Renewable Energy for Development

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Rural Electrification Initiatives in Uganda - Kabale Rural Electrification Project

by Tobias K.R. Karekaho, Kabale Rural Electrification Project, Uganda

Uganda, a country that has mostly been known for its troubled political past, has been on a fast recovery track since the late 1980s with the advent of the National Resistance Movement government under President Yoweri Kaguta Museveni. This fast growth has been achieved with the support of the donor community and major financial institutions through a number of recovery and development initiatives and programmes.

Photo: Tobias K.R. Karekaho

Local people participating in the electrification project

The low access by the population to electricity (estimated at 5% for the whole country and less than 1% in most rural areas) has however hampered the otherwise successful story. The Government of Uganda, having realised the strategic role of the energy sector in its social and economic development process, adopted a new energy policy in 1999.

This new policy embraces the current global trends of deregulation, divestiture and privatisation, through the creation of an enabling legal framework, the Electricity Act 1999. As a consequence, the hitherto self regulating, vertically integrated monopoly Uganda Electricity Board (UEB), was disaggregated into 3 separate companies namely Uganda Electricity Generation Company Limited (UEGCL), Uganda Electricity Transmission Company Limited (UETCL) and Uganda Electricity Distribution Company Limited (UEDCL), while the statutory UEB was left to manage the assets and the ongoing projects. The two companies of UEGCL and UEDCL are now operated on a concession basis by ESKOM of South Africa, and Commonwealth Development Corporation (CDC) in association with ESKOM respectively.

In addition, the Government initiated a multi-pronged ten-year rural electrification program: the Energy for Rural Transformation (ERT), that cuts across several sectors like education, health, and water, aimed at increasing rural access from the present 1% to 10% by the year 2012. Kabale Rural Electrification Project is one of the first initiatives in this drive. The ERT programme offers subsidies to

Rural Electricity in Africa - Theme issue

In this issue of RED we would like to share with our readers four different experiences, in how to provide electricity to rural communities, from Southern and Eastern Africa. What delivery mechanisms can contribute to facilitate rural development? How can the expansion of different delivery mechanisms be supported and made to work effectively? Energy services are necessary for the provision of basic services needed by individuals, communities and private enterprises. Consequently, increasing the currently low levels of access to modern energy services in many countries in Southern and Eastern Africa is considered a high priority and a major challenge confronting governments, the private sector and the science and technology community. With the expectation of addressing these challenges, a wide range of energy sector reforms have been implemented over the last two decades in developing countries and are in the process of being implemented. The articles presented in this issue of RED derive from four different case studies.

In this issue:

private investment in the rural network expansion. These subsidies are intended to bring down costs to affordable levels and part equity funding, assist with commercial investment decisions, and assist with financial closures. The Government has already secured a 450 million loan from the World Bank to fund the bulk of this project.

Project objective

The Kabale Rural Electrification Project is financed through a grant from the Swedish International Development Co-operation Agency (Sida) following a bilateral agreement between the Governments of Sweden and Uganda signed on 2nd November 2001. The immediate objective of the project is increased access to and use of electricity in the project area. It is expected that one year after the construction of the said line, the number of new grid electricity customers will be approximately 70 households, 15 institutions and 100 business sector enterprises.

In the long term, the access to electricity is expected to enable better public services, new investments in agro based industries, less environment stress by reducing the use of wood fuels, batteries, etc., increased access to communication, and improved security through better lighting.

Strategies for success

In order to enhance the success of the project, the following strategies have been adopted:

- **Joint participation**. As far possible the local people have been actively involved in the project in such matters as the line route, the premises to be served initially through open dialogue. In addition, it was agreed that there would be no compensation paid for land or damaged crops. All these initiatives are aimed at not only reducing the project cost but also at enhancing the feeling of ownership.

- **Cost of installation**. In the present day in Uganda, the cost of grid extension (distribution lines, transformers, etc.), is the main inhibitor rather than the cost of consumption. Consequently, in order to accelerate the consumption of electricity in the area, it was agreed that the cost of extending the line to all the premises would be met by the project, and the beneficiaries would pay back this cost over a period; the modalities of this arrangement are yet to be finalised.

