SMALL HYORO POWER NEWS

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Published by
SHP News Editorial Office
Hangzhou Regional Centre (Asia-Pacific) for Small Hydro Power. Hangzhou 310012, P.R.China

Supported by
UNDP/ESCAP Regional Energy Development Programme(REDP) in association with UNIDO

Bulletin of First National Census for Water

Ministry of Water Resources, P.R.China
National Bureau of Statistics, P.R.China

According to the decision of the State Council, the first national census for water was conducted in the period of 2010-2012. December 31, 2011 is set as the standard time point and the year of 2011 is defined as the census period. The scope of census covers rivers and lakes, water structures, major water abstractors for social and economic use, and water-related institutions etc. within the territory of the People's Republic of China (excluding Hong Kong Special Administrative Region, Macao Special Administrative Region and Taiwan). The main contents of census include basic conditions of rivers and lakes, basic conditions of water structures, water use of economies and society, management and protection of rivers and lakes, soil and water conservation and capacity building of the water sector. The census follows "the principle of localization", and selects the county level administrations as the basic working unit and applies multiple methods of survey such as comprehensive survey, sampling survey, typical survey and key project survey.

Table 1 Summary statics of reservoirs of various scales and total storage capacities

Scale of reservoir	Total	Large-size			Medium-size	Small-size		
		Sub-total	Large Type-Ⅰ	Large Type-Ⅱ		Sub-total	Small Type-Ⅰ	Small Type-Ⅱ
Number	**98,002**	756	127	629	3,938	93,308	17,949	75,359
Total storage (100 million m^3)	**9,323.12**	7,499.85	5,665.07	1,834.78	1,119.76	703.51	496.38	207.13

Table 2 Summary statistics of hydropower stations of various scales and their installed capacities

Scale of hydropower stations		Number	Installed capacity (10,000 kW)
Total		**46,758**	**33,288.93**
Installed capacity ⩾500 kW	Sub-total	22,190	32,729.79
	Large Type-Ⅰ	56	15,485.50
	Large Type-Ⅱ	86	5,178.46
	Medium-size	477	5,242.00
	Small Type-Ⅰ	1,684	3,461.38
	Small Type-Ⅲ	19,887	3,362.45
Installed capacity<500 kW		24,568	559.14

Two-phase stratified sampling method was employed by the Office of the State Council Leading Group of First National Census for Water, to conduct samples survey in 31 census areas at provincial level in China. The overall results of post-survey quality examination through random check indicates that the quality of census data is able to meet the expectation, with a missing report rate of 0.11‰ and an average error rate of 6.20‰ for the summary data of index.

With the approval of the State Council, the results of water census are published as follows.

Reservoirs

The number of reservoirs in China totals 98,002, with a combined storage

capacity of 932,312 billion m^3, and 756 are under construction, with a total storage capacity of 121.902 billion m^3.

Hydropower stations

The number of hydropower stations totals 46,758 in China, with combined installed capacity of 333 million kW (Refer to Table 2 for the details).Among them, 20,866 are completed, with combined installed capacity of 217 GW and 1,324 are under construction, with combined installed capacity of 110 GW.

Sluice

There are 268,476 sluices with a flow capacity of 1 m^3/s or above and 2,685 rubber dams (Refer to Table 3 for the details) in China. Among them, there are 96,226 completed sluices, 793 under-constructed sluices, 7,919 flood diversion/discharge sluice, 10,970 water intake/control sluices, 55,137 regulating sluices, 17.198 water drainage sluices and 5,795 tidal sluices.

Embankments

The total length of embankments in China reaches 413,679 km (Refer to Table 4 for the details). The total length of grade-5 embankment is 275,495 km, among which 267,532 km is completed and 7,963 km is under construction.

Pumping stations

There are a total of 424,451 pumping stations in China (Refer to Table 5 for the details). Among them, 88,365 are completed and 698 are under construction.

Watter supply in rural areas

There are a total of 58,874.6 thousand water supply projects in rural areas of China, among which 922.5 thousand are of centralized type and 57,952.1 thousand are of distributed type. The beneficiary population of these projects reach 821 million, among whom 549 million are beneficiaries of centralized water supply projects and 263 million are those of distributed ones.

Small reservoirs and ponds

A total of 4,565.1 thousand small reservoirs were built in China, with combined storage capacity of 30.317 billion m^3. The country also has 6,893.1

Table 3 Summary statistics of sluices of various scales

Sluices		Number	Percentage (%)
Total		**268,476**	
Passing gate flow≥5 m^3/s	Sub total	97,019	100
	Large-size	860	0.9
	Medium-size	6,332	6.5
	Small-size	89,827	92.6
Below (1 m^3/s≤passing gate flow<5 m^3/s)		171,457	

Table 4 Summary statistics of embankment of various grades

Grade of embankment	**Total**	Grade-1	Grade-2	Grade-3	Grade-4	Grade-5	Below Grade-5
Total length (km)	**413,679**	10,739	27,286	32,669	95,523	109,278	138,184
Percentage (%)	**100**	2.6	6.6	7.9	23.1	26.4	33.4

Table 5 Summary statistics of pumping stations of various sizes

Scale of pumping stations		Number
Total		**424,451**
Above scale (installed capacity≥1 m^3/s or installed capacity≥50 kW)	Sub-total	89,063
	Large-size	299
	Medium-size	3,714
	Small-size	85,050
Below scale (installed flow <1 m^3/s and installed capacity <50 kW		335,388

Table 6 Summary statistic of groundwater abstraction wells of various types and total quantity of water withdrawal

Type of water abstraction wells			Number of wells	Quantity of water withdrawal (1,000 million m^3)
Total			**9,749**	**1,084**
Tube well	Sub-total		5,383	1,040
	Irrigation	Sub-total	848	753
		Inner diameter of well tube ≥200 mm	407	613
		Inner diameter of well tube <200 mm	441	140
	Water supply	Sub-total	4,535	287
		Daily water abstraction ≥20 m^3	39	217
		Daily water abstraction <20 m^3	4,496	70
Manual wells			4,366	44

Table 7 Groundwater sources of various scales

Scale of groundwater sources	Number of water sources	Percentage (%)
Total	**1,847**	**100**
Small-size water source (5,000 m^3≤daily water abstraction <10,000 m^3)	824	44.6
Medium-size water source (10,000 m^3≤daily water abstraction<50,000 m^3)	870	47.1
Large-size water source (50,000 m^3≤daily water abstraction<150,000 m^3)	137	7.4
Super-large-size water source (150,000 m^3 ≤daily water abstraction)	16	0.9

thousand cellars and ponds with a total storage capacity of 252 million m^3.

Irrigated areas

Irrigated area in China reaches 1.002 billion mu, of which 922 million mu of cultivated land and 80 million mu of garden and grassland are under effective irrigation.

Construction of irrigation districts

A total of 456 irrigation districts with individual designed irrigation area of 300 thousand mu or above were constructed in China, with combined irrigation area of 280 mu. The number of irrigation districts with individual designed irrigated area from 10 thousand (equal or exceed) mu to 300 thousand mu totals 7,316, with combined irrigation area of 223 million mu. The number of irrigation districts with individual designed area from 50 (equal or exceed) mu to 10 thousand mu totals 2,058.2 thousand, with combined irrigation area of 342 million mu.

Groundwater abstraction wells

A total of 974.9 million groundwater abstraction wells were drilled in China, with a total quantity of 108.4 billion m^3 water withdrawn annually (Refer to Table 6 for the details).

Groundwater sources

There are a total of 1,847 groundwater sources in China (Refer to Table 7 for the details). ■

South-South Cooperation Process of HRC

Cheng Xialei

Hangzhou Regional Center (Asia-Pacific) for Small Hydro Power (HRC) was established in 1981 as one of the seven regional training centers co-sponsored by the United Nations Development Program (UNDP) and the Chinese government, specialized respectively in Biogas, Silkworm, Fresh Water Aquaculture, Rural Comprehensive Development, Acupuncture, Small Hydropower (SHP) and Grass-root Health Care.

Over 30 years of South-South Cooperation, HRC is both a beneficiary and a practitioner of the cooperation, witnessing the great success of China's South-South Cooperation.

I. Background of Establishing HRC

Since the world oil crisis occurred in the 1970s, the global aspiration for an "alternative energy" has been on the upswing continuously. Small Hydropower, as a technically mature, cost-effective and the most viable renewable energy, has won the special favor of the international community. Many developing countries set out to implement the development plan of small hydropower, among which China took the lead. With an aim to intensify international exchanges and cooperation and to support the developing nations in their efforts to overcome obstacles in SHP development, the international community and related UN agencies gradually came to the consensus that an international industrial research and training center needed to be set up in the country with SHP well-developed. Hence three international conferences were held in the late 1970s and early 1980s successively, giving rise to the common understanding that an international SHP center should be established in China. Related legal issues were settled and procedures determined in line with UN regulations during these conferences.

The details for establishing the center were negotiated by UNDP and the Chinese government (through the then Ministry of Foreign Economic Cooperation). It took about two years for the project to settle, from the early 1980s when the idea began to be materialized, negotiated and the preparation started, to November 1981 when the Project Document for Hangzhou Regional Center (Asia-Pacific) for Small Hydropower Research, Development and Training was signed officially.

The construction of HRC was co-funded by UN and the Chinese government. UNDP invested $1.192 million (through the projects CPR/81/004,RAS/80/033,RAS/80/001and RAS/84/001), among which $457,000 were used for training equipment procurement and the rest for scientific research, training, information activities, administration, etc. The then Ministry of Electricity and Water put in an investment of RMB 6.55 million yuan, among which 5.5 million was for land acquisition, office building construction, outdoor water supply and drainage and road construction, and the rest for construction

of staff residential buildings.

HRC's main missions are to provide technical training and assistance for other developing countries, to research on international SHP standard series and development design, to conduct exchanges and technological collaboration on SHP technical information and to research and instruct on key SHP scientific research and technological innovation projects.

II. South-South Cooperation Activities

1. International Training

Entrusted by UN agencies, HRC organized 18 international training workshops in various fields of SHP technology, having 236 participants from Asia, Africa, Latin America, Oceania and the Arab countries during the first ten years. Then in 1993, HRC began to carry out the Chinese government's foreign-aid training programs, hosting two or three sessions annually. Up to now, HRC has successfully hosted 66 international seminars/training courses, having 1388 participants from 111 countries. In November 2011, the "Ministerial Seminar on Water Resources and Small Hydropower for Developing Countries"was conducted by HRC in Hangzhou, 25 high level officials came all the way to attend the 7-day seminar from 12 countries in Asia and Africa, including Cambodia, Egypt, Ghana, Kenya, Malawi, Pakistan, the Philippines, Sierra Leone, Syria, Tanzania, Uganda, Vietnam, etc. It was an attractive and rewarding event which had won enthusiastic responses and significant effect.

2. International Conferences and Exchanges

Since the establishment, HRC has hosted 25 SHP international conferences of various scales both at home and abroad, such as the unprecedented Second International Conference on Small Hydropower which was jointly held by HRC and the International Water Power & Dam Construction of UK in 1986 and attended by 181 experts from 38 foreign countries and 96 domestic representatives; the 93'International Exhibition on Small & Medium Hydropower Technology and Equipment which was held in Hangzhou and attended by over 1000 representatives from over 40 countries; the Promotion Conference for Clean Energy Development in Macedonia which was held in March 2010 in Skopje, the capital of Macedonia, under the co-sponsorships of the Chinese Embassy in Macedonia and the Ministry of Economy of Macedonia. Mr. Dong Chunfeng, Chinese Ambassador in Macedonia and Mr. Fatmir Besimi, Minister of Economy of Macedonia were present at the opening ceremony and respectively delivered speeches. Up to 100 Macedonian delegates attended this conference, tens of press agencies including TV, broadcasting, newspaper, etc. came for interviews, and this event was highlighted in the local TV report at that night. News concerning the successful conference was also timely released on the websites of the Ministry of Foreign Affairs and the Ministry of Commerce of China.

