

Private Participation in Small Hydropower Development in China —Comparison with International Communities

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Abstract: In recent years, Chinese private investment in small hydropower (SHP) has been booming like mushrooms after rain. Globally, many developing countries have formulated a series of incentive policies to encourage the mobilization of private capital for SHP, but the recent enforcement is far from meeting expectation. This article overviews private enterprises investing in SHP domestically, analyzes similarities and differences between China and international communities, as well as the comparability and mutual referential values, and also explores some approaches for improvement. Furthermore, this article presents several particular issues in this respect, with a hope to further promote the sound development of SHP privately financed. Attached here are 2 tables and 2 figures.

Key words: SHP, private enterprises, hydropower development, investment, incentive policies

1 General of SHP development and private investment in China

1.1 An overview of SHP in China

In China, a hydropower station with an installed capacity of no more than 50MW is included in the SHP category, which is mainly situated in rural areas, developed and managed locally along with extension of local grids. Actually, SHP in China, not only suitcases all the hydropower stations each with an installed capacity up to 50MW, but also local power grids correspondingly.

The exploitable SHP resources in China amounts to 87,000MW, up to 23% of the exploitable hydropower resources in the whole nation, and ranks the first in the world. By the end of 2002, over 48,000 rural hydropower stations had been built, with the installed capacity of 31,040MW and the annual output of 103.7 billion kWh in a total, which covers about 40% of the total hydropower capacity and 10% of the total electric power output respectively in China, and also takes world's first place. In some provinces, the rural hydropower accounts for 20-30% of the total power generation.

SHP is usually dispersed, easy to be exploited and integrated into local grids for power supply. As a favorable makeup to large grids, SHP can effectively meet the local power demand. At present, SHP resources in China is principally scattered in old revolutionary, minority nationality, remote and poverty-stricken regions, where the population and the load are sparsely distributed, and the large grid is far from reaching and thus not economically feasible. SHP has already become a backbone industry in the economy of many counties.

1.2 Recent situation of Chinese private enterprises funding SHP

Owing to low investment and risk, long service life, constant profit and low operation cost of a SHP plant, there lifts an upsurge in SHP financing in China with backup of various favorable policies. Especially in recent 2-3 years, private investment in SHP has been springing up like mushrooms after rain as a result of nationwide power shortage, and even continues to be heated.

Before 1990, the construction of rural hydropower mainly counted on central and local governments in a state-owned manner. The 16th National Congress of CPC put forward that "non-public capital is permitted to enter the infrastructure, public utility and other sectors or fields which are not prohibited by laws and rules". This decision undoubtedly paved the way for private enterprises entering the important field of hydropower development. The economic developing strategy "with the public sector remaining dominant and diverse sectors of the economy developing side by side", brought a far-reaching influence to rural hydropower development.

Since 1990s, the financing system for rural hydropower has undergone a reform, and all social sectors are encouraged to develop hydropower through different means such as share holding etc., as to balance power demand and supply as well as meet the government's shortage of fund. For over 10 years, many private enterprises have more or less taken part in the hydropower construction for China's rural areas. The fund ratio for rural hydropower has gradually changed from the government-oriented to the private-oriented. It is estimated that share-holding and private power plants account for a very large proportion among the installed capacity increased each year.

For instance, during 1994-2002 there was a total capacity of 1,058MW from new SHP in Zhejiang Province, and the investment amounted to US\$1.33 billion, in which US\$1 billion was mobilized from private enterprises, more than 70% of the total. In Jingning county of Zhejiang, US\$105,562,300 was accumulated from private enterprises for setting up 91 SHP stations with a total capacity of 155.4MW since 1990. In Guangdong, a total SHP capacity of 1,230MW emerged during the "9th Five year Plan" period, which attracted an investment of US\$839,178,000, with over a half from the private. In Hunan, now the installed capacity of SHP has risen to 3,270MW, half of the total hydropower, and the annual output is more than 11 billion kWh for supplying half of the population in this province. In 2003 there are still 639 stations under construction, with the installed capacity of 145MW and total investment of US\$780 million, and over 80% of fund is from private and foreign investors. Table 1 declares some indices of state-owned and non-state-owned SHP stations in 2001.

