Market Conditions, Barriers and Outlook for Small and Mini-hydro in SEA

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1. Brief description of SHP development in SEA

Table 1 shows that hydropower resources including SHP resources are rich in all the SEA countries, although the bases for statistics are different and may not be accurate.

Table 1 General Profile of SHP Development in SEA Countries

Name of Country	Total exploitable hydro resources (MW)	Development of Small/mini hydro (up to 2000)			
		Existing Stations		Stations in planning	
		No.	Total installed capacity (MW)	No.	Total installed capacity (MW)
Cambodia	10,000 (including large)				
Indonesia	175,000 (including large)	70	29.6		60 (by 2003)
Laos	18,000 (including large)	37	6.04	26	24.77 (up to 2015)
Malaysia	28,500 (including large)	42*	17		
Philippines		55**	74.5	17	86 (up to 2008)
Thailand	10,000 (including large)	28	40.7	19	48
Vietnam	10,000 (including large) 2,000 (SHP)	138	53.4	19	57 (up to 2005)

Sources of statistical data in this paper:

(1) Country report delivered by trainees of relevant countries in the Training Workshops held in HRC during 2000-2001.

(2) AESIEAP Goldbook-2001 (Association of Electrical Supply Industry of East Asia and Western Pacific)

Due to lack of information, data in the table does not include all the SEA countries.

* Only a few in operation. 35 out of 42 have to be rehabilitated.
** 19 of which are not in operation.

It is evident that the resources are all under-developed. The already-tapped capacity is mostly under 10% of the exploitable resources.

It should be noted that quite a number of existing SHP stations are not in operation at present, which need to be rehabilitated or refurbished.

It is understood that most of the SEA countries paid great importance to SHP development for promotion of rural electrification and economic development in their respective countries during the past 2-3 decades. Ambitious plans were stipulated, but due to various reasons and barriers (to be explained later), most of the plans were not fully completed.

Table 2 shows background of economic development in the SEA countries for reference of discussion.

The increase of annual GDP growth rate in 2000 compared with that of late 1900s shows the recovery of economy from crisis struck Asia in 1997.

2. Market conditions of SEA development in SEA

At present, the annual electricity consumption in SEA countries is in general much lower than that of developed countries, especially in rural area. The percentage of accessibility to electricity in rural area is also low in some countries, although high in a few countries. There are large space for development of SHP in rural areas. During the past 2-3 decades, most of SEA countries did great effort to enhance the popularization and supply of electricity to rural areas.

At present, the annual electricity consumption per capita in SEA countries varies from 20+kwh to 2000+kwh, which is evidently low compared with the fast growing economy in the region. (refer Table 3).

The current percentage of household accessibility to electricity varies in a wide range in the SEA countries. The lowest one in Cambodia is 13% (refer Table 3). It is evidently that increase of popularization of electricity supply is an urgent necessity for competing with the fast growing of economy and critical needs for improvement of life of peoples in rural area.

* Urban population occupies 54% of the nation.

In SEA, Malaysia & Thailand are well-electrified countries.

The electricity consumption per capita value in rural area should be much lower than the listed values.

Although the statistic values of percentage of accessibility of electricity in some countries are as high as 71%, the actual continuity and reliability of electricity supply in rural areas are still low.

The percentage of accessibility of electricity in some countries may not be counted on the base of household.

The market condition of SHP development in SEA countries was flourishing during the past 2 decades. Compatible with the fast development of whole electrical industry in these countries, several tens of SHP projects have been built up which brought the total installed capacity of SHP up to several tens of MW in comparison with several MW only in the initial stage in early 1980s.

3. Project/institutional structure and financing approaches

The institutional structure for SHP development varies in different SEA countries, although mostly initiated and controlled by the national electricity authorities (with different names) in early 1980s. During the recent 2 decades, liberalization and privatization of SHP development took place in most countries, but they were just started.

Examples:

(1)Indonesia

PLN (State Electricity Corporation), the government electricity agency has focused on rural electricity in terms of rural electrification technology, including SHP.

Supported by the World Bank, PLN has appointed a rural electrification division to coordinate rural electrification development, which provides PLN with the capacity not only to identify, prepare and develop its own project, but also to coordinate and integrate relevant private sector development.

Table 2 General Background of Economic Development in the SEA Countries in Discussion

Name of Country	GDP per capita in 2000 (USD)	Annual GDP growth rate
Cambodia	700	4-6%
Indonesia	1,110	
Laos	50	7%
Malaysia	4,350	5.8%
Philippines	1,240	4.8% (2000), 3.2% (1999)
Thailand	2,011	
Vietnam	1,700	

Table 3 Present Status and needs of electricity supply in rural area in SEA.

Name of country	Percentage of household accessibility to electricity		Annual electricity consumption per capita (kwh/person)	
	Present (2000)	Target	Present (2000)	Forecast
Cambodia	13%		26 (including urban)	230 (2016)
Indonesia	55%	95% (2004)	302 (2000)	
Laos	30%		93.5	+14.1%/year (2010)
Malaysia	99%		* 2338 (2000)	3300 (2010)
Philippines	75%	~ 100% (2008)	532 (2000)	+8%/year
Thailand	98%		1307(2000)	
Vietnam	71% (for villages)	80%	233 (2000)	590kwh (2005)

The government is keen to attract private sector to take on rural electrification, but realizes that subsidies may be necessary.

Private sectors are now allowed to build, own and operate plant (BOO) as well as sell electricity directly to local customers or to PLN.

A critical issue is that energy product are subsidized by over 27%, which is to be resolved before the ASEAN energy sector can progress fully to competitive market conditions.

The NGO (Non-Governmental Organization) sector plays an increasingly important role in energy development chiefly as advisors to government developers, local interests and project developers. For example, the Swiss Center for Coordination in Technology and Management, based in Belgium and the European Small Hydro Association is playing a role in supply technology.

(2)Malaysia

Three state-owned utilities dominate power generation and distribution in Malaysia, i.e. TNB, SEB and SESCO. The market was opened to Independent Power Producers (IPPs) in 1994 and while initial rates of return on capital were good for IPPs, the Asian financial crisis came as a major blow to IPP profits.

Eventually, Malaysia expects to achieve a fully competitive power market, but reform is still at an early stage and exact process of transition has not been decided.

(3)Situation are similar in other SEA Countries. The common trend is to utilize a government-enabled market-based approach for rural energy development. This signifies a paradigm shift from government planning and management to government orchestration of self sustaining rural energy markets.

Financial approaches.

Government allocation

Private investment (local) with government subsidies

Bank loan: ADB, World Bank, etc.

Grant from donor countries and organization

UN assistance

4. Barriers of SHP in SEA countries

Economic factors. The high initial capital cost of SHP schemes acts as an impediment to the SHP development in SEA countries where the funding problems are most acute.

The specific investment cost per kW of SHP project varies greatly from country to country, from the lowest of USD600/kW to highest of USD 4000~6000/kW.

Further, the pre-investment work, site survey and feasibility study is higher for SHP in percentage of the ultimate investment than the large hydro. Usually, the cost of pre-investment work for SHP could be higher than the acceptable 10-15% of the total investment, even if they are supported by government or foreign aid.

Technology issues. Attentions have been paid to the training and technology transfer in some SEA countries during last 2 decades which enables them to master a great portion of work in SHP development. Although several countries have set up their own capabilities in SHP development, including pre-investment studies, engineering design, construction and operation, but some other countries still need to rely to a great extent on technical support from abroad. This fact, added to the costs of importing foreign expertise, materials and equipment even if foreign aid-supported, has greatly impeded the faster development and more widespread introduction of SHP project.

Socio-economic factors. The socio-economic merits of electricity and of local resources exploitation are well established, but their quantification is still in its infancy. In consequence, they do not usually enter into the evaluation of economic merits and project, which could bring considerable advantages to the local population, are in danger of being discarded by conventional economic analysis.

The concentration of national development in urban and central areas in some SEA countries also causes the difficulties of funding electric programs in rural areas.

Replacement of SHP plants by extension of national grid. It is common that the existing SHP plants would be dismissed and replaced by the grid once the grid is extended to the area (e.g. Vietnam).

5. Policy measures and regulations

During the transition period (commenced from last decade) from government planning and management to government orchestration of self-sustaining rural energy market, many countries' government have adopted a series of government-enabled market-based approaches for accelerating the rural electrification including SHP development as follows:

Creation of an enabling policy framework.

Indicative planning at the national level to guide decentralized, area-based planning by NGOs and private sector.

Market potential assessment and market creation.

Support measures to develop and sustain markets.

Market regulation to protect the interests of the poor and low-income

groups.

A lot of policy instruments have thus been stipulated in many SEA countries. Some illustrations are shown in the followings:

Malaysia and some other countries' government has specifically identified the SHP as an instrument of progress in rural electrification and outlined the terms of their implementation.

