PEREZ-GUERRERO TRUST FUND FOR ECONOMIC AND TECHNICAL COOPERATION AMONG DEVELOPING COUNTRIES

(G77 Project)

Final Report

on

The Demonstration Program of Refurbished Rural Multi-purposed Small Hydropower Project in Asia and South America

INTERNATIONAL CENTRE ON SMALL HYDRO POWER

AUGUST 2014, HANGZHOU, CHINA

I. Project Overview

1. **Project Title**: The Demonstration Program of Refurbished Rural Multi-purposed Small Hydropower Project in Asia and South America
2. **Abstract**: Small hydropower (SHP) is a potentially clean and environmentally friendly form of renewable energy which contributes significantly to poverty alleviation and economy drive particularly in rural areas in developing countries. The future trend of global SHP development will emphasize on but not limit to refurbishment of existed hydraulic facilities and infrastructures including reservoirs, dams, water supplying, diversion systems and even irrigation systems. By this approach, the existed old even abandoned hydro facilities can be upgraded and renovated into new integrated project of multi purposes including power generation, water supply as well as agricultural irrigation and improved efficiency with comparatively lower cost. And such modality can particularly meet the demand of rural SHP development in developing countries of Asia and South America in which the local rural people will directly benefit from the project achieving in energy utilizing, economy growing, society developing and environment improving.
3. **Background Analysis**: Small hydropower is a potentially clean and environmentally friendly form of renewable energy which contributes significantly to poverty alleviation and economy drive particularly in rural areas in developing countries. Even in the global renewable energy mix, small hydropower is a significant and indispensable component. Threatened by climate change and energy crisis, governments all over the world including developed countries in Europe and North America have refocused on small hydropower as one of energy priorities. However, compared with the situation of developed countries in which 70%-80% of its hydro resources has been exploited in average, developing countries in Asia, Africa and South America remain huge potential for development. Even China, the leading country in small hydropower, has only 46% of its resources been developed up to present. While in Asia and South America, only 25% and 40% respectively of the continents' hydro resources have been developed. On the other hand, most majority of the small/pico hydropower projects in rural areas in developing countries are single functioned focusing on power generation thus the hydro resources is not fully utilized to realize its maximal efficiency.

There is no doubt the sustainable development of small hydropower is based on guarantee of hydro resources though SHP is a renewable energy. Therefore, no matter for sake of economic cost-effectiveness or energy saving & energy efficiency, the future trend of global small hydropower development will emphasize but not limit to refurbishment of existed hydraulic facilities and infrastructures including reservoirs, dams, water supplying and diversion systems, and even irrigation systems. By this approach, the existed old even abandoned hydro facilities can be upgraded and renovated into new integrated project of multi purposes and improved efficiency with comparatively lower cost. And such modality can particularly meet the demand of rural small hydro power development in developing countries in Asia and South America. In fact, the integrated multi -purposed refurbishment of small hydropower project is highly appreciated even in America. It is estimated that over 3000 existed single functioned hydro facilities have been refurbished into integrated small hydropower projects with multi functions including power generation, water supplying and agricultural irrigation.

In Asia, China and India are the two most representative emerging developing countries endowed with huge potential small hydro resources. The rural small hydropower development in China has achieved fruitfully and set a unique example for developing countries. However, China is to readjust strategy and policy on rural small hydropower, emphasizing on protective development of small hydro resources, ecologic & environmental friendly function of small hydropower projects as well as integrated multi-purposed refurbishment. While in India, the research and practice on low head small hydropower project based on irrigation system have already accumulated a plenty of experiences, and a lot of rural small hydropower projects have been developed in this way. Similar to India, Sri Lanka also has many rural low/extra low head small/pico hydropower projects with single function of power generation which can be refurbished into integrated multi-purposed projects serving better for rural areas. Compared with Asia, the rural small hydropower is not so fast-developed as expected in South America. However, the existence of a great many of single functioned old/abandoned hydro facilities provide objective preconditions for refurbishment of integrated multi functioned small hydropower projects with power generation, water supplying and agricultural irrigation purposes.

II. Implementation

Purpose: Small hydropower is a proven, clean and sound form of renewable energy which plays a significant role on poverty alleviation, livelihoods improvement, economy promotion as well as ecologic environment protection particularly in rural areas in developing countries. To realize the sustainable development of small hydropower, it is of overwhelming importance to emphasize on reasonable exploitation and maximal efficiency utilization of small hydro resources. However, a plenty of small hydro resources, facilities and infrastructures are not fully utilized in rural areas in developing countries, and most majority of the small hydropower projects are single functioned focusing on power generation. Furthermore, single purposed project including water supply, power generation and agricultural irrigation is obviously infeasible in economy for rural areas in developing countries. Therefore, this project aims to help demonstrating and promoting integrated multi-purposed small hydropower projects with functions of power generation, water supply and agricultural irrigation in rural areas in developing countries particularly in Asia and South America.

