

## **Future of China's Hydropower: Speeding up development and sustainable development**

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Distinguished guests, experts, ladies and gentlemen,

As we all know hydropower as a quality renewable and clean energy is first choice energy for countries rich in water resources in developing energies. After decades of strenuous efforts in hydropower development China's hydropower development has reached a considerably high level. The relation between hydropower development and environment together with the issue of sustainability have been attracting more and more attention with the further development of China's economy and society. Today the UN Hydropower and Sustainable Development Forum is held in China, providing a very good platform for us for a thorough discussion of the relationship between hydropower and sustainable development, which is bound to have positive effect on China's hydropower development and sustainable development. I'd like to voice my opinion on stepping up China's hydropower development and sustainable development in this speech and I will be more than pleased to share my view with experts and friends in the power industry present at this forum.

### **1 Properly understanding the special position of hydropower in the energy mix and enhancing our awareness of the importance and urgency of speeding up hydropower development.**

#### **1.1 Properly understanding the comprehensive benefits brought about by hydropower development and assessing in an objective and scientific manner the import role hydropower development plays in the sustainable development of economy and society.**

As is known to all hydropower development is a systematic project that has multiple functions and can produce comprehensive benefits. Properly understanding the significant functions of hydropower is the basis of our understanding the important role hydropower development plays in the sustainable development of economy and society. I hold that factors in the following aspects should be considered so as to position hydropower development in a proper way:

First, hydropower, a gift endowed by nature, is a quality renewable and clean energy that should be given first priority when it comes to energy exploitation. Most countries tend to develop and utilize water resources first and do not shift to large-scale exploitation of other energy resources until hydropower is fully developed to some extent. Hydropower development as a pillar industry in countries abundant in water resources is conducive to making full use of and protecting the country's land resources, improving ecological environment and ensuring the sustainable development of economy and society.

Second, hydropower development is an important means of river control. An important reason for China's uneven rainfall in terms of season and region and frequent occurrence of floods is the inadequate comprehensive river control and the absence of control project in the upper reaches of

major rivers. Hydropower development is an important ingredient of comprehensive utilization of water resources. As the middle and upper reaches of major rivers are hydropower basis where water resources are concentrated, developing water resources at the middle and upper reaches of major rivers in combination of flood prevention and river control together with building key controlling water conservancy projects can reduce to a large extent floods and other natural disasters at the middle and lower reaches and can produce multiple benefits such as irrigation, water supply, maritime transportation, trans-drainage areas water diversion and land resource development.

Third, hydropower development is an ecology friendly project that is beneficial for environmental protection. As it is an important part of humankind's undertakings to utilize and transform nature, scientific and reasonable planning in hydropower development is conducive to maintaining harmonious unity between humankind and nature and properly protecting the environment. Developing hydropower can not only avoid the use of or conserve minerals as energy resource but also contribute significantly to lessening pollution caused by the large consumption of coal and oil. Besides, hydropower development will produce zero negative impact on the environment and local climate. On the contrary, reservoirs' accumulating water sources in a large area can help improve local climate in some regions and is also conducive to conserving water and land. Large-scale hydro power plants with strong adjustment function in particular are especially beneficial for enhancing water and land conservation and ecological environment improvement.

Fourth, hydropower development is a project that can produce positive benefits for the society. The benefits of hydropower development are not limited to power generation as it can provide a great number of job opportunities, fuelling the development of local economy, serve the great majority of local residents as well as its contribution to flood prevention, irrigation, maritime transportation, water supply, livestock and poultry breeding and tourism, which has been proved by hydropower development practices home and abroad. Cries for speeding up hydropower development has been long quite loud in China's vast western areas that boast rich water resources and beautiful sceneries but are mostly at the same time remote and backward. Both local governments and residents hope to boost local economy and relieve poverty through construction of hydro power stations.

In short, hydro power is an indispensable and irreplaceable quality energy for humankind's making full use of natural resources, providing service for society, economy and people, and ensuring coordinative development between mankind, nature and society. Hydropower development is thus a pillar industry and an undertaking aimed at public good which are of great social value and benefits and naturally play an important part in the sustainable development of economy and society.

## **1.2 Speeding up hydropower development is the urgent requirement by improving China's water resource utilization efficiency and a crucial strategic choice as required by optimizing China's energy mix and realizing sustainable development.**

First, the reality of China's richness in water resources against its low degree of hydropower development determines the urgency of speeding up hydropower development. China is a vast country with a great number of water systems and great density of major rivers. According to the latest results from the 2001-2004 China water resource general survey, China's water resource storage reaches 689GW in theory, among which developable hydropower installed capacity reaches 402GW. By the end of 2003, installed capacity of hydropower units was only 94.9GW, accounting for 24% of the total installed capacity of 391GW. At present hydropower units' total installed capacity has surpassed 100GW, ranking No. 1 in the world. China's hydropower development degree, however, is less than

25% with hydropower units' total installed capacity of 402GW as the denominator. From these figures we can easily see the wide gap between China's hydropower development level and the world's advanced level. Therefore, speeding up hydropower development is the urgent need of improving the efficiency of China's water resource utilization.

