

PROJECT IFUGAO-AMBANGAL MINI-HYDRO

LOCATION Philippines, Ifugao, Kiangan. Lat: 16°47'30.59"N / Long: 121° 6'24.90"E

TIMELINE May 2006 to December 2010 (3 years of studies, 1 year for construction).

CATEGORY GRANT/CSR – with creation of a revolving fund to maintain the 2000 years old Ifugao Rice Terraces, a UNESCO endangered World Heritage Site.
Developed in public-private partnership (PPP).

TECHNICAL PARAMETERS Construction of a 200 kW run-of-the river micro-hydropower plant on the small Ambangal rive and transmission line to generate 1,443 MWh per year of electricity to be delivered to the local distribution network. Design features include off-grid operation in case of national grid blackouts.

OBJECTIVES

- Support local activities to conserve the rice terraces on the UNESCO World Heritage by the creation of a revolving fund and an irrigation system;
- Showcase locally based energy development and regional vitalization;
- Promote the development of sustainable mini-hydropower resources.

BENEFICIARIES & PARTNERS

- GSEP member companies;
- Philippines Energy Department;
- Ifugao Provincial Government (Owner/Beneficiary);
- Residents (farmers, households, schools...);
- Creation of 6 fulltime well paid jobs for O&M activities in addition to revenues allocated to the rice terraces conservation fund.

OPERATORS Special Management Unit formed with the help of GSEP (TEPCO) within the Provincial Government of Ifugao. GSEP contribution includes organization structuring and training of operators; Human capacity building (HCB).

FINANCE

- Total Cost: USD 1,638,000
 - Development (in-kind): USD 388,000;
 - Construction: USD 1,250,000.
- PPA between plant owner (Unit of the Provincial Government) and Ifugao Electric Cooperative. Attractive kWh price lower than national grid tariff and tax exempt. Revenues are sufficient to cover complete O&M and Revolving Fund;
- Earnings are used to create a Revolving (Conservation) Fund of approx. USD 70,000/year;
- IRR forecasted at: 8.85%. Could not justify the CDM registration (high development cost vs. CO2 credits).

ENVIRONMENT

- Detailed environmental impact assessment (EIA) and environmental management plan (EMP);
- Project siting outside the UNESCO World Heritage Rice Terraces;
- Improvement of Rice Terraces Irrigation system;
- Priority given to irrigation (minimum flow) including plant shut down during low flow season.

**HUMAN
CAPACITY
BUILDING &
TRAINING**

- Sustained assistance for the development of the Provincial Management Unit responsible for power plant O&M, Rice Terraces Conservation Fund Management and investigation of future renewable energy (hydropower) sites.
- Pre-selection of personnel and full training of 6 hydropower plant operators and maintenance staff.
- Two years monitoring and assistance after the plant start-up to ensure long term operating and management skills transfer.

**DEVELOPMENT
OUTCOMES**

- Protection of the Ifuago Rice Terraces;
- Sustainable electricity production;
- Reduced electricity tariffs;
- Public-private partnership experience;
- Viability of the company and the conservation fund;
- Job creation.

SUSTAINABILITY

Revenues from electricity sales are sufficient to ensure sustainability of operation and maintenance and capital repayment with small return (however in this case, this part of the revenues is accrued against the Conservation Fund).

Sufficient spare parts and replacements are considered and or local spare part distributors/vendors are available.

Relatively conventional technology and complete training of the plant staff both in operation and maintenance activities evidenced by a two year monitoring after start-up.