- **Service delivery expensive**. While there is general agreement that electrification is necessary for social and economic growth, electricity by itself is not enough to stimulate such growth. Worse still, in the rural areas, the widely dispersed settlements together with low consumption levels due to the generally low levels of income, makes delivery of this service very expensive. One way to reduce these transaction costs is to adopt the integrated approach, i.e. aggregate the extension of electricity with other existing services (e.g. water and communications).

- **Learn and share from each other's experience**. There is a rich experience gained through the different initiatives that have been undertaken in other countries in the area of rural electrification. There is therefore sufficient knowledge and experience to learn from, for any country that wishes to embark on rural electrification projects.

- **Skills development**. Projects that have a donor support should include a skills development strategy. The people trained will not only serve as a resource for maintaining the project outputs but will also serve as a resource base in other future projects. This not only creates employment but also saves the poor countries from the heavy staff costs associated with expatriates.

- **Over-design and standards**. There is the unavoidable trap of over-design when using design criteria in from the developed world that have a higher standards requirement. While safety is not to be compromised, there is need to review the standards in use in the developing countries so as to make them appropriate. This can go a long way in reducing installation costs.

- **Other technologies**. While grid extension is the usual choice in rural electrification, other technologies like solar photovoltaic should be considered, especially in countries with high insolation levels, dispersed settlements, and low income (low demand).

Rural electrification initiatives undertaken by Uganda will have a significant impact on the social and economic transformation of the country in the rural areas. However, there is need to support these efforts through financing arrangements that can ease the burden of connection costs. These grid extension initiatives should also be supplemented by other technologies like solar and wind, where appropriate. ■

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Experience from Tanzania's First Electricity Cooperative

By Mr. William Chambala, Chairman, Urambo Electricity Consumers Cooperative, Tanzania

In the mid-1980s, in a district in western Tanzania called Urambo, the local community took a decision to bring electricity to their rural center. This initiative was made possible, through the community's contributions, technical assistance from Tanzania Electricity Supply Corporation (TANESCO) and the Stockholm Environment Institute and financial support from the Swedish International Development Cooperation Agency (Sida). The process gave birth to the first rural electrical consumer cooperative in Tanzania. This article provides some highlights from this process: the challenges that were faced, the solutions employed and the accomplishments made. Finally, the article points at a few important conditions that could result in more initiatives of the one seen in Urambo.

Urambo district is one of six districts in Tabora Region in western Tanzania. It has a population of about 377 000 people. Urambo town where Urambo Electricity Consumers Cooperative (UECCO) operates has a population of about 22 000 people. Small-scale agriculture is the main economic activity. The main cash crop is flue cured tobacco and maize is the staple food produced mainly for local consumption.

In Africa, until very recently, electricity supply provision was considered to be the domain of government-owned national utilities. As such, utilities concentrated their efforts in urban areas where electricity demand densities are normally high and economies of scale justify electricity business. Owing to resources scarcity, the electrification of rural areas has been very slow and is only available to a small fraction of the population. Many of our villages had to wait indefinitely to be electrified.

Location of Urambo

Urambo rural centre faced the same situation until the mid -1980s when the local community took a decision to bring electricity with their own efforts. The people contributed and purchased three 85 kW diesel generator sets. With the assistance from TANESCO, the power station and distribution network was commissioned in 1986. At that time the power supply was entrusted to the local government.

By 1991, the local government failed to run the system and handed over the running of the power system to an electrification committee consisting of government officials and businessmen. This committee met TANESCO and SEI who assisted Urambo's citizens to establish the first rural power cooperative in the country.

Rural power cooperative by-laws from the USA and Sweden were adapted to the situation in Urambo and TANESCO's legal department adopted the by-laws. The sociology department of University of Dar es Salaam assisted in baseline studies and conducted public sensitization seminars. The cooperative was established on September 30, 1993.

