



Clean, Renewable Hydropower
Protects "Stairways to Heaven"



The Philippine Ifugao-Ambangal Mini-hydro Project



What is the e₈?

The e₈ – which comprises ten leading electricity companies from the global electricity sector – promotes sustainable energy development through electricity sector projects and human capacity building activities in developing nations worldwide.

Mission Statement

The mission of the e₈ is to play an active role in global electricity issues within the international framework and to promote sustainable energy development. This diverse international group offers electricity sector skills and practical competencies in electricity generation, transmission and distribution. With international field-proven expertise in the planning, management, design, operation and maintenance of energy facilities, member companies assist and share their know-how in the effective implementation of sustainable energy development with counterparts in developing and emerging countries.

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American Electric Power
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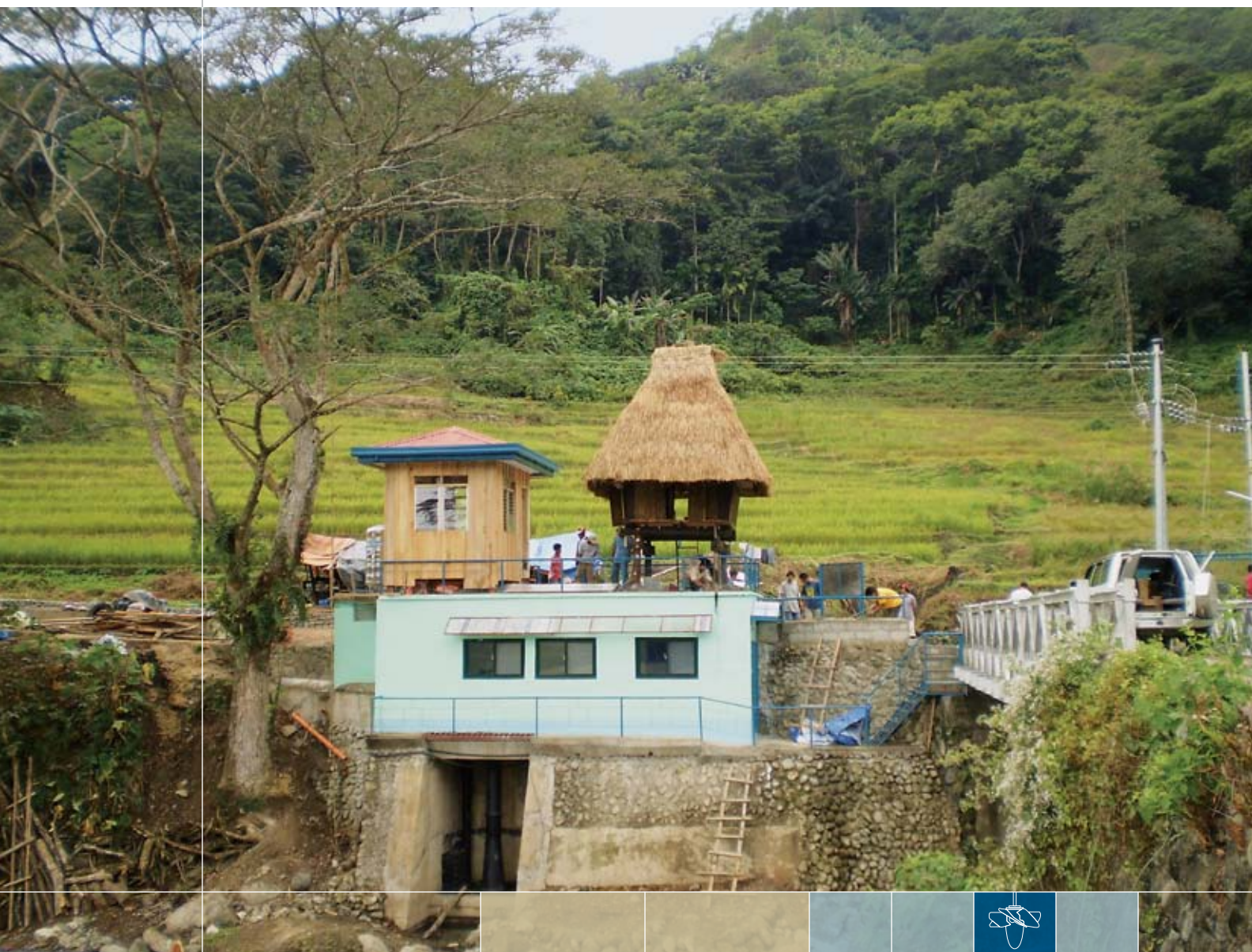
Ontario Power Generation
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Tokyo Electric Power Company, Inc.
Japan

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The Philippine Ifugao-Ambangal Mini-hydro Project



Message from the Chairman of the Tokyo Electric Power Company



It is my utmost pleasure to announce that the construction of the Ifugao-Ambangal Mini-hydro Project, led by the Tokyo Electric Power Company (TEPCO) on behalf of the e_8 , has been successfully completed.

Throughout the phases of the pre-feasibility studies, the feasibility studies and the civil and electrical construction, this project took a total of four years to be realised.

On this occasion, I would truly like to thank the Philippine Department of Energy, the Ifugao Provincial Government, the Municipality of Kiangang, UNESCO, the Ifugao Electric Cooperative, the other e_8 members and all the others involved for their unwavering support during this period.

The e_8 is an organization that was established in 1992 by the major leading electric power companies of the world for the purpose of discussing major energy issues at annual summits and formulating global recommendations based on such discussions.

Furthermore, the e_8 contributes globally via the implementation of a few small-scale but innovative projects aimed at promoting sustainable energy development and usage in developing and emerging countries. The Ifugao-Ambangal Mini-hydro Project has been implemented as one.

Although the project's scale is relatively small, it was not an easy task to construct a hydroelectric power plant in a remote mountainous area, more than 300 km away from Manila. Since the construction site lies along a steep river valley, usage of heavy machinery was limited due to the lack of physical space and transport infrastructure. Hence, most of the civil works were carried out manually.

In addition, securing the understanding and support of the local stakeholders was essential for the success of this kind of project. Therefore, we spent a significant amount of time explaining the details and benefits of the project to the Philippine Department of Energy, the Provincial Government and Council of Ifugao, as well as the local inhabitants.

A major characteristic of the project is the multiple side benefits to be reaped, such as 1) the transfer of mini-hydropower expertise, 2) the renewable energy-based regional vitalization, and 3) the contribution to the preservation of a World Heritage Site. In particular, the prospect of being able to effectively transfer to the local community the e_8 's long-standing know-how and experience of hydropower plant construction and operation was a major determinant in our decision to ultimately undertake the Ifugao-Ambangal Mini-hydro Project.

At the inauguration and turnover ceremony held in Manila, joy and gratitude towards the project, as well as the desire for the conservation of the rice terraces was evident among the attendees, such as the Hon. Angelo T. Reyes, Secretary of the Philippine Department of Energy and the Hon. Teodoro B. Baguilat Jr, Ifugao Provincial Governor. which made the ceremony very memorable and touching.

Although the construction has been completed, we still feel the need to further consolidate the project, including overseeing the future Rice Terraces Conservation Fund management, to ensure its sustainability. Therefore, the e_8 will continue to support this project over a two-year monitoring period.

A handwritten signature in black ink that reads "J. Katsumata". The signature is written in a cursive, flowing style.

Tsunehisa Katsumata
Chairman, Tokyo Electric Power Company

Message from the Secretary of the Philippine Department of Energy



The Philippines is an archipelagic country in Southeast Asia between the Philippine Sea and the South China Sea. The country is mountainous with narrow and yet extensive coastal lowlands. As a tropical archipelago, the Philippines is blessed with a rich lode of renewable energy resources: year-round sunshine, abundant coastal areas teeming with opportunity for wind and ocean energy, and a wealth of agroforestry, riverine and volcanic resources, among others. A rough summation of estimates places the renewable energy potential of the Philippines at an astounding 200,000 megawatts of electricity.

While the country minimally emits greenhouse gases, its location and logistical composition has made it extremely vulnerable to climate change phenomena. Climate change resiliency is an imperative that the Philippines should heed, through, among other means, the utilization of renewable energy. The 200 kW Ifugao-Ambangal Mini-hydro Project is one such avenue.

Our heartfelt gratitude is therefore extended to the e_g, through the Tokyo Electric Power Company (TEPCO), for persevering and pursuing the 200 kW Ifugao-Ambangal Mini-hydro Project in Kiangang, Ifugao. Your commitment to empower the province will have a profound impact both in uplifting the quality of life of the project's beneficiaries and in rehabilitating the Ifugao rice terraces.

Kiangang, Ifugao, is home to the country's treasured Ifugao rice terraces. Although they have been revered throughout and become a top tourist destination, their very existence is threatened because of human activities such as deforestation and climate change. As a World Heritage Site, their conservation is one of the project's main objectives. The rice terraces' history and its safeguarding, through our monuments, are paramount because this will allow us to look back on who we are and how we will be able to map out our future. The 200 kW Ifugao-Ambangal Mini-hydro Project will also provide a model of local sustainable energy-based development and regional vitalization, and promote the development of sustainable mini-hydro-power resources in the rural areas of the region and the Philippines.