Targets: Asia and South America are endowed with hydro resources. Featured by cost-effectiveness and environmental friendliness, small hydropower positively promotes poverty alleviation and economy development in rural areas in developing countries of the two continents. However, most majority of the small hydropower projects are single purposed focusing on power generation. In fact, water supply and agricultural irrigation, apart from power generation, are the two more basic demands for rural people. And it is obviously infeasible to have separate projects with different purposes due to heavy financial burden for rural people. In this sense, demonstration and development of the integrated multi-purposed small hydropower projects can maximally satisfy the basic demands of rural people for different purposes but with comparatively lower cost.

Implementation: The implementation of the project can be divided into five distinct stages among which the first four stages are relevant to this current project document, with the remaining stage representing ongoing strategies into the future for replicating the project in the target countries and

continents. IC-SHP will organize a team of experts and designate programme officer who is to be in charge of the project. (1)The first stage involves reconnaissance and site selection for demonstrating projects in target countries. This will be jointly carried out by ICSHP experts and local counterparts. (2)The second stage is to focus on feasibility studies and design reports for construction of the potential selected sites. ICSHP will be responsible for the tasks meeting specifically the demands of the local sites. (3)In the third stage, ICSHP is to organize two regional seminars in target continents respectively for publicizing and promoting the project. (4) The fourth stage will be start-up of the demonstrating projects in target countries, and ICSHP is to coordinate closely with local counterparts providing technical support as well as equipment back-ups.

Benefits: Ecologically, hydro resources will be reasonably exploited for maximal utilization regarding energy efficiency to realize sustainable development of natural environment. Economically, the integrated small hydropower project can directly mitigate financial burden and promote local economy for rural people. Socially, the project optimizes local resources and meets the basic demands of rural area, improving living conditions for rural people. By promotion of the integrated project, small hydropower realizes multi purposed use and develops local productivity in rural areas.

III. Completed Activities

Activity – 1

Time: August 2013

Location: Uruguay

Implementation: Joint reconnaissance of the existed hydro facilities and infrastructures in rural area in Uruguay was organized by ICSHP with support of local counterpart. Three potential sites namely Paso Severino, Corrales and India Muerta were selected The joint working group carried out on-site tasks including preliminary project survey, engineering measurement as well as consulting activities.

Participants: ICSHP, Local counterpart

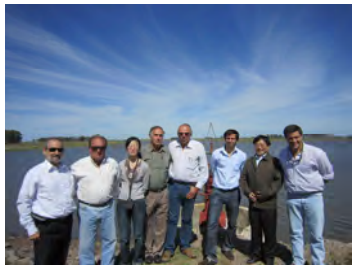
1. The Paso Severino Site



2. The Corrales Site

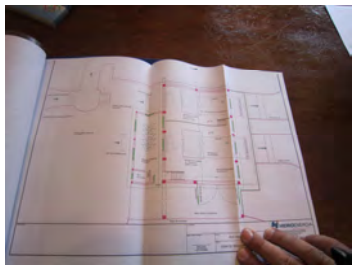


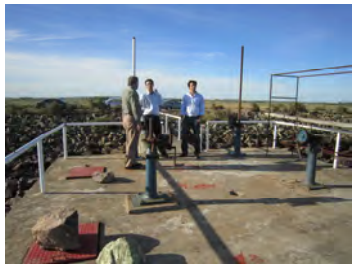



3. The India Muerta Site







Activity – 2

Time: October- December 2013

Location: ICSHP

Implementation: ICSHP organized an expert team to take responsibility of completing the preliminary feasibility studies and design reports specifically for the selected three potential sites in Uruguay

Participants: ICSHP

Corrales.pdf India Muerta.pdf Paso Severino.pdf

Activity – 3

Time: August 2013

Location: Uruguay

Implementation: ICSHP co-organized a seminar with support of local counterpart on small hydro power and its sustainable development focusing on refurbishment as well as upgrade of existed rural small hydro power projects for multi-purpose utilization. The seminar provided an opportunity for sharing the Chinese practice on small hydropower development and current situation of small hydropower in South America, as well as discussing potential cooperation on mutual promotion of small hydropower development in the near future even after the project cycle.

