Private Participation in Small Hydropower Development in China

—Comparison with International Communities

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1 General of SHP development and private investment in China

1.1 An overview of SHP in China

Definition: ***<=50MW*** (installed capacity)+local power grids.

Capacity: ***87,000MW*** (exploitable)

23% exploited

Current Situation(by the end of 2003):

48,000 (amount)

31,200MW (installed capacity)

110.0 billion kWh (annual output)

40% of the total hydropower capacity in China

10% of the total electric power output

All top the world.

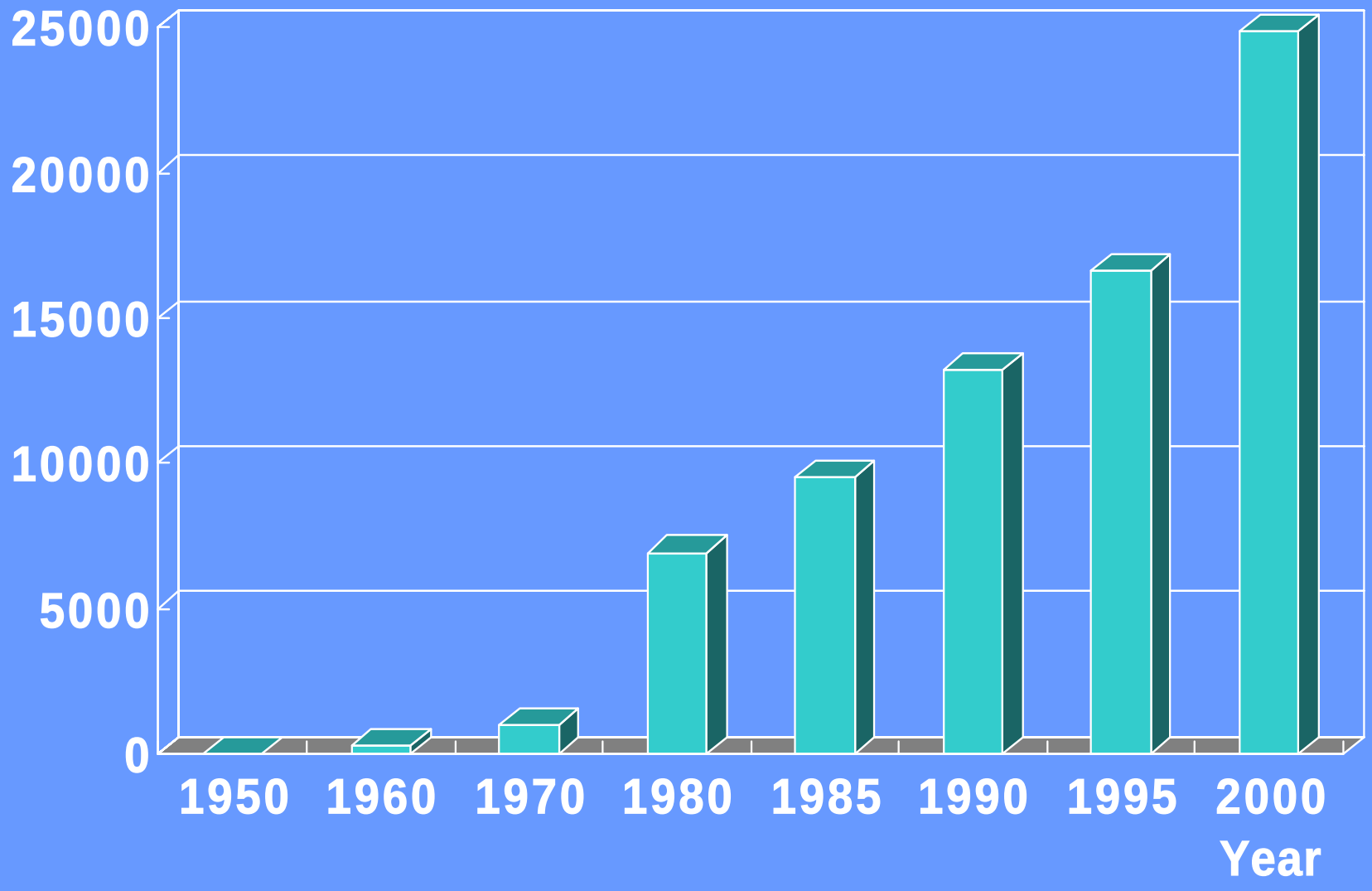