Today the cooperative is more than ten years old and is gaining in strength. Along the way there have been challenges as well as achievements that could be relevant for others embarking on similar initiatives.

Restore the supply at Urambo

An initial challenge for the electrification committee was to restore the electricity supply to Urambo. All the generating sets were in bad condition. In addition there were no funds for repair of the sets and people had no faith in civil servants and businessmen running the power station and the distribution network. Yet another serious challenge was that nobody in the committee had an engineering background, or had any previous experience in power supply provision. To overcome these initial problems, the District Council, businesses and people donated funds to at least keep one set in operating condition and for the purchase of fuel. TANESCO and SEI with the financial assistance from Sida, provided much of the resources to repair two sets to satisfactory condition. The distribution network was also rehabilitated and expanded.

Moreover, training was provided to the technicians and an accountant at the TANESCO branch office. A technical assistance agreement was established between the cooperative and TANESCO whereby TANESCO, for a fee, provides support to the cooperative when the problems are beyond the capacity of the cooperative technicians. This has included tariff studies, monitoring of the power system performance and cooperative financial performance.

No previous experience in running a cooperative

A cooperative consists of members, each one owning at least one share. To become a member you have to buy at least one share and pay a membership fee. A member has got the right to participate in the election of cooperative leaders. The leadership of the cooperative is an elected development committee (board). The development committee consists of ten elected members who oversee the activities of the cooperative. It consists of a chairman, a vice chairman, a secretary, a treasurer and seven members. They oversee the cooperative staff. The staff consists of two technicians, an accountant and a guard. If there are power failures, inefficiencies, resource mismanagement or other poor performance issues the members can vote the committee out.

Other experiences are in operations. We started with a flat rate and did not meter consumers. This resulted in a constantly overloaded diesel generator set and load shedding had to be carried out every night. It also resulted in financial losses Energy conservation awareness campaigns did not work. When a combination of advance payments and meters was introduced, the overload and financial problems were addressed. Now each consumer paid for his/her own consumption.

Another measure to address overloads was tried. Consumers were encouraged to use compact fluorescent (CFLs). Initially these became very popular. Unfortunately they were not very cost effective since they did not last the 8 – 10 000 hours as claimed. Our experience is that CFLs with electronic ballasts are better in rural networks with unstable voltages. Those with magnetic ballasts tend to flicker in our type of networks.

The tariff charged to consumers is a sensitive issue. Tariffs are prepared by the committee and approved in a general members meeting. Our electricity is generated from diesel fuel. The fuel is subject to taxes and duties in the order of 40 - 60%. Since our tariffs reflect the actual costs they are much higher than the lifeline pan-territorial tariffs charged by the national utility. While we charge USc 51 per kWh the utility charges USc 2.6 per kWh (see Figure 1).

The tariffs at times bring complaints from our members that our electricity is expensive. When the price of fuel goes up so do our tariffs. It can be a pedagogical challenge for the development committee to argue for raising the tariffs. What we normally do is provide convincing figures to the members so that they approve the tariffs.

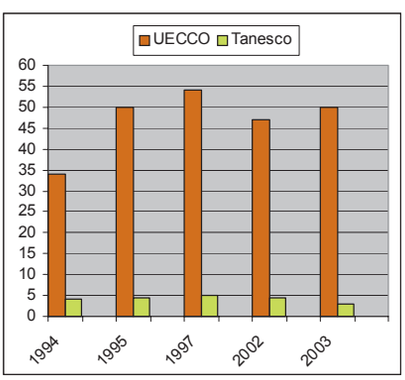

Figure 1: Comparison of cooperative and national utility lifeline tariffs in Tanzania (USc/kWh)

Since electricity services are paid in advance we do not accumulate bill debts. Customers who fail to pay for electricity are disconnected. To restore power they pay a reconnection fee. During 1993 to 1997, TANESCO/SEI monitored the performance of UECCO. From 1996, we were able to meet our financial obligations.

We started with 40 customers in 1993 and today we are 310. The main barrier for customers to connect is that they need to raise the money to cover the cost of a meter and the connection costs.