Participants: ICSHP, local counterparts

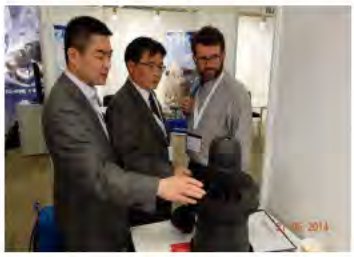
Activity – 4

Time: May 2014

Location: Turkey

Implementation: ICSHP co-organized a seminar with support of local counterpart on small hydro power and its sustainable development focusing on communication and promotion of this project for refurbishment as well as upgrade of existed rural small hydro power projects for multi-purpose utilization. Apart from sharing the Chinese practice and lessons of small hydropower development, the seminar witnessed as well a brainstorm on all aspects of capacity building, technology transferring, project financing, regional coordinating, project replicating and future cooperating which paved the way for sustainability of the project.

Participants: ICSHP, local counterparts



IV. Activities To Be Continued

Activity – 5

Time: June 2014

Location: Uruguay, ICSHP

Implementation: According to the project proposal, the local counterpart was to take responsibility for construction of one refurbished and upgraded small hydropower project with integrated multi-purposes for demonstration among the selected three potential sites in Uruguay previously. While ICSHP was to provide technical support including on-site guide and consulting service, equipment back-ups even limited financial aid if possible regarding the project budget. However, the project was unfortunately suspended temporarily due to financial problem in Uruguay side and will commence to continue as soon as the project capital is ready. ICSHP has already completed the final feasibility study and design report. Besides, ICSHP has also commenced the preparation of equipment order specifically for the turbine generator unit as well as accessories.

Participants: ICSHP, Local counterpart

India
Muerta-Feasibilit

Activity – 6

Time: June 2014

Location: ICSHP

Implementation: Although the follow-up activities are not included directly in the project proposal previously, ICSHP will carry out with no doubt ongoing strategies for replicating the project in developing countries worldwide by sharing the experiences and lessons learned from the project even after the cycle. Furthermore, ICSHP will positively promote the project through consulting services, capacity building, equipment back-up as well as technology transfer.

Responsible by: ICSHP

V. Financial Costs and Expenses

The project costs for activities are strictly based on the financial budget. IC-SHP organized financial staffs specifically for evaluation and review of the economy for the project. Project leaders are also responsible for monitoring of cost for each activities regarding to the project and required for submission of periodical report to the Director General of IC-SHP for processing and stage of the project.

No.	Items	PGTF Fund	ICSHP Fund	Total
1	International travel	20,000 USD	20,000 USD	40,000 USD
2	Equipment purchase	0	52,000 USD	52,000 USD
3	Experts fees	8,000 USD	8,000 USD	16,000 USD
4	Trainings	0	0	0
5	Meetings	1,700 USD	2,800 USD	4,500 USD
6	Domestic travels	0	2,200 USD	2,200 USD
7	Administration fee	0	5,000 USD	5,000 USD
8	Unpaid PGTF fund	3,300 USD	0	3,300 USD
	Total	33,000 USD	90,000 USD	123,000 USD

VI. Project Management and Monitoring

The project is implemented by the International Center on Small Hydropower (IC-SHP). The Chinese government appointed the Ministry of Water Resources (MWR) to ensure that national support for research and development of SHP. Chinese governments & the PGTF will co-finance the proposed consultation missions, case study on the selected SHP projects, seed money for project construction. IC-SHP(in-kind) & PGTF will co-finance the trainings. IC-SHP will provide 'in-kind' assistance for projects, which will form part of the budget contributed by the Chinese government. Progress and monitoring will be done by China International Center for Economic and Technical Exchanges, Ministry of Commerce, the People's Republic of China.

Annex: Breakdown of Expenditure

Expenses covered by the PGTF

International Travels	**US$20,000**
International Transportation	US$15,000
Local Transportation	US$300
Local Accommodation	US$30,00
Living Allowance	US$1,500
International Telecommunication	US$200
Experts Fees	**US$8,000**
Consulting Fees	US$5,000
Accommodation	US$2,000
Living Allowance	US$1,000
Meeting	**US$1,700**
Venue	US$500
Local Transportation	Included in the International Travels
Local Accommodation	Included in the International Travels
Living Allowance	Included in the International Travels
Equipment	US$600
Printing	US$350
Other fittings	US$100
Electronic fittings	US$150
Subtotal	**US$29,700**
Unpaid	**US$3,300**
Total	**US$33,000**