

Affecting Electricity Policy through a Community Micro Hydro Project, Kenya

Themes

- ★ Renewable energy
- ❖ Technical capacity development
- ❖ Institutional capacity development
- ❖ Policy and legislation
- * Poverty alleviation (MDG 1)
- * Health (MDGs 4-6)

PROJECT DATA

Name: Tungu-Kabiri Community Micro Hydro Power Project

Implementing Organization: Intermediate Technology Development Group – Eastern Africa (NGO)

Location: Mbuiuru village, Meru South District, Kenya

SGP Contribution: \$63,700 through Phase 1 and Phase 2 grants

Start Date: April 1998 (Phase 1), January 2001 (Phase 2)

ENERGY OVERVIEW

Energy Resource: water

Technology: run-of-the-river type micro hydropower plant

Application: micro-enterprises (especially agro-processing), health, indoor lighting.

Sector: commercial (agro-processing), residential

Capacity: 18kW

Cost: US\$3,495 per kW installed

Households Served: 400 (3000 people)

BACKGROUND

Approximately 96% of rural Kenyans lack access to grid-based electricity. Instead, rural families light their homes with kerosene, and carry out essential food processing tasks, such as milling grain, using diesel-powered systems. The cost of energy amounts to about a third of a rural family's income. In addition, women and children spend many hours per week searching for wood or dung for fuel.

Hydropower is central to electricity provision in Kenya; over 70% of Kenya's electricity is provided through large hydropower schemes. In 1997, Kenya's Electric Power Act allowed independent power producers to supply electricity to the grid, but small decentralized schemes, such as micro hydropower, were not fully addressed. Micro hydropower is not new to Kenya; prior to the 1960s micro hydro was used to power grain mills. However, these out-dated systems were quickly outpaced by the diesel engine for milling grain. Today, improved technology makes micro hydropower economically viable in many situations, but the country lacks the infrastructure for production and installation of micro hydro systems, or for repair of systems once they are installed. In addition, there are no standards or other policies to encourage and enable local communities to take advantage of this renewable and environmentally benign source of power.



Tungu-Kabiri community working together to build a micro hydro power plant (Meru South District, Kenya).

PROJECT DESCRIPTION

Overview

This project sought to remove the policy, technical and institutional barriers that limited the development and use of renewable energy sources to meet the energy needs of poor, off-grid communities. By demonstrating how communities can organize themselves to build and operate a micro hydropower plant, and by showing how the new supply of energy can improve their lives, the Tungu-Kabiri community project has stimulated changes in national policy and encouraged efforts to build domestic capacity to produce micro hydro system components.

Implementation

The grantee, the Intermediate Technology Development Group – Eastern Africa (ITDG-EA), worked closely with the Tungu-Kabiri community in developing and carrying out the micro hydropower scheme. About 200 members of this 300-household community came together to form a commercial enterprise to own and operate the micro hydropower plant. Each individual purchased a share in the company, with the maximum share having a value of approximately \$50. The 200 members contributed free labor and participated in building a run-of-the-river, "penstock" type micro hydropower system, dedicating one day per week for over a year. In addition, government involvement was sought from the start, and the Ministry of Energy provided technical support throughout the project. The community acquired one acre of land from the government, where they built a micro-enterprise center that now receives power through the project. A 10-member community power committee manages the day-to-day operations of the plant, and conducts community consultations to decide upon

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additional uses for the power generated by the system. In this way, the power committee is also playing the role of a village development agency.

There are two interesting aspects of this project's implementation. First, ITDG and the Ministry of Energy began by doing feasibility studies in this region to assess the potential for micro hydro power. However, they did not inform nearby communities at the time they were doing this, because they felt it would be highly disappointing and a setback if community hopes were raised before the potential for meeting their perceived needs was thoroughly explored through a feasibility statement. It was only after ITDG had determined the feasibility of the project at Tungu Kabiri that the community was made aware of the possibilities of a power scheme. Second, the community was mobilized to decide how best to use the power provided by the micro hydro system. In the ensuing community discussions, the majority of women wanted to use the power first to pump water nearer to the village and to purify it, while the majority of men wanted to begin with electricity and micro-enterprises. In the end, the men's first choice was the route taken, with the plan that water pumping would be installed next. However, while the micro-enterprises have been installed and are operating, the community has not yet been able to find the money to implement the water supply scheme.

Environmental Benefits

Global: Grain-milling is now carried out using micro hydropower instead of a diesel engine or fossil fuel based electricity. In addition, the community will soon be able to cure tobacco using hydropower rather than biomass, thereby reducing the use of wood resources. The use of kerosene for lighting will also be reduced because of the availability of electrical power.

Local: Over time, the reduced use of wood for fuel will reduce local deforestation, thereby reducing environmental damages such as soil erosion, which is a problem in this hilly region on the southern slopes of Mt. Kenya.

Local livelihood benefits

Health: A health clinic is one of the intended uses of part of the micro-enterprise center. With the new power scheme, it will be possible to refrigerate medicines. In addition, some villagers will receive light in their homes, which will reduce their use of kerosene and therefore their risk of respiratory and eye problems. Finally, when water pumping becomes available, improved access to clean water will help improve sanitation and health.

Poverty alleviation: Running micro-enterprises will provide some increased income to certain households, and provide services locally that previously people would have had to travel far to get. Thus, everyone will save time and money traveling, and some villagers' income will increase.

