Gaining ground in community micro-hydro power development in Kenya

by Stephen Gitonga [1], James Mureithi and Daniel K Theuri[2]
1 ITDG East Africa; P.O Box 39493, Nairobi, Kenya. Email: gitonga@itdg.or.ke
2 Department of Renewable Energy, Ministry of Energy , Kenya

Développement communautaire des micro-centrales hydro-électriques au Kenya
Cet article met en relief les défis à relever lors du lancement d'un projet de micro-centrale dans un pays qui ne dispose pas d'une infrastructure adaptée à ce type de projets. L'auteur souligne les aspects qui ont été couverts et ceux qui devraient être pris en considération dans le futur.

Introduction

This article is a case study of work being developed by ITDG East Africa and the Ministry of Energy in Kenya, with financial support from UNDP GEF Small Grants Programme. The project idea started with a meeting between the Ministry of Energy and ITDG staff in March 1997 as a result of the emerging potential of the micro-hydro sector in Kenya. Consequent activities, included seeking for financial support among the following components, started in May 1998:

- A feasibility study
- The installation of one micro-hydro scheme
- A database for micro-hydropower development in Kenya

The feasibility study involved identifying suitable sites country-wide for community micro-hydro power schemes. A detailed desk study of the legal statutes was important as micro-hydro power generation involves various aspects of resource management, such as water use, land use and ownership. The study included a background of the general situation of micro-hydro activities in the country.

Feasibility Study and Sites election

Criteria were developed that helped to identify sites for potential development, and assisted in prioritising the site that would be developed for demonstration. The criteria proved very important during the field visits that were made across the many rivers and rivulets; a sample is provided in Table 1.

Two potential sites for the installation of the community micro-hydro power scheme were identified from a list of over twenty. A detailed feasibility study was conducted on the two, including a social economic survey. Based on refined criteria, a site on the Jiameceu Falls on the River Tungu was selected, about 200Km north of Nairobi, and 12Km from Chuka town, close to Mbuiru village. The social survey helped the team to assess the demand and the potential load factor of the proposed scheme. Technical aspects were studied in detail to ascertain the design and the layout of the scheme. Community micro-hydro power schemes were a completely new concept in Kenya.

The most important aspects that the team considered are the commercially viable end-uses which are environmentally beneficial in a place where the river is running all the year round and the communities are not dispersed beyond the economically viable distances for a community micro-hydro power project.

Social mobilisation

It was important to link up community mobilization activities with the site characteristics because the community is involved in the construction, mainly by providing both skilled and semi-skilled labour. Site characteristics include weir construction, the canal, the powerhouse and the penstock. The community will take over the ownership, management and running of the scheme once completed.

Training

ITDG, the Department of Renewable Energy of the Ministry of Energy, the Nottingham Trent University UK, and the Ashden Trust initiated training courses on

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reference

Figure

Theme

Table 1: Criteria for selecting a site for micro-hydro Geographical and topographical conditions

Aspects	*Rating criteria*
Geographical location – site development can be affected accessibility etc	Very good – if there are existing roads, site accessible by vehicle Good – if site accessible only by 4 wheel drive vehicles Fair – if site accessible only by foot/draught animals Poor – if site inaccessible
Topography and site conditions	Very good – if no major costs on topography, soils and foundation Good – if the above is acceptable but with some minimal costs on site structural strengthening. Poor- if topography, soils and foundation incapable of supporting the physical structures – prone to landslides
Social economic and legal aspects	
Hydropower or diesel Site where power is supplied by diesel and micro-power can replace it	Good – if there are chances of substituting for a diesel engine Fair – if there are no existing activities involving diesel-driven machines Poor – if chances of substitution remote
End uses (local centres) Load centres or power demand areas are conducive to the establishment of micro-hydro potential sites, since without a power demand, not even the most favourable micro-hydro can be economically developed.	Good – if there is an existing commercially or economically viable end-use which is environmentally beneficial Fair – if an existing economically viable end-use is not environmentally beneficial Poor – if there are no existing profitable end-uses. Load centres include: *Community*: lighting; social amenities; community based institutions; hospitals; site schools; cattle dips; etc. *Industrial activities*: grain milling; oils pressing; weaving; ceramics; etc. – the community is expected to set its priorities, which will be accommodated in the design stage.
Remoteness in relation to grid connection Probability of connection to the national grid power	Best – if the site is good for micro-hydro, accessible, and load centres are available, but there is only a remote chance of being connected to the national grid Good – if it is good for micro-hydro, accessible load centres are available and the area is adjacent to the national grid but cost of supply is prohibitive i.e. Below 33Kv to 185 Kvs Fair – if it is good for micro-hydro, accessible and load centres available but the area is covered by low voltage grid distribution line Poor – if it is good for micro-hydropower, accessible and load centre are available, but the grid supply available at competitive costs.
Legal features	Very good – if there are no legal limitations whatsoever Good – if site is subject to permits under laws not limiting entry and rights of way No use – if site is physically available but legally inaccessible due to legal limitations like protected areas such as nature reserves, heritage sites etc.as protected by Act of Parliament
Existing structure Hydroelectric development utilizing the existing small structure (eg diversion canal for irrigation) other indirect utility, such as canals to coffee factories	Good – if there are existing structures Fair – if the existing structures need a lot of upgrading Poor- if there are no existing structures
Remoteness of the site to the community	Very good – if the end-uses are within 600m radius. Good – if the distance between power house and user is exceeding 600m and not more than 2000 metres Poor – if site distance exceeds 2000 metres
Community set-up	Good – if communities live close to each other (village concept) or there is a centralised use of power Fair – if the community set-up is highly dispersed but with centralised use No use – Where the community set-up is highly dispersed
Technical aspects of the site	
Appropriate site	Good – if water supply head and flow are sufficient for the micro-hydro development to meet the load requirement from the community. Fair – if the site has either sufficient load or flow but not both Poor – if the site has insufficient head and unreliable flow No use – if the site is not within economic distance (600 metres for the power transmission)
Relative costs of civil works to be involved?	Good – if no significant civil works needed to develop the site Fair – if minimum civil works is needed Poor – if major civil works is required