Table 1 State-owned and non-state-owned SHP stations (year 2001)

Ownership		State-owned	Non-state-owned (including private-funded)	Total
Stations	Number	8,244	34,783	43,027
	Ratio (%)	19.2	80.8	100
Installed capacity	MW	17,500	8,762	26,262
	Ratio (%)	66.6	33.4	100
Annual output	GWh	62,954	24,187	87,141
	Ratio (%)	72.2	27.8	100

In a nationwide scale, 66.6% of the SHP installed capacity is still state-owned.

1.3 The features of Chinese private enterprise funding SHP

It can be roughly wrapped up as follows:

- 1) PPP—Public Private Participation, which includes:
 - Cooperative development between enterprises from water resources sector and electric power sector;
 - Cooperative development between provincial & county-level investment companies and private enterprises;
 - Development with investment from private enterprises;
 - Foreign invested or joint venture for SHP development.

Any one of above modes can be registered as a limited liability company or a share-holding company limited.

The stock-sharing modes of a company is diverse. Besides capital, the right of land use, labor force, equipment, technology, construction fund etc. can also be taken as shares and even water right can be used for shares as to alleviate the water-use conflict between power station and downstream villages.

Meanwhile, private enterprises not only invest in new hydropower stations, but also directly purchase some medium & small-sized stations under operation in the grid. A development strategy of "walking on two legs" has been emerged in the private investment.

- 2) Private enterprises only finance the construction of power plants, and that for power grids relies on the government or state-owned enterprises.

- 3) Salient benefit.

Where private enterprises favor SHP investment, there is generally short of electric power, and the off-take tariff is relatively high, often above US\$0.03 or even up to US\$0.06 per kWh. When the

construction cost is controlled within US\$730--970/kW, and the utilization hour in the range of 3,000--4,000 hours annually, the rate of investment return is mostly over 10%, that is to say, the investment can be repaid less than 10 years, which is acceptable to most Chinese private enterprises.

The macro benefits of SHP are also evident, such as booming the economy of hilly areas, improving the rural energy structure, bettering the ecosystem, improving the living situation of rural people, promoting agriculture, creating more job opportunities and boosting tourism industry etc. Although these bring no direct economic profit to investors, the local government and people can benefit a lot, who in return, give strong support to station construction and its long-term operation, and ultimately brings out a huge invisible profit indirectly.

4) The initiatives of private investors for SHP increase in full swing. In some provinces where condition permits, various rules or regulations are formulated for a paid transfer of water resources. This transfer can be implemented through public bidding, competitive auction or negotiated concession etc. In recent years, bidding and auctioning on water resources have become white-heated in Zhejiang province. Taking Wencheng county for example, where 30 private investors have been involved in competing for the exploitation right of a hydropower station with capacity of 3MW, finally an ordinary citizen surnamed Lin won the right with a ceiling price of US\$438,000. Meanwhile, 9 investors competed for 2 SHP stations with an installed capacity of 1,500kW and 2,500kW respectively in Suichang county, each with a bidding quotation starting from US\$8,160 and US\$13,300, and finally ending at US\$120,300 and US\$142,700.