The Department of Energy Barangay Electrification Program is a plan surely filled with different challenges as each has its own unique issues and concerns. The electrification project in Kiangang, Ifugao, is a distinctive challenge because we deal with the area's history and. The conscious effort of placing emphasis on the environmental needs was never lost in the Philippine Department of Energy (DOE). It is an ardent wish of the DOE to deliver timely government services while protecting our environment. The start-up cost of renewable energy may be steeper than conventional ones; we are consequently thankful that the e_g and TEPCO have extended a helping hand to realize our mission of utilizing renewable energy applications in our country. Our experiences with barangay electrification tell us that a well budgeted project such as this will result in efficient delivery of electricity to our local population.

I would like to congratulate the e_g for a job well done. Now, we have to sustain the momentum; with our foreign partners by our side, we will generate tangible benefits. Again, thank you e_g!

Mabuhay and more power!

A handwritten signature in black ink, appearing to read 'Angelo T. Reyes'. The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Angelo T. Reyes
Secretary, Republic of the Philippines,
department of Energy

Message from the Ifugao Provincial Governor



My sincerest appreciation to all members of the e_g who found it in their hearts to support the province of Ifugao for its sustainable development and to conserve the Ifugao rice terraces and cultural heritage through the construction of the Ifugao-Ambangal Mini-hydro Power Plant.

May this project inspire all stakeholders to continue pursuing the goals of mainstreaming indigenous knowledge, skills and practices, improving and sustaining quality of life of the Ifugao communities, rehabilitating and protecting critical watersheds, ecosystems and biodiversity, supporting and advocating efforts for good governance, and putting efforts on resource mobilization, movement and partnership building.

I feel grateful that such a project was brought to Ifugao, creating within the province its own source of green energy. I do believe that the success of the project lies in the strong local community stakeholder involvement at each phase of its development. Kudos to the project coordinators who made its implementation and monitoring a collaborative effort among the members, communities and local government units, thus making governance truly participatory.

Haggiyo e_g !

Haggiyo Ifugao!

A handwritten signature in black ink, consisting of several loops and a long horizontal stroke extending to the left.

Teodoro B. Baguilat Jr.
Provincial Governor

Message from the Secretary-General of the UNESCO National Commission of the Philippines



The UNESCO National Commission of the Philippines (NatCom) welcomes the completion of the Ifugao-Ambangal Mini-hydro Power Plant initiated by the e₈ through the Tokyo Electric Power Company (TEPCO).

This mini-hydropower development project is the result of more than six years of consultations and collaboration. We thank the e₈ and TEPCO for continually conferring with us, bearing in mind the guidelines of the Convention concerning the Protection of the World Cultural and Natural Heritage, otherwise known as the World Heritage Convention.

The principles of the World Heritage Convention are paramount in this project, as the Ifugao-Ambangal Mini-hydro Power Plant is located in the rice terraces of the Philippine Cordilleras inscribed in 1995 on the World Heritage List. The international community recognized the rice terraces located in four municipalities of the province of Ifugao for its "living cultural landscape of unparalleled beauty." In 2001, however, the site was inscribed, and is still presently inscribed, on the List of World Heritage in Danger considering the deterioration of the rice terraces brought about by social and economic changes. The inclusion of the site in the endangered list is seen as an essential tool for mobilizing effective, decisive and rapid intervention for addressing the threats facing the rice terraces.

With the objective of securing funds for the conservation of the rice terraces, the construction of the Ifugao-Ambangal Mini-hydro Power Plant is therefore laudable. It is hoped to be a model for a locally sustainable and renewable energy-based rural development undertaking. Likewise, it is hoped that the revenue that will be generated from the project's power sales will significantly contribute to realizing the conservation measures identified in the Ten-Year Rice Terraces Master Plan.

The UNESCO NatCom congratulates the e₈ and TEPCO for this initiative, and we look forward to the long-term contribution of the project in the conservation of the rice terraces of the Philippine Cordilleras not only for the people of Ifugao but for all of humanity.

A handwritten signature in black ink, appearing to read 'P. Soliven', written in a cursive style.

Preciosa S. Soliven
Secretary-General, UNESCO National Commission of the Philippines

In 1995, UNESCO registered the Ifugao Rice Terraces of the Philippine Cordilleras as a World Heritage Site. The World Heritage Committee described the rice terraces as “outstanding examples of living cultural landscapes. They illustrate the traditional techniques and a remarkable harmony between humankind and the natural environment.”

Deforestation, modernisation and climate change, however, threaten to destroy the rice terraces. Hence, in 2001, confronted with the deterioration of the rice terraces and citing deficiencies in conservation planning for the rice terraces, UNESCO placed them on the List of World Heritage in Danger.

In keeping with its mission to address electricity issues and promote sustainable development, the e₈ proposed to the Philippine authorities the development of a 200 kW run-of-river hydropower project that would generate sustainable revenues allocated to the conservation of the rice terraces. The Republic of the Philippines is blessed with abundant hydropower resources that can help address climate change, while providing a model of local sustainable energy-based development, regional vitalization and heritage conservation.

After several years of pre-feasibility, feasibility and environmental studies, including extensive public consultations, and a 10-month construction period, the mini-hydropower plant on the Ambangal river was inaugurated on January 25, 2010.

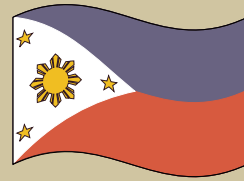
This is the story of how ancient engineering met modern technology, and how the power of water contributed to the restoration and protection of the Philippine “stairways to heaven”.

The Ifugao rice terraces are beautiful ancient structures invested with historic and cultural significance. They are also the major source of livelihood for local residents. They must be restored and protected not only for the Ifugao and Philippine people but for all of humanity. The realisation of the e₈ Ifugao-Ambangal Mini-hydro Project is an important step towards the successful protection of one of the world’s most important cultural treasures by providing clean renewable electricity to the region, regular revenues for the newly created Rice Terraces Conservation Fund and a powerful signal to the people of Ifugao that the terraces are worth preserving for today and tomorrow.

The Rice Terraces of the Philippine Cordilleras



Introducing the Philippines and the province of Ifugao



The Southeast Asian archipelago that makes up the Philippine Islands is the second largest in the world, with over 7,000 tropical islands. With a population estimated at 92 million people in 2009, the Philippines is the world's 12th most populous country.

Located approximately 350 km north of the Philippines's capital of Manila, the province of Ifugao is one of the six provinces of the Cordillera Administrative Region (CAR), one of the eight regions of the Luzon Island, the Philippines's only land-locked region and the largest range in the country.

The region includes the world-famous Banaue rice terraces, ancient sprawling man-made structures from 2,000 to 6,000 years old, that are registered as a UNESCO World Heritage Site.

Ifugao's territory covers an area of 2,628.2 km² with a population 180,700 (2007). The municipal capital of the province, Lagawe, is home to approximately 17,400 citizens.



Location of the municipality of Kiangon, province of Ifugao, Philippines

THE RICE TERRACES

The world-renowned rice terraces of the Philippine Cordilleras are located in the northern part of Luzon Island, in the interior province of Ifugao. Characterised by rugged terrain, river valleys and massive forests, the province of Ifugao is divided into 11 municipalities.

Extensive mountain ranges dominate the region's landscape, with peaks rising as high as 2,500 metres. Above the rice terraces stand lush forests, from which numerous rivers and waterfalls drain into the lowland valleys. The province's mountainous location and its forest cover account for its temperate and rainy climate. The region receives about 4,000 mm precipitation annually.

The steep slopes are home to both the villages and the rice terraces. One of the country's poorest regions, Ifugao is dependent on agriculture, particularly the cultivation of rice. Ifugao farmers continue to use traditional farming practices, not only for cultivating rice in the terraced paddies but also for growing fruit trees and other vegetables. In some cases, vegetables such as cabbages and sweet potatoes are grown in the paddies after the rice is harvested. To this day, cultivation and land preparation are mainly manual.

The extensive rice terraces are located about 1,500 metres above sea level and cover 10,360 square kilometres of mountainside. They were carved by hard labour into the mountains by the Ifugao people more than 2,000 years ago. An engineering masterpiece, it is said that if the steps were put end to end, they would encircle half the globe. There are rice terraces in other regions of Asia; however, the Philippine rice terraces stand out for their altitude and steep slopes of up to 70 degrees.

In addition to the steps, the Ifugao developed a complex system of small dams, sluices, channels and bamboo pipes that serve as an irrigation system bringing water from the rainforests above the terraces to the crops.

A source of life, culture and art, the rice terraces have shaped and sustained the lives of local residents for generations and continue to do so today. Although rice and vegetables are still grown on the terraces, the younger generation is gradually abandoning farming for the thriving and more lucrative hospitality industry. This is a pressing concern, as about half of the population is under the age of 21.