Malaysia's Four-Fuel Diversification Policy was designed to reduce country's over dependence on oil as the energy source. Hydro, including SHP, together with oil, gas and coal are the 4 main sources

The Philippine Republic Act 7156 offers investment incentives to SHP development (some items are also adopted in other SEA countries):

- A special privilege tax of 2% of gross sales of electricity
- Duty free import of machinery, equipment and materials within 7 years of the contract award.
- 100% tax credit on domestic capital equipment for 7 years
- 2.5% special realty tax rates on equipment and machinery
- Value-added tax exemption
- Income tax holiday for 7 years

6. Sharing experience of development of SHP in China

Since early 1950s, the development of SHP stations and local grid in China has been fast in speed and large in scale and stands top in the world with respect to number and capacity. For the past 3-4 decades, the annual increase of SHP capacity in the whole country averaged at 7-13%.

By the end of 2000:

Number of SHP/mini stations in operation ***49,278***

Total/installed capacity ***24,850 MW***

Annual generation ***79,980GWh***

Number of rural people access to electricity ***300million***

Role of SHP in rural electrification: 1/2 of land, 1/3 of countries, 1/4 of population mainly depend on SHP.

During this next 10 years

Addition of SHP installation ***20GW***

Percentage of farmers access to electricity ***98%***

(1) Background

Rich resources

* Total hydropower resources ***680GW***

in which, exploitable ***380GW***

* Exploitable SHP resources ***87GW***

* % of exploitation of SHP resources ***30%***

* Wide spread SHP resources adequately meet the demand of decentralized rural consumers

Integrated development of SHP with irrigation and township industry.

Effective policies and measures (details in later section)

Development of appropriate technology and indigenous manufacturing capability

* In early 1950s, SHP construction was started usually on the basis of and integrated with irrigation projects. The electricity demand in rural area was very low at that time. There was enough time for Chinese to prepare their own knowledge in planning, implementation and operation at low cost level versus introducing advanced technology from developed countries. SHP's own technique and methodology also known as appropriate technology different from large hydro have thus been developed during the past 4-5 decades.

* The machine building sectors in China also started early in producing hydro-turbine equipment. The first 800kW turbine was built in 1951. Around 100,000 units of small/mini hydro turbine have been manufactured since then. At present, there are about 100 manufacturers for SHP machines over the country, capable of producing 1,500MW installation per years.

(2) Policy measures

Development of SHP mainly by localities (local funds, technical labor and material) and supplemented by the state. (technology & fund).

Consistent policy of "self-construction, self management and self consumption", and "Those who invest and construct shall own, manage and be benefited" and setting up concessional electricity supply area for SHP".

Profit of state-owned (including local) SHP stations reserved for further expansion of SHP development in stead of hand-over.

6% value added tax (from 1994) for SHP plants versus 17% for large hydro.

half of income tax (33%) from SHP plants turned back to the plants in some provinces.

Market-oriented electricity tariff for SHP could be set up on the basis of production cost, tax and reasonable profit (similar to avoid cost).

Favorable loan. Several hundred million Yuan (Chinese Currency RMB) of Bank loan has been earmarked for SHP construction every year with a maturity of 10 years.

Collection of funds from farmers, partly by labor input.

Commitment of National grid support to SHP grid coordinated by the government.

(3) Establishment of primarily electrified countries based on SHP

During past 15 year, 600 counties out of total 2400 counties in China

were successively built into primarily electrified counties, based on SHP development. The campaign was under unified direction of central government and separately implemented under leadership of provinces.

In next 5 years from 2001-2005 (10th Five-year Plan), another 400 counties are planned to set up their hydro-based primarily electrification program. In most of these hilly counties, all villages shall have access to electricity, 98% household will be electrified, per capita electricity consumption will reach 500kWh, 30% of household will use electricity in replacing firewood for cooking, which will greatly enable a large area returned from farmland to forest.

(4) Strengthening exchange of experience and economic-technical cooperation with Asia-Pacific countries.

Presently, under globalization of economy and post-accession of China into WTO, as well as the appeal for strengthening the South-South Cooperation in economic and technical field, the international cooperation for SHP is also facing broad prospect. Following the "Go global" strategy for Chinese entrepreneurs, more cooperation project will hopefully be developed all over the world. HRC, upon its 20 years successful operation for cooperation of SHP development in the Asia-Pacific region, is willing and capable of expanding and strengthening cooperative ties with SEA countries in the following field:

Technical training for SHP professionals (30 training workshops for 600 professionals already held so far).

Exchange of information through our SHP-Internet Homepage.

Cooperative R+D projects especially cost-effective, micro-computer based facilities for automating SHP plants, of which some effective models has already been developed.

Consulting services for engineering projects including pre-investment work.

7. Bright future prospect

(1) As predicated by WEC (World Energy Conference) on RES (Renewable Energy Sources) for 1990-2020, SHP has continued to attract attention and indeed now some prominence because:

the long asset life, operational robustness, price stability and its renewable nature makes SHP an attractive option for an electricity supply to small and isolated load centers;

transmission networks connecting large grids to load centers are of restricted extent and there are many areas particularly in the developing countries where electrification has to depend on local generation on a small scale;

small rivers which can be exploited for power production are fairly widespread;

the environmental impact of small hydropower is usually very slight;

other use of water, irrigation and water supply for example, can often be made more attractive by the incorporation of a SHP component,

SHP can serves as a power source for local industry as well as contribute to the public supply in suitable locations;

rehabilitation of old SHP plants at existing dams or structures is often justified by the favorable cost of the energy produced.

In broad terms, it appears that where national policy is favorable to renewables, the pace of SHP development will further be significantly increased.

(2)Macro international environment is favorable to the SHP development

Recent Approval of the Kyoto Protocol by most countries attended in the UN Conference on Sustainable Development in South-Africa has set green energy, including SHP into a very favorable condition. The role of renewable energy is stressed in the Protocol and the Clean Development Mechanism (CDM) has been proposed for a clean start of Greenhouse Gas emission reduction project.

It was emphasized that "physically-naturally occurring renewable energy sources … small hydro … etc. offer the highest CO_2 reduction efficiency.

This will greatly encourage developing countries including SEA to accelerate the SHP development in their countries.

(3)As stated in above sections, all SEA countries' government paid importance to development of SHP for rural electrification.

In some countries, SHP as indigenous energy sources is stressed for preventing dependence on imported fuels.

Ambitious plans have been stipulated in most SEA countries such as Philippines, who has set up a target of electrifying all rural towns by 2008. SHP is of course one of major source for rural electrification. Indonesia also plans to have 95% villages access to electricity, etc, etc.

(4)The ever-increasing importance and effectiveness of South-South Cooperation initiated by the UN organizations pay great importance to the development of SHP in developing countries. Effective South-South Cooperation will be organized for implementation of SHP projects.

Take advantage of these favorable conditions, the SHP in SEA will most hopefully be forwarded in a faster pace in the future after recovery from the financial crisis.

HRC's Annual Report for 2002

2002 is the year of re-vitalization for HRC. In addition to persistent organization of international SHP training workshops, quite a lot of international activities and cooperative projects were strengthened for transition from TCDC on to ECDC/TCDC. Although it was just started, evident results have been witnessed.

I. International SHP training

In 2002, two TCDC (Technical Cooperation among Developing Countries) SHP Training Workshops were conducted at HRC. Attended altogether 32 participants from 19 Asian, African and Oceanic countries. According to the questionnaires, the satisfactory and very satisfactory ratio reached 100% in regard with the training organization work and training effect.

Meticulous preparation was made for implementing the training well. Preparatory meetings of experts were held to arrange and organize the training, including adjustment of scheduling and selection of well-known lecturers. Though the duration of 40 days for each of the workshop was short, the participants benefited much from the training. The monitor of the class, Mr. Wongsavasdi from Thailand addressed: "We all learnt a lot from the workshop. The subjects covered were just appropriate for our country. We'll apply what we have learnt here into our work back home.

During the training, the participants were arranged to visit some SHP stations of various types and hydropower equipment manufacturers. They went to Nanjing Hydraulic Research Institute to visit the Experiment Base which is the largest of the kind in East China. In Shanghai all the participants were surprised by the development level, vigor and by its skyscrapers of the city.

Upon the end of each workshop, HRC arranged a forum for exchange of SHP experience and technology. Representatives from the 19 countries presented their country reports, introducing the experiences and lessons of developing SHP in their own countries. The computer aided presentations were well prepared and informative, often interwoven by the heated discussions. Being aware of the Chinese SHP technology, some participants have expressed their deep interest and strong demand for importing Chinese equipment and technology. Cooperation intents were thus reached with several countries including Indonesia, Thailand and Cambodia.

The two training workshops have been sponsored by Chinese Ministry of Foreign Trade and Economic Cooperation, as one of the technical collaborative projects among the developing countries. All the lodging, boarding, training, pocket money and the domestic transportation fees are borne by the Chinese government. This is part of the Chinese contribution to South-South cooperation.