5) Effective policies and measures. In those provinces with abundant water and exploitable conditions, favorable policies are formulated and certain measures taken to encourage private enterprises to finance SHP in recent years, such as "Decision on Quickening the Development of Medium & Small-sized Hydropower in Yunan Province", "Regulation on Transferring the Right of Development and Utilization of Water Resources in Guizhou Province" and "Regulations on Strengthening Development & Management of Hydropower Resources in Zhejiang Province" etc. In spite of some differences, there are many similarities, including:

- Policy on tariff: it is defined that electricity taken out of rural hydropower is not included in the national power-supply plan, and can be sold under market adjustment. SHP tariff can be determined by the local price administrative authority with a principle of generation cost plus tax and a certain profit. On May 19, 2003 the Electric Power Company Ltd. of Guangxi Autonomous Region brought forward an official document called "Regulation of Energy Sold to the Grid From SHP", with an aim to actively support and encourage the local SHP to connect with power grids, optimize the allocation of power resources, and to fully use the surplus seasonal power of local SHP. A managing model was established with orientation on market and economic profit, as to spin with the demand of market variation. Thus in Guangxi, the problem baffling SHP integration was fairly settled.
- Taxation policy: since 1994, a favorable VAT (value-added tax) of 6% is levied upon SHP (versus 17% on large/medium hydropower), and 33% of the profit levied as the income tax. In some regions, no tax is required on SHP during the first 2 years after operation, and in the second 3 years a certain amount of tax can be deducted. In other areas tax is levied firstly, then one part or even all returned back for further investment, and this is the so-called "supporting electricity with electricity" policy. In Hunan it's stipulated that, a certain amount of tax can be deducted before getting back all construction costs.
- Discount loan: banks always offer support or convenience to SHP when granting loans.
- Governmental support: much attention is paid to areas with favorable situations for SHP development, for overall planning and management on hydropower resources, such as formulation of "Regulation on Transferring the Right of Water Resources Development and Utilization" etc
- Others such as procedures simplified for project approval and land-use application, or favorable policies on off-take quantity and tariff when SHP integrated with a power grid etc. For instance, Guangdong has given priority to purchase electric power from SHP since 2003, and the electricity sold to grid ascended from US\$0.021 to US\$0.036 per kWh. Furthermore, each US\$60.5 per kW was subsidized in discounted loan for project construction.

The above policies vary with different cases in different places, or lots of difficulties remain to be addressed yet, but these favorable situations are undoubtedly the basic requisites for a rapid SHP

development.

6) Recently, a large number of private enterprises are emerging, along with the speedy development of China's economy, and a relatively huge asset being collected in the private enterprises, which lays the most important foundation of financial capability. Taking Zhejiang for example, the non-state-owned investment covers more than 60% of the total in recent years. By the end of 2002, there were over 300,000 private enterprises. In the total production value of this province US\$111.25 billion, 70% attributed to private economy. It's about the same with other developed coastal areas. After growing up, the private enterprises need to find outlets for their funds. Meanwhile, fierce competition exists in most professional sectors, and rightly the power-deficiency provides a golden opportunity. The investment return of SHP may not be very rich, but is relatively stable and reliable. The SHP field thus seems to be a land of promise to private enterprises. Private financing SHP initially started from developed regions in east China, with fund mainly from local investors. However in middle & west China, SHP mainly attracts private enterprises from east China, cooperating with local private companies.

Inside the arising tide of private funding SHP, some negative effects are also brought about, such as illegal campaign of "seizing river section" in which investors scramble for rights of river development. The rights are even transferred illegally in a few places and speculation and profiteering happened in disguised forms. As a result, a batch of so-called "4-withouts" illegal stations are built, i.e., without approval, design, acceptance test or normal management in some areas, which leads to a serious result and damage. Emergent measures were taken by the government to weed out nearly 3,000 illegal stations. These negative effects are also adverse currents in the heated investment attributed to power shortage and chance of making money from SHP. This seems different from other countries which have already experienced the privatization of power industry for a long time, while private participation in SHP in China is just started. Based on the international practice, supervision on private power sector would be a very tough task.