skills, technology transfer and capacity building. The training courses included participants from other countries.

Scheme Ownership and management

The result of the social mobilisation process was the formation of the Tungu – Kabiri Micro-hydro Power Project management committee. The scheme will be operated on a commercial basis through share-holding in the company with support from local government departments.

The ownership structure will fall in the following categories:

- A commercial hydropower group, comprising Mbuiru village community members, who have contributed towards the project.
- A community power company owned by community members through shares

Community contribution

The community has contributed in the following ways:

- Identification and provision of local artisans and resources
- Labour for, among other things, construction, moving building materials; blocking the river during construction; off-loading lorries. (Every Tuesday is a community working day which is costed in the project by the community members.)
- Land provided by the Government for building the power centre and canal; storage space for construction materials and equipment; a pressure lamp for night work; materials for blocking the river during the construction
- Providing finances to pay for registration and Government licences for the project
- Maintenance of the canal (to keep it wet and prevent cracking)

Impacts already achieved

- Community members have organised themselves into a commercial development group, which has initiated a project fund for activities related to the hydro scheme.
- They have acquired, from the Government, one acre of land to build a power centre where micro enterprises, served by the power from the scheme, will be located.
- The community has been empowered to put development issues on to the agenda and is looking at other development activities utilizing power from the scheme.
- The work has attracted the attention of the NGOs, government ministries, private agencies, individuals and donors. For example, two smaller schemes will be installed in Kirinyaga district through collaboration with Nottingham Trent University, ITDG, and the Ministry of Energy.
- Funding for related activities, such as a turbine manufacturers' training ,in collaboration with the Renewable Energy Department, ITDG and Jomo Kenyatta University of Agriculture and Technology and Nottingham Trent University, have been obtained.
- The scheme has become a centre for education on energy and environment for local schools.

Use of micro-hydro power

The scheme will contribute significantly in raising the income and improving the livelihoods of the Tungu – Kabiri river communities. The 18KW scheme will help alleviate environmental problems associated with biomass and diesel fuel use by

- Water pumping (commercial)
- replacing the use of firewood by utilizing ballast load heat from the scheme to cure tobacco
- replacing the diesel engine currently in use for maize grinding by hydro power.
- replacing kerosene for lighting. The community will not benefit at present from a power-distribution system (especially for .lighting their homes) but will use the energy by charging batteries for both lighting and running their radios or TVs.
- Agro-processing

Lessons and recommendations

In a country where there is no micro-hydro power infrastructure, the following were found important factors to consider:

- The level of involvement in micro-hydro power development
- The potential for micro-hydro power development, ascertained by carrying out a prefeasibility study
- The legal statutes and procedures
- The policy aspects in the country that may affect micro-hydro power development
- A lobbying process to policy makers, development organizations, donor and support organizations and the to community groups to create awareness of the role of micro-hydro power in development
- A set of criteria for site selection during the initial stages of the initiative
- A pilot scheme to demonstrate the technology
- A mechanism to create the capacity for manufacturing components such as turbines
- Training of potential micro-hydro experts during the pilot scheme.

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