Several top figures of SHP in China

Yearly increase of SHP installed capacity & generation in China

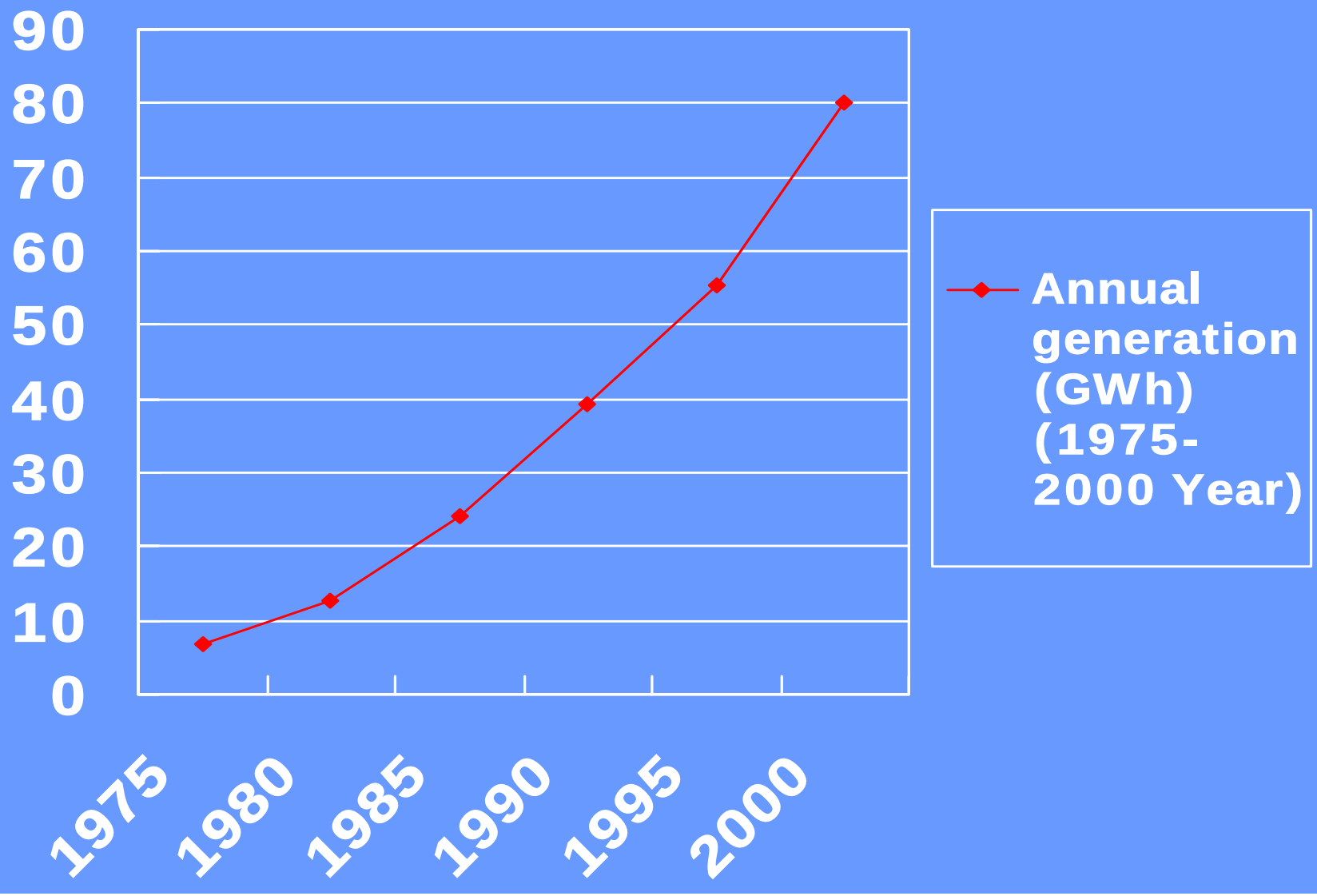
（1950 ~2000 year）

Year	SHP		SHP proportion in total hydro energy	
	Installed capacity（MW）	Annual generation（GWh）	SHP installed capacity ratio	SHP annual generation ratio
1950	3.7		2.2	
1955	7.0		1.4	
1960	251.4		13.0	
1965	330.0		10.9	
1970	1019.0		16.4	
1975	3083.2	6.7	23.0	14.1
1980	6925.5	12.7	34.1	21.9
1985	9521.0	24.1	36.0	26.1
1990	13180.0	39.3	36.6	31.1
1995	16646.1	55.4	32.7	32.6
2000	**24850.0**	**80.0**	**32.4**	**36.2**

SHP installed capacity by years(MW)