Following in our footsteps we have seen several cooperatives being formed. These are Mbinga in 1996, Kasulu in 1998 and Kibondo in 2001. Wino village in Mabanto is still considering forming a cooperative.

Way forward

From our experience we consider that electrification through rural cooperatives is a possible approach that can be used in Tanzania and probably other countries in the region to a larger degree than what is the case today. A number of factors would assist the approach to take off on a larger scale. For example the Government could waive taxes and duties on electrification equipment and fuel used for rural electricity cooperatives. Cooperatives would also benefit from backing from e.g. a national unit or agency that could assist in feasibility and tariff studies, technical assistance and for securing financial resources to make investments in these kinds of initiatives possible. ■

Factors, which contributed to our success, are:

- Strong and committed district leadership of Urambo
- Strong technical assistance from TANESCO Tabora and Dar-es-Salaam
- Financial support from Sida
- Technical assistance from SEI
- Willingness, commitment and support from the members of the cooperative
- Well-devoted development committee leaders and employees of the cooperative

Negative attributes of rural cooperative:

- Rehabilitation of old generator sets turned out to be more expensive than purchasing new ones
- Cash flow problems at the start of the cooperative including outstanding payments
- Escalating fuel prices causing high tariffs and hence difficulties to set fair profit margin
- 40-60% of fuel prices are taxes; these drive power tariff to unfovourable levels
- Absence of storage facilities for service line materials + meters

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"Lighting the Millennium for a Brighter Future" – the Lundazi Energy Service Company in Zambia

by Mr. Mukule Banda and Mr. Daniel Mtonga, Lundazi Energy Service Company (LESCO), Zambia

The PV-ESCO project is a pilot project run, by the Ministry of Energy and Water Development (MEWD) in three districts, Nyimba, Chipata and Lundazi, in the Eastern Province of Zambia[1]. The project is testing a new approach to provide electric light and other basic energy services to people and institutions in rural areas of Zambia. The main objective of the project is to test the Energy Service Company (ESCO) approach in Zambia, adopt it to the national and local situation and learn from the experience gained in applying it in a Zambian context. Ultimately the project experience provides input and recommendations to the Government of Zambia on how and if the ESCO approach to rural electrification can be extended to other parts of the country. This article presents some of the reflections from the Managing Director and the Manager of the Lundazi Energy Service Company.

Photo: Daniel Mtonga

Thatched house for a clinical officer easily electrified with solar power and in this way avoid accidents like fire

[1] The project has previously been written about in Renewable Energy for Development No. 1, Vol. 17, January 2004.

As an ESCO, our main activity is providing electricity on a fee-for-service basis, where the ownership of the electricity generating equipment (in this case Photovoltaic (PV) Solar Home Systems (SHS)) is retained by the ESCO and the clients pay a service fee in advance for using the equipment. We ensure that the systems continue to operate, by providing regular service and maintenance of the equipment installed with each client. If we should fail, the clients will not pay their service fee and we would both loose out. Since December 2001, we have 150 clients on a fee-for-service basis. Our clients include farmers, teachers, civil servants, government institutions and private entrepreneurs. (See figure 1).

Apart from providing electricity on a fee-for-service basis, we have been successful in attracting and meeting the needs of other clients who own their PV systems. To these clients we can offer a range of services from selling all necessary solar components to installing and servicing PV systems. We have been able to do this after forming business relations with equipment suppliers in the capital Lusaka, and through these companies we act as a link between the supplier and the end user and perform after-sales services. The latter is a problem in this geographical setting, located far a way from the capital where dealers and suppliers are to be found (it is a 2-day trip