2 International overview of private participation in hydropower projects

There are some similarities between China and others all over the world with regard to the investment, ownership and operating right etc. in hydropower field (including SHP), and even the whole power industry all definitely under control of state or public ownership. But since the 1980s, the trend of de-regulation and privatization began in most of the countries with various scales and speeds. It certainly purposes attracting the capital of private enterprises for construction of electric power (hydropower), with coexistence of various ownerships or PPP (public & private participation) model, so that hydropower construction can be accelerated, and its management and benefit be improved. In the 1990s, this action was universally motivated. However in recent years, the investment of private enterprises in hydropower is not developed as expected in the world, and its further development is hindered evidently. In March 2004 issue of HRW (<Hydro Review Worldwide>) an article by Mr. Trouille, vice president at MWH (Montgomery Watson Harza) in the U.S. emphasizes that, "in recent years, the situation for private financing hydropower seems not favorable. Recent statements made by private developers canceling their hydropower projects illustrates that the current model used to develop and finance private hydro projects is inadequate". Besides, a working paper entitled "Consequences of Investment Behaviour of Public and Private Enterprises Participating in the Liberalised Power Sector of Colombia" written by Environmental Policy and Management Group, Environmental Science and Technology, Imperial College of Science, Technology and Medicine of Colombia also points out, "investment by the private sector has declined over the last couple of years raising the issue of who will finance the infrastructure development in the region (Latin America)". All the European countries generally show their active attitudes to implement the Kyoto Protocol for promoting the development of renewable energies (including SHP), but practically some issues still need to be addressed. During recent discussion with experts from Renewable Energy Association of Austria, we were informed that SHP in Austria mainly belongs to state-owned power corporations, and its off-take tariff cannot compete with large power stations, especially nuclear power. Private investment for SHP is walking with difficulty. Although a series of incentive policies have been formulated to promote private financing for SHP in many developing countries in Asia, such as India,

the Philippines etc., the implementation in recent years is far from anticipated. For the above aspects, all the nations are analyzing and taking measures to push forward the development of SHP privately funded.

2.1 The cause of widespread decline

There are numbers of reasons for private financing decline in SHP (including hydropower) recently in many countries, the generalized issues of which are as follow:

1) The generation cost is relatively high in early operation (i.e. the first 10-year loan payback period) of a hydropower station, which makes it uncompetitive with the conventional large station in power grids.

As per the analysis (see Figure 1) made by Mr. Teouille with Montgomery Watson Harza in U.S., the average generation or production cost of private funded hydropower stations shall be compared with those of other electric utilities on grids (adopting the typical tariff range of each) in order to ensure the off-take tariff for making private hydropower financially viable. The 100-year time frame shown by the horizontal ordinate in Figure 1 reflects the long economic life of civil works associated with dams and hydropower facilities, because the construction costs for the civil works often represent 50-75% of the total investment costs.

The high initial investment cost associated with hydropower typically requires high tariffs in the first 10-20 years to repay the loans, satisfy the bank's debt coverage ratios and provide an acceptable return on equity. Figure 1 shows a typical range of US\$4-8 cents per kWh. Once the investment loans are repaid, the cost of hydropower drops dramatically since one needs only to pay for operations and maintenance (O&M) cost, royalty payments, and regular electro-mechanical refurbishments and upgrades. Over time, the cost is very stable and is not subject to fuel price fluctuations as thermal power plants. It is estimated that the average production costs are often below 1 U.S. cent per kWh in many countries after the loans for these hydropower stations are repaid. It is 1-3 U.S. cents per kWh in Figure 1.

In contrast to the high initial tariffs often required for hydro projects, the average cost of generation or production is currently between 1 and 5 U.S. cents per kWh. The comparison is made with the average overall generation cost rather than an alternative tariff for a thermal plant. This is also to highlight the current low range of U.S. 1-2 cents per kWh found in many places with abundant existing hydropower facilities that have been fully depreciated and in other places where the construction of thermal power plants had been greatly subsidized.