Besides, HRC has dispatched over 100 delegates to over 30 countries for attending and presenting papers at various international conferences, and has edited and published 92 issues of SHP News (in English) which were distributed to over 90 countries and regions.

3. International Cooperation Research

With full support and funds supplied by UN framework and the Chinese government, HRC has made great achievement on many scientific research programs in collaboration with international and domestic organizations.

The international scientific cooperative research programs, supported and funded by UN framework, mainly include: "Research Program for ELC Application", "Pilot Project on SHP's Automatic & Remote control system", "Research & Development on New-type Turbine", etc. The "Pilot Project on SHP's Automatic & Remote control system" was listed in 1981 as a major scientific research item for international cooperation under the framework of Asia-Pacific Regional Network of UN (CPR/81/004) and was considered as a key program of Chinese Ministry of Water Resources. Over 10 related organizations took part in this first systematic research program on SHP automation which led the automation and remote control construction for small

hydropower plant in China. The project received $82,000 from UN funding, RMB 230,000 yuan from Chinese Ministry of Water Resources and RMB 273,000 yuan from local government.

The international scientific cooperative research programs funded by Chinese government mainly are: "Rural Hydropower Insurance Technology for Emergency Against Disasters Caused by Climate Change", a long-term cooperative project between China and Vietnam, "Technology for Unattended Small and Medium Hydropower Plants", "Technology for Rural Power Loss Reduction", "Module-based Substation Technology and Equipment", "Key Technology for Containerized Mini Hydropower Station", "Dedicated Integrated Chip for Energy-Saving Meter", etc.

4. Foreign-aid on SHP Engineering

Entrusted by Chinese Ministry of Commerce, HRC has undertaken and accomplished 3 foreign-aid engineering projects: design of Moco-Moco Hydropower Plant in Guyana, equipment supply and technical service for Corojo and Moa Hydropower Plants in Cuba, and equipment supply of over 3000 Micro hydropower units in Vietnam.

5. SHP Consultation and Equipment Export

Since the establishment, HRC has provided the technical service such as planning, designing, consultation and equipment completing, etc. for 65 SHP projects in over 30 countries including Vietnam, Mongolia, Rwanda, Sudan, Indonesia, Papua New Guinea, Cuba, Turkey, Guyana, Malaysia, the Philippines, Sri Lanka, Peru, Fiji, Pakistan, Angola, Kenya, Bangladesh, Bhutan, Thailand, Macedonia, Brazil, Vanuatu, etc, among which 28 projects have been put into operation. The total contract amount exceeds $80 million, thus promoting Chinese SHP technology and equipment to go global.

III. Successful Experience in South-South Cooperation

1. With the support of the United Nations and the Chinese government, continually enhancing HRC's Self-development capability

HRC is co-founded by the United Nations and the Chinese government. At the beginning of its foundation, with a small scale and less than 40 staff members, HRC was unfamiliar with international cooperation. The timely and thoughtful guidance of UNDP, UNIDO, International Center for Economic and Technical Exchange of MOFTEC, and Department of Foreign Affairs of MWR played a crucial role in the conduction of HRC's work and the rapid development of international cooperation capability. At the early stage, in a relatively poor condition and with its actual competence and result, HRC undertook the first international training workshop, which successfully gained the confidence from the United Nations and other developing countries in China's commitment of setting up an Asia-Pacific Center for SHP. Afterward, HRC called up experts nationwide to compile the first version of training material for SHP training workshop and launched the English magazine SHP News, as well as carried out a series of influential activities such as hosting international conferences in high standard and large scale jointly with international prestigious publications, which greatly promoted HRC's international reputation, created a number of cooperation opportunities that were not supported or funded by United Nations, such as the scientific research cooperation projects with Brazil, New Zealand, Switzerland, the United States, France, Hong Kong, etc. All of these outcomes achieved from international conferences opened up the international cooperation in a broader magnitude in addition to that arranged by the United Nations, gained the trust and continued support from international community, and thereby laid a solid foundation for the sound and long term development of HRC.

After 30 years development, with expanded scale, over 200 researchers and multi-discipline talents with international vision and nearly hundred million fixed assets, HRC lives up to the good reputation of the important window of foreign cooperation for Chinese small hydropower and the only professional SHP scientific research institute in China. In the 1990s, the relevant UN agency presented HRC with a banner which praised the center as "the SHP Family for Asian-Pacific Region". In 2002, Mr. Annan, UN secretary general, highly praised HRC for its contribution in sharing valuable experience in SHP field with other developing countries. In 2010, HRC's Director General received the "Award for China Foreign Aid Dedication" from Ministry of Commerce.

HRC's development history testifies that helping developing countries to improve the self-development capability based on the input and cultivation from UN and local government in the early phase is the successful mode of South-South cooperation.

2. Seizing the opportunities, expanding technical cooperation to economic and trade cooperation

HRC has paid great attention to the technical training for other developing countries since its foundation, and takes active part in undertaking SHP training workshops and seminars every year. So far, HRC has undertaken 66 international training workshops and seminars with the participation of 1388 technicians and officials from 111 foreign countries. The training workshop/seminar is not only able to share China's appropriate technologies and advanced experience, cultivate talents for developing countries, but also gives full play to the function of bridge of international participants, to expand technical cooperation to economic cooperation, and further into trade cooperation, so as to promote the export of our SHP technologies and electromechanical equipment, and carry out the development of substantial economy. Furthermore, the training workshop/seminar also attaches great importance to cultural and people-to-people communication to strengthen friendship, and makes the contribution by enabling other developing countries to understand a real China.

Most of HRC's participants are now the leaders or technical experts in hydropower and energy fields in their own countries. For instance, a Vietnamese participant has been promoted to the Deputy Minister of Ministry of Agriculture in Vietnam, an Egyptian participant holds a ministerial post in Egypt's Ministry of Electricity & Energy, a South African participant is appointed as the Chief Engineer in Water and Sanitation Department of City of Cape Town, a Tanzanian participant is promoted to Vice President of Tanzania Electric Supply Company Ltd., and another Tanzanian participant is now the Chief Engineer in Tanzania's Ministry of Energy and Minerals. As an indispensable China-friendly force, all the participants serve as the bridge that facilitates to carry out the strategy of "Going Global" and promote the SHP cooperation.

HRC has undertaken 65 overseas technical services in terms of SHP planning, design, consultation, and supplying equipments in complete set (28 SHP stations have been put into operation), two thirds of which were introduced by the participants or undertaken together with enterprises founded by the participants. HRC received good economic benefits with the contract value of over $80 million, which embodied the "multiple effects" of the international training.

The successful practice of HRC's "Going Global" proves that transferring technical cooperation to economic and trade cooperation, and carrying out the development of substantial economy is the effective way for successful South-South cooperation.

3. Building a national innovative cooperation platform and boosting the South-South Cooperation development into a new stage

In cooperation with foreign countries, HRC actively promotes the intergovernmental cooperation in the field of small hydropower, thus boosting the cooperation development into a new stage. In Vietnam, Vietnam Academy for Water Resources(VAWR) and HRC have established a long-term partnership, and under the framework of China-Vietnam Joint Committee on Science and Technology Cooperation, the two sides have succeeded in applying and implementing several Sino-Vietnamese long-term or short-term cooperative projects, and established a bilateral steady cooperation and exchange mechanism. HRC has provided more than 3000 sets of micro hydropower units for isolated operation, helped the Vietnamese side to build a small hydropower automation laboratory and to conduct the pilot development and promotion of containerized micro hydropower units. Moreover, the joint research program called "Rural Hydropower's Insurance Technology for Emergency Against Disasters Caused by Climate Change" was approved and listed as one of the Sino-Vietnamese long-term cooperative projects by both Ministries of Science and Technology. In 2013, the scientific aid project "China--Pakistan Joint Research Center for Small Hydropower" which HRC applied for has been approved by the Chinese Ministry of Science and Technology and has been started.

Practice has proven that by the establishment of a national innovative platform, the South-South Cooperation can be promoted into a new level.

4. Fully understanding the needs of developing countries and creating a new mode of South-South Cooperation

Currently, about 1.6 billion people globally still have no access to electricity, most of whom live in the rural areas of developing countries where there are abundant small hydropower resources. Therefore, it is our duty and responsibility to help those developing countries to shake off poverty by constructing small hydropower stations. In developing

countries, the unfavorable conditions in technology and economy are two major barriers in developing small hydropower, and lack of standards and capability for local equipment manufacturing and maintenance is one of the major technical obstacles. According to research, most developing countries have just started to develop small hydropower, among most of which have no national standards, so they can only use the standards of large hydropower, which are highly uneconomical. China has spared no effort in developing small hydropower for over 60 years, and has gained ample experience, formed a relatively complete small hydropower standards system. Also, China has her unique experience in promoting appropriate technology of small hydropower and reducing cost, which is widely welcomed by developing countries. Therefore, internationalization of Chinese SHP standards is China's contribution to other developing countries. Currently, HRC has undertaken 4 tasks of standards translation, and has been considering compiling SHP Technical Guidance Documents jointly with the international organizations and the International Committee for Standardization. Meanwhile, by the establishment of a national research center and training base, HRC has fostered the capability of local equipment manufacturing and maintenance and advanced the industrial development, thus promoting South-South Cooperation in the field of small hydropower from technical cooperation to a comprehensive economic cooperation, moving forward to a mode of strategic partnership.

By establishing the international SHP standards and cultivating the capability for local equipment manufacturing and maintenance, HRC has put forward the SHP South-South Cooperation into a new strategic partnership mode.

In the new circumstances, as a professional SHP research and training institute in Asia-Pacific region and even in the global scale, HRC should be fully aware of the importance of international SHP cooperation in facilitating China's foreign exchanges and enhancing China's international prestige. HRC will continue to explore and establish new modes of South-South Cooperation, using its own advantages, to conduct bilateral and multilateral SHP cooperative researches, trainings and exchanges, thus enhancing its international fame. Through implementing the strategy "bringing in and going global", HRC will enable the world to know more about China's small hydropower industry, and contribute positively to the SHP development of other developing countries, thus promoting China's small hydropower to the international stage, which is the grand goal during HRC's long-run development.

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The Last SHP Self-supply Region in Jingning of Zhejiang Integrated into National Power Grid

On 3 December 2012, it turned to be sunny after a few wet days, the electricians of Shawan Power Distribution and Supply Station of Jingning She Autonomous County drove to Wutongkeng Village of Wutong Town without delay, to undertake the renovations on the gauges, meter boxes and service wires. The implementation of work signified the beginning of the renovation and upgrade of SHP self-supply regions in Wutong Town.

Following the Contract on Transfer of Wutong SHP Self-supply Town was signed on 27 November of this year, the last SHP self-supply region in Jingning She Autonomous County of Zhejiang Province was formally integrated into the administration of national power grid, and the related renovation and upgrade of power grid began correspondingly. Hearing the good news, a villager in Wutongkeng Village of Wutong Town who is called Lan Shengda said with great pleasure: "we were anxious as there was much power-off before, however, it appears that the sufficient power supply will be guaranteed from now on."

In fact, the expectation of Lan Shengda is just that of all the villagers in the town. Wutong SHP Self-supply County has 11 administrative villages, under which, there are 60 natural villages, with a total population of 6000. Wutong Town is a national demonstration base for agriculture, science and technology, and moreover, it is well know as a "Town of Mushroom". Encouraged by the governmental policies on agriculture, the production of mushroom and jew's-ear has become one of the key industries of the town. In 2011, for only one year, 250,000 bags of mushroom and 400,000 bags of jew's-ear were produced in the town. However, for a long period, the power for Wutong Town was supplied by the town-owned SHP station, and due to lack of sufficient fund for regular maintenance, the equipment became aged with poor capacity of power supply and low reliability, and even with some security risks. Following the socio-economic development, the mode of SHP self-supply region could no longer meet the increasing electricity demand on living and production of local farmers.