Walking the stone walls of the terraces



Harvesting, the livelihood of the Ifugao people



The rice terraces of Ifugao

WORLD HERITAGE

In 1995, recognising the rice terraces as a unique cultural landscape, UNESCO declared them a World Heritage Site.

World Heritage (1995)

The Ifugao Rice Terraces epitomize the absolute blending of the physical, socio-cultural, economic, religious, and political environment. Indeed, it is a living cultural landscape of unparalleled beauty.

UNESCO noted that not only are the terraces “a landscape of great beauty”, but that they represent “the fruit of knowledge handed down from one generation to the next, and the expression of sacred traditions and a delicate social balance.” In short, “the Ifugao Rice Terraces are the priceless contribution of Philippine ancestors to humanity.”

The rice terraces are the only organic and evolving cultural landscape to be considered a world heritage.

In recent years, the majestic rice terraces have started to show their age. Deforestation, modernisation and migration have taken a toll on the terraces. The impacts of climate change also threaten the structures. About 30% of the terraces have been abandoned and the irrigation system is neglected. UNESCO has expressed concern that the site’s value might be lost within a mere 10 years unless current trends are reversed.

Hence, in 2001, considering the deterioration of the terraces, emerging threats and conservation challenges, the World Heritage Committee decided to place the rice terraces on UNESCO’s list of World Heritage Sites in Danger.

In Danger (2001)

“The Rice Terraces of the Philippine Cordilleras in the Philippines is a delicate, evolving cultural landscape. In the absence of a systematic monitoring programme or a comprehensive management plan, it is, at present, impossible to guarantee the preservation and sustainable development of these rice terraces. The Philippine authorities saw the Danger listing as an essential tool for mobilizing effective, decisive and rapid intervention for addressing the threats facing the site.”

AN ENDANGERED WORLD HERITAGE

Threatened by the lack of maintenance and a certain disinterest of the younger Ifugao population –a sign of social changes– the rice terraces are at the heart of a millennium cultural tradition in the Ifugao landscape, a national landmark of the Philippine Cordilleras, and a world heritage for humanity, as it stands today.

In the last decades, a rapid deterioration of the terraces has been observed and the following causes have been identified:

- Loss of biodiversity;
- Reduced farm labour due to increased out-migration of farm labour force;
- Erosion and siltation due to destruction of watershed;
- Loss of interest of the Ifugao population due to erosion of indigenous knowledge systems and values, and increase of terraces maintenance costs;
- Land use conversion and abandonment of rice terraces due to damaged terraces, insufficient irrigation water supply, limited rice farming income, shift in values and priorities of people, unregulated land use and physical planning.

Motivated by a Philippine Government decree and the Ifugao Provincial Government's determination, a task force was formed by the provincial authorities to develop the Ifugao Rice Terraces Master Plan. Structuring the conservation efforts into a 10-year programme, the plan focuses on the means and actions required to restore the terraces, including a detailed budgetary estimate for their implementation.

This Master Plan was a strong motivating instrument for the development of revenue generating projects such as the Ifugao Ambangal Mini-hydro Project, and it inspired the creation of the Rice Terraces Conservation Fund.



A man-made scenery of water planes, a fragile balance between natural elements



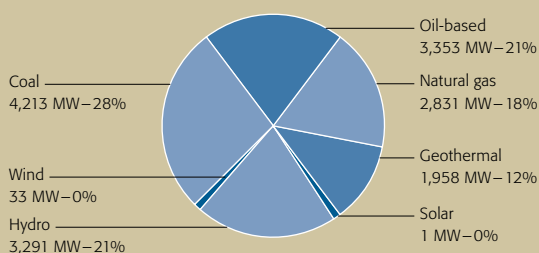
The deterioration of the rice terrace walls has a cascading effect.

Philippines's Power Sector

Although a major part of the electricity produced in the Philippines comes from fossil fuels such as gas and coal, the country also generates a significant percentage of its electricity from renewable energy sources such as hydropower and geothermal energy. In fact, the Republic of the Philippines is one of the world's largest producers of geothermal energy. To date, the country's total estimated potential of untapped geothermal resource is about 2,600 MW.

As of 2008, the Philippines's installed hydropower capacity was approximately 3,290 MW, representing 21% of the total installed generating capacity of the country. The country's vast hydropower potential (more than 13,000 MW) has not been significantly tapped during the last two decades. More recently, however, the Philippine Government has expressed its support for the development of indigenous and alternative energy sources such as hydropower, and some new projects are currently being developed, particularly small-scale hydropower facilities.

Philippines Installed Capacity – 2008



Sual 1,200 MW coal-fired power plant

ENERGY POLICY AND RENEWABLE ENERGY¹

The harnessing and utilisation of renewable energy (RE) comprises a critical component of the government’s strategy to provide energy supply for the country. This is evident in the power sector where increased generation from geothermal and hydro resources has lessened the country’s dependency on imported and polluting fuels. In the government’s rural electrification efforts, on the other hand, renewable energy sources such as solar, micro-hydro, wind and biomass resources are seeing wide-scale use.

It is the government’s policy to facilitate the energy sector’s transition to a sustainable system, with RE as an increasingly prominent, viable and competitive fuel option. The shift from fossil fuel sources to renewable forms of energy is a key strategy in ensuring the success of this transition. Moreover, current initiatives in the pursuit of this policy are directed towards creating a market-based environment that is conducive to private sector investment and participation, and encourages technology transfer and research and development. Thus, current fiscal incentives provide for a preferential bias to RE technologies and projects which are environmentally sound.

GOING FOR CLEAN AND GREEN ENERGY¹

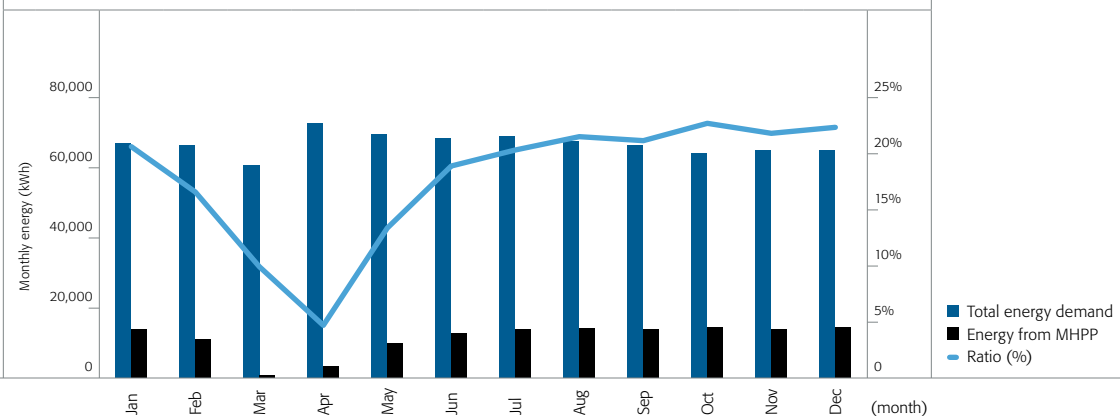
As part of the highlights of the 2009–2030 Philippine Energy Plan, the Philippine Government stated the following on renewable energy:

Renewable energy development was given a tremendous boost with the passage of the Renewable Energy Act of 2008. Since its signing, a total of 206 contracts have been signed, and counting. The target is to double the RE-based installed capacity for power generation at the end of the planning horizon, from its 2008 level of 5,300 MW.

Mechanisms to promote this plan includes Feed-in Tariff (FIT), Renewable Portfolio Standard (RPS) and Net Metering. FIT refers to the RE policy that offers guaranteed payments on a fixed rate per kWh for RE generation, excluding any generation for own use; RPS is market-based policy that requires electricity suppliers to source an agreed portion of their energy supply from eligible RE resources; Net Metering refers to a system in which a distribution grid user has a two-way connection to the grid, is only charged for his net electricity consumption and credited for any overall contribution to the grid.

1. Source: Philippines Department Of Energy Website.

Contribution of the Ifugao-Ambangal Mini-hydro Power Plant to Ifugao’s Energy Demand



Among the plans and programs which will be done in collaboration with the Philippine Department of Energy's state university-based Renewable Energy Centres and other local research institutions is the updating of the DOE's existing RE database as well as the continuing conduct of promotional activities on renewable energy.

ELECTRICITY DEMAND IN THE IFUGAO REGION

The electricity in the province of Ifugao is supplied by Ifugao Electricity Corporative (IFELCO). IFELCO owns the distribution grid and has no power-generating facilities. The electricity delivered to its customers comes from the National Power Corporation (NPC) through the National Transmission Company (TransCo).

IFELCO's supply and demand of power for the study reference years of 2005 to 2007 was used to derive the tariff for energy sales from the Ifugao-Ambangal Power Plant.

The electricity demand and energy for the past three years in IFELCO's franchise area are as shown in the following tables and figures, and, although the peak demand has not changed, the energy has increased 6% year-on-year.