II. International conferences

Director Chen Delivered a Presentation in Thailand

Invited and funded by Center for Energy Environment Research & Development (CEERD) of Thailand, Dr. Chen Shengshui, Director of HRC attended ASEM Green Independent Power Producers Network -First Regional Workshop held in Bangkok on 23-25th Oct. The general objective of the network is to contribute to higher market maturity in the green power business to make sustainable development in the power sector more efficient and competitive. Dr. Chen has delivered a presentation titled "Market Conditions, Barriers and Outlook for Small and Mini-hydro in SEA", which showed HRC's capability of awareness and condition for member countries in this region and was welcome by the participants. During the meeting, Dr. Chen has widely contacted friends from over the world. He has also held a short discussion with Mr.Saha, Head of Dept. of Environment and National Resources in UN-ESCAP and Mr. Lefevre, Director of CEERD. These activities will promote the relation and exchange of information between HRC and UN-ESCAP and other member countries.

III. International cooperation & activities

1. Vitalize and strengthen HRC's international activities

Since early 2002, efforts have been made to strengthen HRC's international cooperation on SHP and contacts were made with some 90 countries and international organizations in the world. Concrete cooperative projects preliminarily set up

between 16 countries and HRC for SHP design, consultation, equipment supply, application of automation technology, engineering contracting and financing, with the countries including Canada, Costa Rica, Greece, India and Indonesia etc. It'd be implemented step by step in 2003 and will have more projects further.

2. Korean Guests Visited HRC

A 5-member delegation from the Academy of Science of D.P.R. Korea, headed by Mr. Kim Gwong Hyok, Director of Electrical Research Institute visited HRC and SHP equipment manufacturers during October 28 to November 5. Friendly discussions for cooperation were held. The delegation has focused their investigation and study on SHP equipment manufacturing level and automation technology in China. Requests from the delegation were: (1) entrusting HRC to provide equipment and technology for renovation of several SHP stations in D.P.R. Korea; (2) provision of more technical information and; (3) assisting in communicating with UNIDO for financing SHP projects in D.P.R. Korea etc.. Letter of Intent for cooperation was signed for successive implementation in the near future.

3. Entrusted by Mortimpex of Mongolia, HRC undertook the design for the Ulaanbaatar Pumped Storage Plant and assisted the selection of the investor in China. The feasibility study design phase has been completed so far. After approval of the owner and the investor, the construction will hopefully be started in 2003.

4. Entrusted by the Hydro Power Institute of Viet Nam, HRC undertook the automation design for a demonstrative SHP station for comprehensive development in Viet Nam. The dam, power house, transmission line have all been completed. What is needed is only the turbo-generator units and the automatic equipment. The natural surroundings of the station is gracefully provided with potential of multi-purpose development including power generation, flood prevention, irrigation, cultivation, environmental protection, tourism and recreation etc.

5. An agreement has been reached between HRC and two Chinese foreign investing enterprises with the Vietnamese Civil Engineering Construction Co and Hydro Power Center of Viet Nam for jointly developing three SHP stations (each of several MW) in Viet Nam. The cooperative mode of EPC contracting or Seller's loan for equipment export was explored. Besides, HRC as the technically responsible side will help setting up the national SHP automatic controlling lab for Vietnamese side.

6. In May, a delegation from the Bluemoon Fund of the United States paid a visit to HRC and both sides held talks relating to application of the fund issues of sustainable development of new and renewable energy as well as the mature experiences of SHP technology in China and assistance in the poverty alleviation for the vast hilly rural areas.

7. Mr. Ario from the Indonesian Ministry of Mines & Energy paid a visit to HRC on 20 Aug. Based on the data the Indonesian side provided, HRC studied and offered quotations to the two hydro power projects in Indonesia. The Indonesian guests also went to visit the Chinese equipment manufacturers nearby.

8. For establishing long-term cooperation with HRC, Dr. Alex Tseng of ORENCO in US visited and held one day discussion with HRC. ORENCO is a US Engineering, Supply and Consulting Co. which has imported several tens of SHP equipment from China into the US and packaged with automatic accessories from USA for SHP in the U.S. Upon discussion, both sides are willing to set up long-term cooperation. At present, Dr. Tseng has introduced several SHP projects in Central America such as Costa Rica and Guatemala for HRC to provide feasibility study, equipment and EPC contracting, etc., which will be implemented step by step.

9. On 11 Nov Ms. J. Wu from the World Bank paid a working visit to HRC. After getting to know what HRC has scored in promoting the global SHP development, Ms. J. Wu who is one of the HRC's old friends, evaluated highly on HRC's achievements in the recent years and recommended that HRC may apply for undertaking some cooperative projects from the World Bank in regard with the SHP training and short-term consultation etc. She showed keen interest to know the changes in investment approaches for SHP stations in China in the past years after HRC staff briefed the introduction to her. Recently official invitation from the World Bank has been sent to HRC for sending an expert to Zambia in Africa for site selection of SHP stations.

10. On 8 Dec., 2002, President of Shree-Neel Corp, India, Mr.S.Pustake paid a friendly visit to HRC and a substantial discussion was held. Shree-Neel Corp is located in mid of India and the rural irrigation system is well developed there, with rich hydro resources which is appropriate for SHP development. Mr. Pustake placed high evaluation to HRC's SHP design, equipment supply, SHP automation and basin hydrological auto-metering. He expressed his keen expectation of long-term cooperation with HRC, jointly exploiting the SHP market in India. For the first phase development, a MOU was signed between the two sides and it is expected to be

implemented in 2003.

IV. Receiving international or overseas visitors & sending out international missions

1. HRC received 12 groups (30 people) of international or overseas visitors. (see the attachment 1)
2. HRC organized 5 groups (7 people) to implement missions abroad.(see the attachment 2)

V Information service

1. Creation of the HRC homepage

HRC formally created the HRC homepage in 2002. Through the building and operating of the information network, we would further enlarge and deepen the information exchange between the member countries in the Asia-Pacific region in the field of small hydro power. Meanwhile, it would also promote the international technical and economical cooperation in this domain, completely demonstrating the principle of "South–South Cooperation". Moreover, it would relevantly promote the international cooperation in SHP technology and experience between the developing countries in the Region and the developed countries in the world as well.

Through the information network, HRC would really act as the "SHP Home of the Asia-Pacific" and serve the member countries more effectively. We have done the following concrete things:

Define the domain name of HRC and the columns. The columns include Hot News, Dynamic Information, successive and current Directors of the Center, Introductions of HRC's Sections/Divisions, Public Services, Friendly Links in the Sector both at home or abroad, Regulations and Principles, Small Hydro Power and its Equipment and Market, etc.

2. HRC publishes its quarterly magazine ***SHP NEWS*** in English and distributes to around 90 countries in the world.

VI. The working plan of 2003

The main goal of 2003 is to further motivate and strengthen the international cooperation and activities, revitalize HRC and its position in the Asia-Pacific region. Apart from continually implementing the international SHP training workshop, we will further explore to widen the international SHP technical cooperation and transfer it into both economic and technical cooperation. Meanwhile, we will bring into full play the regional center, conduct the macro-view SHP study and probe the reform and policies in the Asia-Pacific countries, and provide reference for policy decision in the higher authorities in China.

1. Training of international small hydropower

1.1 Implement well the SHP training workshop for further enhancing HRC's celebrity at home and abroad.
1.2 Take efforts to conduct a SHP training workshop for African participants in collaboration with the World Bank in 2003 or 2004.

2. International conference

2.1 Striving for holding an international conference on SHP within the coming two or three years with the aim to exchange international SHP technology and experience, publicize the achievement and experience of SHP development in China, explore potential market opportunities for HRC and increase its position at home and abroad for consolidating its orientation of institutional unit. An overseas collaborator is to be selected and fixed in 2003.
2.2 HRC will send SHP specialist to Japan to attend the World Water Forum in the coming March to introduce the SHP development in the Asian developing countries. The paper is ready
2.3 HRC will send SHP specialist to the United States to attend the international water power conference in the coming July to introduce the practical and reliable SHP automation technology. The paper is being prepared.

3. Implement actively the SHP international economic and technical cooperation to promote the transfer from TCDC to ECDC

3.1 Complete the work for the pumped storage plant in Mongolia in terms of finance, feasibility study, preliminary design etc.
3.2 Promote the SHP automation cooperation with Vietnam.
3.3 Implement the equipment installation and consultation work for Corojo and Moa SHP stations in Cuba.
3.4 Continue to import and indigenize the SHP automatic controlling equipment from Canada and disseminate it in developing countries.
3.5 Dispatch SHP experts to African for SHP consultation missions in collaboration with the World Bank.
3.6 Trace and settle the ongoing projects of SHP consultation, equipment export and engineering contracting etc including with India, Indonesia, Greece, Sri Lanka, Costa Rica and Canada etc. and strive to open new channels of SHP cooperation.