It is said that following the transfer of the self-supply region, a special fund of 3 million yuan will be invested by the power sector, and it is planned that before March 2013, the renovation on the gauges, meter boxes, service wires, drop wires, air switches, household protection in Wutong self-supply region, as well as the installation of electric information acquisition system will be completed. By the end of April, the renovation on 27 distribution networks in the region, including the improvement on the distributor boxes, low-voltage lines, electricity poles, etc. will be completed. By the end of May, the defects on equipment will rectified for the high-voltage lines and transformers in the region. By the end of June, the administrative system and the related date collecting system for the low and high voltage lines in the region will be set up so as to ensure the subsequent normal management.

Meanwhile, more investment will be further put in the construction of power grid in Jingning, the only She Autonomous Region in China. During the twelfth Five-Year Plan period, the total investment in power grid in Jingning will reach 1300 million yuan, and it is expected that by 2015, an advanced and reliable Smart Grid will be established with the harmonious utilization and rational development of 220kV, 110kV, 35kV and other lower grades of voltage for Jingning Power Grid.

(Source:http://zjnews.zjol.com.cn)■

6th Hydro Power For Today Forum

From 29-31 October 2013, more than 150 delegates met for the 6th Hydro Power For Today Forum, the 3rd Technical Meeting of the Renewable Energy Observatory for Latin America and the Caribbean and the 1st Latin American Hydro Power and Systems Meeting at the State University of Campinas (UNICAMP). The event was jointly organized by the United Nations Industrial Development Organization (UNIDO), International Center for Small Hydro Power (ICSHP) and the Brazilian National Reference Center on Small Hydro Power (CERPCH).

This is the first time that the Hydro Power For Today Forum has been held in Latin America and the Caribbean, and was to signify and promote small hydropower in the region. The theme this year was 'Small Hydro Energy: Local Solutions to Climate Change and Sustainable Development'.

At the opening ceremony, Liu Heng, Director General of the ICSHP, Gustavo Aishemberg of UNIDO Brazil and Director of the Observatory for Renewable Energy in Latin America and the Caribbean, Geraldo Lúcio Tiago Filho, Executive Secretary of CERPCH, Victorio Oxilia, Executive Secretary of the Latin American Energy Association (OLADE), Lorena Lanza, Deputy Minister of Energy of Nicaragua, Ambassador Mariangela Rebuá, Director of the Department of Energy of the Brazilian Foreign Ministry, were joined by representatives of academic authorities and research centers. Mr Aishemberg stressed the importance to improve the energy structure in Latin America and the Caribbean and to make full use of its hydropower resources. He sees the meeting as an opportunity to let more people know about small hydropower and support this technology. Mr Oxilia called on the regional and national policymakers, experts and scholars to take positive action in response to the Rio Summits call for 'The Future We Want' with respect to renewable energy development requirements and to contribute together to the development of small hydropower.

In the keynote speeches that followed, the importance of small hydropower as a renewable energy and as a rural electrification solution worldwide, as well as particularly in Latin America and the Caribbean were brought to the attention. Diego Masera, Chief of the Renewable Energy Unit, UNIDO, introduced UNIDO's small hydropower projects in Africa. He said that sustainable industrial development needs to be based on sustainable green energy. Lara Esser, Senior Programme Officer, ICSHP, provided a global overview of small

hydropower based on the results of the World Small Hydropower Development Report 2013 and called for further technical cooperation worldwide. 148 countries already use small hydropower and another four countries have the potential. In 2011/2012, the global installed capacity of small hydropower (defined as up to 10 MW) is 75 GW, out of an estimated potential of 173 GW.

Victorio Oxilia, OLADE, commented on the publication of the World Small Hydropower Development Report 2013, that it helps to promote small hydropower development and that there is still need to improve on the missing data from Latin America. Martina Steinkusz, Project and Communication Manager, European Small Hydropower Association (ESHA) introduced challenges and

barriers to further small hydropower development in the European Union as well as the Renewable Energy Sources Transforming Our Regions (RESTOR) Hydro project.

During the panel on 'appropriate regulatory frameworks to foster small hydropower development', experiences were shared from representatives of the Chongqing Municipal Water Resources Bureau, China as well as Costa Rica's Institute of Electricity (ICE), CUBAENERGÍA, the Ministry of Energy and Mines of Nicaragua and the Brazilian Electricity Regulatory Agency (ANEEL). The Vice Minister of Energy and Mines of Nicaragua, Lorenza Lanza, presented on past electrification and small hydropower programmes. For example electricity access has risen from 54 per cent in 2006, to 72 per cent in 2012, and the aim is to reach 90 per cent by 2017. Small hydropower is seen as a socio-economic development tool and is firmly supported by the Government of Nicaragua.

During the 6th Hydro Power For Today Forum, the World Small Hydropower Development Report 2013 and its knowledge platform were launched. Furthermore, information on the Capacity Building Program on Renewable Energy of the Observatory for Renewable Energy in Latin America and the Caribbean which will be available online very soon, was presented.

Concluding the first Latin Hydro Power and Systems Meeting, it was decided to convene the next meeting in Argentina and to take turns holding the meeting. The conference succeeded in its aim to play a positive role in fostering cooperative mechanisms for the promotion of hydropower as a clean and renewable energy in Latin America. It was affirmed that this meeting is a milestone for the development of small hydropower in Latin America and the Caribbean and has injected new impetus for action.

Technical visit to the Museum of Energy – Mill park of Corumbataí

On 31 October 2013, the local organizers invited delegates to visit the Museum of Energy – Mill park of Corumbataí. In 1895 this first small hydropower stations was built with two 500 kW units constructed by German engineers and is also Brazil 's third oldest hydropower station. After 120 years and several transformation, the small hydropower station still generates power and remains in its original building. The area around the plant is well protected and has become an important local education base.

Background on the Hydro Power For Today Forum

The International Center on Small Hydro Power and UNIDO have jointly organized a number of high-level international conferences on small hydropower since 2005. The purpose of the series of Hydro Power For Today Forum is to promote hydropower, especially small hydropower, as a clean and renewable energy technologies and to share progress and successful experiences with the international community to promote the hydropower industry and its market development for global sustainable development.

(Source:ICSHP)■

Perspectives: Why Discriminate Against Small Hydro?

By Scott D. Goodwin

As an owner of small hydropower projects, I find the wholesale electric power market to be very negative toward owners of small projects (200 kW to 5 MW). For example, the national renewable portfolio standard (RPS) proposed in late October discriminates against owners of existing small hydroelectric projects while granting rate and tax subsidies to new powerhouses or increased capacity at existing facilities.

What is the basis for this discrimination toward existing hydroelectric power plants, and why are they not getting any of these subsidies to stay in business?

Small hydroelectric projects received a higher rate for power under the Jimmy Carter administration through the avoided cost for renewables contained in the Public Utility Regulatory Policies Act of 1978 (PURPA). However, current prices based on rate structure changes by regional and state independent system operators (ISOs) have resulted in small hydropower producers being so over-regulated they can only get market prices with no subsidies. The irony is that the PURPA laws are still on the books, but new regulations by state utility commissions and the ISOs have created an environment that makes it uneconomical for small hydro project owners to clarify the laws.

The default power purchase price for small hydro is basically

the regional or state ISO day-ahead market price. ISOs on average pay about $35/MWh on peak and $22/MWh off peak. Assuming a project runs for eight hours off peak and 16 hours on peak, this amounts to a blended rate of $30.67/MWh. Many small hydro projects are run-of-river and produce two-thirds of their power on peak.

Based on this blended rate, many small hydro projects are not economically feasible. Federal Energy Regulatory Commission licenses or exemptions make small hydro project owners responsible for:

- Water level stability;
- Flood control;
- Recreational access;
- Wildlife management plans;
- Dissolved oxygen monitoring;
- Water temperature monitoring;
- Emergency action plans;
- Project security plans;
- Invasive species monitoring (such as purple loosestrife and Eurasian milfoil);
- Endangered species sanctuaries;
- Owners dam safety monitoring plans; and
- Several other forms of compliance.

This burden of compliance for the existing hydro project owner is hard to fund on $30.67/MWh, which is basically the same price for non-renewable brown, coal-fired thermal generation.

Before Jan.1, 2001, national hydroelectric capacity was about 90% of all renewable energy. However,

the current proposed legislation says existing hydro should be cut off from RPS subsidies, while new hydro development should be subsidized rates.

That would be like a parent saying the new children get all the financial resources, while the children who sacrificed and helped us get to this land of opportunity have served their useful purpose and will now be pushed over the cliff.

A more balanced and logical approach would be to admit that existing hydro still provides pollution-free power and deserves a better power rate. A suggestion would be that if new capacity receives a $30/MWh RPS credit, existing hydro should be entitled to at least a $15/MWh RPS credit. By providing higher credits for new capacity, this still creates economic incentives for expansion at existing locations and helps keep the economy growing. In turn, providing an RPS credit for existing hydro helps keep the existing members of the hydro community in business. Too many times subsidies are granted for expansion, but when the subsidies run out the owners are driven out of business.

We recognize that there is an intrinsic value in the pollution-free contribution small hydropower facilities provide. In many instances, these small projects have lasted for decades or even up to a century. With modest economic support, perhaps existing hydro can continue to produce clean energy for another century.

Guest Editorial - By Scott D. Goodwin

Scott Goodwin is president and chief executive officer of American Energy Inc., which was formed to acquire and operate hydroelectric power plants.

(Source:http://www.hydroworld.com)■

Small Hydropower, A Promising Technology for Rural Electrification

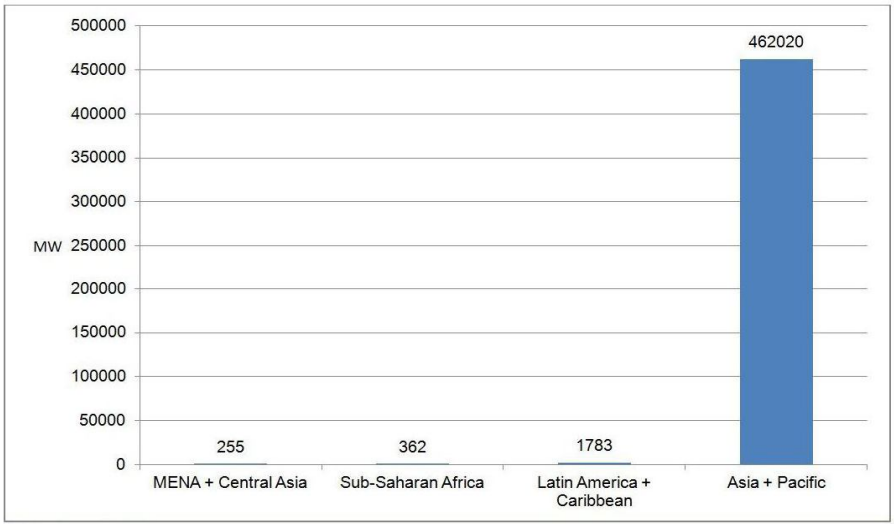
By Marcus Wiemann, Secretary General of the Alliance for Rural Electrification

It is not difficult to agree that a lack of access to energy, and more specifically to electricity, is very likely to be followed by unintended consequences for socio-economic development. To contribute to needed progress in this area, Small Hydropower (SHP) is an important solution in practice.

According to the 2012 IEA's World Energy Outlook, it is estimated that about 1.3 billion1 people still lack access to electricity. 84% out of these live in rural areas. Of course, electricity alone is not sufficient to alleviate poverty, but it is the essential factor that enables active progress in all sectors related to the UN Millenium Development Goals, such as health, education, gender equality or water quality and sanitation.

I The business potential of Small Hydropower

The European Small Hydropower Association (ESHA) and the European Commission's definition of SHP sets the upper limit by 10MW of installed power capacity. An international standard alike could initiate further development of a global market for this sector. ESHA's definition includes also mini-hydro (≤ 1 MW), micro-hydro (≤ 100 kW) and pico-hydro (≤ 5 kW), although each of these systems has its own specific characteristics and applications.



▲ **Table 1: Installed capacity in MW (SHP ≤ 10 MW)**

In 2013, it has been estimated by the International Centre for Small Hydropower (ICSHP) and the United Nations Industrial Development Organizations (UNIDO) that SHP was providing 72 GW of the worldwide electrical capacity, and 67% of it was produced in developing and emerging countries.

