Connecting Micro-hydro Power to the National Grid, Indonesia

Themes

★ Renewable energy
❖ Financing mechanisms and private sector involvement
❖ Institutional capacity development
❖ Policy and legislation
✷ Poverty alleviation (MDG 1)

PROJECT DATA

Name: Upgrading the Capacity of Micro-hydro Facility to Enhance Economic Activities and the Development of the Local Community
Implementing organization: Konsorsium Seloliman (CBO)
Location: Seloliman, East Java, Indonesia
SGP contribution: $27,388
Start date: August 2000

ENERGY OVERVIEW

Energy resource: water
Technology: micro-hydro power; 90% local content; 10% imported (i.e., control panel)
Application: lighting, TV/radio, rice cookers, blowing cotton, crushing paper, selling electricity to the grid
Sector: domestic, commercial, public
Total capacity: 23kW (10kW used by the community)
Number served: 45 households, an environmental learning center, a small business and two boarding schools

BACKGROUND

There is significant potential for micro-hydro systems to meet the energy needs of rural and remote communities in Indonesia. The estimated potential for micro- and mini-hydro is about 500MW, whereas so far only an estimated 5 MW capacity has been installed in rural areas, and only 1MW of this is actually being used.

In 1995, a law was passed to allow small power producers to sell power to the national grid. The power must be sold to Indonesia's national power company (PLN). The Small Power Purchase Tariff outlines the payments, and the circumstances under which they are made. However, until recently the policy has not actually implemented, due to a lack of political will and capacity at PLN. In 2002, new regulations finally made it feasible for small-scale independent power providers to sell to the grid.

PROJECT DESCRIPTION

Overview

This project upgraded the electricity supply for the Seloliman area to meet local domestic, public and commercial needs. In doing so, excess power was generated. The project has since worked to build the capacity of the local cooperative that owns and operates the micro-hydro plant to take advantage of

A micro-hydro power penstock carrying water through terraced ricefields to the powerhouse (Seloliman, East Java, Indonesia).

Indonesia's new policy permitting small-scale producers to sell power to the grid, testing this option as a possibility for other communities in Indonesia.

Implementation

Prior to SGP's involvement, the German development agency, GTZ, sponsored a project to build a micro-hydro system for a major environmental education center in Seloliman. The system was not sufficient to meet all of the community's needs, and SGP's support helped expand the system's capacity. Now, water from the Maron River provides power to the three small villages of Seloliman, including Kali Maron. In addition, the environmental center, called the Center for Environmental Learning, and two Muslim boarding schools receive electricity. One of the boarding schools uses power to blow cotton to make mattresses, and to power a paper crusher. The micro-hydro power system is owned by a cooperative made up of local villagers.

Recently, the cooperative has embarked upon procedures to sell excess power to the grid. The site is not far from the grid, so selling to the grid is feasible, and the cooperative was recently legally registered. The Center for Environmental Learning is currently managing the process, but is training the local cooperative members to take over. The community is in the process of deciding how it will use the funds generated by the sale of power. Initially they intended to waive electricity use fees for local community members, but in a recent community meeting decided instead to keep the fee in place for the time being. After a year of negotiation, the Maron River cooperative received a certificate and license to provide electricity for PLN.

Technology

The micro-hydro power plant produces 23kW total capacity,

but only 10kW are used by the community at night and 5-6 kW during daylight. The system uses an old irrigation ditch, built by the government to irrigate the rice fields, to channel the water approximately 700 meters toward the powerhouse. A large pipe then carries the water down through terraced rice fields into the powerhouse. The equipment used in the powerhouse includes a T14 cross-flow turbine with a capacity of 23 kW, and a speed of 428 revolutions per minute (rpm) for an 11.7 meter net head. The system is designed for a flow of 300 liters per second, and uses a 3-phase AVK synchronous generator.

Environmental Benefits

Global: The presence of the micro-hydro power system means that previous sources of power, which included kerosene, diesel and firewood, are not relied upon as heavily. This leads to reduced greenhouse gas emissions.

Local: Local environmental benefits include reduced pressure on local forests from firewood collection.

