SMALL HYORO POWER NEWS

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SHP IN CHINA

SHP WORLDWIDE

HRC NEWS

New Mission of Small Hydropower

—Keynote Speech on the First "China SHP Forum"

Mr. Tian Zhongxing
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(April 22, 2010)

Chinese hydropower development has an extensive influence worldwide, which can be vividly summarized as one "big" and one "small". The "big" refers to the world-famous Three Gorges Project, and the "small" refers to the small hydropower (SHP) scattering and spreading all over China. After the founding of new China, especially since the reform and opening up, SHP has gained a rapid development in China together with the construction of rural electrification which was initiated by Mr. Deng Xiaoping. So far, 45,000 SHP stations have been built with the total installed capacity of over 54 GW and the annual energy production of 160 TWh, which respectively accounts for 30% of the total installed capacity and generation of hydropower in China. The SHP development paved the way for the rural electrification with Chinese characteristics, contributing greatly to the rural economic and social development in China. In the world today, global climate change has received a deep concern. President Hu Jingtao delivered an important speech "Join hands to Address Climate Change" at UN Summit on Climate Change in September 2009, emphasizing that China would regard the construction of ecological civilization and the development of renewable energy as major strategic tasks. As a clean and renewable energy, SHP will shoulder a new mission in addressing climate change and the construction of ecological civilization.

I New Situation Calls for SHP

China has proclaimed to the world that by 2020, CO_2 emission per GDP will reduce by 40% to 45% as compared at the level in 2005, and non-fossil energy accounts for about 15% of the primary energy consumption. At present, the proportion of non-fossil energy such as nuclear energy, renewable energy and etc is less than 9% in China, which needs vigorous development. SHP is internationally recognized and defined by China's "Renewable Energy Law" to be one kind of renewable energies, which has salient advantages over other energies.

1. Most abundant resources

The technically exploitable SHP potential is 128 million kW, No.1 in the world. It is scattered in 1715 counties (cities) of 30 provinces (municipalities, autonomous regions), generally consistent with the distribution of poverty-stricken people, regions of returning farmland to forestation, nature reserves, natural forests conservation districts and major control regions of water loss and soil erosion. Among these regions, 398 are the key counties included in the national plan for poverty alleviation through development.

2. Most proven technology

SHP, with the appropriate size, does not involve much land occupation or relocation of large quantity. As a renewable energy with a history over 100 years, it was exploited in large scale firstly and thus enjoys the most proven technology. China takes its place among the leading countries of the world in terms of SHP planning, design, construction, equipment manufacturing, operation & management and so on, providing technical consultation, overseas labor services and project contracting to hundreds of projects in over 50 countries, and training thousands of engineering personnel for over 60 countries.

3. Most cost-effective

When taking a look at the national average feed-in tariffs, at present, the prices of thermal power, nuclear power and wind power are respectively 0.36yuan/kWh, 0.50yuan/kWh, and about 0.55yuan/kWh, and the standard price for solar energy is 1.09yuan/kWh, while the price of SHP is only 0.27yuan/kWh. Such a low price is unreasonable and will restrict the development of small hydropower. With the state's settlement of policies to encourage the renewable energy development, SHP's off-take tariff will be gradually set to reasonable, which will still be the most economical. It will continue to play an important role in stabilizing the price level, promoting economic development and improving people's living standards.

4. Most flexible power dispatch

SHP stations, with adjustment capability that meets the demand of the power system dispatch, always undertake peak regulation and frequency modulation. At the same time, thanks to the capability of "Black-Start", SHP stations can serve as the start-up power sources at any moment, just like the last match to light up the regional power grid. SHP is characterized by the flexible start-up, so that it can avoid either the energy waste caused by the warm-up of thermal power generating units before grid-connection, or the energy waste on the grid-connection during the state of hot reserve, and it can also avoid redundant construction of conventional energy for the other renewable energies to ensure the stability of power grid.

5. Highest energy return rate

Construction and operation of energy facilities also need energy consumption and the energy return rate refers to full aperture energy ratio of output to input. According to experts' studies, the energy return rates of various kinds of energy development are shown as follows respectively: 208~280 for reservoir type hydropower, about 170~267 for run-of-river hydropower, about 18~34 for wind power, about 3~5 for biomass , 3~6 for solar energy, 14~16 for nuclear power, 2.5~5.1 for conventional thermal power generation, and only 1.6~3.3 for thermal power generation applying carbon recovery technology. Undoubtedly, the energy return rate of hydropower is the highest.

The new situation calls for the further development of SHP, which is the most advantageous renewable energy in China.

II Ecological Civilization Needs SHP

Relying on the development of SHP, half of the land, one third of the counties (cities), more than 300 million rural population have access to electricity. It makes great contribution in many aspects, such as raising the level of rural electrification, promoting rural economic and social development, improving the production and living conditions of farmers, ensuring emergency power supply and so on. In particular, it plays an important role in reducing greenhouse gas emissions, protecting ecological environment, promoting ecological civilization construction and so on.

1. Reducing greenhouse gas emissions

SHP, as a substitute for fossil energy, has an obvious effect on reducing emissions of greenhouse gases and pollutants. The generated energy of SHP in 2009 reached over 160 billion kWh, which doubles that of Three Gorges Hydropower Station. For replacing coal-fired power generation, 55 million tons of standard coal are saved equivalently, reducing emissions of 140 million tons of CO_2 and more than 0.7 million tons of SO_2.

2. Protecting the forest coverage

During the construction of hydropower and rural electrification, "substituting electricity for firewood" played a significant role in the protection of forest vegetation. In particular, the projects to replace firewood with SHP which were launched in 2003, provided cheap electricity for farmers through the exploitation of abundant SHP resources in mountain areas. Over one million farmers in mountain area applied alternative fuels of SHP following the completion of the pilot projects and enlarged pilot projects. It has changed their traditional living styles relying on cutting down the trees for daily energy consumption, protected more than 4 million mu forest areas, consolidated the work of returning the arable land to forest, avoided the water and soil erosion, and recovered the verdant mountain and clear water.

3. Improving the production and living conditions

Through the development of SHP, thousands of medium and small-sized rivers have been initially put under control and more than 200 billion m^3 of reservoir capacity has been formed. The effective irrigation area reaches more than one hundred million mu. It plays an important role in protecting the flood control security and improving the irrigation and water supply conditions. SHP development has reinforced the collective economy in mountain areas and also promoted the development of public welfare. The closed villages begin to have the access to electricity and water supply, meanwhile, the roads developed and kitchens renovated. With the continuous spread of science and technology in rural areas, the farmers' living habits changes a lot, and the life styles gradually turn to be healthier and more civilized.

4. Transfiguring the ecological environment

The artificial wetlands formed by SHP development improve micro-climate and many wasted lands are covered with green vegetation. In combining with SHP development, the artificial wetlands and hydrophilic corridors are built in many cities which become urban landscape. For instance, in Huizhou district, Huangshan city of Anhui province, the perfect combination of the designing of Pagoda hydropower station and the City Planning creates a new "water street", which is 1500 meters long with an area of 220,000 square meters. It provides an unique urban landscape of "white walls, gray tiles, verdant hills and crystal water reflecting a blue sky"for citizens and visitors to enjoy. Owing to the construction of the second cascade hydropower station at Luanhe main stream in Chengde County of Hebei province, a water park over 1 million square meters and a riverside park of 150,000 square meters get into shape, which are excellent places for tour and leisure activities, adding glamour to the city, its ecology is improved , the urban environment beautified and the city grade enhanced.

SHP plays a unique role in the construction of ecological civilization with a variety of advantages and great potential.

Below:**A SHP station for "substituting electricity for firewood" in Jilin Province**

III Building up Environment-friendly SHP

In previous years, there existed some problems during the development of SHP such as river

enclosure, illegal constructions, negative impact on ecological environment and other problems which spoiled the social image of SHP. In order to deal with these issues, the governments at all levels and the water conservancy administrative departments have strengthened the planning and resource management, enhanced security monitoring, checked and redressed a number of illegal hydropower stations, basically solved the serious problems in the process of SHP development. In the future, we will further clarify approaches, identify tasks, improve measures and strive to build up environment-friendly SHP.

Above: **A Environment-friendly SHP station in Zhejiang Province**

1. New thought

SHP development is not only the important part of water resources utilization, but also the important aspect of energy construction. Moreover, it is closely related to the interests of farmers, local development, environmental protection, ecological construction and so on. In order to multiply benefits of SHP and work well on SHP in the new age, we must conscientiously fulfill scientific outlook for development and endeavor to realize four transformations. Firstly, instead of focusing on the full utilization of hydropower, we should make limited and orderly development of water resources. Secondly, instead of previously focusing on the development of new projects, we should pay more attention to the renovation of old power plants for efficiency improvement and sustainable utilization. Thirdly, instead of focusing on the interests of enterprises, we should give prominence to local development and farmers' interests. Lastly, instead of focusing on the electricity generation, we should lay more emphasis on the ecological functions and environmental effects that developed from water engineering.

2. New mission

Further to the construction of hydropower based rural electrified counties, and the fulfillment of the pilot projects and enlarged pilot projects to replace firewood with SHP, the new missions are shown as follows. Firstly, with the full implementation of the project programming of 2009-2015 to replace firewood with SHP, domestic fuel problems of 6.77 million rural residents of 1.7 million households will be solved, and 1700MW power plant installation will be increased for the purpose of replacing firewood. Secondly, it is concerned about promoting the construction of hydropower-based new rural electrification counties, and 7 GW hydropower installed capacity will be increased during the period of "12th Five-year Plan for New Rural Electrification". Thirdly, actively promote the reconstruction of rural hydropower stations for efficiency improvement and capacity enlargement, and the rehabilitation will be implemented to 20,000 old power stations with a total installed capacity of 15GW. The reconstruction will give new life to those rural hydropower projects which are operating difficultly, on the verge of being abandoned.

3. New initiatives

SHP is a national limited natural resource. In order to maximally reduce the impact of development and utilization on the ecology, we must adopt quasi-market approaches under the unified governmental supervision.

Firstly, uphold restriction and guidance. On the basis of summarizing and promoting local legislation, draft timely and put forth early "Regulations on Rural Hydropower" and "Measures for Water Energy Resources Management" in order to provide the legal basis for lawful administration; to strengthen the supervision of SHP development and operation, and intensify the social supervision; to enhance the resources planning and management, so as to realize the limited, orderly and compensable development of SHP, and to protect the ecological environment as well. Secondly, try to attract the public financial investment. From 2001 to 2008, the financial input from the central and local governments only account for 8% of the construction funds of rural hydropower, the fund from the central government only accounts for 2% of that for rural electrification projects under implementation, so we should endeavor to realize the steady growth of financial funds and seek support in fiscal, financial and taxation policies on SHP. Thirdly, strive to explore for a new mechanism of SHP development with the participation of farmers. The development of SHP must not harm the interests of farmers. We need encourage farmers to use compensation funds to invest in SHP development, so as to increase their long-term stable income, and improve their sense of participation and environmental protection.

Comrades, "Renewable Energy Law" places hydro energy as the priority for energy development . The "Medium & Long-term Development Program for Renewable Energy" which was approved by State Council in 2007 states that, combining with the need for the construction of hydropower-based rural electrification counties and the projects to replace firewood with SHP, we should accelerate the development of SHP resources in the areas rich in water resources, and by 2020, the national installed capacity of SHP should reach 75GW. Under the guidance of scientific outlook for development, together with the close care of the Party Central Committee and the State Council, the firm leadership of party committees and governments at all levels, as well as the energetic support of the participants and the mutual efforts of all SHP working staff, the undertaking of SHP in China will make new and greater contribution to the emission reduction of greenhouse gas, the construction of ecological civilization and to the promotion of economic and social development in the rural areas.

(Source: HRC, Translated by Yu Hengrui) ■

Below:**A SHP station for rural electrification in Hunan Province**

Below: **"SHP and ecological civilization"—the theme of the first China Forum on SHP**

Research on Integrated Assessment Model of Running State of Hydraulic Structures for Small Hydropower

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Abstract: *The running state of hydraulic structures for small hydropower is directly related to the economic benefit of hydropower station and the security of life and their property of the people who live in downstream. Therefore, it's important to evaluate the running state of hydraulic structures. In this article, on the basis of large-scale surveys of the safety status for rural hydropower, the authors find out the most important factors that influence the safe operation of hydraulic structures. They then establish the integrated evaluation indicator system on the operation with these factors. Referring to quantified form can quantify the various indicators, and combining with Analytic Hierarchy Process (AHP) method allows the calculation of the weight coefficient of each indicator. Finally, adopt the weighted integrated assessment model to calculate the running state's value of hydraulic structures, and the running state of hydraulic structures can be effectively divided into different grades by the value of quantification.*

Key words: *small hydropower; hydraulic structures; running state; integrated assessment; model*

1 Introduction

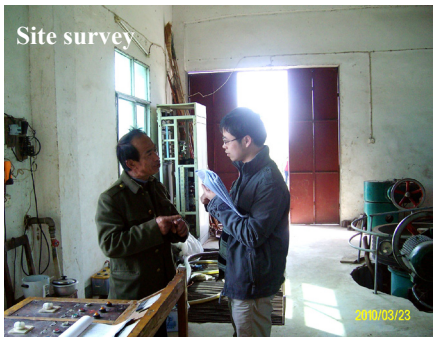
Rural hydropower is not only clean and renewable energy, but also important for rural infrastructure and public facilities. According to the statistics of the Ministry of Water Resources (MWR) at the end of 2008, China had built more than 45,000 small hydropower stations. The installed gross capacity was more than 51 million kW, and the annual power generation more than 160 billion kWh. They accounted for approximately 30% of the total hydroelectricity. The stations under construction will reach up to 20 million kW. Through the development of rural hydropower, rural hydropower helps to solve the electricity problem of about half of the regions, one third of the counties, and more than 300 million rural population.

Despite small hydropower making great contributions for the rural economic and social development, because of historical reasons, economic or technological conditions etc, most of the construction quality is poor, the operational management level is low, and the operational guidance lacks funds. So there are many security risks, which severely threaten the stability and security of the power plants [1]. Therefore, synthetically evaluating the running state of small hydropower will have a


Open-air assembled switchgear

positive effect on improving the level of safe operation in Chinese small hydropower.

At present, a lot of achievements in the field of research on dam safety evaluation have been made at home and abroad, but research results that regard all kinds of hydraulic structures as a whole and integrated assessment of them are obviously insufficient. The running state of hydraulic structures (if no special explanation, "hydraulic structures" in this text indicates "small hydropower hydraulic structures") is influenced by many factors. Any abnormality of hydraulic structure will result in abnormal operation of whole hydraulic structures system. At the same time, the various components of hydraulic structures have different levels of importance. Once a running accident happens, the components will make a different impact on the integrated operation. Weighted integrated evaluation is a very effective multi-factor decision-making method, which can comprehensively assess things affected by many factors. The advantage of the weighted integrated evaluation is fully taking into account of the different influence of each part to whole operation. This article establishes an integrated evaluation model for the running state of hydraulic structures based on this method. The key of the evaluation model is to establish the evaluation indicator system, quantify the indicators and determine the weight of each indicator.



2 Assessment Indicator Systems

In the process of safety survey for small hydropower, some main factors affecting safe operation of hydraulic structures were found, for example, dam seepage, unstable bedrock of spillway, stones separate from tunnel, inadequate flood control capacity of the powerhouse and so on. Selecting the key factors and eliminating secondary factors on certain principles, with these main factors, we can set up the integrated assessment indicator system of the running state of hydraulic structures for small hydropower.

2.1 Principles of Selecting Indicators

Indicator system is a critical step in setting up an estimation model. Rightly or wrongly selected indicators will largely affect the final evaluation results. The selection of indicators generally follows these principles [2-3]:

1)Scientific principle: Indicator concept must be clear, with scientific content. Indicators with more scientific basis reflect better the complex relations within the system.

2)Typical principle: The indicators must be the most common factors which affect the safe operation of hydraulic structures, and they must be representative.

3)Systematic principle: Each part of hydraulic structures on the evaluation indicator system should form an organic whole, having certain hierarchy.

4)Operability: In the process of establishing the evaluation indicator system, the author should choose the major factors which affect the safe operation of hydraulic structures, ignoring minor factors for effective evaluation.

2.2 Establishing the Indicator System

The hydraulic structures of small hydropower generally consist of water-retaining structures, outlet structures, headrace structures and powerhouse [4]. In order to save cost, the spillway and water-retaining structure of small hydropower are generally combined and built above the river bed, so in the indicator system of this article, the block and release structures are merged as a category. According to the principles of selecting indicators, the author selected sixteen typical factors that affect the safe operation of hydraulic structures, and divided them into three major layers by its component, finally setting up the indicator system, just as shown in Figure 1.

2.3 Quantifying the Indicators

After specialists have inspected the state of hydraulic structures on the spot, the indicators can be quantified by scoring according to Table 1.