4. Conduct research on international SHP soft science

Put more efforts on the research of the macro SHP policies, and strategies in the Asia-Pacific countries to provide consultation to Chinese governments for stipulating the foreign-oriented SHP policies and South-South cooperation. The research items include:
4.1 Make use of the South-South cooperation frame and realize "go glo-

bal" strategy in field of SHP development.

4.2 Research on the SHP modernization.

4.3 Research on the SHP development in the Asia-Pacific countries.

5 Others

5.1 Substantiate HRC's homepage with the area of focus on SHP data bank in the Asia-pacific region and the SHP equipment & market, contributing more to the exchange of global SHP technology and experience.

5.2 Continue to edit and publish the English quarterly ***SHP NEWS***.

In the speech delivered at Zhejiang University in mid October, the United Nations Secretary General K. Annan mentioned that right at Hangzhou you make use of Hangzhou Regional Center where you have shared your valuable rich experience in the field of renewable energy with those from the numerous developing countries in the world. You are playing a pioneering role in the regional technical cooperation with the developing countries. You developed a lot of cooperative projects not only in foreign countries, but also you have generously implemented training workshops for those from the developing countries. Advance with the time and let's strive for bright future of HRC and SHP!

Attachment 1

Delegations or Guests hosted by HRC in 2002

No.	Time	Country/District	Number of Delegates	Details
1	Feb.	Powerbase Corp., Canada	1	Discussion on technical cooperation, for introducing the advanced SHP automatic control system from Canada
2	March	Hydro Power Center, Vietnam	2	Discussion on export of SHP control equipment to Vietnam
3	April	Sri Lanka	1	One of the numerous participants of the international training courses on SHP held in HRC paid a visit to HRC, and expressed his keen interest in potential SHP cooperation with HRC.
4	April	Zhong Yuan University, Taiwan	5	Visiting & discussion on cooperation
5	May	Bluemoon Fund, USA	3	Headed by the president, the delegation paid a visit to HRC. Discussion was made between the two sides, focusing on financial support to MHP development; sustainable development for new and renewable energy; mature technology and rich experience of SHP in China as well as assistance on poverty-alleviation of rural people.
6	June	Ethiopia	1	One of the numerous participants for the international training courses on SHP held in HRC paid a visit to HRC.
7	August	Ministry of Mines and Energy, Indonesia	3	On 20 August, officials from the ministry, Mr. Ario and his colleagues paid a visit to HRC.
8	October	ORENCO, USA	1	Dr. Tseng, the president paid a visit to HRC, with detailed discussion on cooperation. As a company aiming at project construction, material supply and consultation, so far, ORENCO has imported tens sets of SHP equipment from China to the market of automatic control auxiliaries in USA.
9	October	Hydro Power Center, Vietnam	5	Head by Mr. Hoang Van Thang, director of HRC, the Vietnamese delegation paid a friendly visit to HRC. Study tour to the hydropower equipment manufacturers was carried out, and an agreement on SHP cooperation was signed.
10	October	Research Institute of Electricity, Academy of Science, DPR Korea	5	Headed by Mr. Kim Gwang Hyok, director of the institute , the delegation paid a one-week visit to HRC, focusing on discussion and technical exchange on manufacture of medium and small sized hydropower equipment in China; automatic control of hydropower station as well as other technology regarding control and protection, etc.
11	Nov.	World Bank	1	Ms. J. W, official from World Bank paid a working visit to HRC, and suggested some related research items and short-term consultation services overseas suitable for HRC to implement.
12	Dec.	Shree-Neel Company, India	1	On 8 Dec. 2002, Mr. Sharad Pustake, director of Shree-Neel Company paid a friendly visit to HRC.

Attachment 2 **HRC's Missions abroad in 2002**

No	Item	Countries	Time	Days	Number of Members	Remark
1	To implement the joint development on SHP automatic control system	Vietnam	June	7	3	
2	To undertake the proof-test on turbine pumps for the Huilon pumped storage power plant, Nanyang, Henan	Japan	August	1	1	
3	To attend the ASEM Green IPP Network First Regional Workshop	Thailand	Oct.	2	1	
4	Study tour of research institutes directors	USA	Dec	15	1	Implemented in 2003
5	To visit and study advanced management model in electrical generation, distribution and other sparks in electrical reform	Norway, Sweden	Dec.	12	1	Implemented in 2003

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(From Page 24)

issues that will strengthen the voice of indigenous people generally, and help empower local communities struggling to protect their water rights.

The Water and Sanitation Program (World Bank) committed itself to funding national capacity building projects for MDG monitoring. Candidate countries are welcomed to apply.

Price Water House Coopers, UN Water and Care International commit to a Global Water Initiative, to bring a substantial contribution to the MDG. It will start soon with a pilot project in Africa supported by the French Government, with results by the end of the year 2003.

Some of the regional commitments include:

The international organizations active in the American region (IADB, OAS, ECLAC, IUCN, SICA, IWRN, CAN, LANBO and GWP) commit themselves to find and negotiate solutions for the following issues: (a) policy development, including rules for efficient and equitable water allocation; (b) meeting financial needs for water resources management; (c) effect of international trade agreements on national water public interest; (d) capacity building for effective decentralization, water governance, management and regulation of services; (e) participatory and efficient risk management; and (f) impact of first world agricultural subsidies on sustainable water management.

Australia commits over AUD$80 million in the current financial year for water activities, primarily in countries in the Asia-Pacific region.

Caribbean and Pacific organizations (CEHI and SOPAC) signed a Memorandum of Understanding to implement the Joint Programme for Action (37 member states), providing for co-operation on matters including the freshwater environment, capacity-building, data and information management, applied research, sharing of expertise.

The Netherlands will concentrate its support to Africa and assist 10 countries in the development of their national plans. Further, it is committed to support the African Water Facility.

The European Commission is committed through EUREAU to include benchmarking into the EU Water Initiative.

The Mekong River Commission (MRC) with the governments of Cambodia, Laos PDR, Thailand and Vietnam, in collaboration with partners will prepare a navigation strategy and program by the end of 2003. The long-term goals of the strategy are to develop sustainable, effective and safe navigation on the Mekong, and to increase the international trade opportunities for the mutual benefit of the member coutries of the MRC.

The final statement said that though increasing water use efficiency through developments in science and technology and improved demand management are essential, these alone may not be sufficient to meet the growing demand for water in most developing regions and particularly in cities.

"All options to augment the available water supply, including increased storage through the use of groundwater recharge and dams, need to be considered, ensuring that all those who will be affected will also benefit," the final statement said. "The recommendations from the World Commission on Dams (2002) can be used as a reference. A wider adoption of good practice is required in order to avoid the environmental and social costs and risks of the past."

(***Source:*** *World Water Council)*

ENROLMENT INFORMATION

2003 TCDC Training Course on Small Hydro Power

Sponsored by the United Nations and Chinese government, Hangzhou Regional Center for Small Hydro Power (HRC) aims at promoting the SHP development in the world. China has most SHP stations, with much experience in SHP development. In order to disseminate SHP technology, HRC has already held with success 36 training workshops for over 600 participants from nearly 70 countries.

1. Objectives: To master the basic theory and principles of SHP development, feasibility study, operation, maintenance etc..

2. Date: From 9 May to 18 June 2003, Hangzhou, P.R. China.

3. Venue: Hangzhou Regional Center for SHP Hangzhou, China.

4. Course Contents: Procedures of SHP development, feasibility study, hydrological analysis, low-cost civil structure, turbo-generator units and auxiliary, electric design, economic evaluation, operation, maintenance.

5. Training Methods: Lectures, discussions, field trips & seminar.

6. Medium of Instruction: English

7. Source of Trainees: SHP personnel or officials worldwide.

8. Methods for Evaluation: Presenting country report on SHP.

9. Participant's Qualifications and Requirements for Admission: The applicants should be under 45 years old, graduated from technical schools with two years' SHP practice, be in good health with no infectious diseases or handicapped, be proficient in English; prepare a review paper or report on SHP development of the participants' country, not to bring family members to the training course, to observe all the laws, rules and regulations of P. R. China and respect the Chinese customs.

10. Training Expenses: The expenses of training, boarding and lodging, local transportation, pocket money of **RMB 30 Yuan** per person per day for those from developing countries during the training period in China will be borne by the Chinese government and distributed by HRC. The international travel costs including round trip tickets, transit fares, the expenses of medical care, insurance for the participants are covered by the participants themselves.

11. Application and Admission: Nominated by their respective governments, applicants are requested to fill up the **Application Form,** which should be endorsed by the departments concerned of their respective governments, and submit with valid **Health Certificate** provided by authorized physicians or hospitals to the Economic and Commercial Counselor's Office of Chinese Embassy (ECCOCE) for examination and endorsement; If endorsed, **Admission Notice** will be issued to the accepted participants by ECCOCE through the related government departments. With **Admission Notice**, participants should go through all necessary formalities with all the mentioned documents to China on the registration date.