Second, severe energy shortage and unreasonable energy mix makes accelerating hydropower development an irreversible trend. China is now world's No. 1 coal consumer and No. 2 consumer of oil and power only after the United States while China's per capita developable energy storage is far lower than the world's average level. Energy issue will remain a matter of strategic importance that has great impact on China's economic and social development. In China's present energy mix the consumption of fossil resources constitutes the majority of the total consumption. As a result, a great deal of exhaustible fossil resources are being consumed while huge quantity of renewable water resources are flowing without being exploited. Such serious waste in energy exploitation should not be tolerated or continued. Therefore, accelerating hydropower development and being an early bird in water resources exploitation are the urgent and strategic requirement of improving China's resource utilization efficiency, optimizing energy mix and realizing sustainable development.

### **1.3 China already owns the adequate technological strength and sound policies to accelerate hydropower development.**

Since the founding of the New China, particularly since the opening and reform, China has successfully constructed a large number of different types of sophisticated large and giant hydropower stations. There have been a lot of breakthroughs regarding both the construction technology and the management of many projects still under construction, such as power stations in the Three Gorges, Xiaowan, Longtan, Gongbo Gorge, Goupitan, Pubugou, Shuibuya Hongjiadu and Sanjiaxi. This suggests that China's hydropower construction is world-advanced. China's technological breakthrough in the fields of high-dam construction, flood releasing, large-scale tunnel construction, huge metal structures' making and installation and the high slope and groundwork handling together with the obvious improvement in the manufacturing technology of turbines, generation units and supporting equipment demonstrate that China has become the world center for hydropower technological innovation. A mature technology and management model for hydropower development has laid a good foundation for expediting the utilization of water energy. At the same time, the West China Development Strategy and the West-to-east Power Transmission Project which is aggressively promoted by the Chinese governments have also helped expedite hydropower development.

To sum up, given the enormous comprehensive benefit of hydropower development, the need of China's economic and social development, and the advantage of early development, such as lower cost, higher output, and less impact on environment and emigration, I hereby cordially suggest that China should further expedite hydropower development, constantly increase the share of hydropower installed capacity among the total installed capacity, and try to reach a target of a 30 million kilowatts of hydropower installed capacity in the whole nation and 30% share of hydropower around 2025. It is in accordance with both China's rich water energy resources and China's need for sustainable social and economic development.

## **2 The principle of sustainable development is essential for expediting the development of hydropower**

### **2.1 Adhering to the principle of scientific planning, constant development, full utilization and coordinated support**

Hydropower plants, especially large ones, require a comparatively long time to construct. Drainage area cascade development is even more complicated. It is essential to make scientific long-term planning as a precondition. Judging from the current practice of hydropower development, there is still no highly systematic and practical planning to unified hydropower development and the West-to-east power transmission project, though this project has been put in practice for many years. Therefore, it is a key task for us to put more efforts on the planning of hydropower development in order to complete and revise the planning on hydropower development of the major rivers in China.

To develop hydropower in China, it is essential to adhere to the principle of scientific planning, constant development, full utilization and coordinated support. The development should be based on the facts of China's water resources, the feasibility of development and demand in the market. The planning should be scientific regarding the development scale and speed of hydropower stations and their supporting facilities. Need of the national grid, comprehensive utilization of water resources, and ecological and environmental protection should all be taken into consideration at the same time. The planning must be comprehensive, scientific, sustainable and feasible. Special efforts should be made regarding the following tasks: 1) catching the opportunity of the "West Development Project" and the "West-to-east power transmission project" and constructing a number of large hydropower stations which are suitable for development in all aspects; 2) further developing hydropower bases in West China; 3) raising funds and making policies to support the development of strategically important, adjustable and multifunctional hydropower stations to help the comprehensive and cascade development for drainage area; 4) developing small and medium-sized hydropower stations and integrating them as a versatile component into the whole picture of hydropower development.

Preliminary work of hydropower lays the foundation of hydropower planning. Preliminary work requires a lot of time and efforts. Poor preliminary work is restricting China's hydropower from even faster development. It is essential to increase the input on preliminary work and improve its management system. A competitive mechanism can be introduced to the reconnaissance and design of hydropower. When the need for hydropower development is completely met, adequate reserve on preliminary work is required to guarantee rapid, healthy and sustainable hydropower development.

### **2.2 Adhering to the principle of a win-win solution for both hydropower development and environmental protection**

Hydropower development is a systematic project with a lot of aspects involved, such as emigration, environmental protection, and soil and water conservation. Apart from adhering to the principle of both full utilization and sustainable development, the planning of hydropower development should adhere to the principle of a win-win solution for both hydropower development and environmental protection. Efforts should be made to maximize the benefit of hydropower and minimize its detriments to serve both the country and the people.

