

Key Issue:

11-Benefits due to Power Generation

14-Development of Regional Industries

Climate Zone:

Tropical

Subjects:

- Rural Electrification and Development of Regional Industries



Effects:

- Preservation of watershed area of Mahagnao Lake
- Development of local industries
- Promotion of Mahagnao Lake, a Natural Park including the power plant as an eco-tourism spot

Project Name: Mahagnao Micro-hydro Demonstration Project

Country: Bgy. Mahagnao, Burauen, Leyte, Philippines

Implementing Party & Period

- Project: Philippine Department of Energy, New Energy Foundation of Japan
2002 (Completion of Construction) -

- Good Practice: Philippine Department of Energy, New Energy Foundation of Japan
2002 -

Key Words:

Preservation of the natural environment within Mahagnao Lake

Abstract:

The project aims to develop and demonstrate a small-scale hydro power plant which will provide adequate and reliable electricity to 3 off-grid upland barangays in the Philippines, together comprising around 300 households. The project also aims to prove the economic viability of small-scale hydro power plants in isolated communities through a simplified maintenance system.

1. Outline of the Project

New Energy Foundation of Japan (NEF) conceptualized the 65 kW Mahagnao Micro-hydro Power Demonstration Plant under the authorization of the Ministry of Economy, Trade and Industry (METI) of Japan and the Philippine Department of Energy. NEF contracted Tokyo Electric Power Services Company, Inc. (TEPSCO) to conduct the feasibility study and serves as consultant for the project.

The construction of the project started in June 2001 and was completed in February 2002. The main beneficiaries of the project are the people residing in Barangays Cansiboy, Logsongan and Mahagnao, Burauen, Leyte.

The Mahagnao project is located at the west foot of the volcanic range, consisting of Mt. Perker, Mt. Noburas and Mt. Gumdalita in Barangay Mahagnao, Burauen. The power plant is situated half kilometer downstream from the outlet of Mahagnao Lake with several creek tributaries and surrounded by lush and green vegetation. The area is situated in the buffer zone Mahagnao Volcano Natural Park, a protected area. The Awasan River, originated from Lake Danao (also known as Lake Mahagnao) it flows to the southwest and joins up with Marabong River. The gentle gradient of the riverbed continues from Lake Mahagnao for 500 m, and the river descends within a steep slope throughout a V-shaped valley and drops at the Guin Annivan Waterfall. The right banks of the river approximately 400 meters downstream from the weir, is comparatively steep slope and several collapses are found. The left bank continues to be a gentle slope. However, downstream part the left bank becomes steep and the right bank become gentle and found some flat ground. The project site is mostly covered with strata, consisting of volcanic breccias and lava. The volcanic breccias comprising the massive soft rock approximately of 10 to 30 cm in diameter.

2. Features of the Project Area

The design of Mahagnao Micro-hydro Demonstration project has been thoroughly done base on the available data that has been collected in order to get reliable and accurate data especially hydrological data to be used in designing the amount of discharge, civil facilities, turbine and generator capacity. Based on the careful evaluation of available data gathered, the run of river type has been selected and best suitable and most economical according to the site conditions. We considered also that the project (Mahagnao Lake) is located in a national park, under the Philippine Law securing of necessary permits would entail additional cost and time.

The construction of diversion weir is not ordinary compare to typical weir design because there is an existing box culvert used an outlet of the lake. The design of weir is very different to typical design. For a typical design of weir, it built across the river in order to divert the flow of water leading to the intake. In this design, the weir is provided with a trench intake so that water will flow on it and conveyed to the intake.

The scheme of Mahagnao Micro-hydro Demonstration Project is run-of-river type with regulating reservoir type which is very unique because the plant capable to operate in two types of operating system (run-of-river and pondage type). In selecting which type to use depends on the available discharge of the river and demand of the system. If the river discharge is sufficient to operate the required demand of the system it will operate on a run-of-river type. However, if the demand is greater than the output of the plant, the system operates as a pondage type.

Table 1: Specifications of the 65 kW
Mahagnao Micro-hydro Project

Table 2: Specifications of the civil facilities

Item	Specification	Item	Specification
Catchment Area	3.3 km ²	Diversion Weir	H2.12 x B 7.00 m
Design Discharge	0.53 m ³ /s	Intake	H2.45 x B1.2 X L4.36
Intake Water Level	EL 100.25 m	Headtank	H3.5 x B2.5 x L12.80
Tailrace Water Level	EL 71.20 m	Material	Spiral Welded Steel Pipe (Carbon Steel)
Gross Head	29.05 m	Penstock dia.	700 mm dia.
Head Loss	3.84 m	Length	510.563 m
Effective Head	25.21 m	Power House	H5.0 x B5.0 L5.0 m
Installed Capacity	65 kW	Tailrace	H1.1m x B1.0 x L8.8
Turbine	1 x Cross Flow		



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3. Benefits

The 65 kW Mahagnao Micro-hydro project is the first hydro project constructed in the province of Leyte. The power generated by the micro-hydro project is being enjoyed by 3 barangays Mahagnao, Cansiboy and Logsongan, thus targeted to serve 282 house holds, a school building, health centers, barangay halls, a church and day care centers.



The Mahagnao Micro-hydro power plant will bring economic benefits to the area by increasing livelihood opportunities, through the development of local industries and for commercial applications. Since abaca and coconut are the main products of these barangays, abaca fiber stripping machine driven by electricity will be introduced to increase the quality and production. Additional livelihood can also be realized through the promotion of the area as an eco-tourism site.

As of October 2002 there are 148 house holds connected to the system and now enjoying the benefits of a reliable source of power. Residents are watching television with video CD, listening to the radio and few house holds now have a Refrigerator and the most important benefit is the student can study during night time.

Tourist Attraction

The small-scale micro-hydro project is located at the foot of the volcanic range consisting of several mountains. The area has a beautiful scenic view with lush and green vegetation and in a declared Natural Park. The area can be promoted as an eco-tourism site for local and foreign tourists.

Education

From the start of the projects operation, engineering students have visited the area from different universities and colleges as part of their study tour program as well as interested micro-hydro developers and proponents. The project will enable to demonstrate and environment friendly renewable sources of power, simple and easy to maintain.



4. Further Information

4.1 Inquiries

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