12. Insurance: The training course organizer dose not hold any responsibility for such risks as loss of life, accidents, illness, loss of property incurred by the participants during the training period.

13. Liaison Address: Attn: Mr. Pan & Ms. Shen Xuequn

Hangzhou Regional Center (Asia-Pacific) for Small Hydro Power

Hangzhou, P.R. China, 310012

Phone:0086-571-88086586

Fax:0086-571-88062934

E-mail: dqpan@hrcshp.org

Web Site: www.hrcshp.org

Application Form for
2003 TCDC Training Course on Chinese SHP

(Please type or print)

1. Family Name:

First Name: **Photo**

2. Date of Birth **3. Country of Birth**

4. Present Nationality

5. Sex **6. Marital Status**

[ ] Male [ ] Female **[ ] Single [ ] Married**

7. Profession

8. Present Mailing Address **9. Permanent Address**

Telephone (City Code) **Telephone**

Fax **Fax** **Email**

10. Person to be contacted in Case of Emergency

Name

Phone

Address

11. Mother Tongue _____

Other Languages	Read	Write	Speak	Understand

"fl" for fluent, "g" for good, "fa" for fair, "p" for poor

12. University or technical education of over 6 months' duration

From-To	Institutions/city/country	Main study field	Degree

13. Your Present Work (including organization name & your functional title):

14. Medical History (Mention any Significant Physical Illness)

15. Purpose of Your Application:

16. I certify that the statement made in answer to the foregoing questions are true and correct to the best of my knowledge. I realise that any misrepresentation or omission on this form renders my application to be reconsidered or even to immediate dismissal.

Date:_____ **Signature: _____**

day/month/year

17. Comments by Recommending Institution or Person:

18. Comments by Chinese Embassy

Seal:_____

Date:_____

A Chinese Magazine "Small Hydropower" by HRC

The Chinese "Small Hydropower", a magazine that National Research Institute for Rural Electrification (NRIRE) and Hangzhou Regional Centre (Asia-Pacific) for Small Hydro Power has edited and published for 110 issues (bimonthly), allocated with the International Standard Serial Number ISSN 1007-7642, and China Standard Serial Number CN33-1204/TV. It was published in Chinese and with English titles. Special features are technical experience of SHP development in China. Information of international SHP activities and important events in the field of SHP have also been widely included.

This magazine has carried news, views and articles on all aspects of small hydro power. It is useful to those who are intersted in technical experience of SHP development in China.

"Small Hydropower" is the only professional publication on small hydropower in China, which is issued domestically and abroad. It is widely circled in all corners of China concerning SHP, and getting more and more popular in over 600 rural counties which is primarily hydro-electrified, more than 2,300 counties with hydropower resources, more than 50,000 small-sized hydropower stations, thousands of colleges or universities, research institutes and other administrative authorities on SHP. Advertising is welcome for any equipment manufacturer to target Chinese market on SHP construction, equipment purchasing or other businesses.

Subscription rates (1 year): USD40.00

The main contents of issue No.108 (2002 No 6) read as follow.

Work Study

Conditions and advantages of the implementation of ecological engineering using SHP replacing fuel in Gansu province

SHP resource exploitation and sustainable development in Anji county

Open up a new prospect for hydropower-based rural electrification in Buerjin county

Planning and Design

Project layout of Xueketan SHP station

Selection of field suppression resistance and field breaker for medium and small generator unit

Enhancing benefit of diversion type SHP station by using rubber dam

Computer Application

Design of automation system in Baixi station

Application of the field bus technique in SHP station

Reservoir storage curve fitting by applying Excel software

Project Construction

Lock chamber excavation and construction technique in Heiquanhe reservoir tunnel

Electrical and Mechanical Equipment

High lift hoist and its application

Application of metal oxide arrester in Huaijie county

Renovation and Reconstruction

Capacity increase and benefits of Nanwan SHP station

Improvement of ZD510-LH-180 water turbine

Capacity increase by regulating installation angle of runner blade for Xinzhuang SHP sataion

Defect analysis of 320kW permanent magnet hydro-generator and suggestion for its improvement

Service and Maintenance

Fault treatment of KGZL-2C generator excitation device

Accident analysis and treatment of varistor blast of excitation system of Qingshandian SHP station

Operation parameter setting for micro-computer based governor of impulse turbine

B_t value setting for YDT-1800 electrical hydraulic governor

Leakage treatment for tunnel in Hupan reservoir No3 SHP station

Analysis of mis-action of emergency distribution valve

Hydropower installed capacity in rural areas increased by 1.88 GW in 2002,China

Ministry of Water Resources of China disclosed recently that the hydropower installed capacity in rural areas was increased by 1.88 GW in 2002, the total hydropower installed capacity of national water industry reached 37.83 GW, the annual generating capacity was 118 billion kWh, among them the hydropower installed capacity in rural areas reached 33GW, the generating capacity was 108.4 billion kWh, accounting for 39% of national hydropower installed capacity and 40% of hydropower generating capacity respectively. The total income of rural hydropower generation & supply in 2002 reached 46 billion yuan in 2002, the profit & tax were 8.1 billion yuan, including 4.2 billion yuan of tax and 3.9 billion yuan of profit. At present, the hydropwer installed capacity in rural areas is equal to the hydropower installed capacity in the late 1980s and the total installed capactiy of power industry in the early 1970s of the last century.

***(Source:SHP NEWS** Editorial office http://www.hrcshp.org/shp/en)*

The main contents of issue No.109 (2003 No 1) read as follow.

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China launches "Small Hydropower for Fuel" Ecological Protection Project

At the 2003 national meeting of directors of Water Resources Department & Bureau, Minister of Water Resources Wang Shucheng raised 3 new "Bright Projects" that will be launched in 2003 in his working report , "Small Hydropower for Fuel" Ecological Protection Project is included in the list, the other two projects are soil-retaining dam and water resources in pastoral areas.

The report pointed out "Small Hydropower for Fuel" Ecological Protection Project is of vital importance to consolidation of the efforts of "converting the land for forestry", improvement of ecological environment, development of mountainous areas, promotion of local economic development and poverty alleviation toward affluence of farmers. At present, the program has passed the examination of Ministry of Water Resources, and is being submitted for approval according to the procedure of capital construction. The project is strived for starting construction within the year. The report requested a good preference of experimental work of "Small Hydropower for Fuel" Ecological Protection Project and construction of pilot areas, summary and promoting of the experience of construction of pilot area, enlarge the construction scale of "Small Hydropower for Fuel" Ecological Protection Project.

Pilot program for "Small Hydropower for Fuel" Ecological Protection Project has been approved by the State Council. To figure out the implementation scheme of "Small Hydropower for Fuel" pilot project and well perform the preparatory work of "Small Hydropower for Fuel" pilot project for early initiation of the Project, Rural Hydropower & Electrification Development Bureau (RHEDB) of Ministry of Water Resources held a meeting on documentation of the implementation scheme of national "Small Hydropower for Fuel" pilot project in Changsha, Hunan on March 7th, 2003.

The main contents of the meeting: to arrange for documentation work of the implementation scheme of "Small Hydropower for Fuel" pilot project; to bring forward requirements for preparation of the implementation scheme; to introduce the situation of the preparatory work and plan of next stage by relevant provinces; to discuss how to carry out well the experimental work of the pilot program.

The participants of the meeting include the relevant leaders of RHEDB of Ministry of Water Resources, the principal officials of Water Resources Department& Bureau of provinces (autonomous regions, municipalities) and the Water Resources Bureau of Xinjiang Production and Construction Group, and responsible technical personnel of county-level "Small Hydropower for Fuel" pilot projects appointed by provinces (autonomous regions, municipalities).

National "Small Hydropower for Fuel" planning area covers 886 counties (cities, districts, banners, divisions) of 25 provinces, autonomous regions, municipalities and Xinjiang Production and Construction Group. The total planning area is 3.5 million km inhabited with 70.8 million households with a population of 0.273 billion, among them, "Small Hydropower for Fuel" project can be carried out in 28.3 million households with a population of 0.104 billion. It requires a total installed capacity of 24.06 million kW and yearly electricity consumption of 34 billion kWh. According to the program, the implementation of the project can reduce the consumption of 0.189 billion m^3 firewood, protect 0.34 billion mu forests, realize eco-benefit of 36 billion yuan and result in huge economic and social benefits at the same time.

*(**Source: SHP NEWS** Editorial office http://www.hrcshp.org/shp/en)*

Myanmar head of state visited China's Yunnan province

Than Shwe, Chairman of Myanmar's State Peace and Development Council, arrived here Friday, beginning his visit to this southwestern Yunnan Province, which shares a 1,997-kilometer border with Myanmar.