In remote communities where the access to electricity is not yet available, SHP offers a feasible solution to tackle this basic need. It is a proven technology that can be connected to the public grid, work off-grid as a stand-alone plant or as the main source to power a mini-grid. In addition to its energy use, water reservoirs can also be combined with irrigation systems for agricultural purposes.

Furthermore, it is a sustainable, clean resource, able to satisfy a high demand of energy without compromising the natural resources, to guarantee a constant supply of electricity, to provide

flood control and to contribute to the reductions in greenhouse gas emissions.

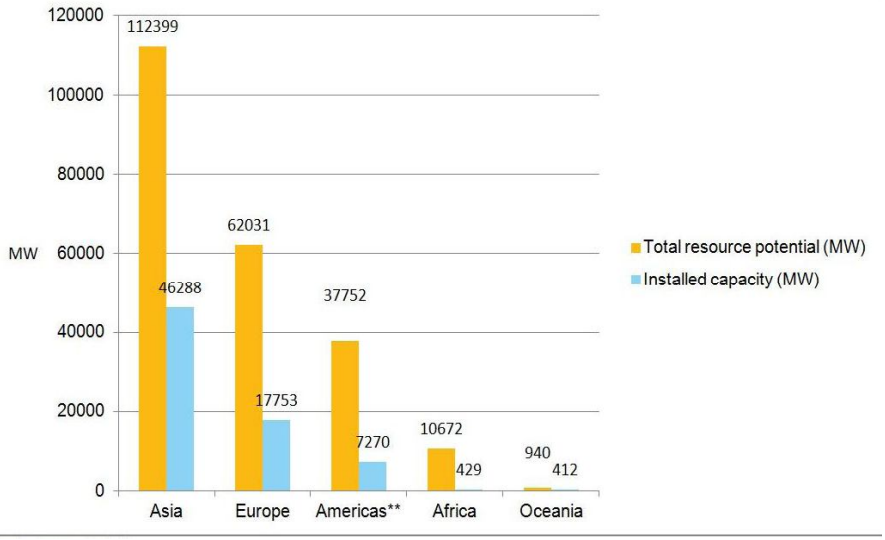
Despite some voices that have been raised against hydropower for its effects on the environment, SHP's impact is actually minimal due to the size and characteristics of the plant.

II Growth opportunities for Small Hydropower outside Europe

Whereas the SHP sector was more focused on Europe before the global economic crisis, the growth perspectives for global activities have become more promising in recent years.

The outcomes of the preliminary assessment "World SHP Development Report" by ICSHP and UNIDO give strong evidence that there is a growing potential for SHP in developing and emerging countries. These perspectives are mainly based on the positive economic evolution in these regions and as a consequence of the increasing demand for electricity.

For example, Asia, where India and China are the major players of the SHP sector, is holding the biggest number of installed projects. While rural areas have already benefited from recent developments, there is certainly more potential to explore. This potential derives mainly from three factors: (i) Availabiltiy of important hydro resources, (ii) stronger electricity demand by major parts of the population, yet combined with (iii) well-established governmental initiatives fostering rural electrification and supporting small scale renewable energy technology (RET) schemes.



▲ **Table 2: Global SHP statistics (SHP ≤ 10 MW)**

Colombia is not included in Americas total potential's statistics, because its figures were not verified when the article was drafted.

In this context, it is also important to highlight the potential of Latin America. According to ICSHP and UNIDO statistics (2013), the total installed capacity is equal to only 19% of the full capacity of the continent (except Colombia. Please, see table 2). Due to the powerful presence of oil and gas, the receptivity of this technology may be weaker than in Asia or Africa, although the continuous instability of fossil fuel prices is easing the path to an increased use of renewable sources in the continent3. In Peru, for instance, which provides for advantageous natural conditions, hydropower is one of the main sources of energy, providing already 63% of its electricity.

III Let electricity flow

Current trends show that the private sector is getting involved more and more in rural electrification initiatives. To support this engagement, it is essential to first properly assess the market situation before adapting existing legal and institutional frameworks or developing new ones. Moreover, the resultant frameworks should aim to allow for the application of suitable business and financing models.

For example, Uganda presents abundant hydro resources and a very low electrification rate in rural areas. In 1999, the Electricity Regularity Authority began to implement legal reforms to open up the power market to the private sector and to finish with the former monopoly of the Uganda.

Electricity Board for power generation, transmission and distribution. This initiative aimed at promoting competition for the generation and marketing of electricity. Within this framework, a new tariff structure was developed and the charge rates and conditions of electricity services were investigated. Further

initiatives to foster hydropower included the identification of potential non-Nile mini-hydro sites with a total capacity of 200MW with the support of the Royal Netherlands Embassy and African Development Bank.

Another interesting example can be found in Latin America. Brazil has been supporting SHP initiatives since 1998 through incentives, which allow owners of power plants to sell energy directly to large consumers (over 500kW), to use the grid system with at least 50% discount on distribution, and with access to special funds to generate energy in remote areas. These funds are mainly targeting North and Northwest areas, where there is a very suitable combination of high concentration of rivers and remote villages demanding electricity.

From the industry perspective, the SHP sector should also consider the need for training and capacity building addressing local stakeholders at all levels: local governments, rural electrification utilities, NGO's, small IPPs, local sources of financing, as well as local private sector and end users.

Furthermore, the industry has already assisted governments and institutions in the past on the creation of policy tool kits to share experience from good practice. Finally, the dissemination of qualified and transparent information is a pre-condition for private sector involvement. This accounts for electricity market developments for both, the short and the long term.

The undeniable conclusion is that SHP is part of the answer to power the electricity of the world. To provide for reliable, cost competitive and sustainable electricity production, this technology offers two options: production of electricity in connection with existing grids and also independently on the basis of off-grids as the more flexible solution.

Let the evidence speak for itself: In a world covered at 70% by water, SHP has already proved itself as a major contributor to electrification in developing and emerging countries with more than 50 million households and 60,000 SMEs powered by SHP at the village-level as well as projects injecting power into the grid2. With the proper legal and institutional support, the right private sector approach and the lessons learnt from the past, there is no telling the growth this technology might experience.

IV Case study

IT Power: Honduras, linking income-generating activities and micro enterprises with energy services

In 2007, the Government of Honduras was awarded a loan from the World Bank for the construction

of at least two Micro Hydro Power (MHP) Stations. IT Power was selected to build these new facilities using a design previously tested. With an installed capacity of 63 kW and 86 kW (Las Champas and La Atravesada) respectively, they were expected to provide electricity to a total of 300 homes in six rural communities. The World Bank advised the design of the Honduran MHP projects to be based on the following fundamental principles:

Use of electricity as a driver for socio-economic development

Building of institutional and technical capacity of all participating stakeholders

Monitoring and evaluation of the project, its implementation, and lessons-learned as seen from the perspective of the end-user

In designing the project in Honduras, several productive applications (by region) were identified and evaluated. Each of these applications were developed designed based on the socio-economic conditions of each community and the past energy needs or local businesses. In addition, a parallel project – the GAPFund – was created to complement and support the construction phase of these MHPs by increasing awareness among rural developers of the synergies between projected commercial activities, community development, new microenterprise initiatives and the level of energy services to be provided.

In close coordination with the communities and stakeholders, a methodology was developed for implementing income-generation activities and micro-finance models for productive applications that were supported by renewable energy projects. This methodology was then applied at both MHP locations and its main components included:

Analysis of local markets: availability of raw materials, access to markets, commercialisation, range of market, etc.

Local market-based technological analysis

Financial analysis

Linking energy needs to financing and micro enterprise

One of the objectives of this project was the possibility of its replication. To support training activities in other communities in Honduras, a toolkit was developed to train instructors and to conduct advanced training programmes. Another document was prepared on the recommended mechanism for providing micro-financing services to the rural sector. The manual aims at increasing capacity building around the establishment and implementation of such financial services and it describes financial policies specific to the rural sector. It also identifies the human resources required, and explains how these should be structured to provide such services, as well as regulations, procedures, support forms, etc.

The methodology described in this manual could be adopted or customised by any micro-financing institution (MFI) that wants to provide a financial service in rural areas. Hence, the manual is also useful for capacity building of credit officials from an MFI.

V Activity results

The two best practice demonstration projects using renewable power from the MHPs were designed for income-generating applications. The enterprise developed for the "Las Champas" community and its surroundings in the Municipality of Irione was for a select market of meat consumers. The population in this area was approximately 3,161 inhabitants, where most of the families consumed at least 1.5 pounds of meat a day.

The enterprise design for "La Atravesada" Coffee House included the purchase of beans, pulp removal and drying (in an organic manner), packaging and sales. The project, due to the level of coffee bean production in the area and the transformation of only 120,000 pounds of dry Pergamino coffee, would use electrical machinery for pulp removal, washing and drying. The set-up of the enterprise would make it easier for the partners to sell their product collectively and thus negotiate

better prices.

In addition to the above, the following material was also developed in the local language (Spanish):

Guidelines to evaluate the connection between rural energy services and income-generating activities, including information that helps final users, project developers and micro financing institutions to identify productive uses;

A micro-credit model to promote and improve access to financing for income-generating activities resulting from usage of energy from MHPs in Honduras;

A manual for business development advisory services for rural micro entrepreneurs in Honduras; this includes a catalogue of financial services for different types of financial and technical services provided as well as a comparison of different credit schemes;

Training/capacity building events designed specifically for the two communities where the MHPs were installed, on MHP-based rural enterprises, along with training manuals for potential micro enterprises;

A monitoring and evaluation programme with guidelines for policy makers and project implementers to understand the impact of productive activities associated with the electrification process (with an emphasis on the reduction of poverty and indicators related to the Millennium Development Goals).

About the Alliance for Rural Electrification and Marcus Wiemann

Marcus Wiemann is responsible for the policy sector and outreach for the Alliance for Rural Electrification (ARE). With a background in International Economics as well as in Political and Environmental Sciences, he works closely together with ARE partners and international organisations on numerous advocacy and policy actions. ARE has become a pioneering actor in the field of sustainable development, supporting and bringing together renewable energy companies who are passionate about rural electrification through off-grid renewable energies.

The Alliance for Rural Electrification is the only international business association focusing on the promotion and development of off-grid and distributed renewable energy solutions in developing countries and emerging markets.

(Source:www.renewableenergymagazine.com) ■

UNIDO, ICSHP Release Comprehensive Small Hydropower Study

The United Nations Industrial Development Organization (UNIDO) and the China-based International Center on Small Hydro Power (ICSHP) have collaborated to produce a new global assessment of small hydropower capacities and potential.

The study, called The World Hydro Development Report 2013, is based on contributions from more than 60 authors and organizations, making it UNIDP and ICSHP's "flagship assessment" on small hydro.

"By publishing this report, our goal is to promote small hydropower development by identifying the world's small hydropower development status and its potential in different countries and regions by engaging with stakeholders to share information," said Diego Masera, Chief of UNIDO's Renewable Energy Unit.

The United Nations Industrial Development Organization (UNIDO) and the China-based International Center on Small Hydro Power (ICSHP) have collaborated to produce a new global assessment of small hydropower capacities and potential.

The report contains 20 regional overviews and 149 country-level reports, making it a "world-first" compilation of small hydropower data, the authors said.

"Small hydropower is one of the most suitable energy solutions for fostering inclusive sustainable development and industrialization," ICSHP Director General Liu Heng said. "But much of the world's small hydropower potential remains untapped. So the first step to remedying the situation is through dissemination of reliable data."

The report will be available online soon and will be updated regularly.

"To ensure the data and information provided by the report is up to date, UNIDO and ICSHP are collaborating with national institutions to facilitate continuous monitoring and collection of small hydropower data," Masera said.

(Source:www.hydroworld.com) ■

Important Role for Hydro in Ireland

Ireland has ambitious plans to increase its use of renewable energy. SLR Consulting Energy Principal, Richard Vernon, explains the role hydropower has to play and how the company has been helping to reinstate a former scheme in Donegal.