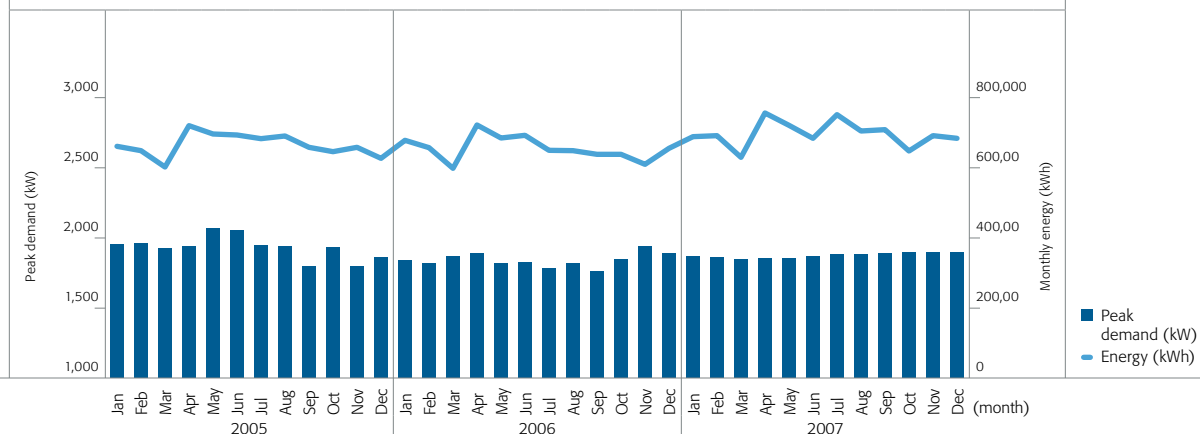
Over a one-year period, the monthly electricity production contributed by the Ifugao-Ambangal Mini-hydro Power Plant will average approximately 18% of the present energy demand in Ifugao. However, this percentage falls to 5% or less during the dry season.

TARIFFS

The electricity tariffs in the Philippines are regulated by the Energy Regulatory Commission (ERC), an independent, quasi-judicial body of the Philippine Department of Energy (DOE).

Utilities that distribute electricity, such as IFELCO, are allowed just and reasonable recovery of costs and a reasonable return on rate base (RORB) to enable it to operate viably. The RORB methodology adopted and applied ensures a reasonable electricity price. Meanwhile, distribution utilities provide different tariff rates for their customers (i.e.: residential, public buildings, streetlights, commercial and industrial).

Electricity Demand and Energy in Ifugao



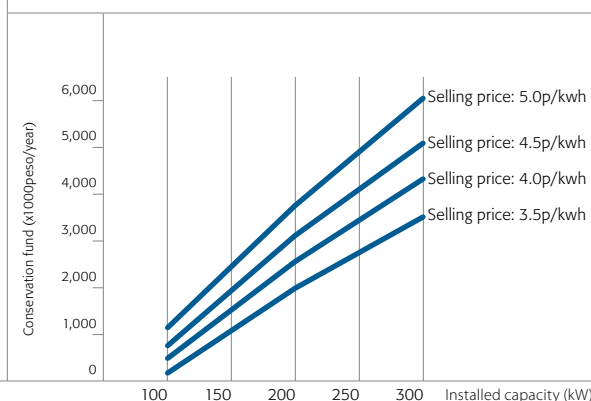
Meetings and discussions with the e₈ study team and representatives of the Ifugao Provincial Government in the course of completing the feasibility study phase of the Ifugao-Ambangal Mini-hydro Project have demonstrated IFELCO's willingness to purchase the power generated from the power plant. As a result, the IFELCO Board of Directors, during its meeting in January 2008, came up with a resolution authorizing its general manager to negotiate and enter into an agreement with the Ifugao Provincial Government.

ENERGY SALES

An Energy Sales Agreement was finalized between the Ifugao Provincial Government and IFELCO. No taxes or transmission charges will be added to the electricity rate of the Ifugao-Ambangal Mini-hydro Power Plant because it utilizes renewable energy sources. The contract stipulates that regular meetings shall be held between the Ifugao Provincial Government and IFELCO to ensure that agreements and arrangements proceed on a basis that is mutually satisfactory to both parties.

The proposed arrangements with IFELCO are beneficial due to lower rates of the Ifugao-Ambangal Mini-hydro Project (zero VAT and zero transmission charges) and allow IFELCO to supply electricity to the municipality of Kiangan during interruption on the TransCo grid. The premise of the proposed sales agreement is that nearly 3 million pesos per year can be raised to support the Rice Terraces Conservation Fund, and IFELCO will also be able to save a certain amount of annual energy purchase cost.

Relation between Installed Capacity for Development and Rice Terraces Conservation Fund to be Generated





The e₈ Philippine Ifugao-Ambangal Mini-hydro Project



Concept and Objectives

The Ifugao rice terraces of the Philippine Cordilleras are recognised by the international community for “its living cultural landscape of unparalleled beauty”, and a UNESCO World Heritage Site. Social and economic changes, as well as human activities such as deforestation, and global warming have however threaten its sustainability. The proposed Ifugao-Ambangal Mini-hydro Project aims to maintain and improve the lives of households engaged in terrace farming in the province of Ifugao, thus contributing to the functional conservation of the Ifugao rice terraces.



Ambangal brook



Traditional Ifugao house

INCEPTION

In 2006, with the objective of improving the quality of life of local farmers and contributing to the rehabilitation of the rice terraces, the e₈ undertook the development of a run-of-river mini-hydro project on the Ambangal river in Ifugao. The creation of a rice terraces conservation fund to be financed by the revenues generated from the project's power sales was an integral part of the project from its inception.

In collaboration with the Philippine Department of Energy and the Ifugao Provincial Government, the Ifugao-Ambangal Mini-hydro Project was realised on behalf of the e₈ by one of its members, the Tokyo Electric Power Company.

The \$1 million USD project, entirely funded by the e₈, is expected to generate 1,450 MWh annually, which corresponds to 18% of the province's total electricity demand.

In keeping with UNESCO's recommendation, the facility will contribute to financing local terraces conservation activities while enhancing local capacity in renewable energy. The project is expected to improve the lives of the terrace rice farmers, and thereby contribute to the conservation of this World Heritage Site.

A key component of the project is the creation of a management unit that will ensure the operation and maintenance of the power facility, as well as the management of the rice terraces conservation fund.

The project is located in the municipality of Kiangan, in the province of Ifugao, about 9 hours by car from the Philippine capital of Manila. Kiangan is home to the Nagakadan rice terraces, one of the rice terraces registered as a UNESCO World Heritage Site, but outside of the World Heritage Site area that it is designed to preserve.

e₈ IFUGAO-AMBANGAL MINI-HYDRO PROJECT GOALS

- SUPPORT local activities to conserve the rice terraces on the UNESCO World Heritage List;
- PROVIDE a good example of locally-based energy development and regional vitalisation (as a "showcase");
- PROMOTE the development of sustainable mini-hydropower resources by:
 - Empowering local communities to manage the hydropower plant as a local economic enterprise strengthened through good governance;
 - Transferring technical expertise in the construction and operation of hydropower facilities.

PRE-FEASIBILITY STUDIES' MAIN CONCLUSIONS

TEPCO conducted the feasibility study in cooperation with the Philippine DOE, the Ifugao Provincial Government and e_g partners.

The primary findings of the study are as follows:

- The Study Team held many consultations with local residents for the proper understanding of the project.
- The population of the province of Ifugao, including the local government, strongly wishes the project to be implemented.
- The Ifugao Provincial Council for Cultural Heritage resolved to welcome the project.
- The Philippine DOE supports the project.
- Based on the measurement of river flow for 20 months, the maximum output (200 kW) is expected to be obtained for 281 days per year.
- The annual electricity generation is evaluated to be approximately 1,443 MWh.
- The Ifugao Provincial Governor established a Technical Working Group (TWG) in the province, aiming at proper plant operation and effective fund management.
- The TWG formulated the guidelines and rules for proper management.
- The guidelines and rules will be authorized by the Ifugao Provincial Council once the e_g approves the project.
- The electricity generated will be sold to the Ifugao Electric Cooperative (IFELCO). IFELCO intends to buy the electricity from the project and is negotiating the selling price with TWG.
- The Energy Regulatory Commission (ERC) will authorize the price after approval is obtained from the e_g .
- Based on the provisional agreed price, it is estimated that about three million pesos (\$65,000 USD) per year can be secured for the Rice Terraces Conservation Fund;
- The Ifugao Provincial Government will establish a Local Economic Enterprise Unit (LEEU) and the LEEU will manage the power plant and the conservation fund.
- Based on a comprehensive Environmental Impact Assessment (EIA) of the project, the Study Team and members of UNESCO confirmed that it would be possible to prevent or mitigate any negative impact on wildlife, tourism, as well as any related social impacts.
- The pre-feasibility studies confirmed that the project is financially, technically and environmentally feasible.