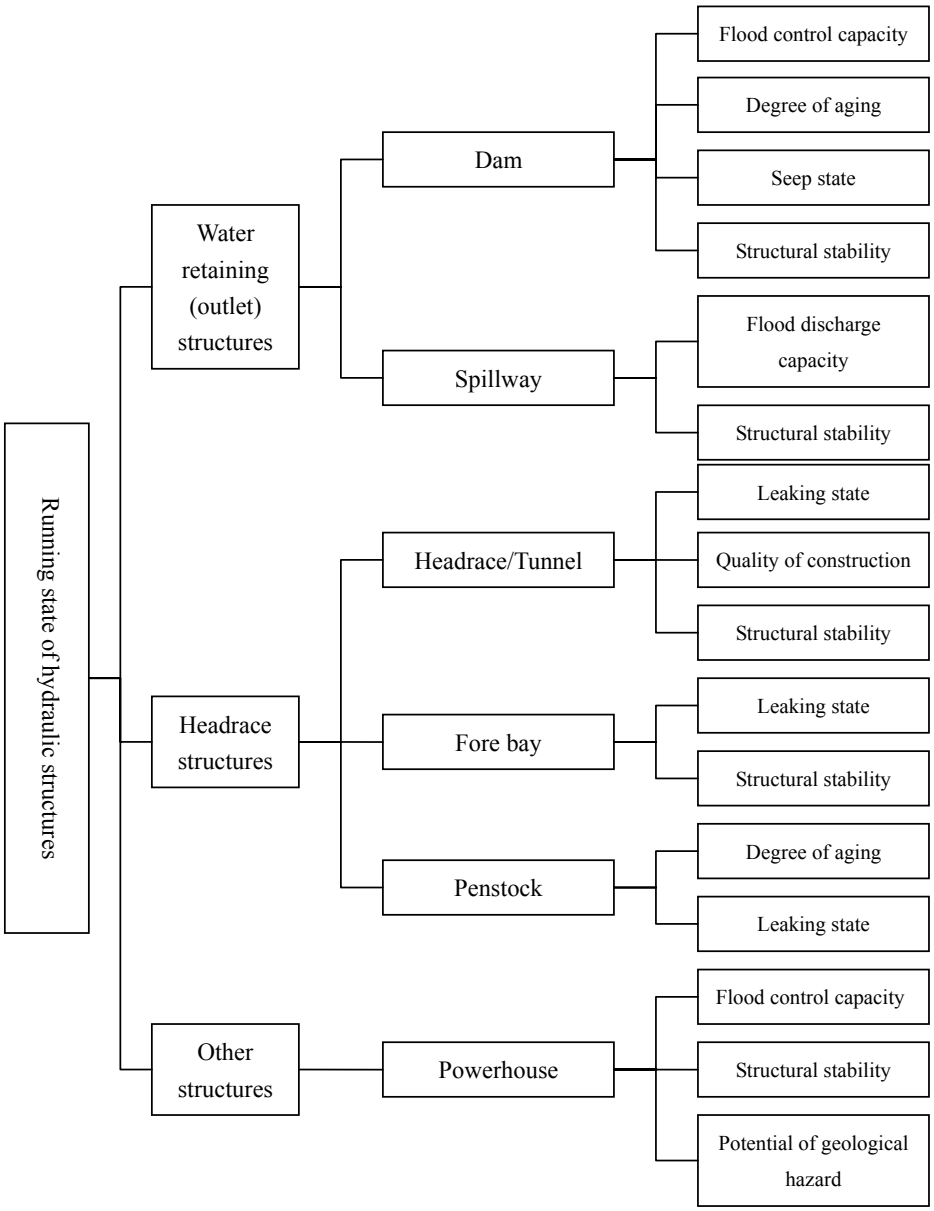


Figure 1 Evaluation indicator system of the running state of hydraulic structures for small hydropower

3 Determination of Weights

When evaluating the running state of hydraulic structures, the degree that each factor influences the safety of hydraulic structure operation is different. A greater weight value should be assigned to the majors factors and the secondary influencing factors should own a small weight value, so that the actual running state of hydraulic structures can be well reflected on. Some methods can be used to decide the weights of each indicator, and this article uses Analytic Hierarchy Process [5-7] to determine the weights. You can see the detailed weights in Table 2.

Table 1 Quantification of indicators

Indicator		Quantified value			
		0 ~ 5	6 ~ 10	11 ~ 15	16 ~ 20
Dam	Flood control capacity	Meet the flood control standards	Meet recent flood control standards	Can not meet the flood control requirements	Flood control capacity is Seriously inadequate
	Degree of aging	Negligible	Slight	Moderate	Severe
	Seep state	Stable and low exit spot	Stable but high exit spot	Deformed and have an increasing trend and low exit spot	Deformed and have an increasing trend, and high exit spot
	Structural stability	Normal	Slight sink but stable	Slight sink and crack	Asymmetry sink and landslip
Spillway	Flood discharge capacity	Smoothly discharge flood	Meet the basic discharge requirements	Floods are not well discharged	Seriously inadequate spillway capacity
	Structural stability	Slope is stable and bottom plate is in good condition	Slope is stable and bottom plate is in moderate condition	Slope is stable but bottom plate is in bad condition	Slope is not stable and bottom plate is in bad condition
Headrace /Tunnel	Leaking state	Normal	Slight	Moderate	Severe
	Quality of construction	Good	Moderate	Bad	Awful
	Structural stability	Foundation is stable	Foundation is moderate	Foundation is bad	Side slope is likely to collapse
Fore bay	Leaking state	Normal	Slight	Moderate	Severe
	Structural stability	Foundation is stable	Foundation is moderate	Foundation is bad	Side slope is likely to collapse
Penstock	Degree of aging	Normal	Slight	Moderate	Severe
	Leaking state	Normal	Slight	Moderate	Severe
Powerhouse	Flood control capacity	Meet the flood control standards	Meet recent flood control standards	Can not meet the flood control requirements	Flood control capacity is Seriously inadequate
	Structural stability	Sound wall, newly-built	Slightly cracked, but normal	Slightly cracked and inclined	Inclined, great chasm, dangerous
	Potential of geological hazard	No potential of geological hazard	Have potential of geological hazard, but have adopt preventive measure	Have adopt preventive measure, but it may fail under special circumstances	Have potential of geological hazard, and no any preventive measure

Table 2 Target weight

1-class indicator(weight)	2-class indicator(weight)	3-class indicator(weight)
water retaining (outlet)structures(0.5)	Dam (0.7)	Flood control capacity(0.417)
		Degree of aging(0.083)
		Seep state (0.125)
		Structural stability(0.375)
	Spillway (0.3)	Flood discharge capacity(0.7)
		Structural stability(0.3)
Headrace structures(0.25)	headrace /tunnel(0.429)	Leaking state (0.429)
		Quality of construction(0.142)
		Structural stability (0.429)
	Fore bay (0.142)	Leaking state (0.4)
		Structural stability(0.6)
	Penstock (0.429)	Degree of aging(0.6)
		Leaking state (0.4)
Other structures (0.25)	Powerhouse (1)	Flood control capacity(0.4)
		Structural stability(0.4)
		Potential of geological hazard (0.2)

4 Weighted Comprehensive Evaluation Model

Weighted comprehensive evaluation [8] (WCA) is an effective overall evaluation method, which makes a supposition: due to the difference of the weight of indicator *i*, so that indicator *i* has a different degree of influence to the whole, expressed with the formula below:

$$C_v = \sum_{i=1}^{m} Q_{vi} W_{ci} \qquad (1)$$

In which C_v is the total value of the evaluation results, Q_{vi} is the quantized value of indicator i($Q_{vi} \geq 0$), W_{ci} is the weight coefficient of the indicator *i* ($0 \leq W_{ci} \leq 1$), got by the Analytic Hierarchy Process (AHP) method, and m is the number of the evaluation indicators.

This method takes into account the impact of each factor on the overall evaluation, gathering the merits of the various specific indicators, and with quantifiable scores shows the results of the evaluation. Therefore, weighted comprehensive evaluation (WCA) is particularly applicable to decision-making, evaluation and selection of technology and program, and it is one of the most common methods currently.

C_v can be got by calculating with formula (1) and it is a number with a range 0-20, so the running state of hydraulic structures can be divided into four grades through different value of C_v, shown in Table 3.

Table 3 Classification of running state of SHP hydraulic structures

Ealculated value	[0,5]	(5,10]	(10,15]	(15.20]
Running state	secure	general	inferior	hazardous

5 Conclusion

In the process of creating this model, determining the weights is a critical course. The judgment matrix using Analytic Hierarchy Process has the need of a coincidence test. If the coincidence of judgment matrix is not satisfactory, Analytic Hierarchy Process will not function, and the weights will be also unreasonable.

Today, small hydropower is still a field prone to industrial accidents. Using the model discussed in this article to assess the operating status of the hydraulic structures is simple and practical. Moreover, this model can help to detect problems and resolve problems as early as possible, reduce the losses to the minimum, and provide some technical support for later reinforcement of the hydraulic structures. ■

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Overflow weir repairing

A quantity of combustible straw stacked in power house

Silting in forebay

The First "China Forum on Small Hydro Power" Held in Hangzhou

On April 22, 2010, sponsored by the Hydro Power Committee of Chinese Hydraulic Engineering Society,the Small Hydro Power Committee of China Society of Hydropower Engineering and the National Institute of Rural Electrification,the International Centre on Small Hydro Power co-organized the first "China Forum on Small Hydro Power" with "small hydropower and ecological civilization" as the theme in Hangzhou. H.E. Hu Siyi, Vice Minister of Water Resources, attended the forum and delivered a speech; Mr.Tian Zhongxing, Director of Bureau of Rural Hydropower and Electrification Development (BRHED),Ministry of Water Resources, chaired the forum.

During the forum, the 2010 Annual Meeting of SHP Special Committee of China Society of Hydroelectric Engineering was also held.

Mr.Liu Xiaotian, chief engineer of BRHED, Ministry of Water Resources of China and Deputy Director of SHP Committee presided over the meeting. Authorized by SHP Committee, Ms.Cheng Xialei, Secretary-general of the committee summarized the work in 2009 and made a report on 2010 working plan. Members and representatives of China Society of Hydropower Engineering attended the meeting.

Ms.Cheng Xialei's report on 2010 working plan was discussed and then approved by the conventioneers. The meeting also made an explanation about the adjustment of the members of editorial board of the journal Small Hydropower. The suggested list of the members was approved in the meeting.

As an affiliated organization of SHP Committee of China Society of Hydropower Engineering, HRC organized and implemented the forum and the annual meeting.

(Source:HRC, Translated by Yu Hengrui) ■

China SHP and CDM Forum

On 14 July 2010, the China Small Hydro Power and Clean Development Mechanism (CDM) Forum was held in Shanghai. Small hydropower is a clean, green and renewable energy which accounts for more thana half of the approved CDM projects, contributing greatly to the energy saving, emission reduction and our reaction to climate changes. The Forum aims at adapting to the latest changes of international rules and to the developing trends of the international market, exchanging the development experience in small hydropower CDM, sharing achievements, building consensus in order to promote China's small hydropower jointly under the context of global climate changes, and facilitating the better and faster development of the small hydropower CDM projects. director general of Hydropower & Rural Electrification Bureau of Ministry of Water Resources Mr. Tian Zhongxing, Chief of Taihu Basin Authority Mr. Ye Jianchun presented in the meeting and gave speeches.

Mr. Tian Zhongxing pointed out that hydropower is currently the largest renewable energy which provides 20% of the world's electricity. China has lots of rivers, and its hydropower potential and technically exploitable potential rank the first in the world. Among these, the annual power generation and the installed capacity of small hydropower accounts for about 30% of the annual power generation of hydropower. With the development of the economy, the society needs to change the energy structure and reduce the carbon emission in order to cope with global climate change. Since the Kyoto Protocol officially came into force, the CDM has been making a big progress in China. The development of CDM project for hydropower has introduced a lot of funds for the construction of small hydropower which promotes the development of small hydropower in China.

He stressed that we should strive for initiative in the international carbon trading market and gradually change the low-end position of our CDM for small hydropower in the international carbon market and the carbon value chain. Firstly, we must strengthen the policy guidance of the small hydropower CDM project; Secondly, departments at all levels of small hydropower CDM should maintain a close relationship with CDM administration for better coordinating the development of small hydropower CDM projects; Thirdly, the industry associations, domestic carbon trading service platform and other agencies should actively build the transactions bridges for the small hydropower CDM projects and train professionals; Fourthly, the related research and academic

institutions should track the changes in international rules and carry out the in-depth researches; Fifthly, we should mobilize the owners' initiative to participate in the development of small hydropower CDM projects. He hoped that through this forum, the local authorities of small hydropower will pay more attention to the guidance of small hydropower CDM projects and enhance the owners' knowledge on developing small hydropower CDM projects, so as to promote the exchanges, communication and cooperation of the involved parties and stimulate the further development of the small hydropower CDM projects in China.

Mr. Ye Jianchun pointed out that climate change is one of the most serious problems the world faces nowadays and it has caused wide public concern in the international community. According to Kyoto Protocol which came into effect in 2005, the developed countries are responsible for a quantified emission limit which was legally binding. They can also, according to the Protocol, carry out cooperation at project level with developing countries, namely the CDM projects, to reduce the cost of domestic emission of the developed countries and to achieve its target of emission reduction. This is an innovative mechanism which plays a positive role both in promoting sustainable development in developing countries and in helping the developed countries to fulfill the emission reduction targets. Under the targets of controlling greenhouse gas emissions, China will reduce emission by 40%–45% for GDP per unit by 2020 and the proportion of non-fossil energy will reach 15%. Therefore, the promotion of circular economy, energy saving and emission reduction and fully relying on renewable energy is a must to achieve the sustainable development in China. Small hydropower is a kind of clean renewable energy and it accounted for about half of the approved CDM projects in our country. However, there still remain some external factors that restrict the process of its development, such as the long duration for application, complicated procedures, strict examination, huge amount of application funds and so on. Hence, nowadays when the issue of climate change gets increasingly heated, we are more urged to invest more capitals and technologies for the development of clean energies such as hydropower and reinforce research and discussion to explore a unique way for boosting the sound development of China's small hydropower.

At the forum, the leaders of relative ministries and experts introduced the latest changes of CDM international rules and the developing trends of the international market, management and developing policies of China's CDM, emissions permission trading, situation and trends of hydropower CDM and so on. Foreign buyers of hydropower CDM, representatives of hydropower CDM owners and the third-party audit institutions introduced the developing situation of CDM projects and related experience. The Forum also carried out related exchanges and discussions.

About 60 participantswere present at the forum, including leaders and experts from Hydropower Bureau and Taihu Basin Authority of Ministry of Water Resources, Department of Social Development of Ministry of Science and Technology, Institute of Global Climate Change of Tsinghua University, CDM Executive Board members, the CDM Centre of Energy Research Institute of National Development and Reform Commission, IN-SHP, Shanghai Environment and Energy Exchange, Shanghai International Consulting Co., Ltd. and guests and experts from small hydropower authorities of related provinces (autonomous regions and municipalities), research institutions and the International Hydropower Association.

Director of HRC Ms.Cheng Xialei, and HRC's expert Mr.Zhao Jianda attended the forum.

(Source:HRC) ■

China to invest billions in water projects

China will intensify its construction of water conservation facilities with priorities given to improving irrigation infrastructure for grain security and projects against drought and floods. Both central and local authorities will increase investment for water conservation construction, including a 10 percent levy on income earned from the leasing of land.

It is expected that about 200 billion yuan ($30 billion) will be invested in constructing water conservation projects in 2011, with a year-on-year increase of 10 percent.

The funds will be used mainly on improving various water conservation facilities for mitigating disasters, renovating water supply for key and medium-sized irrigation regions and ensuring safe drinking water for 60 million rural residents.

Over the next 10 years, the country can double its current average annual investment in water conservation construction.

The total investment in water projects over the past 5 years reached about 700 billion yuan, with a record amount of nearly 300 billion yuan being allocated by the central government. More investment will be made in the construction of water conservation and other facilities in rural areas. Boosting water infrastructure construction in rural areas listed in the No1 document of the Central Committee of the Communist Party of China.

The No1 document for 2011 definitely target water infrastructure, the first special decision the government has ever made to accelerate its development since the founding of New China in 1949. The decision was made because of increasing concerns over the country's grain production.

Other points addressed in the document include:

•The country aims to build effective flood control and drought relief systems by the end of 2020.

•The harnessing of major medium- and small-sized rivers will be completed during the 12th Five-Year Plan(2011-2015).

•The country aims to maintain annual water consumption at below 670 billion cubic meters in the next five years.

•The central government will subsidize the maintenance of public benefit water projects in western regions and poverty-stricken areas.

•The problem of water not safe to drink in rural areas will be eradicated by the end of 2015.

(***Source:China Daily)*** ■

China Hydroelectric to acquire 55.4MW of hydropower projects in China

China Hydroelectric Corporation, an owner, developer and operator of small hydroelectric power projects in China, announced it has entered into a definitive agreement to acquire a controlling interest in a total of 55.4 MW of operating installed capacity in the Fujian province of China.

This acquisition is the first phase of the previously announced "Taiyu Projects" acquisition for a controlling interest in seven operating hydroelectric power projects, representing a total of 114.4 MW.

This first phase of the Taiyu Projects acquisition consists of controlling interest in the following five operating projects: a 74 percent interest in the Jinwei project (16 MW); a 74 percent interest in the Jintang project (11.6 MW); a 55 percent interest in the Jinlong project (10 MW); a 100 percent interest in the Qianling project (13 MW); and a 100 percent interest in the Dongguan project (4.8 MW). These five projects represent a combined total of 55.4 gross MW of the total of 114.4 gross MW for the Taiyu Projects.