Included among its ambitious targets to increase the use of clean energy, Ireland hopes to achieve a renewable contribution of 40% to gross electricity consumption by 2020. Although much of this is expected to be sourced from wind, contributions from other sources, including hydropower, will be important. Parts of the country have abundant rainfall and in the past many small towns and mills relied on hydropower to provide electricity.

Over the last few years, SLR Consulting has worked with two Irish property owners to obtain planning permission to have a former hydropower scheme reinstated and upgraded to modern standards. This had been in place along the Mill River in Buncrana, Donegal from 1905 until the mid-1980s.

Much of the original site infrastructure, including the weir, mill race and pipelines, remain in place and will be re-used as part of the proposed development.

SLR was initially tasked with taking river flow measurements over a year-long monitoring period to help establish the technical and economic viability of the scheme. Having established that the scheme was feasible, our Dublin-based team then prepared pre-planning documentation and began informal consultations with planning authorities, statutory consultees and other stakeholders.

The consultation process was followed by the preliminary design of the scheme and preparation of a detailed Environmental Impact Statement. This focussed in particular on hydrological, ecological, visual and architectural heritage impacts.

Proposed scheme

The Mill River between the existing weir and the former mill is designated as a 'Category 2' River as the existing (natural) river channel over this stretch includes a series of modified barriers (waterfalls) which permits some fish movement to take place. The proposed hydropower scheme is therefore required to ensure that some compensation flow is maintained over the depleted section of the existing channel in order to limit any potential adverse impact on the aquatic environment, the existing fishery and the amenity value of the river.

Reinstating the scheme will entail making structural repairs to (but not altering the design of) the existing fixed weir across the Mill River. Water from the impounded lake behind the weir will be abstracted via a new sluice gate and intake channel with a wash

out channel and spillway to return excess water to the river.

Over 210m of new twin 600-800mm diameter low friction pipes will be installed and buried close to the alignment of the existing open channel section of the mill race, between the intake and the existing cast iron pipes. At that point, the pipes will be slip lined into the old cast iron pipes which run for a further 120m to a site along the river bank, adjacent to the old mill building (a protected structure). The pipes will then be intercepted and connected to a new length of single larger diameter pipe placed in an excavated trench which leads down to a new turbine house at the river bank.

The small turbine house will be approximately 7m long, 6m wide and 6m high. It will be constructed on a rock outcrop at the edge of the river and will have a water outlet below river level.

Turbine choice

In developing the scheme to planning approval stage, SLR Consulting worked closely with New Mills Engineering, a turbine manufacturer based in Carrickfergus, Co. Antrim in Northern Ireland, to identify the most appropriate turbine to install at the site. Having reviewed the flow duration curve for the Mill River and taken account of available flow volumes, a full Kaplan turbine was proposed for the scheme in order to accommodate high variations in flows on the river and ensure the maximum efficiency over the flow range. This will produce a very flat efficiency curve and allow a high unit speed for direct coupling of the generator to the turbine.

Given the low head, a steel semi spiral casing will be used, with the generator close coupled and mounted on the turbine casing. The runner hub is directly coupled to the generator shaft, with the runner blade operating rod running through the generator to the hydraulic blade servo motor at the top of the generator. The turbine guide vanes are also fully regulated. A modified inclined elbow draft tube returns the water to the river, having removed the last of the energy.

A buried electrical cable from the turbine house will be connected to a newly installed transformer at the site. It is anticipated that the electricity generated by the turbine can be fed directly from this point to nearby offices or alternatively to the local electricity distribution network, operated by ESB Networks.

Planning permission for the proposed hydropower scheme was initially granted by Donegal County Council in 2012, but following a third party appeal to the national planning appeals board (An Bord Pleanála) and submission of additional information and clarifications in respect of the scheme by SLR Consulting, planning approval was finally secured earlier this year. Having obtained full planning permission, SLR Consulting and the scheme promoters are now beginning the process of moving the project forward to the development phase.

(Source:www.waterpowermagazine.com) ■

Green Highland Hydro: Unlocking Energy

Scottish land owners and other enterprises have identified the diversification and income generation opportunities that hydropower can bring. Green Highland Renewables is one company at the forefront of delivering this technology.

Scotland has been successfully using run-of-river hydropower for over a hundred years. Its mountainous terrain and high average rainfall that feeds the lochs and rivers provide numerous opportunities to produce renewable low carbon electricity, particularly in rural areas across the country.

Scottish company Green Highland Renewables (GHR) has specialised in the development of small scale hydro schemes since its formation in 2007 when two Perthshire landowners, Alastair Riddell and Iain Wotherspoon, realised the extent of hydro resources.

In 2008, Scottish and Southern Energy (SSE) Venture Capital took a third share in the company, as it considered GHR offered a complementary service to its own hydro portfolio, operating at a development scale not offered by SSE. In 2011 SSE's holding was transferred to Scottish Equity Partners LLP's (SEP) Environmental Energy Fund LP, of which SSE are 50% shareholders. In 2012 SEP and Scottish Enterprise invested significant funds worth £3.3M into GHR. This will allow the company to develop its growing pipeline of hydro-generating sites, as well as to provide a wider consultancy, project management and operation and maintenance to clients.

Ian Cartwright, Managing Director of GHR, said: "We are delighted to have closed this substantial investment round. Hydroelectric site development is a complex process, from prospecting to commissioning. It is therefore important that the company has access to substantial development capital to enable us to take advantage of the growing number of opportunities. This injection of capital means, in addition to servicing demand from our existing clients, we can actively seek out new clients requiring help with site development. We are actively looking for more schemes that we can develop with landowners. These schemes, once completed, can provide landowners with long term relatively risk free income."

The investment was accompanied by restructuring of the board of directors, with Paul Capell appointed as the new Chairman. His 30 years of experience across the renewable energy and water sectors, combined with Cartwright's skills and experience of renewable energy delivery in Scotland, are driving

forward an ambitious business plan to develop, construct and operate hydro schemes across Scotland.

GHR has worked on a wide range of run-of-river schemes throughout every phase of the development process from initial concept through to consent, construction and operation as well as providing remedial works and scheme optimisation. It has been involved in the development of over 20 private hydro schemes and has developed 18 schemes as part of a lease or partnership arrangement. The projects have ranged in size from 100kW-2MW. A further portfolio of schemes is also currently being developed in partnership with Forestry Commission Scotland.

National Forest Estate

In October 2009, the Forestry Commission Scotland (FCS) split the national forest estate into three separate regions (or lots) with the intention of appointing commercial partners to help it investigate and deliver run-of-river hydropower projects. The scheme is part of an overall Scottish Government drive to generate clean and renewable energy and reduce the effects of climate change.

GHR was appointed in August 2010 to progress Lot 3 which covers the north and west of Scotland and the company has been working with the commission over the past 18 months to explore the sites. Two sites have now been submitted for planning approval, both near Loch Garry, and a further three are expected to be submitted in the first quarter of 2013. Further investigative work is being carried out on a number of other sites that will progress throughout 2013.

Kevin Peace, Forestry Commission Scotland's District Manager in Lochaber said: "Scotland's national forest estate is making its contribution to the production of clean and renewable energy by working with Green Highland in the development of a number of small scale hydro projects. Developing renewables on the national forest estate is always to be carried out in a manner that is sensitive to the environment, and through the planning process is subjected to thorough scrutiny. Communities and neighbouring landowners will continue to be consulted as part of the planning process and constituted community groups are eligible for generous community benefit payments and have the option to invest in the schemes."

Case study: Roroyere hydro scheme

Roroyere hydro scheme is another small scale project GHR has been working on. Located on the Allt Gleann Da-Eig, a tributary of the River Lyon, it is one of seven hydro schemes developed as part of the Glen Lyon Partnership (4MW) which was formed between landowners in the glen. Its purpose was to aid co-operation in the development of available hydro potential. Large grid connection costs will also be shared between the seven projects to ensure that the whole project is financially viable.

Glen Lyon has numerous environmental designations such as National Scenic Area, Sites of Special Scientific Interest and Special Areas of Conservation. This is due to the number of significant receptors in the area including Atlantic salmon, otters

and freshwater pearl mussels. All sensitivities were thoroughly analysed and incorporated into the design in order to safeguard the environment.

The scheme generates approx 2500MWh of energy per annum, enough to supply approximately 500 average sized households. The power which is generated is sold to the grid and the project is one of the first hydro projects in the UK to benefit from the Feed in Tariff scheme (FiTs) which provides renewable generators with a guaranteed energy price.

Roroyere is a typical run-of-river project. The main scheme components are:

- Weir structure - A screened intake across the river using a Coanda washover screen, designed to abstract water at 630l/sec.
- Penstock - Buried pressurised pipeline (700mm PE pipe) that takes the water from the intake to the powerhouse.
- Powerhouse - buried design containing a 800kW Pelton turbine and generator and control system.
- Outfall - discharge point back into the associated watercourse.

Procurement

The Roroyere scheme was constructed using a multi-contract approach, with separate contracts awarded for the civil design, project management, civil engineering and mechanical and electrical plant and installation.

Construction started on 19 July 2010 and the completion certificate was issued to the civil engineering contractor in April 2011. Despite the fact that a significant amount of work took place over the winter of 2010/2011 when the weather was extremely challenging, the majority of civil works was still completed in this timescale. There was a significant delay on the turbine delivery date which consequently delayed testing the pipeline penstock. The original date for the turbine delivery was early April 2011 but was delivered three months later. Furthermore there were a number of issues relating to the pipeline testing which delayed commissioning further. The turbine was exporting to the grid with all restrictions lifted by the end of November 2011.

The scheme came in on budget and represents good value for money for a hydro scheme of this size and location. GHR also said that its procurement and project management approach has gained from the experience of developing the Rororyere scheme. Procedures for selection and scheduling of the mechanical and electrical equipment have been developed to reduce the risk of delays occurring in any other scheme.

With the 2011/12 winter being wetter than average, power generation figures for the Roroyere scheme from November 2011 were significantly higher than expected. Conversely the 2012 spring was drier than average and therefore generation figures were marginally less than expected for the first three months in 2012.

For more information please contact Anna Douglas info@greenhighland.co.uk

(Source:www.waterpowermagazine.com) ■

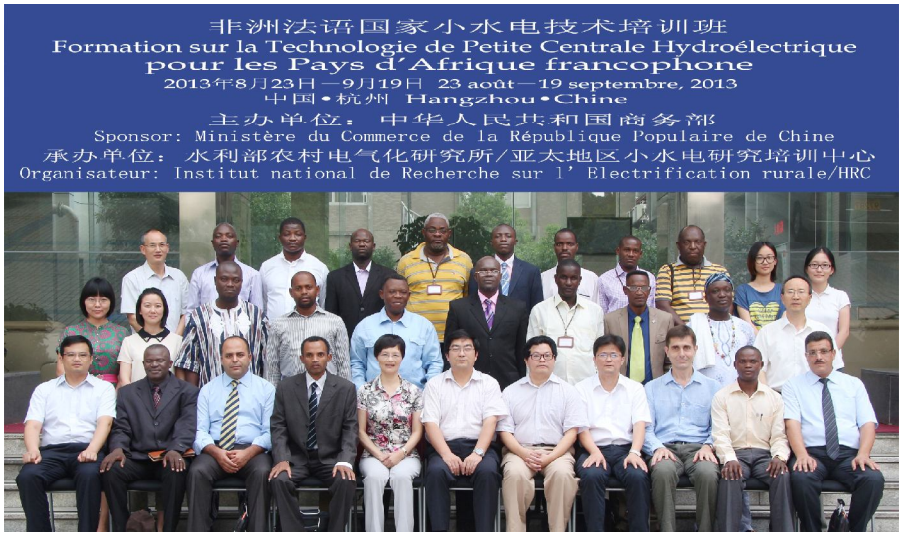
HRC's Annual Report on Foreign Affairs in 2013 and Work Plan for 2014

Hangzhou Regional Center (Asia-Pacific) for Small Hydro Power (HRC)
National Research Institute for Rural Electrification, MWR (NRIRE)
January, 2014

In 2013, led and supported by the Ministry of Commerce (MOFCOM), the Ministry of Water Resources (MWR) and Nanjing Hydraulic Research Institute (NHRI), HRC carried out and implemented the decisions and arrangement of the Central Committee of CPC on speeding up the reform of national water conservancy. HRC staff earnestly studied the documents of 18th Conference of CPC, with high spirits and meticulous attitude, in the practical style of seeking truth, worked hard and forged ahead. Foreign-aid training projects were actively undertaken, international exchanges were expanded, the international market was further developed and several multilateral or bilateral cooperative projects were successfully implemented, thus promoting SHP equipments export and creating social & economic benefits.