Feasibility studies



Memorandum of Agreement signing ceremony in Manila, Philippines

HYDROPOWER POTENTIAL IN THE PROVINCE OF IFUGAO

The province of Ifugao has significant untapped small-scale hydropower potential. During a study done in October 2003 by the Japan International Cooperation Agency (JICA), a survey of the villages without any source of power was conducted in the northern part of Luzon to identify potential sites for mini-hydropower development; a preliminary design of 20 sites was performed.

The study included a reappraisal of a Philippine Department of Energy list of 38 sites in the province of Ifugao, of which 9 sites had potential mini-hydropower capacity totalling 45 MW. In addition, a 2004 study by the Japan Bank for International Cooperation (JBIC), "JBIC Pilot Study on Rural Revitalization – Project for the Conservation of the Ifugao Rice Terraces," identified 51 potential sites for a mini-hydro project, with a total capacity of 110 MW.

As a result of these studies and other hydro development studies conducted in Asia, particularly the Philippines by TEPCO and its engineering subsidiary, TEPCO, it became evident that development of the abundant water resources must be linked to regional economic vitalization and to conservation projects. Because TEPCO's proposal to develop the Ifugao-Ambangal Mini-hydro Project and similar projects in the Philippines did not receive funding from Japanese development agencies, TEPCO proposed going ahead with a pilot project under the banner of the e₈.

The e₈ recognised this unique opportunity to develop the rich water resources of the province of Ifugao, a project that would provide much needed electricity to the region while contributing to the protection of a World Heritage site.



From water to power: Ambangal brook



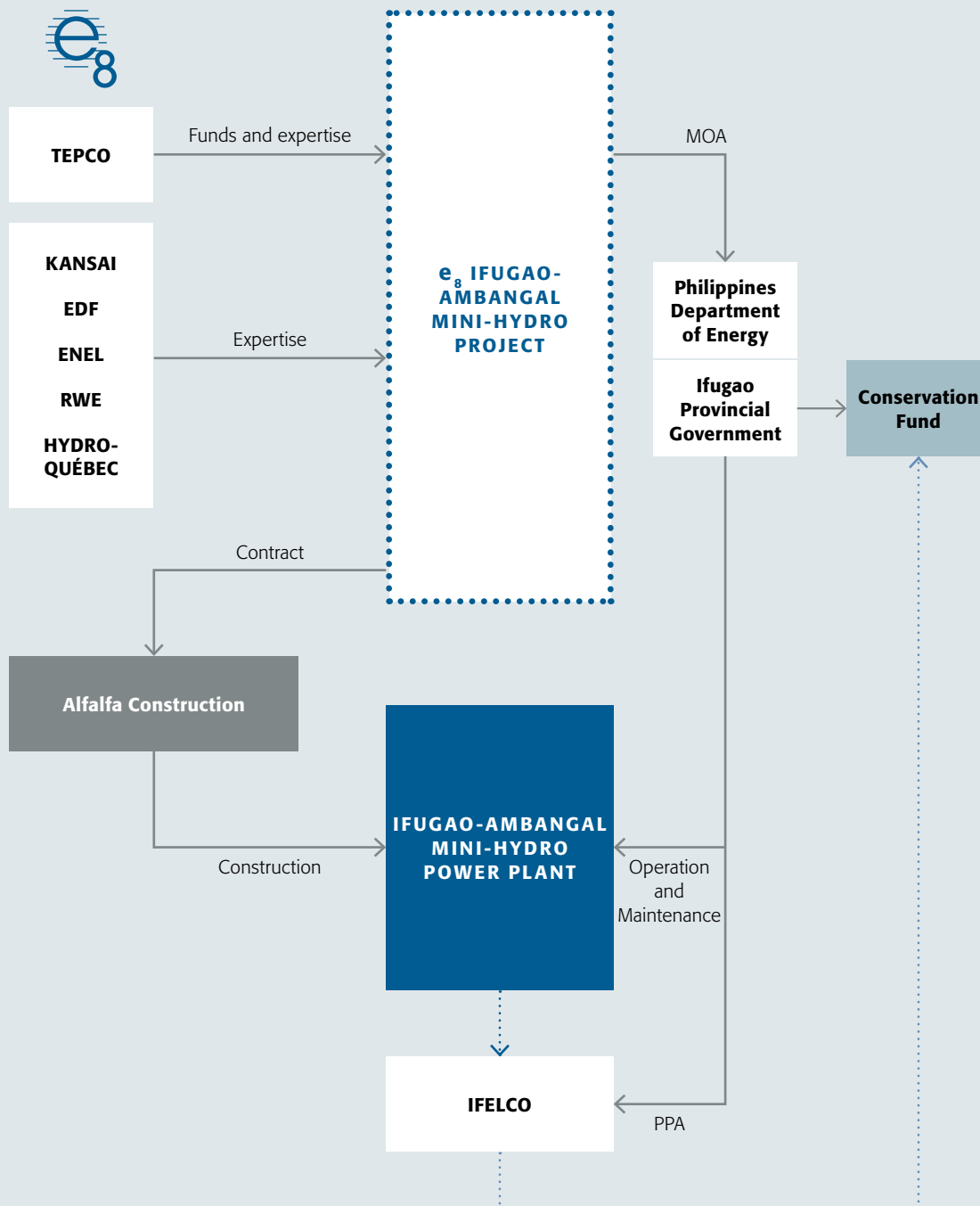
Ambangal 200kW hydro-generating unit

e₈ PARTNERS AND STAKEHOLDERS

The whole project is funded by the e₈, with the main contribution provided by TEPCO. Other e₈ participating members are KANSAI Electric Power Company, Électricité de France, ENEL S.p.A., RWE AG and Hydro-Québec.

For this project, the e₈ could count on the strong and dedicated support of the Philippine DOE leaders and staff, the Ifugao Provincial Governor and the sustained involvement of the Ifugao Provincial Government staff and local authorities and officials.

THE IFUGAO-AMBANGAL MINI-HYDRO PROJECT STRUCTURE



Project Management

The e₈ Ifugao-Ambangal Mini-hydro Project was designed and implemented by e₈ member Tokyo Electric Power Company (TEPCO). Under TEPCO's leadership, a team of international experts in project management, engineering, environmental and social development with in-depth knowledge of the Philippines's natural, social and cultural environment was formed at a very early stage of the pre-feasibility studies.

In order to achieve a close and sustained collaboration with the Philippines's energy sector and Ifugao regional authorities, the e₈ team worked hand in hand with their counterparts at the Philippine Department of Energy and the Ifugao Provincial Government to establish the best approach to the development of the project, and to define the most suitable project structure for the purpose of using the funds generated for the rice terraces conservation.



Technical Working Group meeting: a first step in the exchange of know-how

OVERALL OF MANAGEMENT SYSTEM

A Steering Committee has been formed to assume the responsibility for the overall management of the Ifugao-Ambangal Mini-hydro Project.

The Committee is composed of the Ifugao Provincial Governor and eight other members. It has its own secretariat and hires an external auditor to ensure that the Ifugao-Ambangal Mini-hydro Project is properly handling its personnel, management and financial activities.

Under the Steering Committee, a Monitoring Group is assigned to monitor the overall management of the Ifugao-Ambangal Mini-hydro Project, and regularly reports to the Ifugao Provincial Governor who is the head supervisor of the project. The Monitoring Group is composed of representatives from the provincial and local stakeholders, and the plant supervisor of the Ifugao-Ambangal Mini-hydro Power Plant.

The Local Economic Enterprise Unit (LEEU) is established by the Ifugao Provincial Government, through the Governor's Office, to manage both the operation and the maintenance of the power plant and the proper use of the conservation funds. The LEEU is composed of a "Technical Section", a "Support Service Section", and a "Fund Management Section", according to each of its functions. The Support Service Section and the Fund Management Section utilise the original staff of the existing provincial entities, such as the Ifugao Cultural Heritage Office (ICHO).

This structure has been designed by the e_8 project team and the local authorities with the objective of achieving the most transparent management of plant revenues and conservation funds.

FINANCIAL SCHEME

The project was entirely funded by e_8 and the financial model is based on a financial contribution of \$1,000,000 USD by the e_8 . As per the Memorandum of Agreement signed between the Philippine Department Of Energy, the Ifugao Provincial Government and the e_8 , the project facilities will be handed over by a deed of donation upon commissioning, first to the DOE for a transition period and then to the Provincial Government of Ifugao who will ultimately have the full ownership of the assets, once the conditions for the transfer defined in the terms of the agreement have been met.