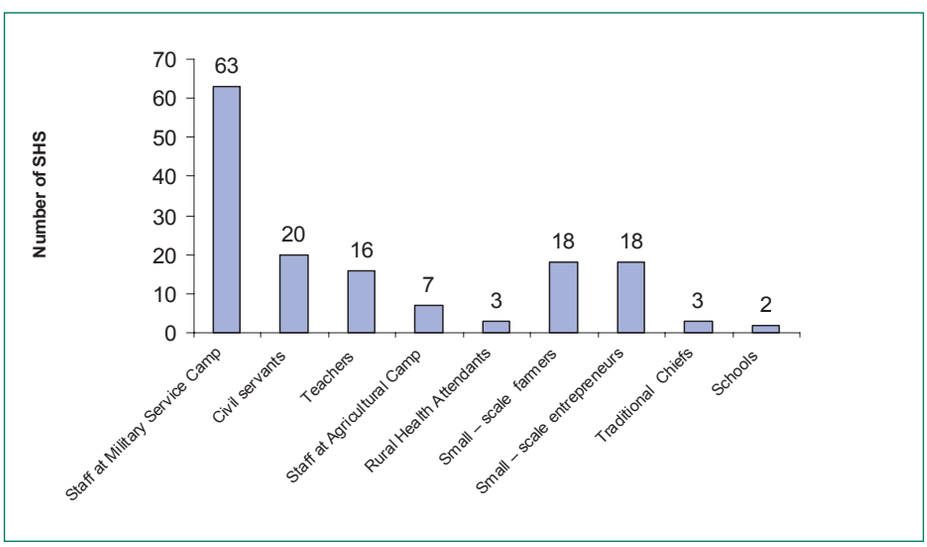

Figure 1: Number of Solar Home Systems (SHS) in the Lundazi ESCO

Photo: Daniel Mtonga

Communication with clients in Lundazi

between Lusaka and Lundazi). We have contacts with dealers, both within and outside of the country, willing to supply components that need to be replaced. A base has been created of dealers and suppliers whom we can contact whenever the need arises.

There is seemingly a high demand for the product and our services and we currently have more than 300 potential clients wait-listed to become fee-for-service clients. With very few options to access electricity, apart from the central part of Lundazi, where there is a grid connection, the market potential for the types of services LESCO can provide in the distinct is great.

However, the creation of this market has depended on the support we have received from the Ministry under the pilot project. The size of the market that could afford to buy their own SHS is small and could not have supported the establishment of a company like ours. Through the project, we have been supported in training technicians, by getting assistance with our business development plans and been able to access favourable credits to acquire the solar home systems. Access to credits from the commercial banks for a small company like ours would not have been possible. Neither would the conditions for loan repayment have been possible to accommodate with reasonable fees levels.

Our set-up, close to our clients, is one of our strongest assets. Our customer relations are important and are built upon close contacts between the company and its clients. We visit our clients on a monthly basis and we sometimes make random visits to see how the clients are using the systems. The clients really appreciate our visits and information is shared on a lot of issues such as how to best improve the energy service despite a uniform system for all clients with different usage needs. The contacts contribute to building a working relationship. With our base in the district, we can provide clients with an easy access to us and we can provide information in the local language. We believe that the clients trust a local company more than a dealer based far away and we think it reduces the fear of investing in a system that will not function well and where there is no easy access to technicians that can maintain the system or service it if they fail. The quality of our services has built a good reputation among local customers.

With the initial support we have received from the Ministry we are today operating a company without any external financial support. Today our customers pay ZMK 35 000 per month (about 7.3 USD) for the services they get from a 50Wp SHS including four light points and a 12 V socket. In addition, each client has paid a one-off installation fee of 250 000 ZMK (about 52 USD). The price for the electricity needs to reflect the costs incurred in the provision of the service. With the data we have collected and the experience we have gained over the past, almost three years of operation, we have come to the conclusion that we need to increase our costumer base to reduce the costs of our services. There is a certain base requirement of staff and office costs that are needed and if these costs can be spread over more customers the price per customer could be reduced. This would also put us in a better position of making new investments in the company. We would like to see an expansion both through new clients that own their own systems as well as through new clients on a fee-for-service basis.