I Foreign-aid Training

In order to strengthen foreign-aid human resources development, deepen south-south cooperation, popularize Chinese SHP technology and equipment, while promote exchanges and cooperation among developing countries, HRC, under the guidance of MOFCOM and MWR, has successfully organized 3 foreign-aid training workshops (seminar) in 2013, i.e. Seminar on Rural Electrification for Developing Countries, Training Workshop on SHP Technology for Francophone African Countries, and Training workshop on SHP Technology for English-speaking African Countries, with 56 participants (officials) from 30 countries in total.



The first 28-day training program, Seminar on Rural Electrification for Developing Countries, was attended by 20 officials from 12 countries. The second 28-day training program, Training Workshop on SHP Technology for Francophone African Countries, had 20 officials and technicians from 11 francophone African countries joined in. The third 42-day training program, Training workshop on SHP Technology for English-speaking African Countries, was participated by 16 officials and technicians from 10 African countries.

The foreign-aid training work was fully supported by HRC's superior institute, Nanjing Hydraulic Research Institute. The Academician of Chinese

Academy of Engineering and the President of NHRI, Mr. ZHANG Jianyun, and the deputy director of Dam Safety Management Department of NHRI, Prof. WANG Shijun, have given the participants special reports respectively, which made the participants understood about Chinese water issues, climate change and its correlative impacts, China's solution to water resources as well as practical way of dam safety management in China. Moreover, participants have also visited Tiexinqiao Experimental Base of NHRI, and Nanjing Automation Institute of Water Conservancy and Hydrology.

During the training, HRC invited the former Chinese Ambassador to Rwanda and Djibouti, Mr. SHEN Jiangkuan, and the former Economic & Commercial Counsellor of several Chinese Embassies to African, Caribbean and South Pacific countries, Mr. FANG Zhimin, to give keynote presentations respectively on "60 Years of China's Aid to Foreign Countries", in order to let the participants well understand the history, policies, financing, forms, distribution, management and cooperation of China's foreign-aid undertakings. The two diplomats have attracted every participant, using rare pictures and vivid presentations.

In the site-visit session, HRC organized a study tour to a college of water resource for the first time. The hydraulic simulation laboratory, water turbine laboratory of Electrical Department, power plant simulation laboratory, power transformation automation laboratory, new energy and intelligent micro grid laboratory have offered participants a chance to practice and to further understand SHP knowledge, and to know China's experience and practice on cultivating hydropower talents. The visit also offered a communication platform for all the participants, teachers and students of Zhejiang University of Water Resources and Electric Power.

Regarding the cultural experiences, the participants and HRC staff had a joint trip on Grand Canal. This trip relaxed participants from their intense schedule, and also spread Chinese culture, promoted the exchanges between participants and HRC staff and deepened our friendship.

Besides, HRC has arranged the updating of training books, and organized a study visit to a mountainous village as to make continuous progress in 2013 foreign-aid training work, which made participants' satisfaction increase

dramatically. The overall evaluation of Seminar on Rural Electrification for Developing Countries amounted to 95 points, and that of Training workshop on SHP Technology for English-speaking African Countries attained 93 points. A small crystal memorial tablet designed by all participants was presented to HRC, expressing their sincere gratitude to HRC for "warm hospitality, dedication, professionalism, knowledge and experience sharing".

II Conference and Meeting

1. Attending the Conference on Foreign-aid Training

From 23rd to 25th January, 2013, HRC designated personnel to attend the national conference on foreign-aid training. A total of 300 participants from the organizers of training workshops nationwide attended the conference. According to the requirements of Ministry of Finance, in 2013, all the training workshops shall adopt budget management and the number of participants for each training workshop shall be under 20. It is advised on the conference that "experimental training" be introduced and more culture-oriented activities be arranged, thus offering the participants an opportunity to much more experience of Chinese culture. It was also proposed that more activities shall be arranged with college students or other organizations for interaction. The participant from HRC put forward three pieces of advice on the foreign-aid training at the conference and all the advice was adopted.

2. HRC Delegation attend China-Pakistan Energy Forum

At the invitation of Consulate General of Pakistan in Shanghai, HRC sent delegates to attend "China-Pakistan Energy Forum" which was held in Shanghai. On the forum, H.E. Mr. Muhammad Nawaz Sharif, the new PM of Pakistan, delivered a brilliant keynote speech and took the question from the audience, and nearly 50 Chinese companies engaged in energy development and investment have participated in the forum.

3. Attending Seminar on Renewable Energy in Rural Areas in Myanmar

From 4th to 5th September, 2013, at the invitation of Global Environmental Institute (GEI), HRC designated personnel to attend the seminar on renewable energy in rural areas, which was held in Rangoon, Myanmar. It was one of the follow-up activities against the visit of officials from Blue Moon Fund of USA and GEI to HRC on 26th June, 2013. The participant from HRC delivered two reports at the seminar, i.e. "Small Hydropower and Rural Electrification in China" and "Preliminary Work for Developing Small Hydropower". The Myanmar side showed great interest in small hydropower, and planned to develop small hydropower to solve the power supply for over 200 remote villages and hoped to get technical support from HRC.

4. HRC Delegation Visited the Embassy of the Bolivarian Republic of Venezuela in China and Signed MOU

On 23rd September, 2013, at the invitation of the Embassy of the Bolivarian Republic of Venezuela in China, a 3-member delegation headed by Ms. Cheng Xialei, Director General of HRC, paid a

visit to the Embassy of Bolivarian Republic of Venezuela in Beijing, and signed Cooperation Agreement on Engineering Consultancy, Technical Training, Know-How Transfer and Industrialization of Small Hydropower Stations in Venezuela. The signing ceremony was chaired by Mr. Alfredo Rojas, Director General of International Affairs Department, the Ministry of Popular Power for Science, Technology and Innovation of the Bolivarian Republic of Venezuela. Small hydropower cooperation between China and Venezuela has been formally incorporated into the cooperation framework of China-Venezuela high-level mixed commission. HRC and Foundation Institute of Engineering and Technological Development (FIETD) of Venezuela are responsible for the implementation of this cooperation project. Joint work group will be set up between two organizations to conduct site selection for the development of hydropower projects in Venezuela.

5. Attending the 18th Annual Meeting of China South-South Cooperation Network

Sponsored by China International Center for Economic and Technical Exchanges, the 18th annual meeting of China South-South Cooperation Network was held in Freshwater Fisheries Research Center in Wuxi, during 15th to 16th November 2013. The leaders and persons in charge from more than 30 organizations including China International Center for Economic and Technical Exchanges, UNIDO and China SSC Network took part in the meeting. The meeting presented a summary of the achievements and experience scored in the field of South-South Cooperation in the past 30 years and all the contributions made by related organizations to the cause of South-South Cooperation. The participants were encouraged to explore actively in seek of a more suitable development mode and direction for South-South Cooperation.

III Visiting Exchanges

1. Foreign Guests Visiting HRC

In 2013, HRC hosted totally 15 batches of 54 foreign guests respectively from Nepal, Kenya, Indonesia, Israel, the United States, Turkey, Iran, Pakistan, Peru, and Vietnam, etc (as per Appendix I). The visit of new and old friends enhances the communication and understanding, improves friendship and trust, thus reaching cooperative purpose for a number of projects. The important visits include:

(1) Chairman of Nepal Energy Development Council Visited HRC

On 9th January, 2013, Mr. Sujit Acharya, Chairman of Nepal Energy Development Council, visited HRC and had a pragmatic and friendly meeting. HRC expressed its willingness to provide assistance to Nepal, using HRC's experience and technology in SHP field at home and abroad, in terms of general survey of water resources, SHP training, consultation, technical refurbishment, equipment supply, SHP project financing and so on.

(2) Governmental Delegation of Sidikalang City, Medan Province, Indonesia Visited HRC

On 13th March, 2013, led by the Mayor of Sidikalang City, the governmental delegation of Medan Province, Indonesia, visited HRC. Sidikalang City is rich in hydropower resources on totally 11 rivers, while the hydropower development is still in its early stage. The visit aimed to learn Chinese experience in small

hydropower development so as to make some preparation for the development of SHP in Sidikalang.

(3) HRC Alumni from Nepal Revisited HRC

On 8th May, 2013, two HRC alumni from Nepal, Mr. Rimal, Chairman of Solar Energy System (SES) and Mr. Poudel, Executive Director of Building Design Authority (P.) Ltd. revisited HRC for an in-depth discussion on SHP bilateral cooperation.

(4) Officers of Bluemoon Fund of United States, and Global Environmental Institute visited HRC

On 26th June, 2013, a five-member delegation from Bluemoon Fund of United States and Global Environmental Institute visited HRC, and had a discussion on providing SHP technical training and consulting service for Myanmar. HRC made exchanges of views on international SHP consulting service and cooperation mode with our guests.

(5) Peruvian Customer Visited HRC

During 29th November to 5th December, 2013, our old customers Mr. Luis H.V.V. and Mr. Jose R.V. visited HRC for cooperation on solar power technology and equipment. Their visit concluded with a contract for 8 sets of solar pumping systems, which will be used to draw water for residents on an island of Peru.

(6) Delegation from Vietnam Visited HRC

During 11th to 17th December, 2013, the Standing Director of Institute for Hydropower and Renewable Energy (IHR) took a delegation including officials from Department of International Cooperation in the Ministry of Science and Technology of Vietnam, professors from Hanoi University of Science & Technology (HUST) and etc., to visit HRC for a long-term cooperative project on science and technology between the both governments, called Emergency-supporting Technology for Rural Hydropower against Disasters Caused by Climate Change.

The two sides exchanged views on the research subject and the implementation program of SHP black-start and the Emergency-supporting Technology for Rural Hydropower against Disasters. The delegation checked the being-fabricated micro hydropower unit for black-start and also visited College of Electrical Engineering in Zhejiang University for discussing the emulation technique of local area network (LAN) power system.

(7) CEO & Chief Engineer of French Company VELCAN Energy Visited HRC

During 16th to 17th December, 2013, CEO and Chief Engineer of the French company VELCAN Energy visited HRC for reviewing their project design report compiled by HRC. VELCAN Energy is a listed company specialized in financing hydropower projects worldwide, including Brazil, India, Laos and Indonesia etc. Now the company owns the developing rights to a number of small and medium hydropower projects with a total installed capacity of over 700 MW.

2. Outbound Missions

In 2013, HRC dispatched 18 delegations of 37 people respectively to Turkey, Macedonia, South Africa, Tanzania, Nepal, Pakistan, Myanmar and others for hydropower equipment installation, technical consultation, contract negotiation, China's foreign-aid training, inter-governmental science and technology cooperation, international conference and so on (as per Appendix II). The important visits include:

(1) Return Visit of Foreign-aid Training to South Africa and Tanzania

At the invitation of Cape Peninsula University of Technology (CPUT) and Tanzania Electric Supply Company Limited (TANESCO), HRC delegation paid a return visit of foreign-aid training to South Africa and Tanzania during 10th--19th April, 2013. During

the visit, the delegation visited 8 governmental departments or organizations including South African Department of Water Affairs (DWA), City of Cape Town (CoCT), Cape Peninsula University of Technology (CPUT), Tanzanian Ministry of Energy and Minerals (MEM), Tanzania Electric Supply Company Limited (TANESCO), Rural Energy Agency (REA), signed 3 Memorandums of Understanding (MoU), carried out 3 technical exchanges or seminars and met with nearly 20 HRC's former training participants.

