization is especially effective in prepayment system and to ensure full safety of data, only a limited number of personnel access the server.

Concerning the role of governments in providing the population with low cost energy saving bulbs, there is no arguing about the advantages of using these bulbs. However, they are expensive and poor people cannot afford them. Moreover, customers are not satisfied with the quality of bulbs on the market. More efforts are needed to boost the replacement of incandescent bulbs by energy saving ones and governments should control the quality of bulbs on the market and reduce

customs duties so as to reduce the cost of the bulbs. As for Rwanda, in a bid to ease the replacement, energy saving bulbs were imported from neighboring countries and the country did its best in reducing the cost, yet customers found them expensive. Moreover, 5 year lifespan bulbs were imported and 5 energy saving bulbs were exchanged against 5 incandescent bulbs.

As for the destruction of incandescent lamps, it was made clear that those lamps contain mercury; hence their destruction might cause environment pollution. To protect the environment bulbs should be buried.

RECOMMENDATIONS

In view of presentations and deliberations thereon, participants formulated the following recommendations:

1. Find out appropriate technologies for rural electrification, in particular the single phase system;
2. Devise clear strategies to reduce non technical losses, especially commercial frauds;
3. Government should ensure that energy saving bulbs are as affordable as possible;
4. Reinforce public-private partnership;
5. Reinforce political will and commitment by respective governments to the financing of the infrastructure sector;
6. Design master plans that reflect sound technical and technological choices;
7. Use various financing mechanisms with a view to making the energy sector as vibrant as possible;
8. Create a business conducive environment;
9. Put in place incentives so as to accelerate the development of local electrical industries;
10. Develop a sound energy policy allowing the reduction of non technical losses through replacement of incandescent bulbs by energy saving ones and by use of prepaid meters.
11. Utilization of prepaid metering.

III. CLOSING SESSION

III.1. VOTE OF THANKS

This was a time for some delegations to express their heartfelt gratitude towards the Government of Rwanda for the red-carpet treatment they get during their stay in the country.

III.2. CLOSING SPEECH BY YVES MUYANGE, THE MANAGING DIRECTOR RECO&RWASCO

In his remarks, Mr. Yves MUYANGE, the Managing Director of RECO&RWASCO thanked participants for their valuable contribution to the seminar and appreciated that the seminar agenda was entirely covered. He noted that the seminar denotes the Government will of creating a conducive environment to the flourishing of the energy sector. Specifically, the seminar is a milestone in setting clear energy policies, regulatory frameworks, initiating enterprises partnerships in view to surmount the existing challenges of electricity access rates in sub Saharan Africa.

Mr. Yves MUYANGE ceased the opportunity to express the GOR and RECO gratitude towards institutions and companies that attended the seminar. He noted that Rwanda's expectations from countries, companies, fundamental financiers in the energy sector, policy makers and project implementers include least cost material and fast ways of implementing Electricity Access Roll-out Program which translates the country's vision of increasing electricity access rates. He also encouraged companies to register and operate in Rwanda so as to facilitate procurement process, and avoids delays that normally are associated with shipping.

CONCLUSION

The International Seminar on Access to Electricity and Development of Local Industries in Africa held at Laico Hotel on 26-27 May 2010 went off in a friendly and cordial atmosphere. Participants and seminar organizers were satisfied with presentations and deliberations made during the seminar. More specifically, the seminar has been an opportunity to absorb lessons from countries' success stories on grounds of access to electricity: technical and financial aspect, strategies to reduce non technical losses and energy efficiency.

At the end of the seminar, with a view to boosting the energy sector in Africa, participants formulated a number of recommendations. Most importantly, they recommended the adoption of clear strategies to using appropriate technologies such as single phase in rural electrification, reduction of non technical losses by replacing incandescent lamps by energy saving ones, reinforcement of private-partnership and utilization of appropriate technologies to achieve universal access. In light of this, asserting that the seminar's objectives were achieved would not be an exaggeration.

IV. ANNEXES

1. Recommendations of the seminar
2. Terms of reference and programme for the seminar
3. Remarks by the Managing Director of RECO&RWASCO Mr Yves MUYANGE
4. Remarks by the World Bank Country Representative, Ms. Mimi LADIPO
5. Introductory remarks by the Secretary General of UPDEA, Engineer Abel Didier TELLA
6. Opening speech by Honourable Minister of State for Energy and Water in the Ministry of Infrastructure, Mrs Colette U. RUHAMYA
7. Closing speech the Managing Director of RECO&RWASCO, Mr Yves MUYANGE.
8. Presentation on Rwanda Electricity Access Scale-up programme 2009-2012, by Engineer Yussuf UWAMAHORO.
9. Presentation on Tunisian Technology and Experience in Rural Electrification, by Jamil KORKED
10. Presentation on Financing of Rural Electrification Programmes, by Orison M. AMU.
11. Presentation on Financing Mechanisms: revolving Fund: Case Study of KPLC, by Eng. Vincent NDWIGA and Ms. Grace OMWENGA.
12. Presentation on Investing in Rwanda: Privileges and Tax Incentives, by Clare AKAMANZI, the RDB CEO.
13. Presentation on Development of Local Industries in Africa: Tunisian Experience, by Mr. Hichem ELLOUMI.
14. Presentation on Development of Local Industries in Africa: Public-Private Partnership, by Mr. BAYIGAMBA Robert, Chairman of the Private Sector Federation in Rwanda
15. Presentation on Cooperation Program and Perspectives of the Belgian Technical Cooperation in the Energy Sector in Rwanda by Mr. Nacer HAMMAMI, Advisor to the Minister of Energy in Rwanda
16. Presentation on Electrification Experience in Bangladesh, by Mr. BHUIYAN SHAFIQUL ISLAM, Chairman of Bangladesh Rural Electrification Board the Private Sector Federation in Rwanda
17. Presentation on SENELEC Strategies for Reduction of Non-Technical Losses, by Mussa DIAGNE , Director General of SENELEC
18. Presentation on Introduction of Energy saving bulbs: Ghana's Experience, by Eng. Bukari M. DANLADI
19. Presentation on Introduction of Prepaid Meters and Energy saving bulbs: Rwanda's Experience, by Lucien RUTERANA Commercial Director, RECO
20. Presentation on Strategies for Reduction of Non technical Losses in Rwanda: the Optical Fibre Cable Transmission and SCADA/EM System Project, by Mr. Anderson G. PEREIRA Managing Director of DRAKA
21. Presentation on Introduction of Energy Saving Bulbs in Senegal, by Mr. Ousmane DIOP
22. List of participants.