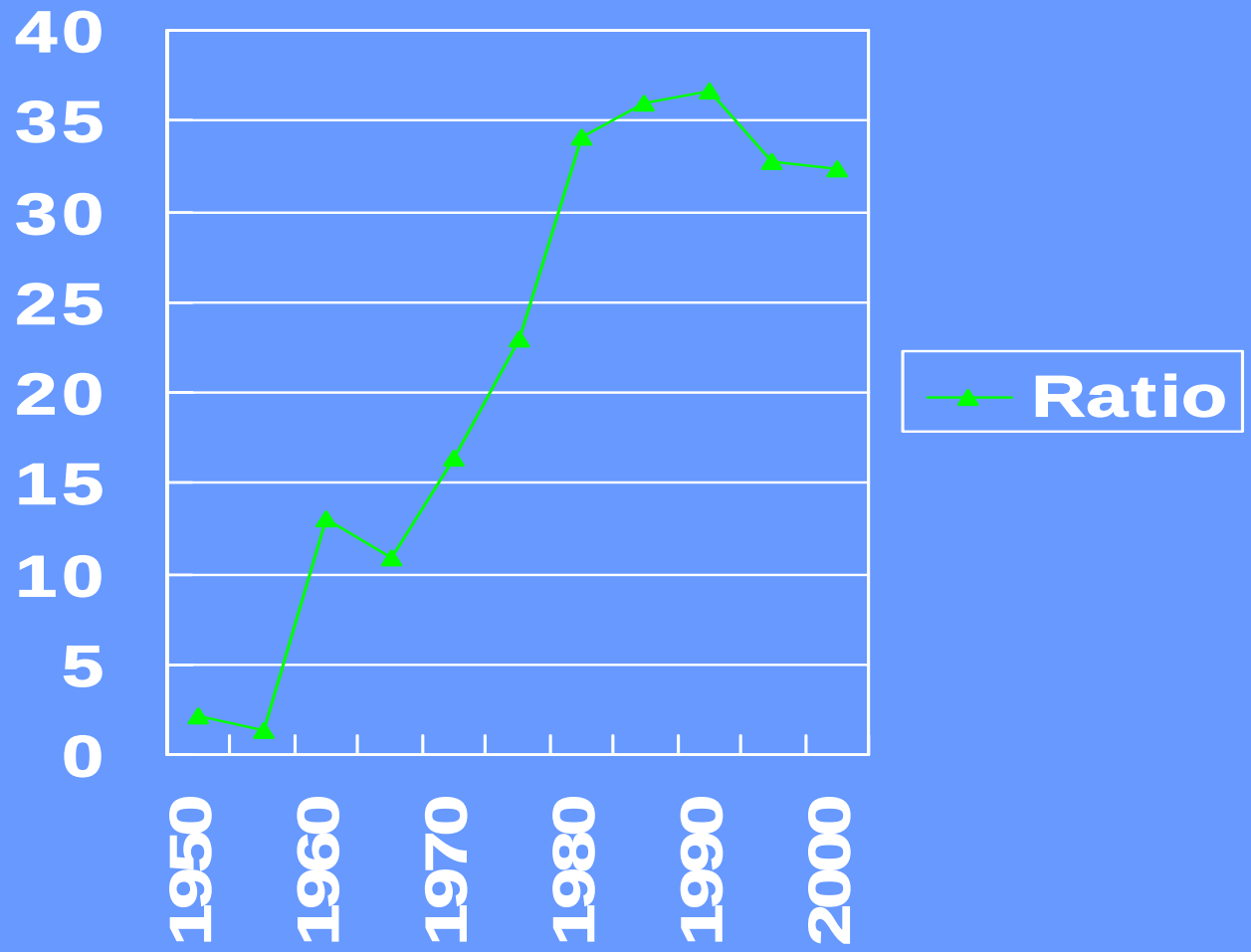


SHP annual generation in China(GWh)



SHP proportion in total hydro energy