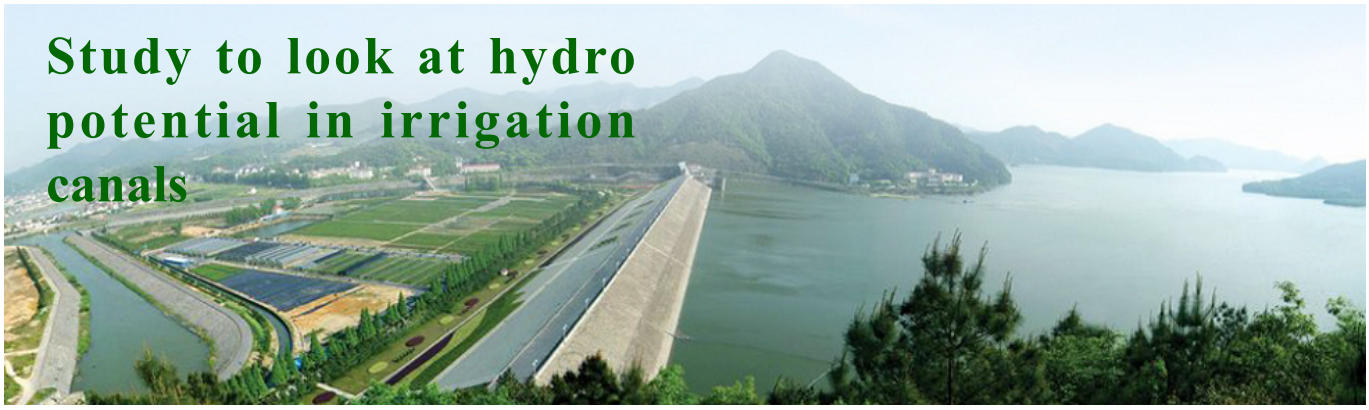
The definitive agreement provides for China Hydroelectric to acquire this first phase for a purchase price of US$61.3 million (RMB 411 million). This acquisition, which is expected to be consummated shortly, is expected to be financed through cash on hand and bank financing. The consummation of the acquisition is subject to customary closing conditions, including, among other things, obtaining government approvals.

The company had announced the signing of the memorandum of understanding for this acquisition earlier in 2010. This first phase of the acquisition, if consummated, will represent an addition of 55.4 MW of gross operating installed capacity, or 43.7 MW of net installed capacity, increasing the company's total gross installed capacity to 548.8 MW, or 532.6 MW of net installed capacity.

In other news, CHC announced that the company has signed a definitive agreement to acquire a 100 percent interest in the Dazhaihe project, a 15 MW operating hydroelectric project in Yunnan province of China, for a purchase price of US$17.6 million.

Earlier in 2010, CHC completed the previously announced acquisition of 100 percent of the Minrui small hydroelectric projects totaling 55.5 MW of installed capacity in the Yunnan province. ■

Study to look at hydro potential in irrigation canals



Colorado State University and engineering firm Applegate Group are to research the potential for utilising low-head hydro turbines in Colorado's irrigation canals following the award of a US$50,000 grant from the state's Department of Agriculture.

Lindsay George, water resource engineer in the Glenwood Springs offices of Applegate, and Dan Zimmerle, a research scientist and adjunct mechanical engineering professor at Colorado State, received the grant, which is part of the Advancing Colorado's Renewable Energy (ACRE) Program to promote energy-related projects beneficial to Colorado's agriculture industry.

In the study, the researchers will examine hydrokinetic turbines that could generate power from an elevation drop in an irrigation channel of 5-30 ft. Water in irrigation canals moves fast enough to produce anywhere from 100 kW to 2 MW of power.

Interest in this type of hydrokinetic power is growing as technology improves. The state of Colorado currently has a MOU with the Federal Energy Regulatory Commission to streamline the permitting process for low impact hydropower projects in existing canals.

"Hydrokinetic turbines produce a small amount of power and are going to be practical in certain situations,"said George. "With our study, we expect to report a total amount of power that could be produced using low-head and hydrokinetic turbines in our irrigation canals that should help irrigation districts in planning their projects.

"New low-head technologies have potential at sites previously considered unfeasible for hydro development because of a lack of significant elevation drop. Irrigation canal drop and check structures, as well as existing diversion dams and outflows, may provide the drop necessary to implement these new low-head hydro technologies." ***(Source: IWP&DC)*** ■

Alstom signs contracts for Brazil SHP plants

Alstom has signed two contracts with Brookfield Renewable Power to supply key plant equipment to the Pezzi and Serra dos Cavalinhos II small hydro plants in the state of Rio Grande do Sul, Brazil.

Alstom's scope of supply for each project includes two Kaplan "S" turbines, two generators, two speed controllers, two voltage regulators and the assembly and commissioning supervision of this equipment. Alstom's Kaplan "S" turbines are specifically developed to fit small hydro needs.

The 20 MW Pezzi small hydropower plant will be built on the Antas River, between the municipalities of Bom Jesus and Jaquirana. Commissioning should start in September 2012. The 29 MW Serra dos Cavalinhos II plant will be located in the municipalities of Sao Francisco de Paula and Monte Alegre dos Campos. Commissioning should begin in November 2012.

Equipment for the projects is being manufactured at Alstom's Taubaté plant, one of its largest hydro manufacturing plants.

In other news, a consortium formed by Alstom and Schrader Camargo, a Colombian assembly company, have signed a contract with Emgesa–a subsidiary of Endesa, and the first private operator in Colombia–for the supply and assembly of electromechanical equipment for the 400 MW El Quimbo hydropower plant.

The total value of the contract is approximately 115 million euros, of which Alstom's share is around 90 million euros (about US$118.2 million).

(Source: HRW) ■

Greening Industries, Greening Cities

Workshop on Small Hydro Power UNIDO Week at the Shanghai Expo

On May 25th, Workshop on Small Hydropower–"Greening Industries, Greening Cities" week was held in the UN Pavilion of the 2010 Shanghai Expo Park. Around 150 people attended the workshop, a highly successful event that enabled face to face dialogue between representatives of government agencies, international organizations and businesses. Mr.Hu Siyi–Vice Minister of Water Resources Ministry, Mr.Yoshiteru Uramoto, UNIDO Deputy DG were present and delivered speeches.

On behalf of UNIDO, Mr. Uramoto welcomed everyone to the Workshop on Small Hydro Power (SHP) at the UNIDO Week in Shanghai. He also expressed his sincere gratitude to IC-SHP for their dedication in making the event a success.

Mr. Uramoto commenced by talking about his personal experience of seeing SHP in action in Africa. He emphasized that it means a lot to small communities in Africa: a miracle that can kick-start all types of ideas and activities. But despite this, he said, SHP development remains limited in Africa. China has given 300 million people the benefit of electricity through SHP. It is now time for other countries to experience the same.

Mr. Uramoto stated that SHP is a low cost, clean, renewable energy that causes minimal environmental impact. By supplying affordable and adequate electricity, particularly in developing countries, SHP leads to economic development and increases employment opportunities while improving local living standards. Due to these many advantages, governments globally are focusing on it as an energy source. China is a leader in SHP, with both abundant hydro resources and "indigenous" technology and equipment. China not only focuses on domestic development, it also supports SHP development in other countries – through technology transfer and related support activities. In 1994, under the joint sponsorship of UNIDO, UNDP and the Chinese government, IC-SHP was established to promote SHP development worldwide through triangulated technical and economic cooperation among developing countries, developed countries and international organizations. Over the past 16 years, said Mr. Uramoto,

Mr.Yoshiteru Uramoto, UNIDO Deputy DG

UNIDO has kept a close relationship with the Center, using it to undertake SHP projects worldwide. UNIDO is now looking to develop additional triangulated cooperation strategies on SHP in developing countries, particularly in Africa, with IC-SHP as its partner.

Mr. Uramoto finished by saying that the UN pavilion – where the workshop was held – symbolized peace, harmony and prosperity. The workshop held within it would show the importance of SHP as a clean, renewable energy source, highlighting its significance in achieving sustainable socio-economic development. Finally, Mr. Uramoto gave UNIDO's sincere thanks to the Ministry of Water Resources for its support.

Mr. Hu welcomed everyone on a day of beautiful weather and to a unique venue, the UN pavilion at the Expo. He outlined that SHP has been playing a very important role in economic development around the world, and as part of the greening of global electricity.

He followed by saying that hydropower provides one fifth of the world's electricity; in 55 countries it accounts for over 50% of electricity generation, and over 90% in 25 countries. He noted that developed countries have developed most of their accessible resources but that there are still many opportunities in developing countries.

China has now over 45,000 small hydropower plants producing over 160 billion kWh per year. This is 30% of the country's total power generation. Electrification of rural areas has been increased from 40% to 99.6%; is important for rural electrification and rural economic development.

In terms of greenhouse gases (GHGs), Mr. Hu said that China will reduce GHGs per unit of GDP by 40% by 2020. SHP has an important contribution to make to this target. SHP development is also important for the Ministry for improving living standards in rural places, replacing wood fuel and improving conditions for farmers. The Ministry needs to provide electricity for 10 million farmers, based on an annual usage of 1,500 kWh per family. They will use SHP, particularly upgrading existing rural hydropower stations.

Mr. Hu went on to discuss the international role of IC-SHP, which has so far provided technical consultation to over 30 other countries. He said that its Light-Up Rural Africa (LURA) project has had very positive feedback from other UN departments and been warmly received by the African countries

Mr.Hu Siyi,Vice Minister of MWR

involved. The Chinese government aims to develop 100 SHP plants in Africa, spread policy knowledge, hold more training and use the International Network for SHP (IN-SHP) to strengthen information exchange between members.

Mr. Tian Zhongxing, director of Hydropower & Rural Electrification Bureau of Water Resources Ministry attended this Workshop and gave a key-note speech on small hydropower's effect in controlling the global climate change and ecological civilization construction and proposed some new approaches on small hydropower development.

Ms. Cheng Xialei, director of HRC attended the Workshop and answered questions put forward by representatives from both home and abroad on how Chinese small hydropower standards goes global so as to support exportation of Chinese SHP equipment.

(Source:HRC) ■

SHP Greening Chenzhou City Development

By Xiang Lili, Mayor of Chenzhou City

Mr. Xiang Lili presented the successful case study of SHP in Chenzhou City. He started by stating that their preferential policies for SHP development were based on 3 aspects:

•Ecological development ideology: The emphasis was put on replanting forest to improve water management, making more water available for SHP plants.

•Promoting industrial energy structure change: A shift from fuel to SHP was promoted. The local government made plans in conjunction with industry for green changeover, but sticking within the idea of 'reasonable' SHP development.

•Policies for SHP promotion: The local government took a leading role, making credits available for companies.

Based on their approach, Mr Lili said that by 2000 Chenzhou had 1.09 GW of installed capacity, and in the 10 years to 2010 this was increased by a further 628MW. Since the 1990s Chenzhou City has invested over 610 million yuan in the electricity infrastructure, reaching 220,000 households. This is at an average cost of 0.5yuan per kWh.

Mr. Xiang also stated that SHP has become a local economic pillar and that Chenzhou Power company is now internationally listed. But he concluded by saying that SHP relies on contribution and support from the relevant stakeholders. He sincerely hoped that Chenzhou City can work with IC-SHP and other institutions and also extends a warm invitation to Chenzhou for sightseeing and investment.

•Xing Yuanyue, Deputy Director, Hydropower Bureau of Rural Electrification of MWR

•Cheng Xialei, Director General, Hangzhou Regional Center for Small Hydro Power(HRC)

•Wang Hangwei, President of Board, Zhejiang Jinlun Electromechanical Co. Ltd

•Xiang Lili, Mayor of Chenzhou City

Panel Discussion & Wrap Up

The final session was a panel discussion with questions from the follows.

Q1 from Joseph Martin, President of Board, Norcan Hydraulic Turbine Inc. Canada

What policies and incentives are there for refurbishment of old SHP plants in China?

A1 by Xing Yuanyue, Deputy Director, Hydropower Bureau of Rural Electrification of MWR

That's a good question. We have a lot of old SHP stations in China from the 70s and 80s. The Chinese government provides funds for improvements and upgrading. There is no policy for fixing tariffs, but we provide funds.

Q2 from Huang Wenbao, President of Board , Changsha Huaneng Automatic Control Group

As a local leader, in the past years we have received many criticisms for our SHP development. This has been some recent improvement, but we think that the government should give SHP more support.

A2 by Xing Yuanyue, Deputy Director, Hydropower Bureau of Rural Electrification of MWR

I think that the speeches of Vice Minister Hu and Mr. Zhongxing this morning gave the evidence of our support for SHP. In the past, there have been some negative impacts, but through hard work we are removing these. Through development of natural resources our country's future direction will be clean and renewable energy. With the highest economic return we attach much importance to hydropower, particularly SHP.

Our 12th 5 year plan will further increase government support for SHP. We are currently discussing the possibilities for preferential tax policies and SHP grids. The tax policy will increase investment support from industry.

Q3 from Zhu Xingjie, President of Board, IC-SHP Gansu Base

The old power stations enjoyed independent networks to provide electricity, but recently those grids are being taken back by the government.

A3 by Xing Yuanyue, Deputy Director, Hydropower Bureau of Rural Electrification of MWR

Another good question. From 1998 we started national grid reform and central government bought some of those independent grids or started joint programmes. So there are increasingly fewer independent self-managed grids. Government encourages them to exist but this does pose some problems – they are not in the national grid reform programme, so may have old cables, less advanced grid management and so on.

Our guidance is that they will be further supported as a model. The state grid wants to eventually include all rural grids into their grid, so with more time, just another 10 years say,

they will enjoy the same benefits.

Q4 from Xu Congxiao, Deputy Manager, Zhejiang Jinlun Electromechanical Co. Ltd

Our company exports to and from about 40 countries, but how can China incorporate international standards, e.g. from Germany and the USA, into our standards. The licenses and standards are all in Chinese. Can our industrial association or government departments translate our Chinese standards into English?

A4 by Cheng Xialei, Director General, Hangzhou Regional Center for Small Hydro Power(HRC)

This is a very timely question. China is increasing its efforts on this issue. Two years ago we did a research project that led to proposals to synergise our materials and standards with international ones. China's SHP has its own features and experiences. Using EU standards

might hinder our development. For example, in Mongolia our equipment can be used for 300,000 kW, but this is much lower if European standards are used. By not accepting our Chinese standards, the costs are increased considerably.

Translations of our standards are now being undertaken. Firstly, the English versions will be launched very soon. Secondly, the Chinese standards will be promoted in other countries, and thirdly, we will make the Chinese standards internationalized.

A4 by Wang Hangwei, President of Board, Zhejiang Jinlun Electromechanical Co. Ltd

Our company works around this problem. We collected lots of material on international standards and created comparison charts to compare them. We are a Chinese company so a lot of international companies don't know our standards. If partners prefer, we use other country's standards, but we must also always meet the Chinese standards. We will try our best to use IEC standards etc, but where this is not possible, we use the Chinese ones.

Q5 from Song Hui, Duputy General Manager, Changsha Huaneng Automatic Control Group

We have two grids in Chenzhou, national and SHP. From the government's perspective, what is the trend for the development of these two types of grids.

A5 by Xiang Lili, Mayor of Chenzhou City

Much will be done to promote both types of grid. The national grid is already good, and SHP grids will be further improved.

Q6 from Liu Heng, Director General, IC-SHP

Please can each panelist provide one sentence on the future of SHP?

Xiang Lili: Chenzhou is a historical city and we hope that SHP will make it a better city.

Cheng Xialei: SHP is a rising industry, and I am sure that there are lots of opportunities ahead.

Xing Yuanyue: SHP will make many poor rural areas eliminate poverty.

Wang Hangwei: I hope that Chinese SHP companies can make their contribution to international SHP development.

(Source:HRC) ■

Training Opportunity by HRC for 2011

No	Name of the Training	Date	Fee
1	Training Workshop on Small Hydropower Technology for Developing Countries	From 26 May to 6 July, 2011	Fellowships will be provided, including international airfares, boarding, lodging, local transportation in China, pocket money and etc. The interested applicants may contact, directly or through their governmental organization, the Commercial Office of the Chinese Embassy for approval.
2	Formation sur la Technologie de Petite Centrale Hydroélectriques pour les Pays francophones en Afrique	Du 18 août au 28 septembre, 2011	

Inquiry may be sent to contact person: D.Pan
E-mail :dqpan@hrcshp.org
Tel: 0086 571 56729285
Mobile: 0086 13958008521
Fax: 0086 571 88062934

Policies and Regulations: Regulating Small Hydropower

Russell W. Ray

New incentives have led to a number of proposals to build small hydropower projects in the U.S. The Federal Energy Regulatory Commission is considering reforms aimed at streamlining the licensing process for the developers of those projects.

Developers of small hydropower projects are seeking big changes in the way their projects are permitted and licensed by the Federal Energy Regulatory Commission (FERC).

Requests to build small hydro projects, facilities with a capacity of 5 MW or less, have been pouring into FERC, thanks to new tax credits, grants, and initiatives to reduce greenhouse gas emissions. "There's a definite increase in interest in the industry and FERC is feeling it in the number of preliminary permit applications and development proposals," said Nancy Skancke, an attorney with GKRSE and chair of the National Hydropower Association's (NHA) Small Hydro Council.Without a simpler, quicker, and more efficient licensing process for small hydro projects, though, the development of new hydropower capacity in the U.S. may be stymied, according to NHA.FERC is reevaluating its licensing process for small hydro projects because of the increased activity.Issues facing the developers of small hydro projects were placed front and center during a technical conference hosted by FERC in December 2009. Written comments were filed in February 2010. The underlying question: Why should a 500 kW project with no significant environmental issues comply with the same regulatory process used for a 500 MW project?

"Projects supplying the smallest amount of generation are paying the most in process costs because the relative scale of those costs is the same regardless of project size," according to written comments filed by NHA. "This situation detracts investor interest in smaller hydro projects and makes finding financing very difficult."