Concluding remarks

In order to expand the ESCO approach, funds need to be made available by the government and the cooperating partners in order to meet the need for rural electrification for rural people. We know that Solar PV is one amongst many exiting and emerging energy technology options that can be used for rural electrification. We also acknowledge that PV is not cost-effective for powering energy-intensive activities such as cooking or manufacturing, but will probably be one among several technologies in a diversified energy sector. However, with only 2% of the rural population in Zambia with access to electricity, we believe that PV at this moment is an option that can quickly increase the number of households and institutions with a basic level of electricity supply. This will provide social equity among Zambians and to make conditions more endurable in remote areas. As such this will make a substantial contribution to increased rural welfare and small business development using solar PV.

Other benefits are reduction of emissions as a substitute for fossil fuel (kerosene) utilized for lighting, lowering the respiratory and eye problems due to prolonged exposure to kerosene smoke and soot, better education (light in the evening for children to read) and health facilities (refrigerators).

Footnote: Since the writing of this article, the Ministry of Energy and Water Development with a grant from Sida has started a process to extend further credits to the PV-ESCOs in Zambia. ■

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Rural Electrification in Southeastern Africa: the case for small hydropower in Kenya

By Daniel K Theuri, ITDG-EA Energy Programme Manager, Kenya

The main delivery mechanism for rural electrification in Kenya, just as in much of the developing world during the last forty years, has been publicly-funded grid extension. The poor service record and high cost of grid extension have led to increasing recog-nition of the value of community-based delivery mechanisms. Community-based schemes can address local needs, take advantage of local resources, stimulate income-generating activities, and provide services in a more affordable and timely manner. A number of small hydro schemes have been successful in providing rural energy services, although there are still some institutional and technical barriers that need to be overcome.

In the 1970s and 1980s, the Kenyan government launched ambitious rural electrification efforts based mainly on grid extension through subsidises and donor support, along with a few isolated diesel powered schemes for some remote towns. The national utility demonstrated its corporate responsibility by committing 2% of its proceeds to rural connectivity.

In 1973, the government created a rural electrification fund and appointed the national power utility as the sole agent for planning, operation and maintenance of the projects. The government continued giving direct budgetary support until the late 1990s when a lack of resources led to creation of a rural electrification fund through a levy of 5% on all electricity consumers.

By June 2002, after 40 years of grid extension and expenditure of nearly 150 million USD, less than 75000 customers had been served, amounting to less than 3% of rural residents. Approximately 60% of the money was spent on financing new extension, with the remainder devoted to operation and maintenance. The quality of service delivery was found wanting, especially during the later years of the 24-year despotic regime that was recently voted out.

Photo: Daniel K. Theuri

Welding of transport carts

Small hydro options

Community-managed small hydropower schemes are among the alternative delivery mechanisms being adopted in Kenya to improve rural access to electricity. Pilot projects have been aimed at demonstrating the potential for small hydropower to support rural electrification and poverty reduction efforts.

The ITDG-EA in collaboration with the Ministry of Energy and with support from the small hydropower centre at University of Nottingham at Trent have developed three pilot community rural electrification projects in Kenya and trained some eight companies on production of two types of turbines.

Resource potential

Small hydropower potential in Kenya, defined as plants less than 30 MW, is estimated at 3000 MW with about 30% considered economically feasible for development. The potential is found in the hundreds of sites dotting the country in the five drainage systems.

Demonstration projects

In 1998, the ITDG-EA and Ministry of Energy embarked on an 18 kW micro hydropower demonstration scheme in the eastern slopes of the volcanic mountain located 185 km north of Nairobi. The scheme was aimed at stimulating income-generating activities by providing electricity services for approximately 300 members of a community business centre. Constraints on electricity distribution initially prevented provision of services to households, but a policy review is now addressing the options for connecting households.

The community determines the types of services to be provided, which in this case include some 14 stalls spanning a range of services. Some services, such as welding, support maintenance of equipment and vehicles for agriculture and small industries. Other services, such as battery charging and mobile phone charging, offer flexibility and security to households. Other services support personal care, entertainment, and convenience through provision of lighting, refrigeration, and communications services to shops and centres.