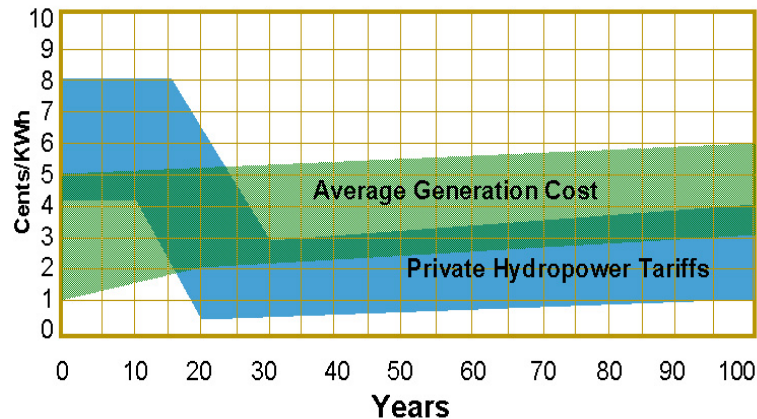


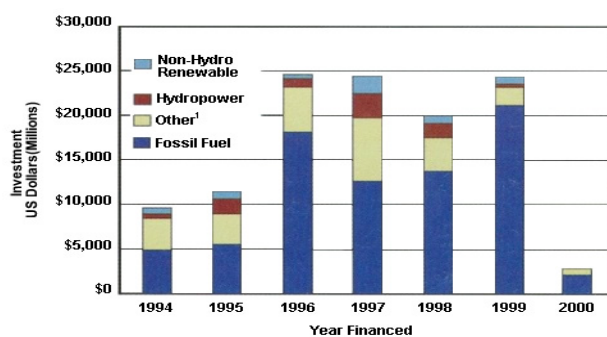
Figure 1 High tariffs in the first 10-20 years of operation can deter private investment in hydropower

Figure 1 clearly shows the problems currently facing the private hydropower industry. The high initial tariffs required to make private hydro financially viable in the first 10-20 years of operation is often not competitive with current bulk power tariffs paid by customers or for alternative thermal options. As a result, very few projects have reached financial closing during the past three years.

Table 2 Installed megawatt capacity for projects financed between 1994 and 2000

Region	Fossil	Hydropower	Other	Non-hydro renewable	Total
Americas	31,591	1,648	9,866	600	43,705
Asia	35,726	1,860	11,654	2,466	51,706
Europe and Central Asia	16,339	1,999	8,386	1,179	27,903
Middle East and North Africa	5,791	0	3,112	0	8,903
Sub-Saharan Africa	808	0	42	0	850
Total	90,255	5,507	33,060	4,245	133,067
Total (percent)	67.8	4.1	24.9	3.2	100

Note: other includes Waste to Energy, Cogeneration, and Multi-fuel Generation.



Note 1: Other includes Waste to Energy, Cogeneration, and Multi-fuel Generation.

Figure 2 From 1994 to 2000, international energy investments show that significantly less investment was made in hydropower compared to many other types of energy. For the sake of clarity, costs and tariffs are shown in 2002 US dollars.

Table 2 and Figure 2 document a sharp decline in financed projects. Table 2 summarizes regional trends in installed megawatt capacity in financed projects from 1994 to 2000. The total amount of hydropower capacity was 5,507 MW, or 4.1 percent of the installed capacity for projects financed during the 6-year period. Figure 2 shows the distribution of annual investments in financed projects over time. It reveals that less investment was made in hydropower in relation to total investments in energy production from 1999 to 2000 than in the preceding four years (1994 to 1998). This trend toward a sharp downturn in the development of new hydro has been confirmed during the past 24-month period.

The data also indicate that there was substantial activity in the power sector with an average annual investment of US\$20 billion to US\$25 billion from 1996 to 1999, but very little investment in hydropower. The limited number of hydropower projects that went through financial closing with private developers during that period had a total investment of US\$4.2 billion for an installed capacity of 3,133 MW.