Applications for new hydro projects surge 30 percent

The number of proposals to build new hydropower capacity is up about 30 percent from two years ago, said Ed Abrams, deputy director of the Office of Hydropower Licensing at FERC.

"A lot of these are at existing federal dams," Abrams said. "We have had quite a few 5 MW exemptions for small projects."But the regulatory process can be difficult to navigate, especially for the developers of small projects, Abrams said.

"They tend to be less sophisticated than the typical relicense applicants, who have professionals at their disposal to prepare the application and do the consultation work," he said. "We're having to kind of hold the hands of a lot of these smaller developers."

Requests to build small hydro projects such as the 400 kW Harris Bridge Hydroelectric Project on Virginia's Rockfish River are up 30 percent over the past two years, according to the Federal Energy Regulatory Commission.

Faster, smarter licensing process sought

Right now, it takes about five years to obtain a license to install hydro capacity at existing non-powered dams. NHA has asked the commission to cut the licensing process down to two years by establishing a more efficient system.

"Only 3 percent of the nation's 80,000 dams currently generate electricity – so the potential for adding electric generation to non-powered dams is enormous," NHA wrote. In addition, the environmental impacts associated with the development of hydropower at existing non-powered dams are typically minimal because the most significant environmental impact – the construction and operation of a dam – has already occurred.

"These are dams that have been there a long time," Skancke said. "If you've got minimal environmental issues, it shouldn't even be that long."

Other recommendations by NHA include:

–Increasing the threshold for "non-capacity" amendments to under 10 MW;

– Approving unopposed exemption applications within 45 days after the notice period expires, unless the commission issues an order to the contrary;

–Modifying the definition for conduit exemptions;

–Providing outreach programs to help those with limited experience with FERC's regulatory process;

–Establishing an online application process for permits, licenses, and exemptions.

Meanwhile, FERC is reviewing the public comments that were filed in February 2010. No one knows for sure what FERC will do next. "We're hoping that they start an expedited rulemaking proceeding to try and fix some of the regulations that would help remove some of these barriers," Skancke said.

More exemptions could be issued

FERC should be issuing more exemptions to small hydro projects, especially in cases where there is no opposition, Skancke said. But FERC has curtailed its use of such exemptions, fearing lawsuits from environmental groups and the threat of court-ordered decision making.

"FERC has the statutory authority to exempt certain types of projects," Skancke said. "It's just not using the authority to its fullest extent.

"It shouldn't take the 'average Joe's' company nine months to a year to get an exemption where there was no opposition."

Jeanne Hilsinger, of MAVEL Americas Inc., a turbine manufacturer, said Europe has developed 17 percent of its economically feasible small hydro potential, while the U.S. has developed 14 percent. In 1940, hydropower accounted for 40 percent of the electricity produced in the U.S. That figure has plunged to 7 percent today.

"Policy really matters," Hilsinger said. "Europe has 17,571 small hydro plants. That's more than seven times the number in the U.S. (2,346)."

Navigant Consulting: U.S. has potential to quadruple capacity

The U.S. has about 100,000 MW of hydropower capacity. However, a study by Navigant Consulting Inc. shows that the technical potential is around 400,000 MW.

"It's a tremendous opportunity, and I think it is sort of an unknown secret," said Navigant Consulting Managing Director Lisa Frantzis.

The study estimates the industry could add 60,000 MW of new capacity by 2025. But NHA, which

commissioned the study, said an increase of that size "will not occur without a series of changes to the status quo, including improvements in certain aspects of the regulatory process for hydropower development."

Up to 700,000 jobs could be created by 2025 if the potential for new capacity is met, the study shows.

"There is a tremendous opportunity in the hydropower sector, not only with jobs, but in terms of megawatts of installations," Frantzis said. "And I think the other exciting thing is that the opportunity would create jobs across the U.S., which is also a real benefit."

Interest in the development of small hydropower capacity has surged in the wake of Congress' enactment of the Energy Policy Act of 2005 and the American Recovery and Reinvestment Act of 2009. The 2009 legislation included a 30percent investment tax credit and grants for building new hydropower capacity at existing plants and non-powered dams.

"We have a great opportunity in North America because we have a lot of infrastructure already in place," said Jay Maher, a senior manager for Kleinschmidt Associates, a consulting company that specializes in energy and water resources. "It's very unlikely that you'll see a great big dam going up, but we have thousands of existing dams that have the potential."

Some of the policy changes recommended by the NHA could be implemented quickly, without a rulemaking proceeding. Such swift action "will enable small hydro developers to take advantage of current incentives for small hydro development," NHA said.

State reform also needed

Industry observers say regulatory reforms are needed at the state level as well."It is estimated that Vermont has up to 400 MW of undeveloped hydroelectric potential," said Sen. Vincent Illuzzi, chairman of Vermont's Senate Committee on Economic Development, Housing, and General Affairs. "But no new hydro site has been developed or redeveloped in Vermont for 25 years because of the permitting obstacles."

In written comments filed with FERC, Illuzzi said Vermont's Agency of Natural Resources has been reluctant to streamline its procedure for obtaining a 401 water quality certificate for hydroelectric projects, despite a new state law directing the agency to devise a more timely, predictable and affordable procedure.

"This has turned into a multi-year process," Illuzzi wrote. "Perhaps Vermont's largest utilities don't want to deal with small power producers."

Among other things, Illuzzi recommended that FERC devise a process that grants automatic approval to hydro projects within 60 days after filing its application, unless FERC steps in to delay the approval.

"We have similar processes like this in Vermont," Illuzzi said. "For example, the Vermont Public Service Board issues a Certificate of Public Good for net-metered projects if there are no intervenors within 30 days."

According to the study by Navigant Consulting, there are 5,140 MW of undeveloped hydropower potential in the Northeast. If that potential was met by 2025, it would create more than 159,000 jobs in the region, the study shows.

"We need simplified state and federal permitting processes for small-scale hydroelectric projects," Illuzzi said. "Vermont, like other states, has the opportunity to generate renewable power in our towns, along our rivers, and at the same time address climate change, generate skilled jobs in construction, and protect the environment. These jobs can't be outsourced."

New players, from private utilities to local communities, are looking to develop small hydro projects, and their experience with the FERC's regulatory process is limited, NHA said. An updated Small Hydro Handbook would be a valuable tool for the industry, the association said.

(Russell W.Ray, Associate Editor of Hydro Review. Appeared in the April 2010 edition of HRW) ■

HRC's Annual Report on Foreign Affairs in 2010 and Work Plan for 2011

In 2010, under the leadership of the Ministry of Water Resources (MWR) and Nanjing Hydraulic Research Institute (NHRI) and with the industrious and unyielding efforts of its entire staff, taking Scientific Outlook on Development as the guideline, HRC has made considerable achievements in terms of foreign-aid training, technical exchange and economic cooperation. Entrusted by the Ministry of Commerce, HRC undertook two foreign-aid training workshops on small hydropower; 48 participants from 20 countries attended the workshops. Various SHP cooperation and exchange activities were carried out; a number of hydropower projects were conducted successfully and international SHP market further expanded.

I Foreign-aid Training Workshops on SHP

1. Training Workshop on Small Hydropower Technology for Developing Countries

Entrusted by the Ministry of Commerce of China, HRC organized the Training Workshop on Small Hydropower Technology for Developing Countries from 28th April to 8th June, 2010. 18 engineers and technicians of SHP and energy domain from 10 countries participated in this workshop. Besides lectures, visits and investigation tours which add to 11 days in total had been organized. The places that the visits and tours covered were Laoshikan SHP Station and Xiaofeng Station in Anji, Fuchunjiang Hydropower Station in Zhejiang Province, Tinghu SHP Station and Nanshan SHP Station in Shengzhou City, Ningbo Pumped Storage Station, Zhejiang Fuchunjiang Hydropower Equipment Co., Ltd , Linhai Electrical Machinery Plant, Linhai Machinery Plant, CHINT Group Corporation which was a well-known private enterprise, and Yiwu International Small Commodity Market which was the biggest of its kind in the world. And, the participants were also organized to attend Shanghai World Expo in Shanghai. The working language of this workshop was English.

The Highlights of This Training Workshop:

(1) Attending the Shanghai World Expo

On 3rd June, the participants embarked on a three-day journey to the Shanghai World Expo. When it came that they had to leave Shanghai, they were all somewhat reluctant. The tour to Shanghai World Expo has not only entertained the participants who have a busy schedule for study, but also served as an excellent opportunity to comprehend the huge development of China since reform and opening up and sense the unique charisma of Shanghai which is the typical representative of modern Chinese cities, thus having greatly publicized China in the new arena.

(2) Find a New Corporation for Visit and Investigation

Apart from small hydropower equipment manufacturers, we also arranged the participants to visit Zhejiang Fuchunjiang

Hydropower Equipment Co., Ltd.. The international participants couldn't help complimenting the China's manufacturing techniques of large and medium hydropower equipment. When the engineer of Zhejiang Fuchunjiang introduced, while pointing to a turbine unit under assembly, that this unit was produced for a station in Vietnam, the Vietnamese participant claimed, "It's really great pleasure for me to see with my own eyes the manufacturing process of the equipment. I will definitely try my best to say a good word for Chinese manufacturers. " Other participants posed questions on the company's cooperating projects with their respective countries and expressed their strong willingness for future cooperation.

(3) Hold Business Discussions

On the afternoon of 31rd May, according to their different nationalities, participants were divided into five groups for a business talk with HRC on international small hydropower cooperation. The discussion was presided over by Chief of Division of Foreign Affairs and Training Mr.Pan Daqing and Deputy Division Chief Mr.Lin Ning and attended by a dozen experienced engineers of New-Tech R&D Center for M&S Hydro/Hangzhou Yatai Hydro Equipment Completing Co. Ltd. The participants introduced SHP development in their respective countries, informed the others of the biggest hindrance and difficulty encountered and expressed their strong willingness to cooperate with HRC. HRC engineers listened attentively and made notes, raising suggestions from time to time.

The four-hour talk had served as a good platform for the international participant to obtain a better knowledge of the technologies and services HRC is able to render; meanwhile, HRC engineers were better informed about the demand of each country, thus laying a solid foundation for future hydropower equipment export and technical consultancy service export.

Here are some abstracts from the participants' evaluation:

"The working members here are very friendly, gentle, helpful and cooperative."

"We are so grateful that every lecturer is trying hard to convey the knowledge to us. I'm deeply impressed by the workshop, so are the other participants, I think. Besides, during our stay in Shanghai, everything was perfectly and considerately arranged."

"The courses are very practical and useful to me. I have learned essential knowledge and expertise on SHP development, SHP design as well as SHP application in rural electrification in our country."

2. Seminar on Rural Electrification for Developing Countries

Entrusted by the Ministry of Commerce of China, HRC organized the Seminar on Rural Electrification for Developing Countries from 11th June to 8th July, 2010. 30 officers and experts of electricity, energy and environment domain from 13 different developing countries came to participate in this seminar in Hangzhou. The contents of lectures were rich and informative, covering the general introduction of rural electrification development in China and its incentive policies, management mechanism of power system and load forecasting for power system and its new technology development, the relationship between rural electrification and environment, the development of new energy for rural electrification, including wind energy, solar energy and micro hydropower, as well as other contents on small hydropower which is closely related to new energy for rural electrification, including the developing modes of small hydropower development, hydrology, Chinese norms for SHP, hydraulic structure, SHP equipments and automation technology, etc. What's more, Chinese water resources, Three Gorges Project, the South-north Water Diversion Project, Clean Development Mechanism (CDM), etc. were introduced as specialized topics.

Besides the normal informative lectures, visits and investigation tours of 9 days in total had been organized. The places that the visits and tours covered were the world famous Three Gorges Power Station, Tinghu SHP Station and Nanshan SHP Station in Shengzhou City, Ningbo Pumped Storage Station, Hangzhou Changhe Generating Equipment Co., Ltd, Zhejiang Windey Generating Engineering Co., Ltd, etc. And, the

participants were also organized to attend the world expo in Shanghai. The working language of this seminar was English.

The Highlights of This Seminar:

(1) Visiting Three Gorges Project

On 30th June, led by Director of HRC Ms.Cheng Xialei, Chief of Division of Foreign Affairs and Training Mr.Pan Daqing and Mr.Lu Jianping, Chief Engineer of Hangzhou Yatai Planning & Design Institute for Medium & Small Hydro Power, the participants embarked on a five-day journey to Three Gorges. This study tour had been deeply impressive for every participant because they had not only beheld the world famous Three Gorges Dam, which typified China's advanced hydropower technology, but also enjoyed the beautiful sceneries of China. No wonder one participant said passionately: "Chinese people are so smart and hard-working to have created such a great project." Another participant wrote in his report of this seminar: "What excites me most is the tour to Three Gorges. I had never expected that I could see the greatest project in the world in my life. I feel so fortunate. That is amazing."

(2) Country Report—A Platform for Mutual Communication

On the afternoon of 5th July and on 6th July, an SHP business talk was held with all participants being divided into 13 groups by their nationalities. This meeting was presided over by three monitors, and proceeded smoothly. The participants from 13 countries introduced the customs and practices of their countries as well as the stage of electrification development with the aid of PPT, video and other multi-media tools so that their country reports were rich and informative in content, colorful and interesting in form. The reporters were all very confident and passionate when giving presentations, while the rest participants listened attentively, frequently nodding their heads and putting forward some questions thus rendering the atmosphere very heated and harmonious. The leaders of HRC and some lecturers also participated in the meeting and communicated with participants genuinely and the business talk was concluded with great success.

(3) Emergency Management

Before the seminar, HRC held a meeting in preparation for the security of the international training workshop and copies of emergency scheme for the international training workshop were distributed so as to make sure that the emergent cases could be detected and dealt with as soon as possible. On the morning of 13th June, Aiko, Tanzanian participant of 2010 Seminar for Rural Electrification, reported that he had a fever and was at once accompanied by an HRC worker to see a doctor in Zhejiang Tongde hospital. His blood sample, which was tested by Hangzhou Center for Disease Control and Prevention, showed that Aiko was infected by acute malaria. Consequently, he

was transferred to Hangzhou No.6 People's Hospital for treatment. Although informed by experts on infection that there had been no malaria-transmitting mosquito in Hangzhou City, we took immediate actions of disinfection and mosquito eradication in participants' study and living areas. From the moment that Aiko was discovered infected by malaria to his final settlement in hospital, the leaders of HRC had paid intense attention to Aiko's treatment and recovery. Mr.Pan Daqing, Chief of Division of Foreign Affairs and Training, and Mr.Wang Linjun, Chief of Administrative Office, had accompanied Aiko to do all the body check and tests painstakingly. Leaders of HRC acquired Mr.Pan Daqing of Aiko's health condition everyday and urged related staff to do work as carefully as possible. With meticulous care, Aiko recovered after three days and resumed his study in HRC.

(4) Business Talk Held for Mutual Cooperation

On the afternoon of 8th July, a business talk on international cooperation was held in HRC. Participants made meticulous preparations for this business talk and exchanged ideas with HRC technicians on detailed projects for cooperation. They introduced the conditions of rural electrification in their countries, the demand, obstacles and difficulties for developing rural electrification, and then further discussed with HRC technicians on the orientations of possible future cooperation.

Participants declared their willingness to be the spreaders of technology, culture and friendship among countries after they returned to their motherland with the abundant knowledge and technology on rural electrification that were acquired in China. They would describe to their family members, friends and colleagues a true China and actively promote technological and business exchange and cooperation on rural electrification between China and other developing countries with the purpose of achieving win-win situation.

Here are some abstracts from the participants' evaluation of the seminar.

"The organizing group of the seminar is terrific. The seminar is rich in content and excellent in form which combines lecture with on-site visit."

"HRC leaders and other staff members are very friendly. Director Cheng, Mr.Pan, and other members of Division of Foreign Affairs and Training are also very helpful."

"More such training workshops ought to be held for other developing countries, because through this seminar, we are able to discover problems concerning rural electrification construction in our countries. It would be excellent if the training period is 45 days instead of 28 days. "

II Various Important Conferences Held or Participated

1. Promotion Conference for Clean Energy Development in Macedonia Held Successfully

On 4th March, under the co-sponsorships of the Chinese Embassy in Macedonia and the Ministry of Economy of Macedonia, proposed and arranged by the Economic and Commercial Counsellor's Office of the Chinese Embassy in Macedonia, HRC held the Promotion Conference for Clean Energy Development in Macedonia with Sinosteel Tiancheng Environmental Protection Science and Technology Co. Ltd. as co-organizer.

Mr. Dong Chunfeng, the Chinese Ambassador in Macedonia and Mr. Fatmir Besimi, the Minister of Economy of Macedonia were present at the opening ceremony and delivered speeches respectively; Ms.Cheng Xialei, Director of HRC

was seated together on the rostrum. Up to 100 business delegates from Macedonia attended this conference. About ten press agencies came for interview, and local TV channel reported this activity that day. News had also been released on the websites of the Ministry of Foreign Affairs and the Ministry of Commerce of China.

At the conference, Director Cheng Xialei, MrLin Ning and Mr.Xu Wei, the Deputy General Managers of Hangzhou Yatai., presented "SHP Development and Rural Electrification in China", "Development and Application of Chinese SHP

Equipment", and "Technology of Renewable Energy and Micro Hydropower". The introduction of solar energy technology was made by Mr.Liu Xuefeng, General Manager of East China Branch of Sinosteel Tiancheng. Four Macedonian experts introduced the current situation and demand on the local development of small hydropower and solar power. After the presentations, participants were divided into two groups, i.e. "Hydropower" and "Solar Power" for diversified and in-depth technical exchanges and discussions on potential projects. Three Macedonian hydropower engineers who had attended HRC's international training workshops before also helped to organize the conference.