Education: Children in houses that receive lighting have an easier time studying at night than before. In addition, those households with increased incomes may now be able to afford school fees.

Reduced drudgery: Collection of firewood and fetching water remain among the most heavy tasks for rural women. The project, once fully completed, will free up women and children from traditional chores that have tended to keep women disadvantaged, and will allow children to attend school more often and participate in other social activities.

Improved local opportunities: In addition to the micro-enterprises, a social hall and community development office are expected to receive power, both of which can contribute to creating greater opportunities and an improved quality of life in the village. Micro-enterprises already in operation include a barber shop, a hair and beauty salon, a welding unit, and a battery charging station. These benefits of power can be enjoyed not only by community members but by residents of neighboring villages as well.

Regional and National Benefits

Demonstration effects: Supporters in two other communities have built at least two pico hydro (less than 5 kW) power projects as a result of the demonstration project in the Tungu-Kabiri community.

Capacity building: The Tungu-Kabiri project stimulated regional and national interest in learning to construct cross-flow turbines for micro hydropower systems. This project imported a cross-flow turbine from Ethiopia, but ITDG and the Kenyan Ministry of Energy realized these could be made in Kenya. A training program was led by a Nepalese engineering company for 12 enterprises from Kenya, Uganda and Tanzania. A separate workshop on the manufacture of Pelton turbines and electronic charge controllers was sponsored by other donors in the region. As a result, Kenya has established its capacity to build system components, including turbines, penstocks, electronic load controllers and others. The project has also built the country's capacity to conduct feasibility studies for potential micro hydro projects.

Policy development: The Ministry of Energy, having been involved in this project from the start, learned a great deal from the experience. The Ministry has realized the potential of micro hydro as a small-scale power source, and has initiated a process with the Kenya Bureau of Standards to establish standards and a code of best practice for the small hydro sector, including standards related to transmission poles, wires and accessories, and general installation.

Capacity Development

The project built the capacity of the local community to construct, maintain and repair a micro hydropower system. It also established their capacity to manage and operate a power scheme. ITDG is still providing advice and support as the community decides upon tariffs for the use of power and rent for the use of stalls in the micro-enterprise center. In addition, Kenya's improved capacity to manufacture the components of micro hydro systems, as described above, was another result of the project.

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Beneficiaries

The primary beneficiaries are the 200 households holding shares of the commercial power entity in the community. Secondary beneficiaries are the entire Tungu-Kabiri community, as well as others from surrounding communities, who benefit from the services provided in the micro-enterprise center.

Partners

The Tungu-Kabiri community was the most important partner in developing and carrying out the project. They donated land, materials and all of the labor requirements, and also paid cash for licenses and ground handling of materials that were shipped to the community.

The Intermediate Technology Development Group (ITDG), which received grant funds from SGP, brought technical expertise and also contributed additional funding outside of the SGP grant.

Several Kenyan government departments were also involved, bringing technical expertise and other assistance to the project, including the Renewable Energy Department of the Ministry of Energy, the local government authority, the Ministries of both Water and Land, and the Social Services Department.

LESSONS LEARNED

Environmental Management

This project illustrates the potential for communities to develop and manage their own power systems in Kenya. ITDG's work in assessing the feasibility of various sites suggests that there are a number of sites where such micro hydro projects are feasible.

Barrier removal

Technical: The community built the entire micro hydro system, and in doing so learned all of the technical aspects of the system, including how to perform maintenance. Thus, involving the community in all aspects of project development from the start is critical to reducing local technical barriers. The project also effectively used opportunities to build manufacturing capacity for micro hydro system components. Government involvement seems to have helped with this, especially in facilitating efforts to build manufacturing capacity for cross-flow turbines.

Policy: This project was quite successful at addressing policy barriers at the national level through a single demonstration project. This was greatly facilitated by the fact that the project involved the Ministry of Energy as a partner from the very beginning. Thus, the Ministry saw itself as having a stake in the outcome, and saw first-hand the benefits that micro hydropower can offer. This made taking steps toward improving the policy environment for micro hydropower much easier.

Institutional: Ensuring complete community ownership of the power and its benefits is essential. This project achieved this directly by having community members purchase shares directly, providing capital for establishing other productive uses for the power. In addition, the community was involved in construction of the scheme as much as possible. This effort represents a large investment of time and money, which means that the community is not likely to abandon interest in maintaining the project, and instead will seek to meet the community's needs through its use.

Financial: This community still faces large financial barriers to taking full advantage of their new power source. For example, currently they would like to use some power to pump water up from the river so that women could reduce their work in fetching water for drinking and irrigation. Drinking water could also be purified using some of the power, which would reduce exposure to disease. However, as of a site visit in May 2003, the community had so far been unable to find the money to purchase the pipes and the purification equipment. Similar financial barriers exist for the many other communities for whom micro hydro power may be a technical possibility.

Scaling Up

This project has led to important changes that are critical to expanding the use of micro hydropower in Kenya. The two most important impacts are building capacity to manufacture system components domestically, and initiating a process to establish standards for component manufacture and installation. Both of these are essential to establishing a market for investing in micro hydropower projects. The project itself demonstrates that even poor rural communities, when they understand the benefits that such power can offer, are willing and able to contribute financially and physically to such a project. However, the financial resources from poor communities alone are not generally sufficient to construct micro hydro schemes. This financial barrier will need to be addressed if scaling up is to occur.

SOURCES CONSULTED

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