Right after his arrival, Than Shwe, who just concluded his visit to neighboring Sichuan Province, met with Bai Enpei, Secretary of the Yunnan Provincial Committee of the Communist Party of China and Yunnan Governor Xu Rongkai.

Bai said during the meeting that the high-level visits between the two sides would help Yunnan and Myanmar to find more cooperation opportunities in the fields of economy, technology, culture and personnel exchanges.

Than Shwe said his visit to China was successful and he hoped Myanmar and Yunnan could expand cooperation in replacing illegal drugs plants with agricultural crops, in the hydropower sector and the use of natural resources.

He said Myanmar would improve its roadways to Yunnan Province and he hoped the two sides could accelerate cooperation in that aspect.

(January 11,2003)(Xinhua)

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GE buys into generator equipment firm

GE Power Systems has announced it has acquired majority stake of Kvaerner Power Equipment Co Ltd, one of China's leading suppliers of hydropower generation equipment. This transaction marks the largest acquisition by GE Power Systems in China.

Kvaerner Power, a joint venture established in 1995, was owned 61 per cent by Norwegian Kvaerner Energy, and 39 per cent by Chinese State-owned Hangzhou Electric Equipment Works (Hangfa) in Hangzhou, capital of East China's Zhejiang Province. It has been a global manufacturer supplying water to wire package of hydropower equipment up to 150 megawatts.

The new company is named GE Hydro Asia Co Ltd. GE will have 90 per cent ownership while Hangzhou Industrial Asset Management Co Ltd, Hangfa's parent company, will remain a minority owner with 10 per cent.

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Newly-rich Ethnic Minority Businessmen Invest in China's Power Industry

As the investors of the newly-built Yongfu Hydroelectric Power Station in Rongjiang County of southwest China's Guizhou province, Wu Huiming and Ye Huajie spent a memorable Spring Festival this year.

With Wu and Ye's investment of 40 million yuan (about 4.82 million US dollars), the power station with a total installed capacity of 7,500 kW began operation at the beginning of the Chinese Traditional lunar New Year, which fell on Feb. 1.

The two investors were born in Jingning She Ethnic Autonomous County in the south of Zhejiang Province. As the only autonomous county in east China. Jingning is a mountainous area and was on the country's list of 140 poor ethnic minority counties.

The local government has used every means possible to tap its resources and has made considerable progress in developing small- and medium-sized hydro-electric power stations.

With the support of the country's poverty-relief plan, a number of local residents like Wu and Ye have become rich by participating in or investing in the construction of power stations in recent years.

As China implements its western development strategy, these "adventurers" with rich experience in developing the power industry are setting their eyes on provinces in the middle and western parts of China with abundant waterpower resources, such as Hunan, Jiangxi and Guizhou.

Wu Huiming said that investing in power stations in western China can bring many talents and advanced technology and management methods to these areas so as to help develop the local economy.

Chen Fuwang, a former peasant from Jingning, invested 115 million yuan (about 13.86 million US dollars) in constructing the Xiahuikeng Hydroelectric Power Station with an annual power output of 53 million kilowatt-hours in Shangrao County of east China's Jiangxi Province.

Together with an investment of 25 million yuan (about 3 million US dollars) from the local government, the project was listed as one of the key projects of Jiangxi Province.

The power station has been built and put into use. It is expected to turn in tens of millions of yuan in revenue a year.

At present, more than 50 businessmen from Jingning have invested more than 400 million yuan (about 48.2 million US dollars) to construct more than 20 small-sized hydro-electric power stations in the middle and western part of China.

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Country Report on Small Hydro Power

NOEL R. ESTOPEREZ

Philippines

Brief Introduction

Population (2001E): 82.8 million
Location/Size: Southeast Asia/115,830 sq. mi. (slightly larger than Arizona)
Major Cities: Manila (capital), Quezon City, Cebu,Davao
Languages: Pilipino (official; based on Tagalog), English (official)
Ethnic Groups: Christian Malay (91.5%), Muslim Malay (4%), Chinese (1.5%), other(3%)
Religions: Roman Catholic (83%), Protestant (9%), Muslim (5%), Buddhist and other (3%)
Proven Oil Reserves (1/1/02E): 178 million barrels (Oil and Gas Report)
Oil Production (2001E): 8,460 bbl/d
Oil Consumption (2001E): 356,000 bbl/d
Net Oil Imports (2001E): 347,540 bbl/d
Crude Oil Refining Capacity (1/01/02E): 419,500bbl/d
Natural Gas Reserves (1/1/02E): 3.693 trillion cubic feet
Natural Gas Production and Consumption: (2000E) Negligible
Recoverable Coal Reserves (2000E): 366 million short tons
Coal Production (2000E): 1.49 million shorttons
Coal Consumption (2000E): 9.5 million short tons
Electric Generation Capacity (1999E): 12 million kilowatts, **13,459 MW**
(2002) Electricity Generation (2000E): 40.7 billion kilowatthours (bkwh) (57.5% thermal, 19.9% hydro, and 22.6% "renewables"*)
Electricity Consumption (2000E): 37.8 bkwh

Brief History

Hydropower development in the Philippines started in 1913 with the first power plant established by missionaries in Baguio City, the Camp John Hay Hydroelectric Power Plant with an installed capacity of 560 kilowatts. The private sector continued the development of water resources for power generation until Commonwealth Act No. 120 created the National Power Corporation (NPC) in 1936. The law nationalized the hydroelectric power industry and reserved for the use of NPC all streams, lakes, and rivers in the country where power may be developed, subject to existing rights. In 1979, Presidential Decree 1645 mandated the National Electrification Administration (NEA) to develop the country's small-scale hydropower potentials (mini-hydro).

With the expected increase in power demand and the large amount of investment requirements for power generation, the Philippine Government offered the private sector the opportunity to earn rates of return which

are competitive with the returns from similar business activities. In 1987, executive order No. 215 was approved allowing private sector participation in power generation activities. Republic Act. No. 6957 or the BOT/BT Law was passed in 1990 to complement E.O. 215 authorizing the financing, construction, operation and maintenance of infrastructure projects by the private sector. This was later amended by Republic Act No. 7718 (BOT, BOO, BT Law) in 1994. These laws paved the way for NPC to offer specific hydropower projects with capacities ranging from 5 MW to 50 MW to the private sector under a BOT scheme.

To further boost private sector participation in hydroelectric power generation, the government enacted Republic Act No. 7156 in 1991, otherwise known as the Mini-Hydroelectric Power Incentives Act.

Last year, the Electric Power Industry Reform Act 2001 also known as R.A. 9136 was passed which mandates the privatization of National Power Corporation (NPC).

Two major reforms are embodied in RA 9136, namely, the restructuring of the electricity supply industry and the privatization of the National Power Corporation (NPC). The restructuring of the electricity industry calls for the separation of the different components of the power sector namely, generation, transmission, distribution and supply.

On the other hand, the privatization of the National Power Corporation (NPC) involves the sale of the state-owned power firm's generation and transmission assets (e.g., power plants and transmission facilities) to private investors. These two reforms are aimed at encouraging greater competition and at attracting more private-sector investments in the power industry. A more competitive power industry will in turn result in lower power rates and a more efficient delivery of electricity supply to end-users.

The Electric Power Industry

The Philippine power industry is divided into three major sectors: generation, transmission and distribution. Under the present power industry structure, NPC generates its own electricity and buys electricity from IPPs.

Generation used to be a monopoly of the NPC until the issuance of Executive Order No. 215, which opened the generation sector to private investors. At present, a number of IPPs generate and sell electricity to NPC and other customers. NPC transmits electricity to distributors and large industrial customers via high-voltage wires. NPC is also responsible for constructing the transmission grid highway interconnecting the main islands nationwide.

Distribution of electricity at its usable voltage to end-consumer is performed by investor-owned electric utilities, notably the Manila Electric Company (Meralco), a few local government-owned utilities and numerous electric cooperatives which sell to households as well as commercial and industrial enterprises located within their franchise areas at retail rates regulated by the Energy Regulatory Board (ERB).

Power Infrastructure Development

To meet the increase in electricity demand of 5.1 percent, an additional capacity of **217 MW** was installed during the year, bringing the country's total installed capacity to **13,459 MW**. This includes the **140 MW Casecnan, 70 MW Bakun and 7 MW Bubunawan** hydroelectric power plants installed during the period.

On the other hand, the 22 MW Bohol Diesel power plant was retired during the year. A total of 2,304 MW of aging oil-based power plants that have outlived their useful economic life was retired since 1995.

With the government's desire to decrease dependence on imported oil, the country's power generation mix for 2001 is dominated by coal at 41.3 percent followed by geothermal steam (21.6 percent), oil (21.0 percent), hydro (15.9 percent) and natural gas (0.2 percent). This is a significant shift from the historical generation mix of the country which was predominantly oil.

Hydro Power Development

- The country's policy of reducing its dependence on imported fuels has given attention to the development of its indigenous energy resources. The abundance of water resources in the country makes hydropower energy an important sector on energy planning.