The conference was proven to be a full success as the Ambassador Dong addressed in his speech, "Hangzhou Regional Center (Asia-Pacific) for Small Hydro Power, has rich experience in international cooperation for small hydropower and solar power, as well as equipment supply. The conference aims to present an overview to Macedonia, about China's capability on technical advancement and equipment manufacturing in small hydropower and solar power. We would like to explore cooperation opportunities for private investors and governmental departments between both two countries, and to make contribution to the development of clean energy industry in Macedonia."

2. Director of HRC Attended the UNIDO Workshop

On 25th May, 2010 Shanghai Expo's "United Nations Industrial Development Organization (UNIDO) Week—Workshop on Small Hydropower for Promoting Green Economy and Sustainable Development of Communities" was held in the UN pavilion of the Expo Park. Vice Minister of Water Resources Ministry, Mr.Hu Siyi, Deputy Director General Mr.Yoshiteru Uramoto were present and delivered speeches.

Mr.Tian Zhongxing, Director of Hydropower & Rural Electrification Bureau of Water Resources Ministry attended this workshop and gave a keynote speech on small hydropower's effect in controlling the global climate change and ecological civilization construction and proposed some new approaches on small hydropower development.

Ms. Cheng Xialei, Director of HRC attended the workshop and answered questions put forward by representatives from both home and abroad on how Chinese small hydropower standards go global so as to support exportation of Chinese SHP equipment.

The representatives of UNIDO headquarters, China office of UNIDO, International Small Hydropower Association and some other international organizations as well as leaders of related bureaus of Water Resources Ministry, representatives of local governments and companies and experts in small hydropower attended this workshop with the purpose of finding a way to develop environment friendly small hydropower. Some experts of Division of International Cooperation, Science and Technology of HRC also took part in the Workshop.

3. HRC Leaders Participated the China SHP and CDM Forum

Forum on SHP in China & CDM was held on 14th July in Shanghai. Director of HRC Ms. Cheng Xialei and professor Mr.Zhao Jianda from Division of International Cooperation and Technology took part in the forum. The Forum aimed at adapting to the latest changes of international rules and to the developing trends of the international market, exchanging the development experience in small hydropower Clean Development Mechanism (CDM), sharing achievements, building consensus in order to promote China's small hydropower jointly under the context of global climate changes, and facilitating the better and faster development of the small hydropower CDM projects.

Director of Hydropower & Rural Electrification Bureau of Ministry of Water Resources Mr.Tian Zhongxing, Chief of Taihu Basin Authority Mr.Ye Jianchun were present in the meeting and gave speeches. Mr.Tian Zhongxing pointed out that the development of CDM project for hydropower had introduced a lot of funds for the construction of small hydropower which promoted the development of small hydropower in China. He stressed that we should strive for initiative in the international carbon trading market and gradually change the low-end position of our CDM for small hydropower in the international carbon market and the carbon value chain.

At the forum, the leaders of relative ministries and experts introduced the latest changes of CDM international rules and the developing trends of the international market, management and developing policies of China's CDM, emissions permission trading, situation and trends of hydropower CDM and so on. Foreign buyers of hydropower CDM, representatives of hydropower CDM owners and the third-party audit institutions introduced the developing situation of CDM projects and related experience. The Forum also carried out related exchanges and discussions.

About 60 participants were present at the forum, including leaders and experts from Hydropower Bureau and Taihu Basin Authority of Ministry of Water Resources, Department of Social Development of Ministry of Science and Technology, Institute of Global Climate Change of Tsinghua University, CDM Executive Board members, the CDM Centre of Energy Research Institute of National Development and Reform Commission, IN-SHP, Shanghai Environment and Energy Exchange, Shanghai International Consulting Co., Ltd. and guests and experts from small hydropower authorities of related provinces (autonomous regions and municipalities), research institutions and the International Hydropower Association.

4. Director of HRC Attended 15th Annual Convention of China SSC (South-South Cooperation) Network

On 23rd Oct, the 15th Annual Convention of China SSC (South-South Cooperation) Network which was sponsored by China International Center for Economic & Technical Exchange of MOFCOM, organized by South-South Global Assets and Technology Exchange (SS-GATE) was held in Shanghai. Senior Advisor of United Nations Industrial Development Organization (UNIDO) Ms. Liang Dan and Director of Special Unit for South-South Cooperation of the United Nations Development Programme (UNDP) Mr.Zhou Yiping were present at the meeting and delivered important addresses. Assistant to the Director of China International Center for Economic & Technical Exchange, Mr.Zhao Yongli and President of South-South Global Assets and Technology Exchange (SS-GATE),Mr.Lin Jian gave speeches respectively. Deputy Division Chief from China International Center for Economic & Technical Exchange, Ms.Zhang Wei presided over the meeting and made an annual working report of China SSC Network of 2010. About 60 representatives from the member agencies of the network attended the meeting.

At the meeting, the member agencies reported the work carried out in 2010 in the field of south-south cooperation and offered suggestions on the improvement of the network. Director of HRC Ms.Cheng Xialei gave a report on the work that HRC has been conducting in 2010, which includes: conducting SHP researches and standardization work, organizing foreign-aid SHP training workshops, successfully hosting Promotion Conference for Clean Energy Development in Macedonia and carrying out SHP technical consultation and international trade and so on, among which Ms.Cheng put emphasis on the internationalization of SHP norms and suggested that this item should be listed in the working program of China SSC Network. The proposal received full recognition from Ms.Liang Dan, the Senior Advisor of United Nations Industrial Development Organization who added that Chinese enterprises must breach technical barriers to enter into international market and expand international trade. Madam Cheng and other participants also took part in the celebration of 65th anniversary of the UN establishment in the Shanghai Expo on 24th Oct.

III International Communication and Cooperation

In 2010, HRC has dispatched 9 teams of 22 people abroad and received 21 batches of 69 foreign guests including Director General of Atmospheric Science and Technology Directorate, Environment Canada Charles Lin and his delegation, Norwegian Minister of Oil and Energy, Mr.Terje Riis-Johansen, and the Governor of Nordland, Mr.Odd Eriksen and their delegation, etc. These visits have greatly facilitated HRC's international exchanges, enhanced its international influence and promoted HRC's cooperation with international SHP counterparts, thus bringing win-win result.

1. Mr.Murat, Design Engineer of Pik enerji—the Design Company of Murat II, Visited HRC

On 26th February, Mr.Murat, engineer of Pik enerji which was the design company of Murat II in Turkey, visited Hangzhou Yatai. He discussed with engineers of HRC on the civil works, the drawings and the design of Murat Power Station.

In the meeting, Deputy General Manager of Hangzhou Yatai Mr.Xu Wei and engineer of Hangzhou Yatai Mr.Wang Xuefeng rectified the problems existing in the design, which saved a lot of materials, and Zhang Tian, the liaison of this project, also discussed with Mr.Murat on the subcontract-related things, including the progress of this project, the design and electrification. The meeting proceeded smoothly with many important problems being solved successfully.

2. Director General of Atmospheric Science and Technology Directorate, Environment Canada paid a visit to HRC

On the morning of 28th April, 2010, Mr.Charles Lin, Director General of Atmospheric Science and Technology Directorate, Environment Canada paid a visit to HRC, accompanied by the other two respected guests. The leaders and experts of HRC had a friendly and pleasant meeting with the Canadian delegation.

Director General Charles Lin made a presentation on the efforts and achievements of Environment Canada in the fields of weather, climate and air control. Meanwhile, he expected to learn more about SHP development in China.

Following a warm welcome to the guests on behalf of HRC, Director Cheng Xialei detailed the status quo of SHP development in China, as well as the efforts and achievements of HRC in the field of small hydropower. It was also mentioned that HRC hopes to introduce the technology of VLH turbo-generator unit from Canada with kind assistance from Environment Canada.

Director General Charles Lin applauded the successful development of SHP in China, especially the good experience of "Substituting SHP for Fuel" which deserves to be popularized. After returning to Canada, he would help HRC to promote the introduction of VLH technology. Moreover, the potential cooperation on renewable energy was discussed at the meeting.

3. President of Gena Electric France Visited HRC

From 2nd to 4th May, Mr. Philippe Quinzin, President of Gena Electric France and Mr. Jean Michel Natrella, General Manager of Gena Electric France, visited HRC. Accompanied by General Manager of Hangzhou Yatai Mr.Dong Dafu, Deputy General Manager Mr.Lin Ning, and Mr.Meng Ke, the interpreter, they visited HRC's laboratory and the subcontractors—the hydropower factories in Zhejiang Province. They also discussed with our managers on the equipment supply for equipment updating of several small hydropower stations in Guinea and the preliminary cooperation intention have been reached.

4. Thailand's TEAM Group Visited HRC

From 7th to 13th May, representatives of Thailand's TEAM Group, Mr.Thongchai Mantapaneewat, Mr.Chawalit Chantararat, Dr.Jirapong Pipatt anapiwong and Mr.Thanawara Thongluan, visited Hangzhou Yatai. Representatives from both sides discussed the new energy exploitation project in detail and visited some manufacturers.

Ms.Cheng Xialei, on behalf of HRC, extended warm welcome to the

guests from TEAM Group and gave a detailed introduction to the experience of China's small hydropower development, HRC's contribution and achievements in small hydropower development and expressed our sincere wishes to cooperate with TEAM Group in jointly expanding Thailand's small hydropower market in the future.

5. Norwegian Minister of Oil and Energy and Governor of Nordland and Their Delegation Visited HRC

On 29th May, headed respectively by the Norwegian Minister of Oil and Energy, Mr.Terje Riis-Johansen, and the Governor of Nordland, Mr. Odd Eriksen, the two distinguished delegations from Norway jointly paid a visit to HRC. The 16 Norwegian guests who were accompanied by Deputy Director Gu Jianxin and Vice Division Chief Wang Jun from the Department of Foreign Affairs of Zhejiang Province received a warm welcome. Director of HRC, Ms.Cheng Xialei met the delegations, and together with Deputy Director Huang Jianping and the Chiefs from the Division of Foreign Affairs and Training, Division of International Cooperation, Science and Technology, and the Center of R& D, held a cordial and friendly talk with the guests.

After making an informative presentation on SHP Development in China and HRC Briefing, Ms.Cheng Xialei, together with the other HRC participants, offered the satisfactory answers to all the questions from the Norwegian guests concerning the issues on SHP planning, regional differences in SHP development, integration of SHP into power grid, SHP cost and CDM, etc.

Both Mr.Terje Riis-Johansen and Mr.Odd Eriksen delivered warm speeches, showing their high appreciation to HRC for the kind hospitality and the rich-content introduction. They mentioned that the cooperation on water resources management would be carried out between the related sector of Norway and the Ministry of Water Resources of China, and they hoped that further steps would be taken into the field of SHP.

6. Representatives from Pakistan United Electric Company Visited HRC

From 31st May to 6th June, Mr.Sardar Sajid Javed and Mr.Zahid Aziz Mugha from Pakistan United Electric Company visited Hangzhou Yatai. The two sides held a discussion on bilateral cooperation over the equipment of Hillan (2×300kW), Rangar-I (2×300kW) and Halmat (2×160kW) projects. Accompanied by engineers of Hangzhou Yatai and interpreter, Mr.Sardar Sajid Javed and Mr.Zahid Aziz Mugha visited equipment manufacturers. A contract was signed and both parties expressed their willingness for more intense future cooperation. Deputy General Managers of Hangzhou Yatai Mr. Lin Ning and Mr.Xu Wei, and Project Manager Mr.Wang Xiaogang, accompanied Mr.Sardar Sajid Javed and Mr.Zahid Aziz Mugha throughout the whole process.

7. Mr. TASKIN, the Owner of Garzan Project Visited HRC

From 10th to 13th June, Mr.Taskin, the owner of Garzan Project of Hangzhou Yatai visited HRC. HRC workers accompanied representatives of Sinosteel Tiancheng, the major contractor of this project and Mr. Taskin, the owner of Garzan Project to visit Zhuoyu Valves Company in Changsha, Kinte Industrial Co. Ltd.,

Nanping Electrical Machinery factory and Hangzhou Yatai to inspect the manufacturing of valves, excitation system, turbine-generator and monitoring system and a discussion was held to solve the existing problems.

By comparing the advantages and disadvantages of all the manufacturers, Mr.Taskin showed his preference to those of large scale. Mr.Xu Wei, Deputy General Manager of Hangzhou Yatai introduced the features and background of Chinese manufacturers in the process of visiting and Mr.Taskin finally chose a factory to his satisfactory.

8. The Owner of Murat I & II Hydropower Projects in Turkey Visited HRC

On 26th June, Mr.Mehmet Gunes, the owner of Murat I & II Hydropower Projects in Turkey together with two assistants visited HRC. Leaders of Hangzhou Yatai, Mr.Dong Dafu, and Mr.Lin Ning introduced the background and current business of HRC and Hangzhou Yatai; the project team briefly reported the execution progress of this project. Acknowledging the capability of Hangzhou Yatai in hydropower equipment completing, Mr.Mehmet Gunes expressed his belief that this project could be finished successfully and expressed his hope that the standard of Chinese equipments could be further improved and Chinese equipment manufacturers were able to manufacture equipments with high quality following the standards. Mr.Mehmet Gunes also visited HRC's laboratory and was satisfied with the quality of Garzan Project's SCADA system, which was still in debugging.

9. Board Chairman of Dragon Inportacao e Exportacao de Produtos Manufaturados Ltda Visited HRC

On 27th July, a five-person delegation led by Mr.Qiu Chengyan, Board Chairman of Dragon Inportacao e Exportacao de Produtos Manufaturados Ltda. visited Hangzhou Yatai. Deputy General Manager of the Hangzhou Yatai Mr.Xu Wei and Project Managers Mr. Wang Xiaogang and Ms.Zhang Liping attended the meeting. Mr.Xu introduced the background and achievements of HRC as well as the information of Hangzhou Yatai and its business home and abroad. Representatives of both sides discussed the exploitation of small hydropower project in detail and expressed vision for more cooperation in the future projects.

10. The Owner of Turkey SAF-I Project Visited HRC

From 23rd to 24th August, a delegation of three people led by Mr. Mustafa, the owner of SAF-I Project in Turkey visited HRC and made a bilateral cooperation discussion on the equipment of hydropower project with representatives of Hangzhou Yatai. Accompanied by Hangzhou Yatai's interpreter, Mr.Mustafa and his delegation visited Hangzhou Lulutong Generating Equipment Company and Andi Reservoir in Jinhua. The two parties discussed in detail the small hydropower project development and expressed willingness to cooperate over more future projects.

11. General Manager of ICTAC Company in Turkey Visited HRC

On 27th August, a three-person delegation led by General Manager of ICTAC Company which was a business partner of Hangzhou Yatai, visited HRC. The two parties discussed the horizontal unit project and visited equipment manufacturers in the company of Deputy General Manager of Hangzhou Yatai Mr.Lin Ning and the interpreter. As a group company with large business scale, ICTAC bears quite strong ability in contracting. During the meeting, ICTAC SUPHIA showed great interest in Hangzhou Yatai and signed a cooperation plan for three projects in the later phase.

12. CEO of Papua New Guinea Hydropower Development Company and Mr.Allan Guo Visited HRC

On 17th September, Mr.Warren Woo, CEO of Papua New Guinea Hydropower Development Company and Mr. Allan Guo visited HRC.

Deputy Director of NRIRE, Mr.Huang Jianping informed foreign guests of HRC's basic information, the work that are conducted and the achievements that are made by HRC in SHP domain as well as China's experience in SHP development. Chiefs of relevant divisions discussed

with foreign guests on the joint development of Papua New Guinea's SHP resources.

Papua New Guinea boasts rich SHP resources while the electrification rate of the country is only 20%. The guests claimed that they were deeply impressed by the expert team of HRC with comprehensive SHP expertise, complete facilities and equipment, rich national and international SHP developing experiences. They hoped earnestly to develop rich SHP resources in Papua New Guinea jointly with HRC.

13. Indian Guests Mr. Soni and His Delegation Visited HRC

On 20th September, Mr.Valmik Soni and his delegation from India paid a visit to HRC. Hangzhou Yatai Hydro Equipment Completing Co., Ltd and the Division of Foreign Affairs and Training of HRC jointly received the Indian guests and the two parties held a friendly and cordial meeting.

India is very rich in rural hydropower resources, which so far have not yet been well exploited. As successful developers in the fields of real estate and resorts, the guests expressed their keen desire to develop the local hydropower, and they hoped to get technical assistance from HRC and import SHP equipment from China.

During the meeting, the guests introduced the concrete conditions of the potential MHP projects, based on which HRC provided preliminary consultation and answered questions as well. The feasibility of the projects and implementation plan were discussed together. The Indian guests sincerely gave a high evaluation on HRC and the bilateral cooperation in future was expected to be fruitful.