(2) Visiting Turkey for Signing New Contracts of Hydropower Equipment Supply

From 25th November to 4th December, HRC delegation headed for Turkey visiting old and new customers and signed contracts with two of them as to supply the complete sets of electro-mechanical equipment for three hydropower projects. So far, HRC has provided complete sets of electromechanical equipment and installation service for 23 hydropower stations which are in commercial operation. The stable and reliable equipment as well as superior technical service provided by HRC have earned unanimous satisfaction from the owners, resulting in quite positive market feedback.

(3) Visiting Pakistan for Cooperation and Exchange on Renewable Energy Technology

During 6th to 12th December, 2013, HRC delegation visited Pakistan for implementation of a governmental grant project sponsored by Chinese Ministry of Science and Technology. The delegation made an official visit to H.E. Mr. Zahid Hamid, Minister of Science and Technology of Pakistan and held a meeting for bilateral cooperation. The delegation also visited Chinese Embassy in Pakistan and was warmly received by Chinese Ambassador Mr. Sun Weidong. Besides, a lecture was given by the delegation to renewable energy researchers from all around Pakistan. A cooperative agreement was signed between HRC and Pakistan Council of Renewable Energy Technology (PCRET) to jointly build a SHP research center for hybrid system of hydropower, wind power and solar energy as well as the research and demonstration of container-type micro hydropower station and automation technology.

IV Information Dissemination

In 2013, HRC has edited and published 6 issues of Small

Hydropower and a special issue for Technical Seminar on Renovation Project for Rural Hydropower in Chinese and SHP News of 2013 in English. Besides, the Alumni database and the English introduction to HRC's affiliated companies on HRC's website have been updated. The website released over 100 pieces of news.

V International Cooperation on Small Hydropower

1. Implementation of Inter-governmental Science & Technology Cooperation Program

In 2013, HRC jointly carried out technical cooperation and research with foreign organizations in the field of small hydropower and new energy resources. Much was done in terms of inter-governmental cooperation on science and technology.

In July 2013, HRC and Pakistan Council of Renewable Energy Technologies (PCRET) jointly applied to Ministry of Science and Technology of both countries for foreign-aid project for developing countries—China-Pakistan Joint Research Centre for Small Hydropower, which was finally approved. The project has already been kicked off, and HRC dispatched a delegation in early December 2013 to Pakistan for the execution of the project. During the visit, HRC and PCRET signed the agreement on implementation of the project, and both parties would collaboratively carry out study and demo on SHP, wind & solar energy hybrid system, containerized mini hydropower plant, and automation technology, in an effort to establish a China-Pakistan Joint Research Centre for Small Hydropower, which will serve as a high-level base between Chinese and Pakistani governments for study, demonstration, development and capacity building on renewable energy technology.

HRC and the Institute for Hydropower and Renewable Energy (IHR) in Vietnam have been in a continuous contact for science and technology cooperation. In 2011, HRC and IHR jointly applied for the research project of "Emergency-supporting Technology for Rural Hydropower against Disasters Caused by Climate Change". The project has been approved by the 8th meeting of joint committee on science and technology and was listed as a long-term project on science and technology cooperation between Chinese and Vietnamese governments. The year of 2013 witnessed great achievements of the project. Two parties jointly studied and researched on "black start" for small hydropower plant and the detailed implementation plan for emergency-supporting technology for rural hydropower against disasters. HRC will soon provide a set of container-type micro turbine-generating unit to Vietnamese side, cooperatively promoting the study and research on the "black start" technology.

In addition, HRC has been engaging in trial-manufacturing and popularization of hydropower equipment with countries including Bulgaria, Venezuela, Montenegro, etc. under the governmental cooperation framework.

2. Export of Hydropower Equipment and Power Station Design

In 2013, HRC actively developed the international market in Pakistan, Turkey, Kenya, Peru, Indonesia, Nepal, Macedonia, Serbia and other countries, undertaken the supply of electromechanical equipment for ten hydropower stations, with the contract value of nearly 7 million dollars. Meanwhile, HRC continued to conduct equipment supply and on-site installation for on-going projects, carried out after-sale services and spare parts supply for the completed projects.

In terms of design and consultation for oversea hydropower projects, HRC has successfully carried out the design and consultation for projects in Indonesia, Kenya, Papua New Guinea, Vietnam, Laos, Ukraine, Kosovo, etc. Three contracts have been newly signed in overseas market.

So far, HRC has undertaken planning, design, consultation, equipment supply and installation work etc. for over a hundred small hydropower stations in more than 30 countries and regions, with a total contract value of around 100 million dollars, among which, 45 hydropower stations have been constructed and put into operation with the electromechanical equipment supplied from HRC, and a total installed capacity reached 800 MW more.

VI Work Plan for 2014

1. To conduct three foreign-aid training projects entrusted by MOFCOM, i.e. Seminar on Rural

Electrification for Francophone African countries, Seminar on Rural Electrification for Asian Countries, and Training Workshop on Small Hydropower Technology for English-speaking African Countries, and continue to strive for creating the demonstrative foreign-aid training base of MOFCOM.

2. To hold China-ASEAN Training Workshop on Micro Hydropower and Solar Energy in Hangzhou.

3. To hold an overseas training workshop and an abroad promotion conference respectively, i.e. Seminar on Small Hydropower Technology for ASEAN Countries and Promotion Conference on Renewable Energies in Pakistan.

4. To fully take the advantage of HRC as the "Family of Small Hydropower in the World", and to strength intensive and extensive exchange and promote cooperation between HRC and governmental departments and counterparts in SHP field, so as to keep HRC as an important "window" for international cooperation; Meanwhile, to further enhance the contact with Word Bank, Asian Development Bank and other international organizations, hence expending the scope of business and international influence.

5. To continue the implementation of two projects, i.e. China-Pakistan Joint Research Center for Small Hydropower and the research project called Emergency-supporting Technology for Rural Hydropower against Disasters Caused by Climate Change, strive for other foreign-aid projects, enhance the bilateral cooperation with Pakistan, Vietnam, Tanzania, South Africa, Bulgaria, Montenegro, etc. in the field of renewable energy such as small hydropower and rural electrification, establish national oversea scientific research and training platform, and carry out joint research and project demonstration in a large scale.

6. To give the full play of the leading role of HRC in formulating/revising national and industrial standards, step up the promotion of the standardization of project design, consultation and civil works construction. To engage in the translation of standard in terms of design, consultation and civil works construction for domestic hydropower stations as well as manufacturing standards for SHP equipments, etc., and finally promote these standards abroad.

7. To actively explore the overseas market, such as, to maintain the Turkish market and carry out the maintenance and spare parts supply for the accomplished hydropower stations in Turkey, to develop Ethiopian hydropower market together with George Mason University and American New Energy Company, to further develop African market on the basis of the Angola and Kenya projects which are both under construction, to take Macedonia projects as a demonstration as to increase market share in East Europe, to expand Southeast Asia market including Vietnam and Indonesia, and to explore Pakistan, Nepal and other South Asia markets based on the setting up of China-Pakistan Joint Research Center for Small Hydropower, .

8. To establish and improve the management system of foreign affairs and to standardize and reinforce the management of foreign affairs work.

(Source:HRC)■

Appendix I

Foreign Guests Visiting HRC in 2013

No.	Time	Country/Organization/ Delegate (s)	Objectives & Achievements
1	9 Jan.	The chairman of Nepal Energy Development Council	The visit aimed at pursuing bilateral technical cooperation in small hydropower (SHP) between Nepal and China and it was expected that the concrete cooperative projects would be conducted in near future.
2	24-26 Feb.	The general manager and an engineer from the Kenyan company	The foreign guests had a meeting with HRC, discussing the related issues of the cooperative project in Kenya, including the civil works, electrical equipment, circuit layout, etc. In addition, a consensus has been reached on the next-phase work.
3	13 Mar.	A 13-member governmental delegation from Indonesia	Aiming at being well informed of Chinese experience in developing SHP so as to make advance preparation for local SHP development, the delegation had a meeting with HRC and paid a visit to Shimentan cascade hydropower station which was designed by HRC.
4	8 May	The chairman of the board and the executive director of the Nepalese companies	Two HRC alumni, Mr. Rimal and Mr. Poudel revisited HRC for an in-depth discussion on SHP bilateral cooperation. Based on a full mutual understanding, an MOU on bilateral cooperation in the field of SHP and other renewable energies was signed.
5	23-25 Jun.	3 delegates from the Israeli Company	The visits have been paid to the manufactures of turbine, diesel generator, crane and turbine-generator respectively with the related equipment inspected. The owners of the project were satisfied with the equipment and the work concerned. It was expected to explore more cooperative projects in Africa.
6	26 Jun.	5 delegates from Bluemoon Fund of the United States, and Global Environmental Institute	The delegation introduced briefly about their project status in Myanmar and expressed that HRC was exactly what they were looking for as a future cooperative partner. Some specific SHP projects cooperation were expected to be carried out for gaining mutual benefits and win-win results in the near future.
7	30 Jun.- 3 Jul.	5 owners of cooperative projects in Turkey and Macedonia	The visit aimed at strengthening the cooperation and exchange, based on which, new projects were expected to be explored in near future.

8	17-18 Jul.	4 delegates from the Irani company	The foreign guests had a discussion with HRC on the technical issues of the cooperative hydropower project to be implemented, and also paid a visit to the equipment manufacturer.
9	15-16 Aug.	3 delegates from the Turkish company	The foreign guest had a meeting with the HRC professionals, sharing SHP experience and achievements scored by HRC and discussing about the new cooperative hydropower project. In addition, a visit was paid to the equipment manufacturer.
10	5-20 Sep.	The delegate from the Pakistani company	The contracts for two new cooperative projects were negotiated and signed. In addition, the visit to the partner company was paid for potential hydropower projects.
11	5-7 Nov.	2 delegates from the Turkish company	The visit aimed at promoting the cooperation in the field of hydropower. An intent on cooperation has been reached via technical exchange on 2 potential hydropower projects.
12	29 Nov. -5 Dec.	2 delegates from the Peruvian company	Aiming at looking for an appropriate manufacturer for the potential solar power project, the foreign guests, accompanied by HRC professionals, paid a visit to equipment manufacturers and a contract has been signed between HRC and Peruvian company finally.
13	11-17 Dec.	7 delegates from Vietnam	The Standing Director of Institute for Hydropower and Renewable Energy (IHR) took a delegation including the members from the Division of Asian and African Affairs under the Department of International Cooperation in the Ministry of Science and Technology of Vietnam, Hanoi University of Science & Technology (HUST), etc., to visit HRC for a long-term cooperative project on science and technology between the both governments, called Emergency-supporting Technology for Rural Hydropower against Disasters Caused by Climate Change.
14	16-17 Dec.	3-member delegation headed by the president from the French company	The visit aimed at potential cooperation with HRC in the field of hydropower. Focusing on investment in hydropower projects worldwide, this listed company in France is undertaking hydropower projects in Brazil, India, Indonesia, Laos, etc., with development rights for medium and small sized hydropower stations with the total installed capacity over 700,000kW.
15	22-24 Dec.	The Technical Counselor of Pakistan Embassy	The visit aimed at promoting the implementation of the China-Pakistan Joint Research Centre for Small Hydropower, which is to be set up collaboratively by HRC and PCRET. Mr. Counselor also paid a visit to HRC's laboratory.