2) The necessary financing for preparing a hydropower project should be provided, or a streamline investment cannot be realized. Generally, private enterprises would not take a high risk for putting too much in the front-end work such as river planning, reconnaissance, site selection, feasibility study and project approval etc., and it can be up to 15% of the total project investment in some countries, so that in the competitive bidding process many projects are lack of extensive & intensive feasibility and environmental impact assessment studies.

3) Lack of a package of clear and exercisable investment policies for hydropower development in some countries. Policies have been made out from different governmental departments, and lack of well-coordinated efforts from host governments to promote hydropower developments.

4) The procedures for proposing, examining and approving a hydropower project or contract negotiation (for instance, power purchase agreement) etc. still need to be simplified in some countries, otherwise it would be time-consuming and spoil the enthusiasm of private investors. In Austria, as a visiting expert said, a SHP project may wait for several years at the least, or even 10 years for approval, and finally nobody would inquire about it (possibly there is sufficient power).

5) Non-power benefits such as flood control, aquaculture, recreation, irrigation, water supply or other

purposes are very important but are not bringing any financial revenues to the privately developed projects.

6) Affected communities, publics, environmental agencies and NGOs cannot be involved earlier in the project planning, which often deters the construction process or results in conflicts afterwards.

7) The economic downturn and changed investment climate in many less-developed countries, and current liquidity crises confront many independent power producers (IPP). Furthermore, political turmoil and uncertainties in the rate of currency exchange in several countries destroy the confidence of foreign investors.

2.2 Measures proposed by international professionals

With regard to the decline of private financing for SHP, suggestions have been raised by international professionals to explore new ideas and approaches for solving the following critical issues on SHP development:

1) The host governments must formulate for the private-funded hydropower projects a set of clear, well-coordinated and exercisable policies, monitoring measures, and legal & contractual framework to eliminate the different decisions from various departments, power corporations and other governmental agencies. The short-sight actions of officials due to short tenure of appointment through elections shall be prevented.

2) All front-end studies on projects shall be financially supported by host governments, developers and concerned donor agencies.

3) Project proposing, examination & approving procedures and contractual negotiations shall be carried out in advance.

4) An overall analysis shall be conducted for the long-term and comprehensive benefits of a hydropower project. Multi-lateral, bilateral and donor agencies need to support the host government in financing a hydropower project to cover its non-power values such as flood control, irrigation, aquaculture, tourism and so on.

5) The abilities of consumers and utilities payable to the market-based tariff need to be assessed and forecasted. Extensive front-end technical, environmental, socio-economic studies and site investigations are required to determine the project's optimum parameters, and power-supply area, off-take or power-purchase agreement (on quantity and price) and taxation etc. need to be negotiated. Marginal costs of generation need to be defined and financial scenarios analyzed in a deregulated market to render the project financially viable.

6) Communities, public, environmental agencies and NGOs in the location or under affection of the hydropower project shall be involved in advance for discussing and addressing related issues.

7) In case of a joint finance of public and private, the equity proportion of each party should be early determined.

All in all, many countries in the world now are facing challenges in pushing forward the private investment in SHP. But SHP development, including private financing sector, is also embracing favorable opportunities under the global voice for environment protection and the daily increasing expectation on renewable energy. If serious measures are adopted under the joint efforts of the host countries and international agencies as well as non-governmental organizations to solve the aware existing problems, the situation of private investment in small hydropower is able to get out of the low valley and achieve its due development.