in China (1950～2000 Year)

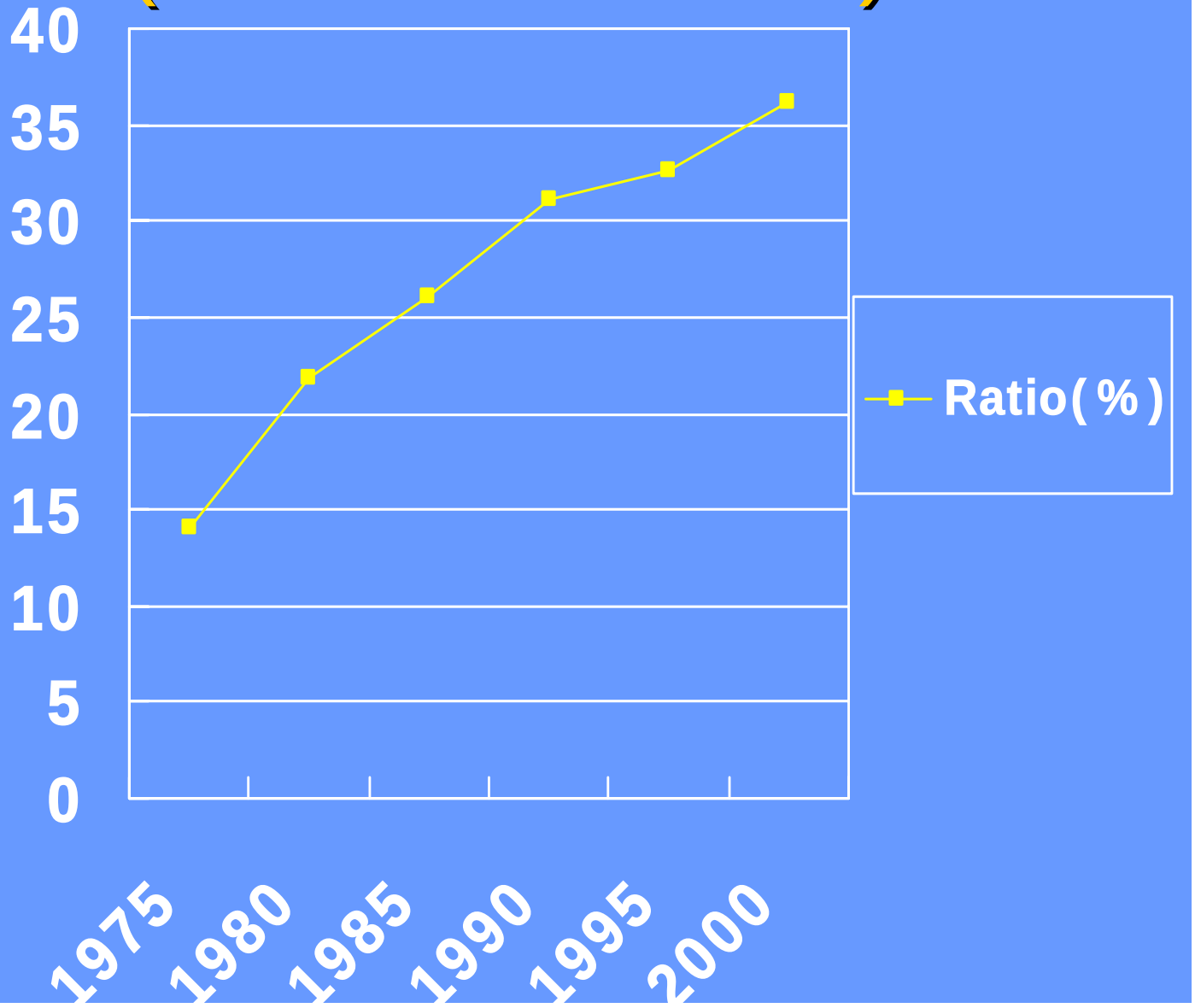
- SHP installed capacity ratio (1950~2000 Year)