Appendix II

HRC's Outbound Missions in 2013

No.	Time	Delegate(s)	Country	Missions & Achievements
1	14 Mar.- 27 Jul.	1	Turkey	To give instruction on the installation of turbine-generating units in Turkey.
2	21 Mar. - 28 Sept.	2	Turkey	To fulfill the installation and debugging of turbine-generating units in Turkey.
3	2-22 Apr.	2	Turkey & Macedonia	To hold discussion on cooperative hydropower projects in Turkey and Macedonia.
4	10-19 Apr.	5	South Africa & Tanzania	To pay a return visit of foreign-aid training to South Africa and Tanzania, and hold discussion on cooperative projects.
5	23 Apr.- 21 Jul.	2	Turkey	To give instructions on the installation of turbine-generating units in Turkey.
6	12-18 Jun.	2	Nepal & Pakistan	To hold discussion on cooperative hydropower projects in Nepal and Pakistan.
7	23 Jun. - 18 Sep.	1	Turkey & Macedonia	To fulfill the installation and debugging of hydropower projects in Turkey and Macedonia.
8	2 Jul. - 3 Aug.	2	Turkey	To fulfill the installation and debugging of turbine-generating units in Turkey.
9	22 Jul. - 10 Oct.	1	Turkey	To fulfill the installation and debugging of turbine-generating units in Turkey.
10	17-26 Aug.	2	Turkey & Macedonia	To hold discussion on cooperative hydropower projects in Turkey and Macedonia.
11	19 Aug.- 4 Nov.	2	Kenya	To give installation instruction for the hydropower projects in Kenya.
12	3 Sep.- 15 Oct.	2	Turkey	To fulfill the installation and debugging of turbine-generating units in Turkey.
13	25 Nov.- 6 Dec.	3	Turkey	To hold discussion on cooperative hydropower projects in Turkey.
14	6-12 Dec.	4	Pakistan	To fulfill the implementation of a governmental grant project sponsored by Chinese Ministry of Science and Technology – "China-Pakistan Joint Research Center for Small Hydropower".
15	13-21 Jan. 2014	1	Turkey & Serbia	To hold discussion on cooperative hydropower projects in Turkey and Serbia.
16	Postponed	3	Angola	To hold discussion on cooperative hydropower projects in Angola.
17	Postponed	1	Turkey	To fulfill the installation and debugging of hydropower projects in Turkey.
18	Postponed	1	Turkey & Macedonia	To hold discussion on cooperative hydropower projects in Turkey and Macedonia.

(Source:HRC) ■

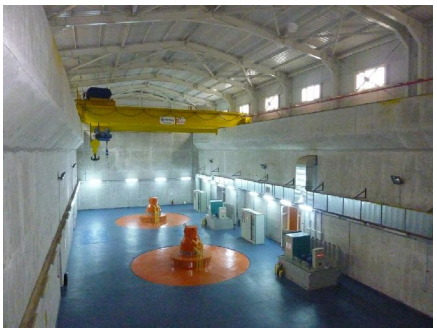
Hangzhou Yatai, Marketing for Future

Lin Ning

Hangzhou Yatai Hydro Equipment Completing Co., Ltd., briefed as Hangzhou Yatai, is a sub-company of Hangzhou Regional Center (Asia-Pacific) for Small Hydro Power (domestically called National Research Institute for Rural Electrification (NRIRE) of the Ministry of Water Resources). Hangzhou Yatai started the business for R&D, fabrication and trading of automatic control systems for hydropower plants, and in 2005 engaged itself into procurement & supply of the electromechanical equipment for hydropower projects abroad. The first deal was only USD12,000 exporting a set of 220kW Turgo turbine to a never-met tea plantation owner in Sri Lanka, and after that some micro turbine-generator sets were supplied to Japan, Philippines and Fiji etc.

Thanks to the policy of hydropower development privatization, Hangzhou Yatai until now, has furnished over 50 hydropower plants with the supply of electromechanical equipment and services of equipment installation, installation supervision, testing, commissioning and training etc. in more than 10 countries including Peru, Indonesia, Pakistan, Vietnam, Turkey, Macedonia, Kenya and Angola, and among which 30 hydropower plants are accomplished in Turkey.

Kale HEPP in Turkey (3×13MW)



Osmancik HEPP in Turkey (2×4.83MW)

Sandia HEPP in Peru (1×1.2MW)

Gikira HEPP in Kenya (2×250kW)

Halmat HEPP in Pakistan (2×320kW)

Gikira HEPP in Kenya (2×250kW)

Hangzhou Yatai has been managing its business on a steady way for these years, with a total turnover of more than USD70 million achieved and the installed capacity of accepted hydropower plants amounts to 800MW more. The business of Hangzhou Yatai also expands to solar energy field as solar pumping systems are supplied to Peru now.

However, constraints still exit to prevent Hangzhou Yatai from going further and farer. The appreciation of Chinese yuan imposes desperate negative impact on export business of Chinese companies and Hangzhou Yatai is also not exceptional, but mainly the constraint of Hangzhou Yatai arises from its market downturn since the Turkish market is nearly finished. The Turkish currency Lira is also devaluated against American dollar day after day, and dramatically the exchange rate is increased from 1.2 in 2007 to 2.2 in 2013 for each US dollar, thus Turkish clients paying more for equipment procurement. So Turkish market becomes weaker and weaker, and both the amount and the installed capacity of planned hydropower projects decrease. Project owners just wait for the recovery of economy or a lower interest rate for credit, or alternatively transfer the license before deadline.

Therefore, there is no way other than exploring new market and other business lines for the future of Hangzhou Yatai, and here are some ideas or suggestion as follows:

1. To stronghold the Turkish market for new projects of old customers

Totally 30 hydropower plants have been completed and accepted in Turkey, and all are in stable and reliable operation now. With these references Hangzhou Yatai sets up trustable and wide links with dozens of customers who always come to us for any new project. Five projects are ever awarded from one customer and some projects are still proposed with this company. Mutual trust and easy understanding helps contract negotiation and facilitates the project management as well. Turkish market must be taken as a stronghold for new projects of old customers and the potential projects of new customers.

2. To extend after-sale services for plant installation, inspection and maintenance

The after-sale service is key important for hydropower plant and some customers always question about how to ensure a continuous technical service for future operation of power plant, including supply of spare parts, routine inspection and

Sena HEPP (3×10.8MW) in Turkey

Runner installation for four-jet Pelton turbine

Runner checking for Kaplan turbine

Ozluce HEPP in Turkey (2×18.9MW)

Site assembly of rotor windings for generator

Site Training for Operation and Maintenance

Moa HEPP in Cuba (2×1MW)

Gangelas HEPP (1×800kW+1×400kW)

even overhaul etc.. Luckily a group of 20 experienced engineers and technicians is available specifically for site services such as on-site training, testing, installation, maintenance and overhaul etc., and most of them stay in Turkey and check the equipment that Hangzhou Yatai or others supply. It is specified in the Chinese national standard, that a hydropower plant needs an overhaul after 3-5 years' operation, thus improving its operating efficiency and service life, and for daily operation & maintenance, Turkish technicians need training for Chinese proven expertise.

3. To shift the market orientation from Turkey to other emerging areas

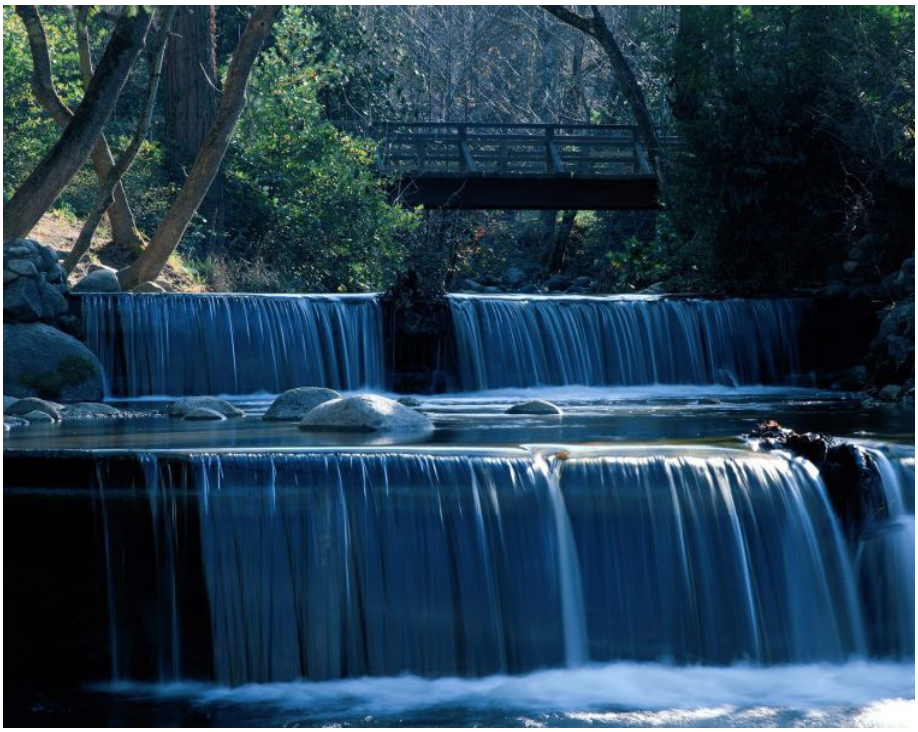
Beside Turkish market, Hangzhou Yatai enters other emerging countries such as Macedonia, Cuba, Kenya, Angola and Peru etc., and we are also continuously looking for opportunities in Serbia, Albania, Bulgaria, Gorgia, Nepal and Indonesia, and we expect to award more projects from these countries and experience breakthrough in the near future. In general, Hangzhou Yatai needs to balance its marketing shares in different promising countries or regions and gradually shift from Turkish market to more and more emerging countries in Arica, East Europe, South Asia and Southeast Asia, thus the market of Hangzhou Yatai will be more steady and reliable if more regional markets involved.

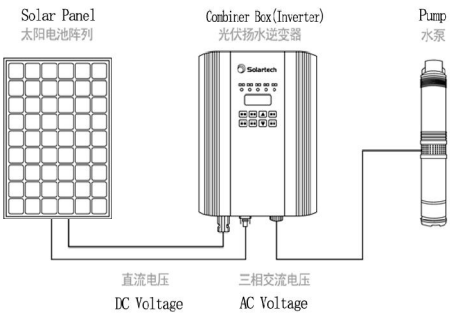
4. To widen the business scope for other renewable energies

Obviously, engineering consultancy, project design, equipment supply & installation etc. for hydropower plants are the main business line of Hangzhou Yatai, while we also engage ourselves into the technical development and equipment procurement of other renewable energies including wind power and solar energy. We set up strategic partnerships with top Chinese enterprises for providing solution and system to solar power and wind power projects. We just supplied 8 sets of solar-pumping systems and auxiliary equipment to Peru and right now, we are developing the market in Kenya, Macedonia etc. for the off-grid solar power-generating systems. In Turkey spend unremitted efforts for developing wind power projects in cooperation with German-based technologies.

5. To undertake inter-governmental cooperation for preparing market penetration

Hangzhou Yatai is approved to undertake the long-term cooperative project between the Ministries of Science & Technology of China and Vietnam called "Emergency-supporting Technology for Rural Hydropower against Disasters Caused by Climate Change" and to set up "China-Pakistan Joint Research Center for Small Hydropower Technology". Training courses or seminars are sponsored by Perez Guerrero Trust Fund or financed





Solar pumping systems and equipment for Peru (under construction)

Bilateral science & technology cooperation with Venezuela and Pakistan respectively

from Chinese government and ASEAN Secretariat etc. With bilateral government's support, more wider and higher platforms will be applied, so that extensive and intensive cooperations can be initiated for technical training, trial fabrication, technical R&D and application of proven technologies etc., and after that the emerging market will follow.

Conclusions: It's surely not easy to find a potential & stable market like Turkey, but there is no way if Hangzhou Yatai wants to keep its growth for another 10 years or even longer. Everybody needs to do his best and tries to be the best, for marketing the future of Hangzhou Yatai.

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HRC's Training Opportunities for 2014

No.	Project Name	Time	Venue	Working Language
1	2014 Séminaire sur l'Electrification rurale pour les Pays francophones d'Afrique	16 mai-12 juin, 2014	Hangzhou, China	français
2	2014 Seminar on Rural Electrification for Asian Countries	22 August-18 September, 2014	Hangzhou, China	English
3	2014 Training Workshop on Small Hydropower Technology for English-speaking African Countries	15 October-25 November, 2014	Hangzhou, China	English
4	Technical Seminar on Small Hydropower for ASEAN Countries	To be confirmed	Djakarta, Indonesia	English
5	China-ASEAN Training on Micro hydropower and Photovoltaic System for Rural Electrification	To be confirmed	Hangzhou, China	English