- Number of household connections n.a.
- Total wattage provided by electrification Installed Capacity: 200 kW
Annual Energy Generation:1,443MWh
- GHG emission reduced/avoided Approx. 630 tons of CO2/year.
- Number of public buildings connected n.a.
- Energy efficiency Conventional power with RE
- Total person days provided in Capital Project 12,000 person days
- Total capital invested (G-SEP) 1M USD
- Number of O&M training days provided 90 days
- Computers provided n.a.
- Internet connection provided n.a.
- Telecommunication connections provided n.a.
- Projected Indirect Sustainability Impacts (qualitative description)
 - Facilitated health care
 - Facilitated education: Joint activities with local colleges
 - Facilitated water access/irrigation: Distribute water from headrace to rice paddy
 - Facilitated local entrepreneurial activity: Establish a local IPP
 - Other impacts: Preserve the UNESCO World Heritage rice terraces

REPLICATION

The Philippines Department of Energy (DOE) has established a structured policy framework, including tariff structure to promote renewable energy and was highly supportive of the project team led by TEPCO.

Inventory of potential renewable energy sources have been conducted by DOE.

Availability of small/medium (low overhead) contractors with sufficient construction

supervision skills.

Availability of local technical skills though can require tailored human capacity building for specific technology/technical know-how transfer.

KEY SUCCESS FACTORS

- Support from local and national authorities;
- Public awareness campaign / public hearing;
- Creation of an effective structure of governance;
- Production of prefeasibility and environmental studies.
- Renewable Energy Incentives including tax exemptions.

STATUS

Commissioned in January 2010. Assets transferred to Ifugao Provincial Government Management Unit in 2011.

First operating period (2 years): operating performance has reached 88% of the Feasibility forecast, which is excellent considering the severe drought season of 2010.

LESSONS LEARNED

- Cooperation of National and Provincial Governments was key to the successful acceptance of the project in the early stages. Experience of the Project Leader in the region also facilitated the relationship with the different stakeholders. Philippines Department of Energy (DOE) was a major catalyst in promoting the project
- Ifugao Provincial Government (PGI) took part in the project from the FS stage, and the cooperation of such local partner was absolutely essential to the project's success. It was agreed that TEPCO and DOE would not be directly involved in addressing equipment-related and legal issues arising after the start of operation, but that these would mainly be met by the PGI while fully respecting the expectations of the local residents. This has made it possible to foster an awareness of ownership by the PGI, and this is expected to support future project sustainability.
- Project risks such as cost overruns and other liabilities can be both mitigated by and allocated to the proper parties through a formally signed Memorandum of Agreement (MOA) between the Parties and special provisions included in the local subcontractors' contracts.
- Considering the tight constraints on the cash flow of the local engineering firm, the cost of purchasing materials was paid in advance and prompt payments made on completion of each stage. Thanks to this, the construction work was completed on schedule. This situation is typical of the developing regions.
- At first, the hired operators had no knowledge at all of electrical or mechanical engineering, but they were brought up to speed through training and operational experience. It was difficult to hold training on all conceivable eventualities before the start of operation, and follow-up activity was therefore important after this point (during the monitoring period). Meanwhile, the fact that not a single operator quit in the first two years proves that the working conditions and remuneration are good.
- For ease of installation and maintenance, it was decided that the main equipment (such as the turbine, generator and penstock pipes) should be sourced from Japanese manufacturers, while general purpose items would be supplied in the Philippines. Combined with the use of low-cost local labor, this reduced the project costs. Moreover, consumables needed for operation and maintenance should ideally be procurable locally in future; this should have been considered from the equipment design stage.
- Full-time staff for this project was appointed within the PGI. Procedures for inward and outward payments related to O&M were clearly specified in a manual, leading to correct management. Expenditure related to rice terrace conservation was also included in the manual in line with basic rules for maintaining local fairness set out by the PGI, and this is being properly implemented.

- Because the necessary permits and licenses, including the “power generation business license” (COC: Certificate of Compliance) and power unit charge (Order), were obtained after the start of operation, no income from electricity charges was received for the first 18 months of operation. All permits should have been solidly in place before the start of operation. Operation should never be started on the “expectation” of obtaining licenses.
- This project has created a new and sustainable model for using power sale revenues to support the conservation of rice terraces in a World Heritage site. In response to this project, the Japan International Cooperation Agency (JICA) plans to develop a similar project in Ifugao Province. This could potentially make a huge contribution to the diffusion of renewable energies and the conservation of rice terraces in the Philippines.