Although the scheme currently produces some 14 kW, the total potential of the site is estimated at 40 kW. The community contributed labour and purchased the land for the centre and obtained water permits and approvals. The UNDP small grants programme supported physical development of the site while ITDG-EA and the Ministry contributed time and facilities. A committee of 13 men and women manage the scheme on behalf of the community, who own shares and are entitled to dividends.

There were also two pico hydro demonstration projects aimed at investigating the potential for fuel substitu-

Enabling Conditions

1. Policy Climate. The 1987 energy policy focused on security of supply and indigenous resources, emphasising large hydro (over 30 MW), geothermal power and the search for oil. The current energy policy is still not explicit on development of decentralised schemes, recognising alternative sources of energy only in as much as they substitute for biomass and/or improve security of supply.

2. Legal Limitation. The major barrier to community-owned decentralised energy is the legal limitation in the 1997 Electric Power Act, which allowed self-generation but denied distribution or sale to a third party. It also limited decentralised schemes to less than 1 MW, for use as standby power or alternative energy for communication. This detracted from the complementary role of decentralised systems and contributed to the national utility acting as an inefficient monopoly with poor corporate governance and public image.

3. Institutional Framework. There is no unified institutional or regulatory framework for off-grid schemes. The current legistlation addresses mainly grid extension, national schemes, and governmental levies, contributing to weak planning and poor management in decentralised schemes.

4. Mobilisation of Resources. Two important aspects of renewable energy schemes are upfront payment and the need for resource assessment. The Environmental Management and Coordination Act requires Environmental Impact Assessment costs to be included in project costs, while decentralised schemes do not benefit from economies *of scale*.

5. Lack of Data. Since small hydro schemes are run of the river systems, a significant amount of daily flow data is required for optimal design and to insure discharge availability. In Kenya, as in many Sub-Sahara African countries, historical data gathering has been neglected and sometimes assumptions are used in place of empirical data.

6. Technological Options. The technology chosen must address specific site requirements and optimising parameters to ensure versatility, efficiency, and reliability. Technical advances must be considered alongside the limited resource potential.

7. Capacity Development. One of the major handicaps facing decentralised systems like small hydro is the lack of skills for manufacture, design, testing, quality assurance and infrastructure maintenance. There is also a need to address low capacity for undertaking resource and environmental assessments.

Evolving Strategies

1. Policy Advocacy and Support. ITDG has advocated comprehensive energy policy review to give direction and guide the development of small hydro schemes.

2. Demonstrating it works. ITDG and the Ministry are continuing with joint efforts to evaluate the performance of small hydro schemes under varying hydrological regimes.

3. Community Awareness and Interest. Communities need to share in the development process. Fundraising for backstopping of projects by ITDG will be supported with a view to sustain efforts by communities as national capacity is developed.

4. Training and Capacity Development. Training programmes are needed for local artisans and companies to install, manufacture and design the various scheme components.

Lessons learned

1. There is strong demand for modern energy services in rural areas. Community-organised rural electrification schemes based on small hydro offer viable alternatives to grid extension.

2. Community ownership of rural electrification schemes is attainable through the instruments of shareholding and regular election of officials.

3. For small sized Pico hydro, communities can pay the costs, but the systems often fall short of demand. The provision of two lights substituted for only 56% of kerosene use.

4. The schemes need to include standards and codes of practice to safeguard public interest in cost and safety for both users and operators.

tion in households to replace kerosene and torch batteries. The schemes produced 1.1 and 3.2 kW, respectively, providing 57 and 162 homes with one or two 13-watt lamps along with a socket outlet for a radio. The community contributed posts and labour for the supporting wire distribution network. A monthly consumer service charge of 1.5 USD covers operational and maintenance costs. Power consumption is regulated by load limiters to ensure equity in use.

Conclusions

Rural electrification in Kenya has had mixed results in political, social, and economic terms. Community-based rural electrification can in many cases offer a more effective delivery mechanism compared to grid extension, but several barriers remain. The government is revising energy policy through a dialogue with stakeholders, which will hopefully result in an institutional environment that can support small decentralised hydropower. ■

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