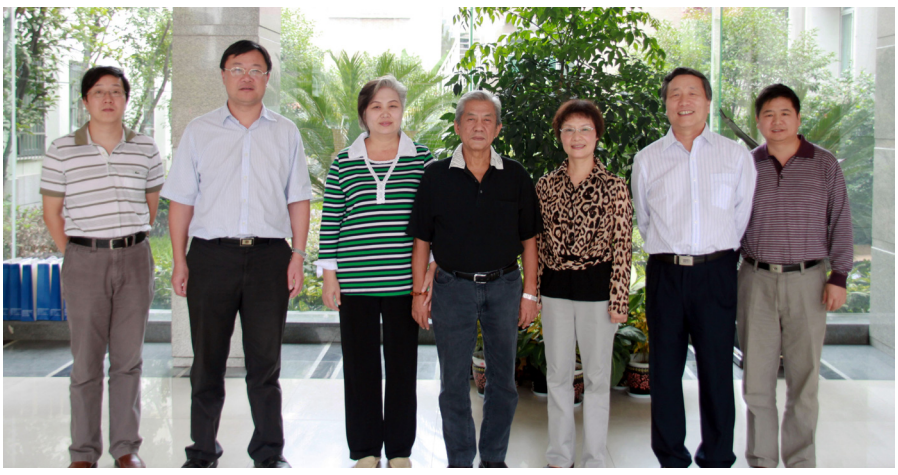
14. Chief Representatives of Indonesia BAGUS KARYA Company in China and His Delegation visited HRC

On 25th September, Mr.Lin Konggui, Chief Representative of Indonesia BAGUS KARYA Company in China and his companions visited HRC. Director of HRC, Ms.Cheng Xialei, and Deputy Director of NRIRE, Mr.Huang Jianping and some Division Chiefs held a cordial and friendly meeting with the foreign guests. Director Cheng Xialei introduced HRC's briefing and expressed the willingness to cooperate with BAGUS KARYA Company. Mr.Lin introduced the details of Indonesian small hydropower resources and the incentive SHP policies issued by the Indonesian Government, as well as the plan of BAGUS KARYA Company on developing small hydropower. Both sides together made a specific arrangement for the collaborative project to be conducted on next step and discussed the tentative plan and framework for long-term cooperation.

15. Mr.Kishor from Nepal Solid Waste Resources Management Center Visited HRC

From 21st to 22nd October, Mr.Kishor from Nepal Solid Waste Resources Management Center visited HRC. Mr.Kishor and his delegation also visited the thermal powerhouse under Hangzhou Jingjiang Group in the company of Deputy General Manager of Hangzhou Yatai, Mr.Lin Ning and the interpreter. The two sides had an in-depth exchange on related issues in the prophase of waste incineration powerhouse, and expressed their wishes to conduct concrete cooperation on the future projects.

16. Participants of Asia Pacific Leadership Program Visited HRC



On the afternoon of 19th October, participants of Asia Pacific Leadership Program Mr.Rahul Shah from Nepal and Mr.Eric Escosio Noble from the Philippines visited HRC. Director of HRC Ms.Cheng Xialei and Chiefs of the Division of Foreign Affairs & Training, Division of International Cooperation, Science & Technology and Hangzhou Yatai met with the guests and had a cordial exchange with them.

Director Ms.Cheng Xialei firstly introduced the basic situation of the development of Chinese small hydropower and the overall policy in the field of small hydropower development. Mr.Lin Ning, Deputy General Manager of Hangzhou Yatai, introduced HRC's Briefing and HRC's work in small hydropower. Director Cheng Xialei and Division Chiefs jointly answered questions raised by the foreign guests in terms of the exploitation and development of the renewable energy, the innovation in energy fields and cultivation of leaders, etc.

The foreign guests were grateful for HRC's warm reception. Mr. Shah expressed their keen desire to cooperate with HRC in energy and other fields, at the same time he earnestly recommended HRC's participation in Asia Pacific Leadership Program.

17. Norwegian Delegation Visited HRC

On 22nd October, the Norwegian delegation, headed by Mr.Helge Stanghelle, Director of Rana Development Company (Rana Utviklingsselskap) together with Ms. Karen Kuvaas, mayor of Narvik and other eight members visited HRC. Director of HRC, Ms.Cheng Xialei together with heads of Division of Foreign Affairs and Training, Division of International Cooperation, Science & Training and the New-Tech R&D Center for M & S Hydro received the delegation and held a cordial and friendly meeting with them.

Director Cheng Xialei firstly delivered a speech of welcome to the Norwegian guests for visiting HRC. Chief of Foreign Affairs and Training Division, Mr.Pan Daqing gave a briefing on small hydropower development in Zhejiang Province and Deputy General Manager of Hangzhou Yatai Mr.Lin Ning presented HRC's briefing and its work in the field of small hydropower. Ms.Cheng Xialei together with Division Chiefs replied questions from the Norwegian guests concerning SHP planning, integration of SHP into power grid, SHP cost and CDM, etc. Mr.Helge Stanghelle, head of the delegation, briefed HRC leaders on the basic situation of energy market in Norway and discussed energy and power issues jointly.

18. Mr. Taskin from Turkish Fernas Company Visited HRC

On 10th December, Mr.Taskin from Turkish Fernas Company visited HRC, for the sake of the Garzan Project in Turkey. Leaders of Hangzhou Yaitai and Garzan Project team members attended the meeting in the morning.

Project Manager of Engineering introduced the SCADA system of Garzan Project to Mr.Taskin, focusing on the designing of SCADA system for Garzan Project. Amendment and supplement were made for the single line drawings of the project and approved by both parties.

The rapid development of HRC surprised the Turkish guests. And their confidence in cooperating and purchasing our equipment and technology was enhanced. Mr.Taskin sincerely hoped that broader cooperation would be made between us in the near future not only on the purchase of hydropower equipment, but also in the designing field of hydropower.

19. Peruvian Agent and His Wife Visited HRC

On 11th December, the Peruvian agent of Hangzhou Yatai Mr.Luis and his wife paid a return visit to HRC for the hydropower project in Peru. Director of HRC Ms.Cheng Xialei, heads of Hangzhou Yatai Mr.Dong Dafu and Mr.Lin Ning, and Peruvian project team members attended the meeting in the morning.

The rapid development of HRC won our guests' admiration. Mr. Luis sincerely hoped that broader cooperation would be made between both sides in the near future not only on the purchase of hydropower equipment, but also on hydropower technology, such as hydropower design, etc.

20. Mr. Sajid from Pakistani UEC Company Visited HRC

On 20th December, Pakistani guest Mr.Sajid from Union Electric Corporation paid a visit to HRC for inspecting the finished electro-mechanical equipment of three small hydropower projects in Pakistan. Mr.Dong Dafu and Mr.Lin Ning, heads of Hangzhou Yatai, together with project team members attended the meeting. The project manager reported the progress of equipments manufacturing. The two sides discussed the development of new project.

Impressed by HRC's professional team, first-class service and profound engineering background, Mr.Sajid was very satisfied with the quality of equipment and surely believed that the equipment provided by HRC would serve its function successfully.

The visit further promoted the mutual friendship and broadened the cooperation in the near future.

21. Turkish Guest Mr.Hakki from DURAKBABA Company Visited HRC

On 24th December, Turkish guest Mr.Hakki from DURAKBABA Company visited HRC. Mr.Dong Dafu, General Manager of Hangzhou Yatai together with Deputy Managers Mr.Lin Ning and Mr.Xu Wei attended the meeting on the afternoon of 25th. At the meeting, Mr.Lin Ning introduced HRC's Briefing and complete equipment export projects in recent years which left Mr.Hakki a deep impression. Later on, two parties discussed the projects that could reach in-depth cooperation, such as hydropower, wind power, solar energy, etc. Both parties felt confident about the projects that would be carried out in the future. Then, accompanied by the HRC staff, Mr.Hakki paid a visit to factories and greatly appreciated these factories, which laid a solid foundation for broad future cooperation.

IV Research and Information Exchange

1. On 22nd April, sponsored by the Hydropower Committee of Chinese Hydraulic Engineering Society, the Small Hydropower Committee of Chinese Hydroelectric Engineering Society and the International Network on Small Hydropower, the National Research Institute of Rural Electrification (HRC) and the International Centre on Small Hydro Power co-organized the first "China Forum on Small Hydro Power" in Hangzhou with "Small Hydropower and Ecological Civilization" as the theme. Mr.Hu Siyi, Vice Minister of Water Resources, attended the forum and delivered a speech; Mr.Tian Zhongxing, Director of Rural Hydropower and Electrification Development Bureau under the Ministry of Water Resources, chaired the forum.

Mr.Tian Zhongxing, Director of Rural Hydropower and Electrification Development Bureau under the Ministry of Water Resources, gave a keynote speech entitled "New Mission of Small Hydropower". The forum

collected eighty-five theses in total, forty-one of which were selected into conference proceedings, among which three are awarded first prizes, five second prizes and seven third prizes. The conference proceedings were included in the magazine Small Hydropower, No. 2, 2010.

Meanwhile, the second "China Forum on Small Hydro Power" is planned to be held at the end of 2011 and the collection for theses is already initiated. The theme of this forum is designated "Small Hydropower and Livelihood Improvement".

The range of theses include:

(1) Development plan of rural hydropower in the new age;

(2) Innovative research on mechanism to benefit farmers during rural hydropower development;

(3) Development and application of management information system for rural hydropower;

(4) Researches on efficiency increase and emission reduction vs ecologically friendly technology for

rural hydropower;

(5) Technical researches on security guarantee of rural hydropower;

(6) R&D and promotion of new technology and new equipment in rural hydropower;

(7) Standardization system researches on small hydropower;

(8) Construction and management of new rural electrification;

(9) Construction and management of substituting SHP for fuel;

(10) Security supervision of rural hydropower;

(11) Other related researches.

2. In terms of scientific research, in 2010, seven scientific research projects were completed and passed the acceptance; nine projects are being implemented as scheduled; contracts of six projects were newly signed; nine projects are under application, three of which are publicly announced. In 2010, 28 standards were formulated and amended, among which two were issued and implemented, six were reported for approval, three passed the acceptance, three were reported for investigation and six exposure drafts were submitted.

3. In 2010, HRC organized and implemented six domestic training workshops: two training workshops on related standards of substituting SHP for fuel, three training workshops on security supervision in rural hydropower, one training workshop on related standards of new rural electrification. 365 participants from 24 provinces (autonomous regions, municipalities) and the Xinjiang Production and Construction Corps attended the training.

4. In 2010, HRC published 22 scientific papers and one monograph. "Digital Power Leakage Protection Technology" was bestowed Second Prize of 2010 Dayu Water Resources Scientific and Technology Awards. Technical Specification about the Type Parameter and Performance of Small Hydraulic Turbine won the second prize in Zhejiang Province and the first prize in Xihu District; three standards: Operation Regulations for the Installation of Power Leakage Protector, Hydraulic Power Design Discipline for Small Hydropower, Specification on Compiling Hydropower Development Plan of Medium and Small Rivers were awarded first prize in Hangzhou. Ms.Cheng Xialei, Director of HRC, was bestowed "Award for China Foreign Aid Dedication" by MOFCOM. Mr. Lu Jianping was bestowed Advanced Individual Award by MWR for Technical Supervision in Water Resources.

5. The edition and publication of English small hydropower magazine of 2009—2010 have been finished, achieving the shift from monochrome publication to chromatic one and completed an essential leap not only in terms of the contents and writing materials, but also in terms of layout edition, which received enormous compliments. HRC's website is updated on time, especially the timely release of information of two small hydropower training workshops and important HRC news. In total, there are 77 news and 38 pieces of English information.

V Equipment Completing and Export

In 2010, Hangzhou Yatai Hydro Equipment Completing Co. Ltd has newly signed contracts with foreign clients for providing complete sets of equipment of USD 8.5967 million (RMB57.25 million yuan). It has undertaken the projects of electromechanical equipment completing for the three small power stations in Pakistan: Hillan (2×320kW), Rangar-I (2×320kW), Halmat (2×160kW), the equipment shipment was made in late December. Newly signed projects of electromechanical equipment completing for the two power stations in Turkey, KALE (3×11,580kW) and OSMANCIK (2×4830kW) have entered into the phase of manufacturing. Automatic supervision control system contracts for Turkish GARZAN Cascade I Power Station, Azerbaijan Chichekli Power Station and Armenian GETIK Power Station were newly signed. OTLUCA-I, OTLUCA-II, BOGUNTU, CAMLICA, SARACBENDI and KARTALKAYA projects were under implementation, among which five have now entered into the phase of final installation and debugging. CAMLICA project is expected to be put into operation at the end of the year. Turbine-generator installation of KARTALKAYA project was suspended owing to the replacement of penstock by the owner. Another installation will be conducted in the first half of 2011.

VI Engineering Design

In 2010, Planning & Design Institute for M/S Hydro has undertaken 20 engineering design projects, the contract value of which amounts to RMB13.62 million yuan. The projects undertaken include: bid design and construction drawing of PHUONG DO Station in Vietnam, PAKKAT Station in Indonesia; pipeline design of Turkish YAZNIZCA Station; design review of LAHIENG2 Project in Phuc Yen, Vietnam; feasibility studies and technical consultation of TOL MINI HYDRO Project in Papua New Guinea; design contract of THUAN HOA Hydropower Engineering Construction in Vietnam (30MW); Indonesian RAHU2 Hydropower Station Project. Projects under design include: engineering design of Thai An Hydropower Station in Ha Giang, Vietnam; engineering design of Muong Hum Hydropower Station in Lao Cai, Vietnam; preliminary appraisal and bid-inviting design for TRAM TAU Station in Vietnam; construction design for Thai An Hydropower Station in Vietnam. The follow-up projects include: tendering and preliminary negotiations for projects in Vietnam, Kenya, Albania, Papua New Guinea, and the US, etc.; preliminary work of four power stations that People ELE. Appliances Group China plans to undertake the EPC; design and bid of a 75MW power station in Kenya.

VII Working Plan in 2011

2011 is a crucial year for HRC's rapid and scientific development. This is the year when we should unite to strive for progress under the guidance of Deng Xiaoping Theory and the important thoughts of "Three Representatives" and seriously complement the spirit of the CPC's 17th Congress and the 5th Plenary Conference of 17th Central Committee and carry out the Scientific Concept of Development in an all round way. So, we must concentrate on the following work:

1. Earnestly implement foreign policy and working policy of water conservancy formulated by the Central Government, endeavor to carry out multilateral cooperation, actively applying for and hold foreign aid small hydropower training workshops of the Ministry of Commerce and make greater contribution to cultivating more professional technical talents for international small hydropower development, and laying a solid foundation for promoting the friendship and cooperation between China and other developing countries.

While actively applying for training workshops of Ministry of Commerce, the international and domestic enterprise-oriented training workshops should also be vigorously enhanced. Small hydropower training workshop should be held according to the demands of governmental sectors at home and aboard as well as those of the public institutes and enterprises. On one hand, we shall provide training workshops for national enterprises under the strategy of "Going Global"; on the other hand, we could offer small hydropower technology and experience for foreign governments and enterprises, giving HRC's advantages to full play thus promoting international exchange and cooperation.

2. Carry out management and technical researches on foreign rural electrification system and mechanism and ecology-friendly small hydropower development, and intensify small hydropower standard internationalization cause. At the same time, cultivate a batch of comprehensive talents that are capable of technology, management and communication through bilateral, multilateral and other channels to create opportunities for HRC's sustainable development.

3. Implement "Going Global" strategy, take full advantage of the existing international platform, make use of the opportunity brought by foreign aid trainings, actively expand the market in Africa, South America, Southeast Asia, East Europe, etc., broad the fields, expand the channels and approaches of economic cooperation, undertake energetically small hydropower programs and scientific research projects, continue to carry out foreign engineering consultation, contract and labor service cooperation.

4. Strengthen technological innovation, promote the international cooperation with developed countries, learn advanced technologies and management experience, seize the opportunity and face the challenge in

a more active attitude, further promote all-direction, multi-level and wide-range foreign cooperation. In 2011, HRC plans to introduce two important items of technology: (1) Introduce American specific integrated chip for grid energy-saving apparatus. (2) Introduce foreign ultra-low head/ non-head small hydropower technology.

5. In order to celebrate HRC's 30th anniversary, edit and publish 30-Year History of HRC.

6. Verify and publish the French version of the teaching material Small Hydropower.

Table 1 Foreign Guests Hosted by HRC in 2010

No.	Time	Organization/Country	Guest(s)	Briefing
1	16 Feb.	Pik Enerji Company, Turkey	1	The discussions were held on some details about the design of MURAT Hydropower Project in Turkey.
2	28 April	Atmospheric Science and Technology Directorate, Environment Canada	3	A presentation on the efforts and achievements of Environment Canada in the fields of weather, climate and air quality control was made by Director General Charles Lin of the Directorate, and the guests were shown the status quo of SHP development in China. The potential cooperation on renewable energy was also discussed at the meeting and the guests would help HRC to introduce the VLH turbine-generating technology from Canada and France.
3	2 ~ 4 May	Gena Electric France	2	The discussions were held on equipment supply for the SHP stations in Guinea. Visits to some local hydropower stations and equipment manufacturers were also arranged for the guests—the President and the Project Supervisor of Gena Electric France
4	7 ~ 13 May	TEAM Group of Companies, Co., Ltd, Thailand	4	The in-depth discussions were held on the development of new energy projects. Visits to some equipment manufacturers were also arranged for the guests.
5	29 May	Delegations from Norway (Headed respectively by the Norwegian Minister of Oil and Energy, Mr.Terje Riis-Johansen, and the Governor of Nordland, Mr.Odd Eriksen)	16	An informative presentation on SHP Development in China and HRC Briefing was made by HRC Director Ms.Cheng Xialei, and HRC experts offered the satisfactory answers to all the questions from the Norwegian guests concerning the issues on SHP planning, regional differences in SHP development, integration of SHP into power grid, SHP cost and CDM, etc. Both Mr.Terje Riis-Johansen and Mr.Odd Eriksen mentioned that the cooperation on water resources management would be carried out between the related sector of Norway and the Ministry of Water Resources of China, and they hoped that further cooperative steps would also be taken into the field of SHP.
6	31 May — 6 June	Union Electric Corporation Pvt. Limited, Pakistan	2	The discussions were held on the details of Hillan (2×300kW), Rangar-I (2×300kW) and Halmat (2×160kW) hydropower projects. The contracts were signed and more cooperation was expected to be carried out in future. The visits to some equipment manufactures were also arranged for the guests.