SHP proportion in total hydro energy in China (1975～2000 Year)

- SHP annual generation ratio

(1975 ~ 2000 Year)



% of SHP station for connection in grids in China:

		Connected to state grid	Local grid	Isolated operation	Total
SHP installed capacity	MW	6,412	17,869	1,981	26,262
	%	**24.5**	**68**	**7.5**	**100**

Comparison of production cost of SHP and other energies

Generation type	Per kW investment (Yuan/kW)	Fuel cost (Yuan/kW)	Energy Production cost(Yuan/MWh)
SHP	**5,000~8,000**	**0**	**5~10**
Diesel power	2,500~3,500	20~35	35~50
Small thermal power	3,000~4,500	15~25	25~35
Wind power	10,000~15,000		30~100
Photovoltaic	20,000~30,000		100~300

1.2 Recent situation of Chinese private investing in SHP

In recent years, private investment in SHP has been springing up owing to low investment and risk, long service life, constant profit and low operation cost of a SHP plant.

Before 1990, 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 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.

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

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

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

Reform of financing system for rural hydropower(1990-): all social sectors are encouraged to develop hydropower through different means (share holding etc)., as to balance power demand and supply as well as meet the government's shortage of fund.

For over 10 years, the fund ratio for rural hydropower has gradually changed *from the government-oriented to the private-oriented.*

Share-holding and private power plants account for a very large proportion among the installed capacity increased each year.

in Zhejiang(1994-2002):

>70% of the total were from private enterprises.

US$1 / US$1.33 billion for 1,058MW.

In Jingning county of Zhejiang("Hometown of Chinese Rural Hydropower"): 91 SHP stations since 1990.

100%, 155.4MW, US$105,562,300

Contribution to GDP: 12 % (2002) ,11.6%(2003)

Local fiscal charges: 25.9 % (2002) ,24.9%(2003)

In Guangdong(9th Five year Plan) :

> 50% of 1,230MW, US$839,178,000

In Hunan(2003): 639 stations

>80% of 145MW, US$780

1.3 Features of Chinese privately funded SHP

1) PPP—Public Private Participation, includes:

A) Cooperative development between enterprises from water resources sector and electric power sector;
B) Cooperative development between provincial & county-level investment companies and private enterprises;
C) Development with investment from private enterprises;
D) Foreign invested or joint venture for SHP development.