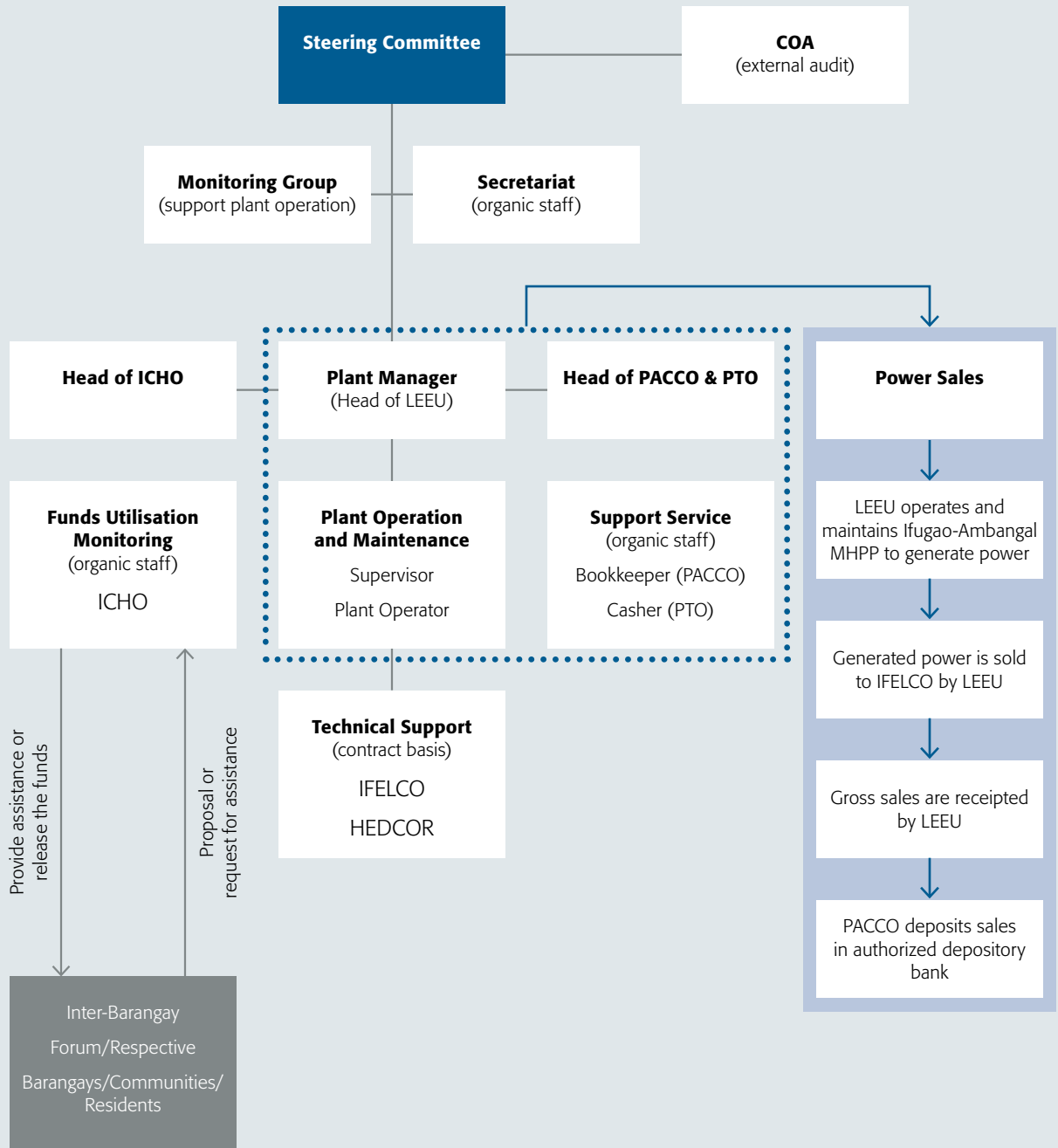


Technical Working Group meeting: defining the project parameters



Ground-breaking ceremony

THE FUTURE IFUGAO-AMBANGAL MINI-HYDRO PROJECT IMPLEMENTING SCHEME AND FUNDS DISBURSEMENT FOR TERRACES CONSERVATION ACTIVITIES



COA Commission of Audit
HEDCOR Hydroelectric Development Corp Inc.

ICHO Ifugao Cultural Heritage Office
IFELCO Ifugao Electric Cooperative
LEEU Local Economic Enterprise Unit

PACCO Provincial Accounting Office
PTO Provincial Treasure Office

ENVIRONMENTAL IMPACT ASSESSMENT

The project, while not within the purview of the Philippine Environmental Impact Assessment System because of its small size, was the object of a comprehensive environmental assessment based on international guidelines established by the World Bank, the Asian Development Bank and the Japan Bank for International Cooperation for large-scale development projects. The E_g, as the funding agency, required an environmental assessment because the project was located within the area of the rice terraces, although outside of the World Heritage Site area.

The comprehensive environmental and social impact assessment under the supervision of Tokyo Electric Power Company lasted one year. It looked at air and water quality, vegetation, wildlife, public acceptability and the social and cultural environment, including living conditions and livelihood, heritage, landscape and indigenous people.

The study concluded that the project would have no or minimal negative impact on air and water quality, vegetation and wildlife, and, if minimal, these impacts could be mitigated. Therefore, an Environmental Management Plan was put in place to manage the impacts during both the construction and operation phases. Moreover, no site of cultural, historic or religious significance would be negatively impacted. The project was developed in harmony with the natural elements and surrounding environment. In addition, because the project is a concrete example of the use of hydropower for development, it resonates with ancestral Ifugao practices that revere water as a primary life force: water is a natural resource harnessed by the Ifugao people for agriculture, but also a tool to help build terraces and dams, and to move large rocks.

According to Manual Dulawan, historian and noted authority on Ifugao culture, local residents welcome sustainable development opportunities such as the Ifugao-Ambangal Mini-hydro Project and look forward to its contribution to the local economy. Moreover, following an assessment of the site location, Mr Dulawan noted that “the whole project will not negatively impact local beliefs, customs or rituals.”

“At the start when you were coming to consult with us, we were doubtful and suspicious. We were concerned because part of our forest and rice land will be affected. But after the series of meetings and contacts, I began to change my mind, especially when I saw how the team was seriously working even during bad weather. This was also observed by our neighbours. We gave our consent even if we were not 100 percent sure. But it was a good decision and I was happy when the project started construction and the lands affected were compensated. During the inauguration, there were many people who attended. I am convinced that the project, as you have been saying during the many community meetings, is for the benefit of the community.”

Eliza Guimbugan, resident of Pindongan, Kiangan.

The involvement of local community stakeholders during the pre-feasibility and feasibility phases was key to the success of the project. Several community consultations and outreach activities were held in the three villages (barangays) concerned: Ambabag, Pindongan and Mungayang. During these consultations, three issues became apparent: 1) What would be the impact of this project on the lives of local communities? 2) Would they benefit from this project? 3) Would the project have an impact on the availability of water for irrigation?

Following the consultations, public acceptability surveys were also conducted to evaluate awareness of, and support for, the project. The impact of the project on the water available for irrigation was often mentioned; however, once their concerns were alleviated, residents interviewed expressed full support for the project. The survey results reveal that an overwhelming majority of respondents supported the development of the Ifugao-Ambangal Mini-hydro Project.

ENVIRONMENTAL MANAGEMENT

Wildlife disturbance

policy of no poaching/hunting implemented;

Clearing of vegetation

area about 3 km by 1.4 km; 162 trees, four species; trees used in construction; tree inventory conducted and tree planting done;

Multiple water uses

project designed to take into consideration the need for water for irrigation, hence reduced electricity production during dry months;

Employment

creation of 180 jobs during construction period and six permanent jobs for maintenance and operation, contributing to the local economy;

Landscape

designed and developed in harmony with traditional Ifugao structures and using indigenous materials to integrate into landscape;

Cultural heritage

no perceived negative impact on the Ifugao culture;

Generation of funds

dedicated to the rice terraces conservation program for the protection and promotion of the cultural heritage.

The Ifugao-Ambangal Mini-hydro Project will increase the supply of clean, renewable electricity to the region, and through its power sales, bring much needed funds dedicated to the restoration and conservation of the rice terraces. More importantly, the project confers value to the ancient structures and the ancestral practice of terrace rice farming. Hence, the protection and valorisation of an ancient cultural heritage is done in harmony with a way of life and a livelihood.

Project Implementation

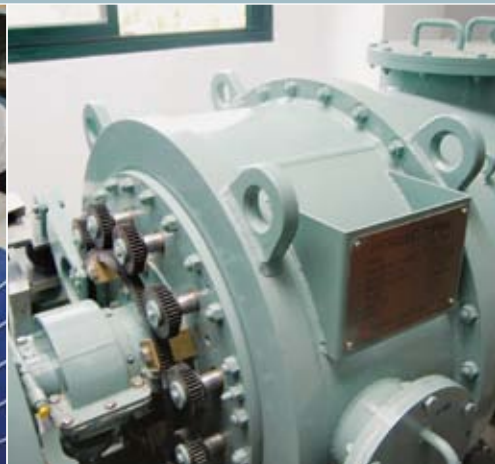
From the launch of the pre-feasibility studies to the commissioning of the power plant, the implementation of the 200 kW Ifugao-Ambangal Mini-hydro Project took almost 42 months (May 2006-December 2009), including an 11-month construction period, from the site mobilisation in January 2009 to the plant start-up in December 2009. The construction of the civil structures was carried out by Alfalfa Construction, a local civil contractor with experience in the rather challenging work conditions of Ifugao. The dedication of the workers, the constant collaboration of the Philippine Department of Energy and Ifugao Provincial Government's staff were key to this successful achievement.