3 Comparability between international and China's situation and their mutual referential values

Internationally, privatization, liberalization or de-regulation has been pushed forward in electric power and hydropower sectors (including SHP) since 1990s, and a big voice in publicity and encouragement has been motivated for this sake. But over 20 years, it has not been carried out well as expected, and at the beginning of the 21st century, it seems to cool down quietly. Presently, some nations, international agencies and experts are exploring the ways to sustain the PPP (Public & Private Participation) investment mode. China seems to be different. Privatization and liberalization have never been posed except the strategy of "public sector remaining dominant and diverse sectors of the

economy developing side by side”. Since 1990s, private investment in SHP quietly warmed up and even continued to be heated. In many places, the new capacity of SHP takes the lead overwhelmingly, and operates with evident profits. Currently, private-funded SHP has already been developed to a relatively large scale in China. However in other developing countries, it seems still at a trial stage with scattered development. Of course, the social, economic and political backgrounds between China and others differ from each other, and distinctive discrepancies are also existed in resources, market conditions, policies and measures etc., apart from similarities. Here some comparable aspects are drawn from the following issues for discussion in the purpose that something valuable can be taken as a reference:

1) Potentials of private fund

Chinese private enterprises have been developed shortly, but their impetus is swift and powerful. Up to now, the production value of private enterprises in the country amounts to US\$447.4 billion, 1/3 of the total GDP. During 1980-2000, an investment of US\$91.9 million was from private enterprises, covering 33% of the social fixed assets investment in this period. As the power market is opening up, private financing SHP also rapidly booms thanks to the stimulation of favorable policies. In recent years, most of the private capital is mobilized domestically for hundreds of MW, or even nearly one million kW in capacity annually, with simple financing approaches. In many developing countries, private funds for SHP construction mainly rely on international sectors, instead of domestic enterprises, thus complicating the financing channel, formalities and procedures, and is not easy to get success. Therefore, when this issue is talked about in foreign countries, appeals are usually made towards international financial agencies to adopt effective measures and consider whether the requirements on the risk of exchange rate and the front-end work for small hydro similar to large hydropower is reasonable? Unfortunately, much has been talked but little was done.

2) Background of power market

In recent years, electric power is deadly deficient everywhere in China, as a result of continuous and quick development of economy. In many regions, especially developed provinces, the demand for electric power is like “a hungry person not choosy about his food”, and even small diesel generators are extensively used just as drinking poison to quench thirst, without concerning the cost and environmental pollution. Thereby, SHP naturally becomes a highlight to investors in those regions where conditions and resources for SHP exploitation are available. This seems different abroad, as electric power is not insufficient in developed countries such as Europe. Meanwhile, rural hydropower in developing countries is far less important as to affect the local economy. So it can be concluded that, macro economy and power market background are basic conditions that affect private enterprise funding rural hydropower.

3) Market admittance and approval system

Since de-regulation policy is adopted in most countries, there is no obstacle, in principle, for SHP accessing the power market as an IPP (independent power producer). But PPA (power purchase agreement) is still not easy to be reached with respect to the application for grid connection, off-take quantity and tariff. Regarding the development of small rivers, policies about paid transfer and competitive winning of the use right have already been executed in China. However, free application and transfer are available in many other countries, which is much more favorable. In China, it's very simple to get approved since SHP stations are managed by local governments, but on the contrary, nearly all the SHP stations in other developing countries are placed under the jurisdiction of central government, thus resulting in a complex examining and approval process, and there would be additional obstacles in case of foreign investment. These differences are not the key factors, but they always bring about adverse effects.

4) Benefit issue

Just as mentioned above, the off-take power quantity and tariff directly affect the enthusiasm of investors. A specific amount of financial subsidy still has to be used to stimulate private financing SHP in some countries. In China, the off-take tariff of SHP has also been limited at about US\$0.024 per kW in many areas years before, which not only hindered private but also public financing. Responding the call for green energy in the globe, SHP, as the most practical green energy, can possibly be improved in its economic benefit with supports from various incentive policies, and finally steps out of the present downcast state.

