Community-Based Rural Micro Hydro Project, India

Themes

★ Renewable energy
⁂ Linkages with other environmental goals
❖ Institutional capacity development
✷ Poverty alleviation (MDG 1)

PROJECT DATA

Name: Micro-Hydel Project
Implementing Organization: Mallanadu Development Society (NGO)
Location: Kerala, India
SGP contribution: $26,883
Start Date: September 1999

ENERGY OVERVIEW

Energy Resource: water
Technology: micro hydro (two turbines installed)
Application: lighting, television/radio, water pumping
Sector: domestic, public, small-scale enterprises
Cost of power per inhabitant: approximately $2 per month for four 10W compact fluorescent light bulbs; extra for the 25 families owning color or black and white televisions
Total power provided: 16 kW (20 kW installed capacity)
Households served: 161 connections (146 domestic, 10 shops, 5 institutions)

BACKGROUND

Thulappaly is a remote village in the western part of the state of Kerala, located along the Naranamthode, a tributary of the Pampa River. This tributary begins in the Ernakulam and Thalapparakotta forest reserves.The village site is very hilly, and households are located in small clusters of 5-15 houses,spread out over a large area.Given its isolation,the village is unlikely to receive grid power anytime soon.The community is composed of people from Hindu, Christian and Muslim backgrounds, and land holdings are small and marginal. Agriculture is the main source of livelihood, mainly via small household gardens, with some animal husbandry as well. Prior to the project, all households used kerosene for lighting,and many also cut down trees for firewood. Women and children also walked considerable distances to fetch and carry water back to their homes.

PROJECT DESCRIPTION

Overview

This project used a process-based, learning-by-doing approach to building and operating a micro hydro plant in this community.The community invested a significant amount in the project, both financially and in-kind, with an estimated contribution of approximately $22,000.The community now runs and maintains its own power system,and is more interested in preserving the local forest than previously. Community members pay for electricity charges, and compared to state-run operations are more likely to pay their bills on time. In addition,since electricity generation is local, there is little waste of electricity via transmission losses.

Implementation

The implementation steps included establishing a community committee for the project, conducting a feasibility study to assess the best location for the plant, building the plant and the electricity distribution system, and then operating and maintaining the plant.

The power system is owned by all power consumers,called the General Body.This Body elects a nine-member executive committee, which manages the power system.A village electrician, a local youth, is appointed by the General Body, and is paid a monthly sum of Rs. 1500, or approximately $60.The electricity generated by the plant is used for lighting, water pumping, television and radio.The system involves 10km of distribution lines laid by the community.The water storage system for electricity generation helps recharge the groundwater, which has improved irrigation.

Technology

The micro hydro system has an installed capacity of 20kW. A weir was constructed about 700 meters from the powerhouse, and water is diverted through an 8-inch pipe for 600 meters, then through a 6-inch pipe into the powerhouse and generator.There is a 50m3 forebay tank at the end of the head channel, which is also used as a de-silting tank.The system uses two synchronous, 50 Hz generators with horizontal shafts, and a horizontal shaft pelton wheel turbine. Using the two turbines during months in which there is sufficient water, 16kW can be generated. However, during the summer months the water supply is insufficient,and therefore the project installed a 15kW diesel generator for use during that time. Electricity is generated and distributed from 5am to 6:30am, and from 6:30pm to 10:30pm.

Environmental Benefits

Global: Since the village previously depended upon kerosene and sometimes firewood for lighting, the installation of electrical connections in 200 households has reduced their use of these fuels, thereby reducing greenhouse gas emissions. However, during the summer months,water in the river is insufficient to generate hydro-power, so during this time the community relies on a diesel generator.This generator was installed by the project, and it is not clear whether this generator emits more or less greenhouse gases than was formerly emitted through kerosene use.

Local: Because the local watershed is now the source of power, the community is more interested in protecting the forest. Community members have begun planting trees, and have reduced the number chopped down.

Livelihood Benefits

Health: The reduced use of kerosene and firewood means that

indoor air quality is improved,which can lead to a reduced incidence of respiratory illnesses.

Education: Due to the improved indoor lighting, children have an easier time studying at night.

Income generation: Many households are spending less on electricity now than they used to spend on kerosene. However, this varies according to the household.

Reduced drudgery: Since the power system helps bring water closer to the community, women and children have to carry water on their heads for a shorter distance.

Agricultural productivity: The system of storing water for purposes of electricity generation may contribute to improved agricultural productivity, because this improves the groundwater recharge rates.This means that irrigation of crops is easier.

Community empowerment: Through this project, the community's ability to work together on common projects has been improved.

Capacity Development

This project has resulted in an improved local capacity for people in the community to find solutions to their problems.The establishment of a community committee to manage the project was the first step, and the overall participation of the community in the process has helped people realize their ability to manage their own resources and improve their situation.

Beneficiaries

The primary project beneficiaries are the 146 households in this village that now have lighting and access to television and radio. In addition, 10 small enterprises and 5 institutions have benefited from an improved power supply. Women and children particularly benefit since water must be carried for a shorter distance.

Partners

The Mallanadu Development Society worked closely with the community, which established a community committee to manage the project. The community members also contributed financially and helped build the new power system.

LESSONS LEARNED

Environmental Management

This project illustrates the link between micro hydro power and protection of local forests. Since the community now depends upon the river to provide power, community members are now more interested in preserving the watershed. However, education and awareness about this connection is necessary if community members are to take action.

Barrier Removal

Institutional: The project illustrates the importance of working with a community so the residents feel they have an ownership in the project.Reports about the project suggest that the institutional development conducted through this project has spilled over into other community efforts, although there are no specifics about this. If this is the case, then institutional barriers at the community level have indeed been reduced.

Information/awareness: The community is now aware of impacts on the local watershed, and is motivated to protect it.

Scaling Up

SGP reports indicate strong potential for replicating this project in other areas. SGP in India has discussed the possibility of larger grants from UNDP and/or GEF for similar efforts, and has contacted India's Ministry of Renewable Resources concerning an assessment of the effectiveness of this project. A cost-benefit analysis may be performed. Similar micro hydro systems have been developed in two other villages of Kerala: Moolakkayam (Pathanamthitta district) and Koinadu (Idukki district).

SOURCES CONSULTED

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