Construction contract signature



Construction team meeting



Hydraulic turbine section

IMPLEMENTATION SCHEDULE

Noteworthy for their careful site selection and equipment sizing, as well as their comprehensive communication outreach and consensus building activities, the pre-feasibility and feasibility studies' stages launched in the spring of 2006 were concluded in May 2008. The authorisation to initiate the detailed design and construction phase was given by the e₈ Chairmen at the 2008 La Malbaie Summit, held in June. Finalisation of comprehensive design and bidding processes for the selection of the civil contractor and electromechanical equipment supplier were completed between June and November 2008, with the ground-breaking ceremony taking place at the site on December 10, 2008.

Despite the harsh on-site conditions created by the seasonal typhoons that went over the region in the spring of 2009, and the difficulty of the terrain which required that most of the work be carried out manually, the civil construction work, and the equipment installation and testing were successfully completed by December 2009. The official proceedings were conducted in two steps: the handover ceremony was held in Manila on January 22, 2010, and the site inauguration was celebrated next to the newly built powerhouse on January 25, 2010.

PROJECT MILESTONES

Pre-feasibility and feasibility studies including environmental and social impact assessment	From May 2006 to May 2008 Project receives go-ahead at the e ₈ La Malbaie Summit in June 2008
CONSTRUCTION	
Arrival of penstock pipes (PVC) at Manila port (CIF)	April 28, 2009
Completion of installation of penstock pipes (PVC)	September 15, 2009
Arrival of one unit 200 kW mini-hydro generating system at Manila port (CIF)	October 24, 2009
Completion of installation of 200kW mini-hydro generating system	November 20, 2009
Completion of commissioning test	December 11, 2009
Final inspection of the civil work	January 15, 2010
Plant inauguration	January 22, 2010
MONITORING	January 2010 to December 2011

After the commissioning of the plant, the e₈ and the Philippine Department of Energy (DOE) will monitor the operation and maintenance of the power plant, and the management of the Rice Terraces Conservation Fund for two years, during which time the power-generating assets will be in the custody of the DOE.

The plant will be transferred to the Ifugao Provincial Government in December 2011.

PROJECT SITE

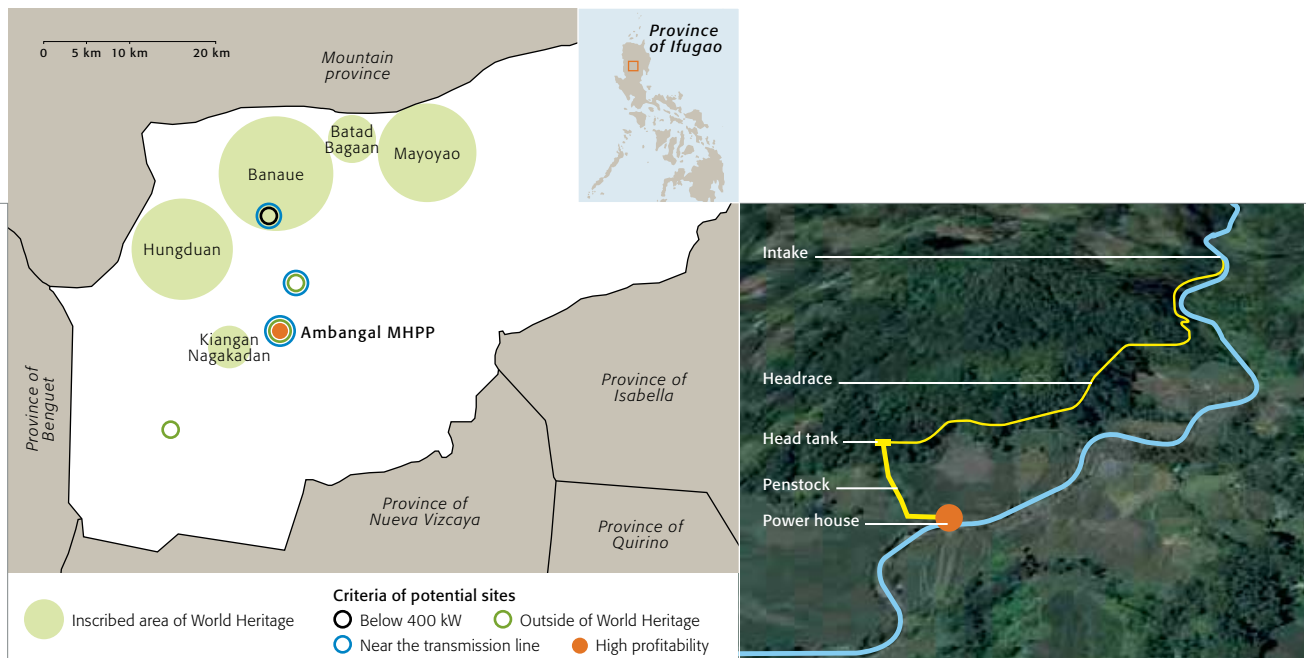
The final selection of the Ifugao-Ambangal Mini-hydro Power Plant site was performed as part of the feasibility study and based on criteria identified by the e_g project team, namely:

1. The site must be selected from among potential sites below 400 kW.
2. The site should be outside the inscribed World Heritage site area.
3. The site should be close to existing transmission lines.
4. Priority to be given to the most profitable site/ (to maximize the conservation funds).

POTENTIAL SITES AND THEIR CONFORMANCE TO SELECTION CRITERIA

Criteria	Site A (Ambangal)	Site B	Site C	Site D
1 Original Potential (kW)	380	260	400	160
2 Location Relative to the World Heritage Area	Far	Far	Near	Far
3 Location Relative to the Transmission Line	Near	Far	Near	Far
4 Profitability (Peso/kWh)	111	149	162	326

Source: DOE (JBIC pilot study on rural revitalization project for the Ifugao rice terraces) Note: Peso/kWh- Construction cost/Annual Generation



Location map of the potential sites

General layout of the project and existing irrigation systems using Google Earth® Satellite Imaging

The selected site layout features several components: an upstream catchment area and intake structure, a 1.6 km open channel headrace, a head tank structure, an embedded 290 meters penstock and an open type diversion channel, the powerhouse and a step-up transformer station, and a 1.8 km transmission line to the IFELCO connection point.

CONSTRUCTION A HUMAN CHALLENGE

Building a hydropower plant is a challenging task. In the case of the Ifugao-Ambangal Mini-hydro Power Plant, the construction was even more demanding. Steep slopes, limited site accessibility and severe weather that could provoke landslides posed additional difficulties with regard to performing the work in a timely and safe manner. Under such stringent conditions, the use of heavy machinery was very impractical.

Construction of run-of-river hydropower facilities under major seasonal water flow variations, such as the ones in Ifugao, had also to be well planned. Preparation work and implementation schedules were carefully assessed to avoid working on the intake structure and powerhouse river shore foundation during the high waters period.

Following the particularly strong typhoon season that hit the Ifugao region in the spring of 2009, some of the headrace path had to be modified due to landslides. Earth retaining curtains were put in place to prevent additional slides during the work, and the scope of the headrace civil work had to be considerably altered so as to add a bridge section to the open channel (flume design).

At the peak of the construction period, 180 workers were dispatched to the different site areas to build the civil structures manually, bringing construction material, such as cement bags and concreting material, by foot over narrow mountain trails, digging and backfilling the excavations with shovels, building temporary scaffoldings and support structures by hand from locally available framing material, and carrying, installing and fitting heavy penstock pipe sections, all manually. Handling of heavy pieces of equipment was also critical.

With the cooperation of all local stakeholders, and the contractor and workers who used their skills to build the civil structures, the e₈ project team was very happy to be able to complete the construction within the scheduled timeframe.



Installing the penstock pipe sections



The limited use of heavy construction machinery has the advantage of leaving a smaller construction footprint.



Traditional house builders

The inauguration of the power plant took place at the powerhouse site on January 25, 2010, in presence of the officials from the Philippine Department Of Energy, the Ifugao Provincial Governor, the e₈ representatives, namely from TEPCO and TEPCO (a TEPCO affiliate, responsible for the project's management and execution), the project team and participants, and some 300 locals who came to celebrate the event.