7	10 ~ 13 June	Owner of Garzan Hydropower Project, Turkey	1	The views were exchanged on the issues of equipment based on the visits to the related manufacturers for checking the production of valve, excitation system, turbine-generating unit and control & supervision system, etc.
8	26 June	Owner of Murat I & II Hydropower Projects	2	The backgrounds and achievements of HRC and its subsidiary Hangzhou Yatai Company as well as the implementation of Murat Project were introduced. The owner got to know more about the company and believed that the project would be fulfilled smoothly and the standards for equipment production were expected to be improved. The guests also visited the laboratory and were satisfied with the SDADA system of Garzan Project under debugging.
9	27 July	Dragon Agenciamento de Importacao e Exportacao., Brazil (Headed by the Board Chairman)	5	The productive discussions were held and bilateral cooperation was expected to be carried out in future.
10	23 ~ 24 Aug.	Owner of SAF-I Hydropower Project, Turkey	3	The discussions were held on bilateral cooperation of hydropower equipment supply. The visits to some local hydropower stations and equipment manufacturers were also arranged for the guests.
11	27 Aug	ICTAC Company, Turkey (Headed by the General Manager)	3	The discussions were held on bilateral cooperation of the hydropower project with horizontal units. The visits to some equipment manufacturers were also arranged for the guests.
12	17 Sept.	Hydro Development Ltd., Papua New Guinea (Headed by the CEO)	2	HRC Briefing was introduced by Mr.Huang Jianping, Deputy Director of NRIRE. The discussion was held on the bilateral cooperation. The guests sincerely hoped to cooperate with HRC on the development of the abundant SHP resources in Papua New Guinea.
13	20 Sept.	Indian Guests	2	The plan for local SHP development was introduced by the visitors, based on which the feasibility and implementation were discussed, and the initial consultation was offered by HRC. The guests gave a high evaluation on HRC and the bilateral cooperation in future was expected to be fruitful.
14	25 Sept.	BAGUS KARYA Company, Indonesia (Headed by the Chief Representative in China)	3	The HRC briefing and the details of Indonesian SHP resources and the incentive SHP policies as well as the plan of BAGUS KARYA Company on SHP development were introduced respectively by the two sides. A specific arrangement for the collaborative project to be conducted on next step and the tentative plan and framework for long-term cooperation were made together.
15	19 Oct.	Participants of Asia Pacific Leadership Program	2	A cordial exchange was made and the guests expressed their desire to cooperate with HRC in energy and other field.

16	21 ~ 22 Oct.	Solid Waste Resources Management Center, Nepal	1	An in-depth discussion was made on the preliminary issues of refuse incineration plant based on the visit to the thermal plant and the concrete cooperation on the projects in future was expected.
17	22 Oct.	Delegation from Norway (Headed by Mr. Helge Stanghelle, Director of Rana Development Company (Rana Utviklingsselskap) and Ms. Karen Kuvaas, mayor of Narvik)	10	The SHP development in Zhejiang Province, the HRC's briefing and its work in the field of SHP, as well as the basic situation of energy market in Norway were introduced respectively by the two sides. The issues concerning energy, SHP planning, integration of SHP into power grid, SHP cost, CDM, etc. were discussed together. The concrete cooperation in the field of energy was expected.
18	10 Dec.	Fernas Company, Turkey	1	Some design details about the SCADA system of Garzan Hydropower Project were discussed and confirmed. The guest expressed the desire to carry out more cooperation with HRC in future.
19	11 Dec.	Project Agent, Peru	2	A cordial exchange was made between the two sides. The guests expected to broaden the cooperation with HRC, not only on equipment supply but also on hydropower design.
20	20 Dec.	Union Electric Corporation Pvt. Limited, Pakistan	3	The progress on the cooperative projects was briefed, and the issues for equipment acceptance and the new projects were discussed. The guests were satisfied with the equipment quality and expected the successful operation of the stations.
21	24 Dec.	DURAKBABA Company, Turkey	1	The efforts and achievements of HRC and its subsidiary Hangzhou Yatai Company were introduced, and the in-depth discussions were made on bilateral cooperation in the field of hydropower, wind power and solar energy. The visits to some equipment manufacturers were also arranged for the guest.

Yunnan to build 136 SHP plants over next 5 years

China's Yunnan Province plans to invest RMB 8 billion (about US$121 million) over the next five years to construct 136 small-scale hydro plants, the Yunnan branch of the National Development and Reform Commission (Yunnan NDRC) reported.

With its vast water resources, the province had a total installed hydropower capacity of 24.23 million kilowatts as of the end of last year, according to Yunnan NDRC statistics.

The commission noted that hydroelectric power currently accounts for more than 66 percent of Yunnan's total installed power capacity.

Earlier in 2010, China Hydroelectric Corporation completed the previously announced acquisition of 100 percent of the Minrui small hydroelectric projects totaling 55.5 MW of installed capacity in Yunnan Province.

Table 2 HRC's Outbound Missions in 2010

No.	Time	Delegate(s)	Country	Objectives and Results
1	1 ~ 10, 1-24 March	2 2	Macedonia & Turkey	In Macedonia, the Promotion Conference for Clean Energy Development was held successfully, and the discussions with the local developers in the field of hydropower and solar energy were made widely, based on which the fruitful bilateral cooperation were expected to be carried out in future. In Turkey, visits were paid to the owners of the related cooperative projects for view exchange and technical discussion.
2	11 ~ 24 April	1	Nepal	The follow-up seminar of the Advanced Hydropower Management Training of SIDA was attended with the experience of rural electrification and renewable energy gained.
3	12 ~ 27 May	4	Turkey	Visits were paid to PIK ENERJI, AKFEN and some other companies, and the technical issues of cooperative projects and the marketing development were discussed.
4	12 June —10 July	1	Turkey	The investigation and coordination were undertaken on the site of hydropower projects in Anamur.
5	5 ~ 23 Aug.	3	Turkey	The confirmation of technical schemes and the negotiation of technical agreements and commercial contracts of OSMANCIK and KALE Hydropower Projects were fulfilled. The visits were also paid to some old and new customers for potential cooperation.
6	18 ~ 29 Sept.	2	Turkey	The technical exchange and on-site guidance were undertaken for MURAT I & II Hydropower Projects, and the visits were paid to CAMLICA-III and SARACBENDI Hydropower Stations for on-site investigation.
7	25 Sept. — 14 Oct	2	Turkey	The confirmation of technical schemes and the negotiation of technical agreements and commercial contracts of Binek, Kemercayir, Uchanlar, Ucharmanlar Hydropower Projects were fulfilled. Visits were also paid to AKFEN Company and some other customers.
8	28 Nov. — 10 Dec.	2	Turkey	The negotiations of commercial contract and technical agreement were made for BAGISTAS Hydropower Project and the technical coordination with the owners and the design company was undertaken for the KEMERCAYIR, UCHANLAR, and UCHARMANLAR projects. Visits were also paid to RENAISSAICE and ENDA companies.
9	10 Dec.— 9 March 2011	3	Turkey	The on-site guidance for equipment installation was offered for MURAT-I and MURAT-II Hydropower Projects.

Table 3 Papers Published in 2010

No.	Title	Magazine	Serial No.	Category	Author
1	Study on the Mechanism to Benefit Farmers during Refurbishing Rural Hydropower Stations	China Water Resources, No. 14, 2010	ISSN1000-1123 CN11-1374/TV	Domestic core journal in Chinese	Cheng Xialei Fan Xinzhong Lu Xiaoping
2	Thoughts on Reform of Scientific Research Institutions of Public Benefit	Water Resources Development Research, No. 9, 2010	ISSN 1671-1408	Domestic ordinary journal in Chinese	Cheng Xialei
3	About Safety Guarantees for Rural Hydropower in China	Small Hydro Power, No. 2, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Xu Jincai Zhou Lina
4	Application of Containerized SHP Station in Technical Rehabilitation of Old Hydropower Plants	Small Hydro Power, No. 2, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Xu Wei
5	Research on Complementary Adjustment System between Hydropower and Wind Power	Small Hydro Power, No. 2, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Dong Dafu Xu Jincai
6	Application of Simplorer in Complementary Adjustment System between Hydropower and Wind Power	Small Hydro Power, No. 2, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Zhang Wei Dong Dafu Xu Jincai
7	On-site Analysis and Treatment on Failures of High-speed Horizontal Francis Turbine-generating Unit	Small Hydro Power, No. 2, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Wang Xiaogang
8	Paying Attention to the Impact of Public Opinions on SHP Development	Small Hydro Power, No. 5, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Cheng Xialei
9	Technical Development and Norm Revision of Leakage Current Protector for Rural Power Grid	Small Hydro Power, No. 3, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Zhu Mingjuan
10	Calculation for Selection of Neutral Point Equipment of Generator in Thai An SHP Station in Vietnam	Small Hydro Power, No.5, 2010	ISSN 1007-7642	Domestic ordinary journal in Chinese	Jiang Xingfen

11	Considerations on Short-circuit Current Calculation in Three Phase AC System in Medium and Small Sized Hydro Power Station	Small Hydro Power, No.6, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Jiang Xingfen
12	Core Technology and Prospect of Energy-saving Meter in Power Grid	Small Hydro Power, No.6, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Zhu Mingjuan
13	Optimal Design of Automatic Control of Cooling Water Supply in Song Quang SHP Station in Vietnam	Small Hydro Power, No. 5, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Zhu Mingjuan Yao Zhaoming
14	Design of Diaoluohe-II Hydropower Station	Small Hydro Power, No. 5, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Yan Jun
15	Application of Communication Server Based on Modbus/TCP Protocol	Small Hydro Power, No.6, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Hu Changshuo
16	Calculation for Design Runoff in Pakkat SHP Station	Small Hydro Power, No.6, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Rao Dayi
17	Empirical Study on Property Right Policy of Rural Hydropower Project	China Rural Water and Hydropower, No. 3, 2010	ISSN1007-2284	Domestic core journal in Chinese	Yao Yuelai Zhao Jianda
18	Key Issues in SHP Investment	Small Hydro Power, No.6, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Chen Kaijun Lu Jianping
19	Refurbish Rural Hydropower and take the road of Sustainable Development	Small Hydro Power, No.2, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Liu Zhongmin Lin Xuxin, etc.
20	Quality Control of Steel Gate Fabrication and Installation in Canal System	Small Hydro Power, No.4, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Wang Yanjun Zhou Jianxiong
21	Research on Intelligent System of Hydropower	Small Hydro Power, No.4, 2010	ISSN1007-7642	Domestic ordinary journal in Chinese	Zhou Zhizhi Yuan Yue Xu Jincai
22	Effects of Wenchuan Earthquake on Yele Dam	ROCK AND SOIL MECHANICS , No.11, Vol.31, 2010		Paper collected in SCI, EI and ISTP	Cao Xuexing He Yunlong Xiong Kun Liu Bin

(Source:HRC) ■

Vice Minister of MWR Inspected HRC

In the morning of April 21, Mr. Hu Siyi,Vice Minister of Water Resources inspected HRC, accompanied by the Director of IC-SHP Mr. Liu Heng, Vice President of China Institute of Water Resources and Hydropower Research Mr. Wang Xiaogang and Vice President of Nanjing Hydraulic Research Institute (NHRI) Mr. Chen Shengshui.

On behalf of Director Cheng Xialei, Deputy Director Mr. Xu Jincai made a report to Mr. Hu on the general situation of scientific research and other work of HRC as well as the working scheme for the next stage.

After hearing the report, Mr. Hu gave an important speech. He fully appreciated the achievements made by HRC and gave detailed instructions to the program application and platform construction, requiring HRC to frequently report work on the preparation and construction of SHP Technical Engineering Center to the relevant bureaus and departments of MWR and hand in the application documents in due time.

Director Liu Heng and Vice President Mr. Wang Xiaogang proposed several suggestions for the enhancement of bilateral cooperation for mutual development respectively.

In the end, Vice President Mr. Chen Shengshui expressed his gratitude to Mr. Hu for inspecting HRC and made significant instructions to HRC's development at the next stage. He demanded that the leadership of HRC carefully study and implement the requirements of Mr. Hu's speech so as to make further improvement on various aspects of future work.

The leaders, division chiefs and senior engineers of HRC attended in the meeting.

(Source:HRC) ■

Mr. Hu Siyi, Vice Minister of MWR inspected in the R&D center of HRC

Inspected in the lab of HRC

Director General Charles Lin from Canada Visited HRC

On the morning of 28 April 2010, Mr. Charles Lin, Director General of Atmospheric Science and Technology Directorate, Environment Canada paid a visit to HRC, accompanied by the other two respected guests. The leaders and experts of HRC had a friendly and pleasant meeting with the Canadian delegation.

Director General Charles Lin made a presentation on the efforts and achievements of Environment Canada in the fields of weather, climate and air control. Meanwhile, he expected to learn more about SHP development in China.

Following a warm welcome to the guests on behalf of HRC, Director Cheng Xialei detailed the status quo of SHP development in China, as well as the efforts and achievements of HRC in the field of small hydropower. It was also mentioned that HRC hopes to introduce the technology of VLH turbo-generator unit from Canada with kind assistance from Environment Canada.

Director General Charles Lin applauded the successful development of SHP in China, especially the good experience of "Substituting SHP for Fuel" which deserves to be popularised. After returning to Canada, he would help HRC to promote the introduction of VLH technology. Moreover, the potential cooperation on renewable energy was discussed at the meeting.

Mr. Huang Jianping, Deputy Director of HRC, also present at the meeting.

(Source:HRC) ■

Ugandan hydro project wins clean energy award

The 8 MW Kakaka project in western Uganda is one of two clean energy projects selected as winners of the Climate Technology Initiative's (CTI) Private Financing Advisory Network's (PFAN) Clean Energy Financing Award 2010.

This US$18 million project is seeking $6 million in equity and $12 million in long-term debt. The plan was promoted by Greenewus Energy Africa Ltd. based in Uganda.

The other award winner was Barefoot Power Company, which distributes solar-charged LED lights and electrical products to the rural poor in Africa.

The winners will receive one-on-one coaching on progressing their business plans toward financial close, accessing investors, and deal facilitation. These projects will be showcased at other forums and events hosted by CTI PFAN and the AFRICEF sponsors and co-organizers.

More than 65 businesses submitted their proposals for review. Nine projects that could reduce greenhouse gas emissions by about 500,000 metric tons a year were presented to investors at the CTI PFAN African Forum for Clean Energy Financing (AFRICEF) in September.

AFRICEF was sponsored by CTI, the Renewable Energy & Energy Efficiency Partnership (REEEP), the U.S. Agency for International Development (USAID), and the International Center for Environmental Technology Transfer of Japan. ■

Delegations from Norway Visited HRC

Mr. Gong Zheng, Vice-governor of Zhejiang Province met the delegation

On 29 May 2010, headed respectively by the Norwegian Minister of Oil and Energy, Mr. Terje Riis-Johansen, and the Governor of Nordland, Mr. Odd Eriksen, the two distinguished delegations from Norway jointly paid a visit to HRC.

The 16 Norwegian guests who were accompanied by Deputy Director Gu Jianxin and Vice Division Chief Wang Jun from the Department of Foreign Affairs of Zhejiang Province received a warm welcome. Director of HRC, Ms. Cheng Xialei met the delegations, and together with Deputy Director Huang Jianping and the Chiefs from the Division of Foreign Affairs and Training, Division of International Cooperation, Science and Technology, and the Center of R& D, held a cordial and friendly talk with the guests.

The first visiting on 29 May

After making an informative presentation on SHP Development in China and HRC Briefing, Ms. Cheng Xialei, together with the other HRC participants, offered the satisfactory answers to all the questions from the Norwegian guests concerning the issues on SHP planning, regional differences in SHP development, integration of SHP into power grid, SHP cost and CDM, etc.

Both Mr. Terje Riis-Johansen and Mr. Odd Eriksen delivered warm speeches, showing their high appreciation to HRC for the kind hospitality and the rich-content introduction. They mentioned that the cooperation on water resources management would be carried out between the related sector of Norway and the Ministry of Water Resources of China, and they hoped that further steps would be taken into the field of SHP.

Bilateral conversation

On the same day, Mr. Gong Zheng, Vice-governor of Zhejiang Province, met the Norwegian guests at the Zhejiang Great Hall of the People. Director of HRC, Ms. Cheng Xialei was present at the meeting.

On Oct 22, the Norwegian delegation, headed by Mr. Helge Stanghelle, Director of Rana Development Company (Rana Utviklingsselskap) together with Ms. Karen Kuvaas, mayor of Narvik and other eight members, visited HRC. Director of HRC, Ms. Cheng Xialei together with heads of Division of Foreign Affairs and Training, Division of International Cooperation, Science & Training and the New-Tech R&D Center for M & S Hydro received the delegation and held a cordial and friendly meeting with them.