5) Incentive policies

The above-listed indicate that, all objective unfavorable factors can only be addressed by the incentive policies of relevant government and the effective coordination of related international organizations. It is well known, a set of incentive policies have already been formulated in many countries, but why is the effect little? By wrapping up the experience in China and abroad, it is cognized that an overall package and coordination of policies is one of important factors. For many years, Chinese government has been continuously making out and revising a complete set of incentive policies, which plays an important role in promoting the private financing and even the development of whole SHP sector. Even though, there are still some issues underlying the power system reform.

4 Several special issues related to SHP privately financed in China

Although hydropower industry privately financed becomes so heated at present, the problems impeding the further SHP development will most probably emerge and intensify in the future, along with the gradual alleviation of power shortage and execution of the policy of “separation of power plant from grid, and competitive pricing for integration into grid”.

Although some provinces with abundant hydropower resources have already formulated regulatory rules for hydro development, generally speaking, there are still many problems. It is necessary to draft a long/medium-term planning adaptable to the restructuring of power industry and aiming at serving the local economy for strengthening the guidance and standardizing the management. The risk of depleting hydro resources cannot be taken for sake of immediate interests, and the disordered exploitation of hydro-energy resources in some regions should be altered as soon as possible. Furthermore, the market-based allocation of development right for hydro-energy resources, as well as the paid transfer of development right on state-owned hydro energy shall be gradually practised for attracting high-quality capital and preventing corruption, as to ensure a sound and sustainable development of private funded hydropower etc.

Besides, the tariff-decision mechanism before the structural reform of power system is not reasonable. The construction of domestic power grids is lagged behind, which hinders the transmission of electricity from SHP. These two issues have always been obstacles need to be uprooted in the process of SHP development. Objectively, SHP is inherently disadvantageous with low regulating performance, seasonal generation, low quality and unreliability of power supply, which in a certain degree, endanger the economical operation and safety of large power grids. The monopoly of power management system is the main obstacle for SHP development. In the past, the power industry in China usually encompassed power generation and supply as a whole, and the grid dispatcher always played the roles of both “athlete” and “referee”. Additionally, with the influence of planned economy, the arrangements of power generation and off-take quantity were often emphasized on large hydropower, but neglecting SHP in a long term, and large grids and power utilities cared more about their own benefits, despite of the overall situation. After the restructuring of power industry, in policy staffs of power sectors are allowed to finance SHP as stakeholders. Thereof, SHP shared by power sectors can enjoy a privilege for grid-connection and off-take tariff, which actually results in an unfair competition. Therefore, presently there are two obstacles that need to be overridden for SHP development: one is difficult grid-connection, and the other is low off-take tariff. These two issues have been addressed in some provinces and cities, however in a nationwide scale, more or less problems still exist. While speeding up the construction of power source, the construction of power grid should be carried out simultaneously.

Under the existing power management system, the private power utilities still confront some difficulty. The “Notice on the Scheme of Power System Reform” promulgated by State Council brought forth that, two monopolies shall be broken in the power system reform in China, one is the sectorial monopoly integrating power generation, transmission and distribution, and the other is the regional monopoly of “one corporation in one province”, which should be replaced by policies of “separation of stations from power grid, competitive pricing in grid connection, and separation of transmission for a competitive power supply”. Several independent power generating corporations and power transmission corporations shall be set up in the whole country, and numerous power distribution corporations also be set up for shaping a fair, competitive, open, and healthy socialist power market. Now the power system reform is pushed forward steadily, but slowly, and the reform of “separation of

transmission from distribution” is not brought into effect, the main and auxiliary grids are far from being separated, and the system of transmission and distribution as a whole needs to be broken. In order to improve this situation, the power system reform needs to be further deepened, for establishing a nationwide, more efficient and open power market system mainly based on a competitive & open regional power market, as well as socialist market economy. On June 25, 2004, the “Notice on Further Strengthening the Work of Rural Hydropower” from MWR reiterated that “the independent power distribution corporation shall be oriented to push forward the power system reform”, which certainly will further advance the SHP funded by private enterprises to a sound, reliable and favorably rolling development in China.

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