Hydro Potentials

A total of **14, 367 MW** of hydro power potentials has been identified in 293 sites throughout the country.

In the main island of Luzon, **8,874 MW** out of 10, 100 MW of hydro potentials remain to be developed in the future. For the Visayas, around **638 MW** of untapped hydroelectric power resources were identified while in Mindanao, **2,641 MW** can still be harnessed. On a countryside basis, around **12, 153 MW** of hydro capacity or about 84% of the total potential capacity, offer an opportunity for future development. [PEP 1992]

Hydro Conditions in the Philippines: A Situationer Luzon Grid

Hydroelectric plants operating in Luzon are a mix of small run-of-river and mid-size pondage type dams. The biggest of the hydro units is the 360-MW Magat hydro plant . Hydro played a major role in power generation in the Luzon Grid . It contributed to the grid an average energy of 2,871 GWH or about 20% of the total grid electricity production.

Visayas Grid

The two hydroelectric power plants in the Visayas are relatively small and old, considering that they were operational in the fifties and sixties. The 1.2 MW Loboc hydro in Bohol was commissioned in 1957 while the 0.8 MW Amlan hydro in Negros was put on-

stream in 1962.

Mindanao Grid

For the past twelve years, 1980-1991, the average yearly inflow to Lake Lanao was recorded at 85 cms. From 98 cms recorded in 1980, the inflows exhibited erratic movements throughout the years until a continuous decline in the last three years was observed. In 1991, the average inflow was measured at only 61 cms or 28% below the average level.

The same thing was observed in the Pulangi average annual inflows. The average inflow for the period was measured at 127 cms. In 1991, the inflow reached only 91 cms.

The alarming deteriorating inflows from Lake Lanao and Pulangi River could be attributed to the El Ñino phenomenon and the forest denudation brought about by the rampant illegal logging activities around Lake Lanao and Pulangi areas.

Small-Hydro in Philippines

Small and mini-hydro projects have the potential to provide energy in isolated villages and hilly areas where extension of grid systems is uneconomical. Recognizing this fact, Philippine government encourage the development of establishing mini-hydropower plants in the country through its "O Ilaw" rural electrification program which stipulates 100% electrification by 2004 and the Republic Act 7156, an act granting incentives to mini-hydroelectric power developers. The total identified mini-hydropower resource potential is about **1132.5 MW.**

Table 1 List of Power plants (Mindanao Grid)

Source/Type	Capacity (MW)	Location	Source/Type	Capacity (MW)	Location
Diesel	**437.59**		**Mini-hydro**	**14.60**	
Mirergy	18.90	Cagayan de Oro City	Agusan	1.60	Bukidnon
Cotabato Light	10.00	Cotabato	Bubunawan	7.00	Bukidnon
Davao Light	58.89	Davao City	Talomo	2.50	Davao City
Gen Santos	50.00	General Santos City	Upper Talomo	1.20	Davao City
Power Barge 117	100.00	Davao del Norte	Matling	1.50	Lanao del Sur
Mindanao PB Dsl 118	100.00	Agusan del Norte	Mountain View 1&2	0.80	Bukidnon
WMPC	100.00	Zamboanga	**Oil Thermal**	**108.60**	
Geothermal	**108.48**		NMPC	108.60	Surigao del Sur
Mindanao I (Mt. Apo)	54.24	N. Cotabato			
Mindanao II (Mt. Apo)	54.24	N. Cotabato			
Hydro	**982.18**				
Agus 1 Unit 1	40.00	Marawi City	**TOTAL MINDANAO**	**1,651.37**	
Agus 1 Unit 2	40.00	Lanao del Sur			
Agus 2	180.00	Lanao del Sur			
Agus 4	158.10	Lanao del Norte			
Agus 5	55.00	Lanao del Norte			
Agus 6	200.00	Fuentes, Iligan City			
Agus 7	54.00	Lanao del Norte			
Pulangi 4	255.00	Bukidnon			

Table 2 Energy Resource potential

	Oil (MMBO)	Gas (BCF)	Geothermal (MW)	Coal (MMMT)	Hydro (MW)
Region IX					
Zamboanga Del Norte				1.00	19.90
Zamboanga Del Sur			115.00	45.00	39.51
Basilan					1.35
Total			**115.00**	**46.00**	**60.82**
Region X					
Misamis Oriental					227.04
Misamis Occidental			40.00		7.39
Bukidnon				50.00	720.76
Camiguin					3.21
Total			**40.00**	**50.00**	**958.40**
Region XI					
Davao del Norte			60.00		28.76
Davao del Sur				100.00	60.09
Davao Oriental					74.25
South Cotabato	54.18-521.30	60.60-1,107.40	60.00	230.40	61.69
Sarangani				120.00	46.85
Total	**54.18-521.30**	**60.60-1,107.40**	**120.00**	**330.40**	**212.79**
Region XII					
North Cotabato			101.50		454.59
Sultan Kudarat	54.18-521.30	60.60-1,107.40		300.30	33.13
Lanao del Norte					231.97
Total	**54.18-521.30**	**60.60-1,107.40**	**101.50**	**300.30**	**719.69**
Region XIII (CARAGA)					
Surigao del Sur				209.00	171.31
Surigao del Norte			55.00		11.72
Agusan del Sur					17.00
Agusan del Norte					88.06
Total			**55.00**	**209.00**	**288.09**
ARMM					
Maguindanao				108.00	220.33
Lanao del Sur					11.29
Sulu	1,545.00	6,749.00			0.13
Tawi-tawi					0.90
Total	1,545.00	6,749.00		108.00	232.65

Status of Mini-hydro Power (MHP) in the Philippines (100 kW<MHP<10 MW)

There are fourteen mini-hydroelectric power operating contracts awarded by the DOE with a combined generating capacity of **45.66 MW**. Twelve of the contract belong to Hydro Electric Development Corporation (HEDCOR) and its sister company, the Northern Mini Hydro Corporation (NMHC). HEDCOR operates eleven mini-hydro plants, while NMHC operates three. These two companies were the initial beneficiaries of RA 7156 when their facilities were registered in 1992 and 1993, to avail of incentives under the law. Twelve of these plants were already existing while two of the plants were under construction at the time of the passage of the law. Some of these plants namely, Ampohaw, Bineng 1, Bineng 2, and Bineng 3 have been upgraded to increase generating capacities.

The other two contracts belong to Bicol Hydropower Corporation (BHC) and Bubunawan Power Co., Inc. (BPC). The **960 kW** Inarihan MHP of BHC was commissioned on 23 February 1998, while the **7 MW** Bubunawan Falls MHP of BPC is targeted for completion and commissioning by early 1999.

Per DOE records, the total installed capacity of fifty-one (51) existing mini-hydro facilities all over the country is **81.12 MW** representing 3.52% of the total installed hydropower capacity of **2304.64 MW**. These mini-hydro plants are either administered by **NPC, NEA, NIA, DOE** and privately owned. However, seven of these mini-hydro plants are

inoperational due to a number of reasons (siltation, structural, damage caused by a 1990 earthquake, no flow etc.). the average annual power generated by these mini-hydro plants is around 200 gigawatt-hours (GWh) contributing an equivalent of 0.34 million barrels of fuel oil equivalent (**MMBFOE**) to the country's energy mix.

FUTURE PLAN: Iligan City (City of Waterfalls)

Topography and Vegetation

Iligan City's topography and vegetation is characterized by a narrow coastal alluvial plain fronting Iligan Bay at the footslopes of undulating hills and mountains. Several river valleys are found in the city with relatively steep slopes. At the mouth of Agus river, very steep slopes separate the coastline and the highland areas. The city is blessed with more than 20 waterfalls. The city land area has 12% of elevations lower than 100 meters above mean sea level while the remaining areas of more than 65% are with elevations of 300 meters above. More than half of Iligan' land area, or about 63% have slopes of over 30%. The predominant vegetative cover consists of coconut groves and banana plantations, which are found in plateaus and other lowlands as well as in slopes and highlands. Heavy tropical forests are found in slopes of 30% and greater and these are mostly located inland. A few swampy areas covered with marsh grass are within the barangays of Del Carmen and Bagong Silang. Some fruit trees such as mango, durian, jackfruit and tropical hardwood like lauan, molave, apitong, etc., are scattered in cultivated areas in the hinterland barangays.

Climate and Hydrology

Rainfall is evenly distributed throughout the year, averaging 139.79 mm per month for the past twenty years. Records for the past two (2) years (1998-1999) show a monthly average of 177.02 mm and 302.08 mm at 13.50 and 20.67 days, respectively.

Climate is Type C, characterized by a short dry period of one to three months. Heavy rains usually occur in the months of January, February, June, September and December. Lowest rainfall recorded is in the month of April. Annual temperature is 27.4 .

Future Plan

In the future it is envision that a pilot mini-hydropower plant will be constructed in the city with the strong linkage with the government, power utility, academic institution and non-government organization.