Director Cheng Xialei firstly delivered a speech of welcome to the Norwegian guests for visiting HRC. Chief of Foreign Affairs and Training Division, Mr. Pan Daqing gave a briefing on small hydropower development in Zhejiang Province and Deputy General Manager of Hangzhou Yatai Hydro Equipment Completing Co. Ltd., Mr. Lin Ning presented HRC's briefing and its work in the field of small hydropower. Ms. Cheng Xialei together with Division Chiefs replied questions from the Norwegian guests concerning SHP planning, integration of SHP into power grid, SHP cost and CDM, etc.

Mr. Helge Stanghelle, head of the delegation, briefed HRC leaders on the basic situation of energy market in Norway and discussed with them energy and power issues. Mr. Per Eidsvik, Senior Adviser of Nordland County Council, has visited HRC last year as well as this May when he joined the delegation to HRC which was headed by Norwegian Minister of Oil and Energy and the Governor of Nordland. On this third-time visit to HRC, Mr. Per Eidsvik was in high spirit and delivered an enthusiastic speech. He has always cherished the sound momentum of communication between HRC and Norwegian Government and expected concrete cooperation in future with HRC in the field of energy equipment and technology domain.

(Source:HRC) ■

Mr. Terje Riis-Johansen, the Norwegian Minister of Oil and Energy

Mr. Odd Eriksen,the Governor of Nordland

Discussion in HRC

The second visiting on Oct. 22

Promotion for Clean Energy Development in Macedonia

More than 100 delegates from Macedonia attended the promotion

On March 4, 2010, the Promotion Conference for Clean Energy Development in Macedonia was held successfully in Skopje, the capital of Macedonia. Under the co-sponsorships of the Chinese Embassy in Macedonia and the Ministry of Economy of Macedonia, this significant event was conducted by HRC with Sinosteel Tiancheng Environmental Protection Science and Technology Co. Ltd. (briefed as Sinosteel Tiancheng) as the co-organizer.

Mr. Dong Chunfeng, the Chinese Ambassador in Macedonia and Mr. Fatmir Besimi, the Minister of Economy of Macedonia were present at the opening ceremony and respectively delivered speeches, and Ms. Cheng Xialei, Director of HRC was seated together. Up to 100 delegates from Macedonia attended this conference. Tens of press agencies including TV, broadcasting, newspaper etc. came for interviews, and at the night local TVs reported this activity. News has also been timely released on the websites of the Ministry of Foreign Affairs and the Ministry of Commerce of China.

At the conference, Director Cheng Xialei, Mr. Lin Ning and Mr. Xu Wei, the deputy General Managers of HRC's affiliated Hangzhou Yatai Hydro Equipment Completing Co., Ltd., presented "SHP Development and Rural Electrification in China", "Development and Application of Chinese SHP Equipment", and "Technology of Renewable Energy and Micro Hydro Power". The introduction of solar energy technology was made by Mr. Liu Xuefeng, General Manager of East China Branch of Sinosteel Tiancheng. The current situation and demand on the local development of small hydropower and solar power were introduced by 4 Macedonian experts. After the presentations, participates were divided into two groups, i.e. "Hydropower" and "Solar Power" for diversified and in-depth technical exchanges and discussions on potential projects. Three Macedonian

Mr. Dong Chunfeng, the Chinese Ambassador in Macedonia interviewed the correspondents

Ms. Cheng Xialei, Director of HRC delivered a speech

hydropower engineers who ever attended HRC's international training workshops also helped to organize the conference.

The conference was proven to be a full success and the Ambassador Dong addressed in his speech like this, "Hangzhou Regional Center (Asia-Pacific) for Small Hydro Power, has rich experience in international cooperation for small hydropower and solar power, as well as equipment supply. The conference aims to present an overview to Macedonia, about China's capability on technical advancement and equipment manufacturing in small hydropower and solar power. We would like to explore cooperation opportunities for private investors and governmental departments between both two countries, and to make contribution to the development of clean energy industry in Macedonia."

HRC attached great importance to this conference. Director Cheng Xialei and Deputy Director Xu Jincai also instructed the preparatory work, and Hangzhou Yatai Hydro Equipment Completing Co., Ltd. provided sufficient inputs to support the smooth implementation of the conference. ***(Source:HRC)*** ■

Leaders of HRC Made Work Report to BRHED

On Feb 24th 2010, Vice-President of Nanjing Hydraulic Research Institute(NHRI) Mr. Chen Shengshui, Director of HRC, Ms. Cheng Xialei etc. made a special trip to report on the work of HRC to Bureau of Rural Hydropower and Electrification Development(BRHED),MWR.

Director of HRC, Ms.Cheng Xialei reported HRC's work on scientific research, technology development, industrial standards, international cooperation, market expansion and other areas conducted by HRC in 2009 and the preliminary plan for 2010. Deputy Director Mr.Xu Jincai reported on the implementation of ongoing project "Plan of Efficiency improvement and Emission Reduction Project for National Rural Hydropower" and the special project for public welfare industry "Technological Research on Security Guarantee of Rural Hydropower Station".

After listening to HRC's report, Director Mr Tian Zhongxing, gave full recognition for HRC's achievements in serving China's hydropower industry and expressed his thanks to HRC for its support in the work of BRHED. Mr. Tian also introduced the BRHED's work carried out in line with the principle of "one target, two tasks, three project-constructions and four-systems building"; he also briefed the working plan of 2010. Also he put forward requests for HRC's further development.Other leaders of BRHED also provided concrete advice for the implementation of "Plan for Efficiency improvement and Emission Reduction Project for National Rural Hydropower", "Technological Research on Security Guarantee of Rural Hydropower Station" as well as the standardization management, the management of SHP Special Committee and the preparation work of the first "SHP Forum in China".

On behalf of NHRI and HRC, Mr. Chen extended his gratitude to BRHED for their deep concern on the report of HRC and also for their warm and thoughtful arrangements; he expressed his heart-felt thanks for BRHED's long-term guidance and help on HRC's work. He expressed that HRC will earnestly learn and grasp the essence of the leaders' remarks, implement various concrete proposals in order to accelerate HRC's development in a quicker and better manner with an aim to better serve China's rural hydropower industry. ***(Source:HRC)*** ■

"Silver Award" to HRC by MOFCOM

New China's Aid to Foreign Countries has gone through a glorious course of 60 years. During the last 60 years, generations of foreign aid staff bravely and unselfishly made outstanding contributions to the cultivation of friendship between the Chinese people and the people of recipient countries, and the promotion of solidarity and cooperation with other developing countries. In order to carry forward the dedication of the older generation of foreign aid staff and inspire new foreign aid staff to carry on the past tradition and open a way for future, and to promote the scientific development of our foreign aid mission, the Ministry of Commerce (MOFCOM) decided to commend 499 gold winners and 826 silver winners of "Award for China Foreign Aid Dedication".

Director of HRC, Ms. Cheng Xialei is the only one nominated from Ministry of Water Resources to receive such an honor, which also signified a full recognition and high evaluation on HRC's remarkable contribution to Foreign Aid Training over the years.

Since its establishment in 1981, HRC has successfully hosted 57 international training workshops and training courses entrusted by the Chinese Ministry of Commerce, Ministry of Water Resources, Ministry of Science & Technology, UNDP, UNIDO, FAO, ILO and etc. Totally 1142 officials and professionals from the fields of hydropower and other energies of over 100 countries have participated in the training. The abundant teaching contents cover SHP planning, hydrology, feasibility studies, low-cost SHP civil works, SHP equipment selection, automatic controlling equipment, operation and maintenance of SHP plants, economic assessment, SHP development and environment, investment and financing in SHP development, micro hydropower and containerized units, turbine pumps and other topics. The training programs were much welcomed and highly praised by the developing countries because of the remarkable effects. Over the years HRC has been affectionately referred to as: "The Family of Small Hydropower in the World" by international participants.

The contribution of HRC to foreign aid training was not only highly praised as "the Model of South-South Cooperation" by the Ministry of Commerce, but also was widely recognized by the world communities. In a speech delivered at Zhejiang University on Oct. 14, 2002, the former United Nations Secretary-General Kofi Annan pointed out "Right here in Hangzhou, China, you have made use of the Regional Center where you share your valuable rich experience in the field of renewable energy with those from numerous developing countries in the world. China is playing a pioneering role in the regional technical cooperation with other developing countries. You developed a lot of cooperative projects not only in foreign counties, but also you have generously implemented training workshops for those from other developing countries."

Through the implementation of foreign aid training courses, HRC, on one hand, extensively introduces the technology and experience of SHP development in China, cultivates SHP talents for developing countries, so as to improve their capacities in SHP construction and stimulate the booming of the clean energy SHP and other renewable energies, and at the same time continually deepens

the friendship between China and the recipient countries. On the other hand, HRC actively prompts international economic cooperation based on the in-depth exchange of SHP technology and experience, and further promotes the export of Chinese hydropower equipment.

HRC's foreign aid staff will inherit and carry on the fine traditions of China's aid to foreign countries, forge ahead in a pioneering spirit, work hard and earnestly, and make every effort to open up a new prospect of our foreign aid work.

(Source:HRC) ■

SHP training workshops in 1980s

SHP training workshops in 1990s


授予 程夏黄同志:

中国援外奉献奖银奖

Silver Award for China Foreign Aid Dedication

中华人民共和国商务部

Ministry of Commerce of the People's Republic of China

二〇一〇年

SHP training workshop in 2008

SHP equipment completing and export

SHP technical exchange and economic cooperation

MY STAY IN CHINA

By Araya Ghebreslassie, Eritrea

My name is Araya Ghebreslassie from Eritrea (East Africa). I have been working for Rural Electrification Unit, which is Under Supervision of the Ministry of Energy and Mines. I was appointed by the Ministry to participate in the Rural Electrification Seminar for Developing Countries organized by Hangzhou Regional Center (Asia-Pacific) for Small Hydropower(HRC) and sponsored by Ministry of Commerce of the Peoples Republic of China.

For me it is a great chance to have such impressive experience. In my career I have never been in China but also never been abroad. Thus it is something exceptional in my life time. Even though I had some overview about China, but I did not expect such unique world. Really in my experience China is another world in many sides of the country's development.

Without exaggeration I get life in Hangzhou very pleasant and enjoyable. In all standards the city is very charm and enchant. Really" Paradise on Earth." Especially the West Lake, the Grand Canal and all the attractive streets which are extremely delightful to see them.

When we arrive at Hangzhou airport we went to our hotel accompanying by one of the HRC staff. In the morning of 11/06/2010 it was the opening ceremony of the Seminar as well as the official beginning of the one month workshop. The seminar was about ***Rural Electrification for Developing Countries***. And then all the lectures come one by one according to the given schedule and thus let me give some summary of my experience from the seminar.

During the four weeks time we cover all the prepared lectures and the second part of the program, which is the direct observation to different hydropower stations and different dams? In my opinion the course was very impressive, all the lecturers were very talented, they know how to transfer, how to teach and how to manage time. Not only that but also they had knowledge of the subject matter. Moreover they had good english command. Before I come China I expect that the lecture could be in Chinese and then we will learn with an interpreter. Because I heard such way of lecturing. However, everything was out of my perspective in HRC. Here I understand that HRC has a long time experience of providing such courses. Thus this

adds the course more elegance and tidiness. Generally HRC provided to us a perfect and precise course with professional lecturers.

The other remarkable program was the direct observation/visit to the hydropower stations and dams. According to the program of HRC, I had also visited the SHP stations and hydropower equipment factories. I studied how the dam and hydropower station comprises and how the hydro turbine and generator operate in the plant. I had seen the modern factories which produce many kinds of turbines and generators, especially the CHANGHE Generating Equipment. After that I had a chance to visit the TINGHU hydropower station which is located in the basin of Caoe River. Here I noticed that how a rubber dam has been constructed. And then we headed to NANSHAN Hydropower station which located in the basin of Changle River and we had seen the power station and the amusing dam as well as all the designs and infrastructures there. And also at this juncture, I can say that it was a dual benefit because I get a chance to see the beautiful mountains covered with dense forest around the NANSHAN hydropower.

After that we lead to Xikou pumped storage plant which located in Ningbo city. And I had seen the turbines and the two dams, lower and higher reservoirs. So here I learnt that we can construct a hydropower station by adapting such experience. Especially in areas of low rainfall, this is more preferable in my country.

In addition to this, I had a chance to visit the marvelous THREE GORGES DAM. I consider myself as very lucky man to have this opportunity. THREE GORGES is a very famous dam for many reasons which comprise so many world records. At this point we noticed all the infrastructures and the12 hydro turbine generator units in the right bank power station, and also we get an explanation about the 14 left bank turbines and the 6 units in the underground power station. All in all currently 22,400MW have installed capacities, which account the world's largest hydro electric power.

I can say it that one of our stage's amazing episode. And also it was a project which witnessed the potential and creativity of Chinese engineers and professionals, and as a whole this realizes the People's Republic potential. So again I am very lucky lucky man to get this precious opportunity.

During our stay we had another exciting program, which is the sightseeing program. So as per schedule of HRC we start by visiting the Grand Canal. This is the famous Hangzhou- Beijing artificial canal. Here I perceived that the great performance of the ancient Chinese people. And we visit the three Grand Canal museums, Very impressive and unique. Then our next visit was the west lake which is very attractive. Even though the city Hangzhou is one of the tourist center in many sides but I do not think that there could be a site which compare with West Lake as a means of tourist center. Because in my opinion I can say it is a place which makes people pleasurable and delightful. Especially its artificial beauty as well as its natural performance made it very remarkable.

Another interesting visit was Shangahai. When we finish visiting of the hydropower station of the Ningbo city we lead to Shangahai. At this time, we had a chance to visit and to pass through the 38 km long sea bridge (the world's longest sea bridge) which connect Ningbo with Shangahai. This is very marvelous creation of Chinese people. Moreover, when we enter to the largest city of china. We head to the ***Shangahai Expo of 2010***, which had been considered us as lucky participants. Yeah, we are really lucky to visit the Expo which has been very unique in many aspects. Notably, it is a world Expo which has been conducted for the first time in the Asia content. But it is also first time out side of the first world. Also it is very large Expo which gathered the entire world's culture, development, technology and soon. So all us visit to our respective pavilion and every got his/her country in Shangahai. Thus we are lucky that we get this precious opportunity and to visit this wonderful Shangahai Expo, which many people of the

world covets to visit it. And we also visit to the newly developed area of Shangahai which is called Pudin square; it is the center of the city. And in our way back Home we had a chance to visit the Henan city, which is known as a leather town. And here we notice so many beautiful leather made materials.

Our next visit was Shennongjia scenic spot and natural reserve. This trip had a dual purpose; particularly as a continuity of the seminar we get a lecture about environmental protection and solar energy industry. Here I understand that china has great achievement about solar energy industry. From the lecture we had, I perceived that the materials for the solar energy which produced by Chinese industries are cheaper than the western once. So it is advisable to use these Chinese equipments. And I hope we will make it feasible on our side.

In addition to this as a continuity of visiting hydropower stations and dams we had a visit to the Three Gorges hydropower project.

Furthermore the other program was continuity of sightseeing thus we had a visit to Shennongjia scenic spot and natural reserve. According to the schedule in the first day we observe the beautiful scenic spot of the Shennongjia area. Generally this area is extremely attractive and marvelous; especially I was much amazing about the Natural Bridge. Here we also observe the cultural belief, custom and values of the local inhabitants of the area. In the whole of our visit we had a helpful explanation about every event by an escort; this gives flavor to our trip. In the next day we lead to the Shennongjia Natural reserve and at this point we visit to different sites, which are very interesting and delightful and as a Termination of this trip we visit to a small zoo of Golden monkey. And after that we head back to Yichang city, here we used another way and we notice many infrastructures under construction.

In the next day we direct our way to wuhan city and here we had a visit to another tourist area which is called East lake not west lake as well as to Moshan Mountain scenic spot. After that we got back to Hangzhou and the following days we finished the remaining lectures. On 08/07/2010 the closing ceremony of the seminar was conducted in a very glowing manner.

Generally on my side both programs, meaning that the lecture as well as the sightseeing program was very enjoyable and interesting. Moreover during my stay I observe that China is beautiful country which possesses so many resources. Especially its natural resources have kept naturally. I perceive that Chinese people love their nature and they are very keen to keep their natural beauty.

Furthermore the highest thing which really inspires me is that the spectacular organization of Chinese people everywhere. I mean from top to bottom as well as in the reverse. I think it could be very difficult to administer about 1.33 billion people without such organization. However, it did not face me any failed occurrences during my stay. In addition to this all the amazing development which china has acquired should come from this great integrity and organization, both among the people as well as between the government and the people. Because I believe that organization is a fundamental issue in every progress. I hope we will have such kind of organization in Africa, especially in our country. So I can say that I learn this wonderful experience during my stay.

And I would like to extend my gratitude to the government of China for the constructive relationship with Africa specifically with developing countries. Besides to the Ministry of Commerce of the People's Republic of China for their sponsorship to this interesting and valuable seminar. Likewise, to HRC for their preparing to us a perfect course and for their great organization in every situation and to all member staffs of HRC, especially to the organizing committee who lead by Mr. Pan for everything they did to us. Really they made us to feel just like in our home.

Last but not least I would like to express my heartiest thanks to all Chinese people especially to residents of Hangzhou for their smiling face, guest friendlier and soon.

Finally, I would like to give some suggestion:

Among them I suggest that HRC should to consider in preparation of specific and detail lecture related to the previous course notably, concerning SHP for developing countries.

Moreover, I suggest continuing of the health and constructive assistance of the People's Republic of China and Africa.

(Source:HRC) ■