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

off-take tariff: US$0.03 -- US$0.06 per kWh.

construction cost: US$730--970/kW

utilization hour: 3,000--4,000 hours annually

investment return: >10%, less than 10 years

The macro benefits of SHP are enormous: 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 no direct 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

5) Effective policies and measures

In Yunan: “Decision on Quickening the Development of Medium & Small-sized Hydropower Province”,

“Regulation on Transferring the Right of Development and Utilization of Water Resources in **Guizhou** Province”

“Regulations on Strengthening Development & Management of Hydropower Resources in **Zhejiang** Province” etc.

In spite of some differences, similarities are:

--Policy on tariff
--Taxation policy
--Discount loan
--Governmental support
--Others: 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.

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

Zhejiang example: the non-state-owned investment covers more than **60%** of the total in recent years, over **300,000** private enterprises by end of 2002. In the total production value of this province US$111.25 billion, **70%** attributed to private economy. Same in other developed costal 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. Investment return of SHP may not be very rich, but is relatively stable and reliable. The SHP field seems to be a land of promise to private enterprises. Private financing SHP started from developed regions in east China, with fund mainly from local investors. In mid & west China, SHP mainly attracts private enterprises from east China, cooperating with local private companies.

Some negative effects in the arising tide of private funding SHP: illegal campaign of **"seizing river section"**, 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. A batch of **"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 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.

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.

***Since 1980s*, trend of de-regulation and privatization began in most of the countries with various scales and speeds**, purposes attracting the capital of private enterprises for construction of electric power (hydropower), with coexistence of various ownerships or PPP model, so that hydropower construction can be accelerated, and its management and benefit be improved.

***In 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>)** 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”**.

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. 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. **SHP in many developing countries in Asia, such as India, the Philippines etc., the implementation of incentive policies in recent years is far from anticipated.**

2.1 The cause of widespread decline

There are number of reasons for private financing decline in SHP (including hydropower) recently in many countries, the generalized issues of which are as follow(7 causes here):

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.