Possible Area of Cooperation

- Economic Cooperation
- Financial Cooperation
- Research and Developments

Concluding Remarks

I would like to express my deepest appreciation and gratefulness to the HRC staffs, lecturers for their sincere efforts and shared knowledge.

My stay in Hangzhou,China is indeed a blessing. It deepens my understanding of my profession. The knowledge I gained, the good accomodation, the hospitality of all the people I met here in China and the friendship are extra blessings.

These are seeds that will be implanted in me and I will nourish them so it will bear fruits.

And for all participants, I hope we have the same feelings. We should be one in in these endeavors not only for a cleaner and greener environment to live but also a unified world where we share and understand each other amidst our diversities. And I think, this is the essence of SHP development.

Thank you very much.

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China's massive cross-country water project approved

BEIJING, Nov. 25 (Xinhuanet) — China announced Monday it has approved in principle a plan to build the world's most massive water transfer project.

Addressing a press conference in Beijing Monday, Vice-Minister of Water Resources Zhao Jiyao called the South-North Cross-Country Water-Transfer Project a strategic infrastructure undertaking for China's sustainable development and a huge environmental endeavor.

He quoted Premier Zhu Rongji as once saying that the project is aimed at relieving severe water shortage in north China, and it will conserve water, tackle pollution and be environmentally friendly.

The project includes three south-north canals in the eastern, central and western parts of the country, according to the minister.

By 2050, it is expected to be capable of shifting 44.8 billion cubic meters of water annually, with 14.8 billion cubic meters, 13 billion cubic meters and 17 billion cubic meters carried out the eastern, central and western canals respectively.

In the first phase of the project, three sub-projects will include two sections of the eastern canal in Jiangsu and Shandong provinces, and the shoring-up of the Danjiangkou Reservoir Dam in central China's Hubei Province, at the head of the central canal.

The central canal will draw Yangtze River water up to Beijing by 2010, and the eastern canal will take Yangtze River water to Shandong Province by 2005.

The completion of the first-phase sub-projects are likely to improve the quality of drinking water in some northern areas where-underground water contains harmful pollutants. ¡ö

South African windfarm combined with hydro

A R100-million windfarm, in Kouga in the Eastern Cape of South Africa combining wind energy with pumped storage, is on schedule and should be operational by the end of the year.

The clean power generation plant is expected to be installed by the middle of the year and will not only be a source of "green energy", but could well give rise to a new wind power industry in South Africa. The project is based on a farm near Jefferies Bay, owned by a farmer from the UK, who identified the conditions on the farm as ideal for wind power generation.

Dubbed the Genesis Project, the seven-megawatt wind farm is estimated to cost some R70-million, while the second component of the venture, a pump storage scheme, is anticipated to cost an additional R30-million.

Van der Linde explains the importance of the pump storage scheme: "One of Eskom's main requirements is stable availability of power, which cannot be guaranteed with wind power. Thus, using hydropower generation as back-up, we will be in a position to fulfil this criterion".

As the Genesis Project is being developed with the support of Eskom, the utility is enthusiastic about the initiative, as it would not be required to reinforce its electrical distribution networks in the region. This capital deferment would effect a saving for Eskom in excess of R15-million a year.

The establishment of the pump storage scheme would also entail enlarging a holding dam on the farm, so it could supply sufficient volumes of water for hydropower generation during peak times.

Van der Linde says that funding for the project will most likely be obtained from the Carbon Credit Fund of the World Bank, which has already identified multiple opportunities for renewable energy projects to be implemented throughout South Africa.

The Carbon Credit Fund is an incentive scheme, which aims to assist projects that can reduce carbon emissions. The fund pays between $2 and $4 a ton of carbon that is saved. It is understood that the fund may pay a percentage of the carbon credits up front, which would be a boost for the Genesis Project.

The initiative's coordinators are also looking to the Dutch Bank and other financial institutions for funding.

The next step in the development of the wind farm would be to conduct an environmental impact assessment (EIA) study, given that the project comes in the wake of the newly-released White Paper on renewable energy.

Most of the wind generation equipment will be imported from Demark, whereas the towers would be produced locally, with Danish and Dutch interests. The project will ultimately aim to create a local wind power industry, which would mean that eventually all components could be manufactured in South Africa.

Van der Linde adds that the project would also benefit local businesses, as contracts for the construction of the farm will be announced "as soon as possible". Two Eastern Cape companies, New Port Projects and Africoast, have already been contracted to start work on the construction and hydropower components of the farm. ¡ö

Community micro-hydro and pico-hydro

The first micro-hydro scheme run by ITDG in Kenya is nearing completion and has taken significant steps towards sustainability.

Capacities for local turbine manufacture have been built, including the electronic component fabrication. The project is being developed in partnership with the Renewable Energy Department (Ministry of Energy) which is reviewing the standards and regulations for distribution and transmission for micro power systems. This is a key issue which may have a significant impact on the costs of micro-hydro power schemes.

The pico-hydro power project is seeking to establish a sustainable infrastructure for the development of micro-hydro power for rural communities. It is researching the potential for pico-hydro (up to 5kW per unit) to be a sustainable and affordable technology for community electrification projects in rural Sub-Saharan Africa.

The project is a collaborative activity between Nottingham Trent University and ITDG-EA Energy Programme. ¡ö

3rd World Water Forum Concludes 100 New Commitments Made

More than 100 new commitments on water were made by participants of the eight-day **3rd World Water Forum**, the most important international water meeting ever, which concluded **March 23, 2003**.

The Forum was held in the three neighboring Japanese cities of Kyoto, Shiga and Osaka from March 16-23, holding 351 separate sessions on 38 interlocking themes dealing with water, especially on how to bring safe water and sanitation to the entire world.

Some 24,000 participants from 182 countries, more than triple the number of participants expected, attended the sessions. The key issues that they addressed revolved around balancing increasing human requirements for adequate water **supplies** and improved **health** and **sanitation** with **food** production, **transportation, energy** and **environmental** needs, while most countries will require more effective **governance**, improved **capacity** and adequate **financing**.

Of the more than 100 commitments reached during the Forum, the climate theme accounted for more than 20 commitments, and gender issues produced 13 commitments.

Some of the global agreements included:

The Ministry of Land, Infrastructure and Transport of Japan has supported the establishment of the International Flood Network (IFNet), launched during the Third World Water Forum for flood mitigation at the global stages. IFNET is committed to launching the "Global Flood Warning System" project, with the capacity to create the precipitation maps all over the world every 3 hours. As a result, flood warnings in the world will be vastly improved, benefiting up to 4.8 billion people.

The World Water Council committed to developing and implementing with a consortium of International financial institutions, UN agencies, international non-governmental organizations, and research institutions a program aiming to precisely identify and highlight the benefits brought by sound water management and provide governments with appropriate tools and analysis so that they may be considered in priority setting, planning, development, management, and budgeting for the water sector.

UN-HABITAT signed a memorandum of understanding with the Asian Development Bank (ADB) to create a program to build the capacity of Asian cities to secure and manage pro-poor investments and to help the region meet the Millennium Development Goals (MDG) of halving, by 2015, the proportion of people without safe drinking water and basic sanitation. The program will cover a pipeline of US$ 10 million in grants from ADB and UN-HABITAT for the first two phases and US$500 million in ADB loans for water and sanitation projects in cities across Asia over the next five years. Additional funding for Water for Asia Cities has also been made available to UN-HABITAT by the Government of Netherlands.

UNESCO and the World Water Council committed to promote, develop and support the establishment and operation of an independent, easily accessible facility that can help solving problems related to transboundary waters by providing on request access to experienced technical advisers, tools, training sessions and mediators.

The partner international organizations and research institutes (WWC, UNESCO-IHE, FAO, KIP, IFPRI, IWMI and SOAS) committed to continue their efforts and to lobby for financial support to develop a better understanding of the concept of Virtual Water, its application and its impact and to provide governments with information and tools to consciously utilize virtual water trade as an effective way to promote water saving and make it an integral part of government's national and regional water, food and environmental policies.

A broad consortium of organizations (GWP, NRC, FAO, WWC, IWA, WMO, UNEP, IUCN, UNESCO, UNDP, WB, ISDR) which supported the International Dialogue on Water and Climate, are committed to continue building bridges between the climate and water sector, and develop activities to better cope with climate impacts. These organizations will form an "International Water and Climate Alliance".

The United Nations Development Programme (UNDP) commits to a Community Water Initiative, aimed at building on the power of the local community to solve water and sanitation challenges. Its aim is to provide innovative communities with small grants to expand and improve their solutions to the water and sanitation crisis. The Community Water Initiative has an estimated target budget of $50 million for 2003-2008.

Through the Indigenous Peoples Kyoto Water Declaration, the indigenous participants of the 3rd World Water Forum commit themselves to forming a network on water

(to be continued on Page 11)