Livelihood Benefits

Health: Reduced use of kerosene for lighting, and firewood for cooking rice, means improved indoor air quality, which is likely to bring health improvements, especially for women and children.

Reduced drudgery/improved opportunities for women and children: Now that women and children spend less time searching for firewood, they have more time to participate in community activities, and children have more time to play and to study.

Income generation: The small enterprise in mattress-making at the local Muslim boarding school was developed just after the introduction of the micro-hydro power. Each mattress can be sold by the school for $25-$30 apiece. In addition, the cooperative running the micro-hydro plant is planning to sell power to the grid. The cooperative estimates that the venture with PLN will produce about $400-$450 per month of income. This revenue will be used to establish a capital fund for village development projects.

National Benefits

It appears that this will be the first time a community-run micro-hydro plant has sold its power to the national grid. This will test the practicality of this approach, and open up this possibility for other Indonesian communities. In addition, the national grid operators will have additional sources of power generation.

Beneficiaries

The 45 households (about 250-300 people) of Kali Maron, and other inhabitants of the region, are the primary beneficiaries. In addition, the 10,000 annual visitors to the Center for Environmental Learning benefit from power and additional learning opportunities, and about 50 students at the Muslim boarding school benefit from the additional income generated through the sale of mattresses.

Capacity Development

Capacity development is on-going for community members involved in managing the micro-hydro plant. Mainly, the Center for Environmental Learning has been supporting them in their plans for the sale of power, and the goal is that they would be able to manage this on their own soon.

Partners

The most important partners in the current effort to sell power to the grid are the community members, represented by the Konsorsium Seloliman (the grantee), and the Center for Environmental Learning. This is a major center for learning, receiving 10,000 visitors per year. It is also highly independent, receiving 90% of its funds from private sources. This has meant that the center had the freedom it needed to engage in this innovative effort. Several other agencies have also been involved, including the German development agency GTZ, Lem21 and an Indonesian group, Yayasan Bina Usaha Lingkungan.

LESSONS LEARNED

Environmental Management

This project illustrates one possible future way to link livelihoods of communities with environmental management. Since micro-hydro power has little or no environmental impact, and often watershed conservation follows their installation, the possibility that communities could sell this power to the grid is quite interesting. This project will be interesting to follow up on as this sale takes shape. In particular, it will be interesting to note what happens if the community does indeed remove all local tariffs for power use due to the revenues from the power sales. One might anticipate that this would cause the over-use of power, since it would cost nothing to users. However, it appears that for the time being, villagers will still pay for their power.

Barrier Removal

Policy: The project makes use of an existing policy framework that allows for the sale of power by small-scale producers to the grid. However, this project may very well assist in reducing barriers for community-based micro-hydro schemes wishing to participate in this opportunity. It is believed that this is the first such project to take advantage of this, and therefore it is likely to encounter some challenges along the way. Learning from these challenges could help make this policy more widely usable for communities in other areas of the country. It may also serve as an example to encourage other countries to implement similar policies.

Institutional/Cultural: The project also addresses barriers of fear among community members. Three decades of centralized government have left communities with passive attitudes. Embarking upon a self-organized power generation project was not an easy step to take. It will take a continuing effort to maintain the organization and build the sustainability of this new venture. Many lessons are still left to learn, but already the community and local organizations have seen the value of working

together to overcome unfavorable institutional arrangements and cultural barriers.

Scaling Up

As mentioned above, this project could serve as an example for other Indonesian communities. However, this will depend upon the ability to track and communicate the results and impacts of this effort. The Center for Environmental Education will likely be key to achieving this.

SOURCES CONSULTED

Project Record 0078i, SGP Project Database, http://www.undp.org/sgp

Promotion of Renewable Energy Sources in South East Asia. Country Profile: Indonesia: http://www.aseanenergy.org/pressea/indonesia/countryprofile/renewable_energy_sources.htm and Renewable Energy Policy Incentives: http://www.aseanenergy.org/pressea/indonesia/countryprofile/renewable_energy_policy_incentives.htm (September 17,2003).

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