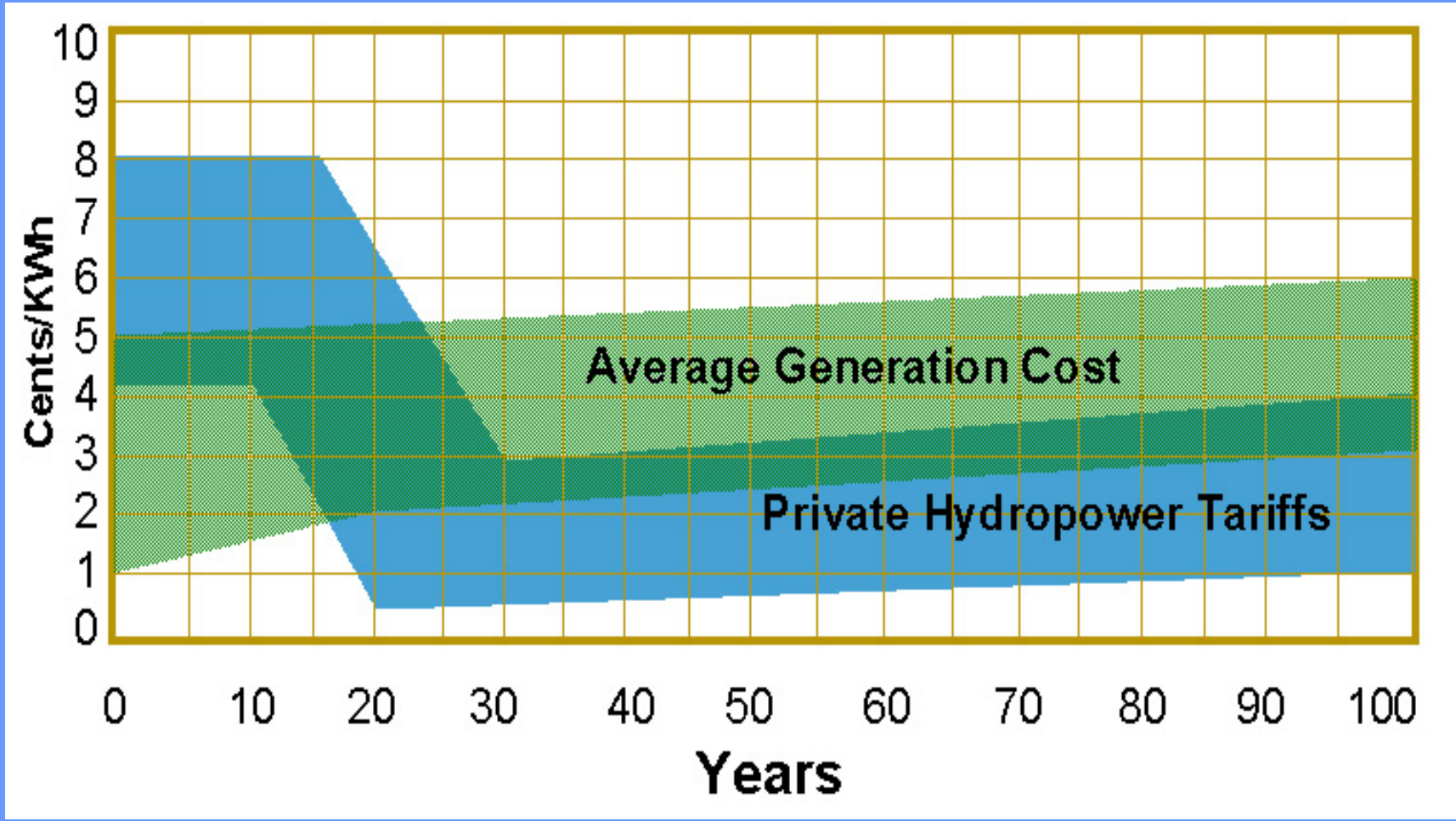


Figure 1 **High tariffs in the first 10-20 years** of operation can deter private investment in hydropower

Figure 1 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 MW 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-Saharian Africa	808	**0**	42	0	850
Total	90,255	**5,507**	33,060	4,245	133,067
%	67.8	**4.1**	24.9	3.2	100