THE IFUGAO-AMBANGAL MINI-HYDROPOWER PROJECT

Maximum Output	200 kW
Effective Head Height	63.5 m
Maximum Discharge	0.425 m ³ /s
Annual Electricity Generation	1,450 MWh

COMPONENTS	
Diversion weir	Floating 1.2 m height by 20 m length
Intake	Side intake
Settling basin	Sediment capture: 0.1 mm diameter Water diverted into the nearby irrigation system
Headrace	Open channel of 0.6 m width by 0.8 m depth 1.6 km from intake to head-tank
Head-tank	Open 2 m width by 6.5 m length Compatible with fluctuations in volume and power demand
Penstock	PVC 0.5 m diameter pipe, 290 m length, underground
Spillway	Existing irrigation channel located near head-tank
Powerhouse	3.35 m width, 7.4 m length and 2.5 m height, located near Ambangal bridge
Turbine and Generator	Inline Francis-type turbine, synchronous-type generator
Transmission Line	13.2 kVA, 3 phase, Length=1.8 km



Ifugao officials and villagers attending the site inauguration ceremony



Cutting the official inauguration ribbon



Official turnover ceremony – with Philippines DOE Secretary, Hon. Angelo T. Reyes, and Tepco Chairman, Mr. Tsunehisa Katsumata

According to the e₈ principle which requires that a project implemented by the e₈ must be monitored for a certain period of time after it has been commissioned, in order to assess its long-term sustainability, the Ifugao-Ambangal Mini-hydro Power Plant operation and management has entered a two-year monitoring programme starting with commercial operation in January 2010. During that period, the e₈ project team will dispatch mission teams at various intervals to assess the project's performance and make any recommendations for improvements, either in operation and maintenance activities, funds management, and systems and equipment.

From the early stage of implementation to the end of the monitoring programme, the e₈ keeps track of all the main project's events to derive lessons learned that can be used on future sustainable renewable energy project schemes, and share them with its members, stakeholders and partners in a project closing report prepared by the e₈ project team.

RICE AND WATER

A power scheme designed around a shared renewable resource

The Ifugao-Ambangal Mini-hydro Project taps the river as it flows through a valley between Ambabag and Pindungan, two villages (barangays) that can be reached by a steep 1.7 km mountain path. The river is also used for irrigation by the residents of a third village, Mungayang.

The project is a run-of-river facility that includes a floating-type diversion weir equipped with a flushing gate and a settling basin. The region's climate is favourable to this type of project, as precipitations are abundant.

The facility is designed and developed to blend into the natural environment. For example, the pond, when filled, appears like a flooded terrace, and the headrace will be covered in vegetation. The power plant is located in a basement structure. A traditional native house was built on top of the powerhouse structure to serve as a resting area for the operation and maintenance staff.

The power plant is close to existing transmission lines; therefore, only a 1.8 km connecting line was needed.

Farming is the major source of livelihood in the region and the largest single source of household income. The availability of water for irrigation is therefore of utmost importance. During the public consultations, several inhabitants expressed their concerns about the availability of water for irrigation.



Ambangal powerhouse composed of a power-generating equipment room, an operators room and accommodation in a traditional house



Control panels in the power-generating equipment room

During the January to May dry season, the power plant will occasionally be closed when the flow is at minimum to ensure that water for irrigation is available. This temporary closure will also allow for annual maintenance of the plant.

Prior to the development of the project, a power purchase agreement was negotiated and signed with the Ifugao Electric Cooperative (IFELCO), the local electricity distribution cooperative. This agreement advantageously offers lower electricity rates to IFELCO from the hydropower plant. In addition, it will allow IFELCO to provide electricity to the municipality of Kiangan during interruptions from the national transmission grid. Not only will such sales raise over \$100,000 USD per year, but IFELCO is also expected to save on the cost of electricity.

Revenues from the sale of electricity from the Ifugao-Ambangal Mini-hydro Power Plant will provide funds necessary to prevent further deterioration of the terraces.

THE RICE TERRACES CONSERVATION FUND

All proceeds from the power generated by the 200 kW Ifugao-Ambangal Mini-hydro Power Plant, except for those needed for the operation and maintenance of the plant, will go to terraces conservation purposes: maintenance and stabilisation of the rice terraces, and irrigation systems to reverse their deterioration.

A government agency was established by the provincial authorities to manage the operation and maintenance of the plant and the conservation fund.

The projects to be funded under the Rice Terraces Conservation Fund include the following:

1. **Rehabilitation of damaged rice terraces**
This program focuses on the restoration of damaged rice terraces, which will contribute substantially to the socioeconomic and environmental development of the terraces as a whole.
2. **Rehabilitation of communal irrigation systems**
This program focuses on the construction, improvement, and rehabilitation of the communal irrigation systems to ensure equal distribution and continuous water supply for the rice terraces in order to increase rice production and income.
3. **Livelihood projects**
These projects are meant to provide alternative sources of income for farmers, to increase the low productivity of the rice terraces, and to minimize the migration that depletes the labour force.
4. **Reforestation projects**
For the establishment of tree nurseries, forest enrichment, and agro-forestry programs.
5. **Cultural enhancement**
Programs that enhance Ifugao indigenous traditions, arts, sciences, athletics, and cultural products, such as annually organized and promoted festivals at the provincial and municipal levels, and contribute to the economy and cultural awareness.
6. **Pest control and soil fertility**
Programs that support the propagation of indigenous pesticide plants and fertilizers.

It is expected that \$65,000 USD per year will be channelled to the conservation fund. This represents about 10% to 20% of the funds necessary to protect and restore the terraces, to the extent that they can be removed from the endangered list. It is anticipated that this project will attract future investments.

The protection of cultural landscapes such as the rice terraces of Ifugao can contribute to the development of modern techniques of sustainable land use and support harmony between humankind, biological diversity and the natural environment.

“A culture or society needs to adapt and adopt in order to continue to exist. The Ifugao culture has been able to adapt to natural and manmade conditions [...] through the process of acculturation, and many good and beneficial changes like farming technologies, centralized governance, Christianized religion, formal education, etc. But in spite of all this, the Ifugaos in Kiangang have maintained their distinctive cultural identity which distinguishes them from others.”

Manuel Dulawan, author of *Oral Literature of the Ifugao*.

BENEFITS TO THE LOCAL COMMUNITY

The Ifugao-Ambangal hydropower facility benefits the Ifugao people in several ways.

In the short term, 180 local jobs were created, raising the level of revenues in the community. The operation of the plant will also create permanent jobs for six plant operators.

The plant generates 1,450 MWh of much-needed, reliable and clean electricity for the region, meeting 18% of the province’s needs, while reducing greenhouse gas emissions by approximately 633,000 kg of CO₂ per year. The expected \$65,000 USD in annual revenue from electricity sales will be used for the new Rice Terraces Conservation Fund, and dedicated to restoring and protecting this World Heritage Site.

This mini-hydropower project also offers a concrete example that natural resources can be developed in a sustainable manner to provide income for the region, and to protect the landscape and the heritage, in harmony with other prioritized usages. The protection of a World Heritage site and new energy development come together in a productive blending of the past and the present, the old and the new, conferring value to a people’s heritage and preserving it for the future.

The development of this project also demonstrates the capacity of a local government to both venture into local energy development and support rice terraces conservation efforts.

It is hoped that the project will not only help preserve the historic terraces but encourage more young people to farm the rice terraces.

The Ifugao-Ambangal Mini-hydro Project is a showcase of the benefits of a sustainable mini-hydropower project. As a pilot project, it is expected to attract other innovative projects that use a natural resource to raise money to protect a cultural heritage site.

Human Capacity Building Activities

An essential objective of the e_8 is to maximize the transfer of knowledge by a close collaboration with the local stakeholders that will have to take over projects by themselves, whether it is a replication of an e_8 investment project such as the Ifugao-Ambangal Mini-hydro Project or their own renewable energy development plans.



Introducing the hydropower plant operating crew at the inauguration ceremony

EMPOWERING THE STAKEHOLDERS

Human capacity building activities are designed to achieve that purpose and this mini-hydropower project was no exception. During all phases of its implementation, the e₈ team members shared their expertise with participants from the Philippine Department of Energy and the Ifugao Provincial Government technical and management staff who formed a Technical Working Group dedicated to the project's development. Various activities were assigned to the group members, creating a participation process where each individual could contribute, share his/her experience, develop a methodology to integrate the different aspects of the project's implementation for future replication, and develop the tools to manage the Rice Terraces Conservation Fund.

In preparation for a smooth transition from the power plant construction to the operating period, a selection panel was formed to recruit local personnel to be assigned to the operation and maintenance activities. A staff of six trained operators were selected among 17 potential candidates after undergoing a full three-month training that included classroom lectures, hands-on exercises and exams developed and coached by the TEPCO hydropower plant operation/engineering staff. TEPCO's instructors assisted the trainees throughout the training sessions in Ifugao.



Technical preparation meeting



Future operators in a training session

The Ifugao-Ambangal Mini-hydro Project was designed and developed by the E_g under the leadership of the Tokyo Electric Power Company with the goal of securing funding for the restoration and conservation of Ifugao's "stairways to heaven".

The project is a perfect example of true sustainable energy development, providing much needed clean, renewable electricity to the region, improving quality of life for people working in the rice terraces, and contributing to the conservation of a world-renowned cultural heritage. Local communities, who were involved at all stages of the project's development, welcomed the new hydropower plant and benefit from it in several ways.

Sustainable energy projects such as the Ifugao-Ambangal Mini-hydro Project can protect our heritage while improving quality of life today. By showcasing this pilot project, the E_g hopes that it will lead to the development of other small-scale renewable energy projects in the region to improve quality of life and conserve heritage.



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