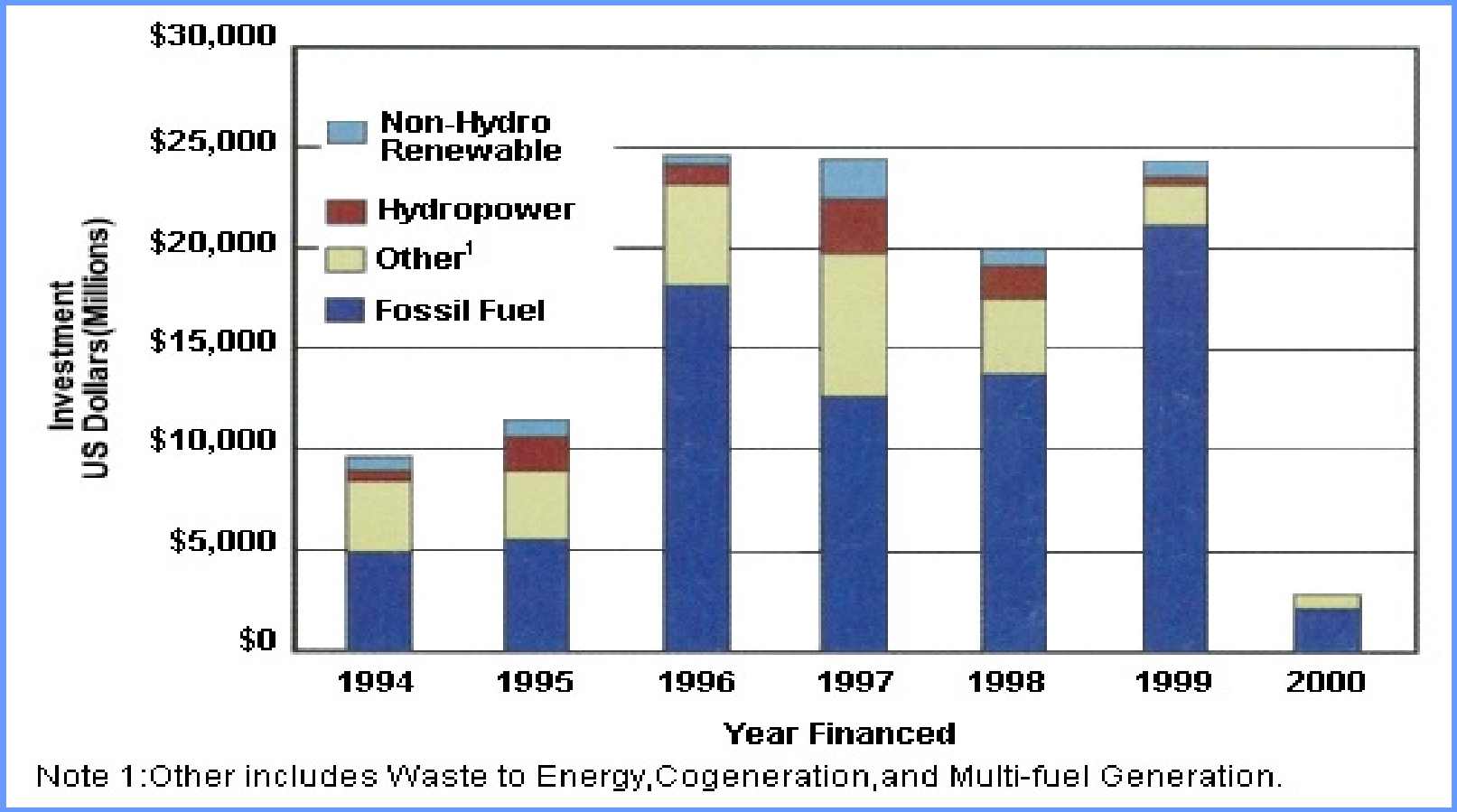


Figure 2 From **1994 to 2000**,international energy investments show that **significantly less investment was made in hydropower compared to many other types of energy.**

Table 2 and Figure 2 document a sharp decline in financed hydropower projects:

1994 ～ 2000: 5057 MW, 4.1% of total electricity

1999 ～ 2000<<1994 ～ 1998(investments in hydropower)

1996 ～ 1999: US$20 ～ US$25 billion (average annual investment in power sector) but very little in hydropower.

for private developers is limited :

US$4.2 billion, 3,133 MW

2) The necessary financing for preparing a hydropower project should be provided, otherwise 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, PPA) etc. still need to be simplified in some countries.**

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.

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, suggestion have been raised by international professionals to explore new ideas and approaches for solving the following critical issues on SHP development(7 suggestions here):

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 PPA (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.**

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(including UN,WB) as well as NGOs 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. 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 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".

Some comparable aspects are drawn from the following issues (5 aspects):

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. 33% investment from private(1908-2000)

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 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, 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. But PPA is still not easy to be reached.**

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.

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.

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”.

1) 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 disordered exploitation of hydro-energy resources in some regions should be altered as soon as possible.**

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.

2) **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.

The monopoly of power management system is the main obstacle for SHP development.

While speeding up the construction of power source, the construction of power grid should be carried out simultaneously.

3) Under the existing power management system, the private power utilities still confront some difficulty.

The power system reform is pushed forward steadily, but slowly, and the reform of ***"separation of transmission from distribution"*** , *"separation of stations from power grid, competitive pricing in grid connection, and separation of transmission for a competitive power supply"* etc.**are 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.

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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Thank you very much for lending me your ears and your attentive listening !!