The development and utilization of water energy resources is generally beneficial to the environment. However, depending on the region, drainage area and project, there can be certain impact. Assessment on environmental impact by hydropower development should adhere to the

principle of comprehensiveness, objectiveness and science. With expediting hydropower development and problem solving by development as a precondition, both positive and negative impacts on environment by hydropower development should be taken into account. On the one hand, the negative impact on the ecological environment and reservoir area resettlers should be minimized by scientific planning, design optimization and effective engineering. On the other hand, the positive impact should be maximized on water transportation, flood prevention, irrigation, water supply, tourism development, and soil and water preservation. Thus, the harmony with the eco-system and the environment can be proactively kept, and a win-win result to both hydropower development and environmental protection can be achieved.

China's water resources are mainly concentrated in the vast western region where hydropower development is an important means of fuelling the development of local economy and of poverty relief but also an effective measure to rectify the damages to the environment caused by bad weather or irrational development in the western area. Therefore, accelerating hydropower development in the western area is beneficial for both the country as a whole and for the local people. Apart from large-scale hydropower stations as key electrical sources developed by the country with special emphasis, regional middle and small hydropower stations also deserve active development. Developing small and medium-sized hydropower stations can help satisfy the demand for power by local economic development and further promote the development of local economy and improve people's living standards as well as providing a great number of job opportunities.

### **2.3 Adhering to the principle of comprehensive drainage area cascade development.**

More than 20 years of hydropower development practice since the reform and opening up to the outside world, a mechanism of comprehensive drainage area cascade development has gradually come into being. Such a mechanism is conducive to arousing all concerned parties' enthusiasm to develop hydropower, to saving investment, enhancing management, shortening the development process and to planning as a whole accessing system and delivery design. Therefore it is justifiable to say that such a mechanism can help bring about maximum comprehensive benefits of hydropower development.

When deciding on development manner, scale and order of cascade hydropower stations we must make an all-round analysis encompassing various factors like geological location, adjustment function, scale of installed capacity, relation between upper stream and down stream and demand for power. Such planning should also go with the development planning of the grid where a drainage area belongs. The construction of large-scale hydropower stations with obvious adjustment and compensation functions in particular calls for systematic, orderly and coordinative planning with a drainage area viewed as a whole so as to maximize the adjustment benefit and drainage area comprehensive benefit.

Take Wujiang Hydropower Development Corporation Ltd., a share holding subsidiary of China Huadian as an example. Wujiang Hydropower Development Corporation Ltd. is the first basin hydropower development corporation established in 1992 by the approval of state council. In accordance with development guiding principle of "basin based, cascade based, rolling development based and comprehensive development based" and the mode of integration of construction and management, Wujiang Hydropower Development Corporation Ltd., by using the earnings and part of depreciation of the completed Wujiangdu hydropower station and Dongfeng power station as the capital, carry out rolling development. During the period of its development, shareholders promised that all earnings should be put into rolling development, which solved the problem of lacking of

capital fund. With the newly built units put into operation, the “rolling snow ball effect” can be seen and promoted the development of hydropower. At present, in Wujiang basin area, the situation is as follows: one basin corporation is developing four hydropower stations simultaneously, at the same time greatly boosting economic development and environment improvement of regions to which the drainage area belongs and even of Guizhou as a whole. And Wujiang Hydropower Development Corporation Ltd. has found the new model of self-development, rolling development, fueling local economy and comprehensive benefits.

#### **2.4 Adhering to the principle of suiting measures to local conditions and timing conditions**

As far as energy development concerned, there shall be corresponding development strategy and plans according to different countries, different areas, different energy structures and different development stages. At present and from a long-term point of view in China, the problem of China’s power distribution and structure lies in the follows: China depends too much on coal while for certain reasons it takes a rather long time to develop other advanced, clean energies such as nuclear power and wind power. Consequently, what we should do right now is to start as soon as possible speeding up the development of hydropower which shall benefit both the energy and environment protection. To develop hydropower, the principle should be adhering to suiting measures to local conditions and timing conditions, treating differently and speeding up the promotion.

For the rivers suitable for basin development, the projects shall be initialized after the environmental protection evaluation conducted in a comprehensive, objective and scientific manner. It should be intensified to have a multi-win comprehensive planning of energy, water conservancy, environmental protection, economy and society and to carry out the plan stage by stage in long-term, mid-term and long-term, which can benefit the development of social economy. For the rivers whose basin development may produce a lot of negative influence on resident allocation, environmental ecology, historical relics and natural scenery, survey and demonstration should be further carried out and measures shall be taken to reduce the negative influences. The solution shall be found and the development is ought to be scientific, rational and reasonable. Overdue long-time argumentation needs to be avoided to avoid missing the opportunity.

### **3 To speed up the development of hydropower, a mechanism of market linkage shall be established and the corresponding policies shall be perfected**

With the development of social economy and the deepening of power sector reform in China, the system of hydropower development needs to be perfected. A mechanism of market linkage shall be established and the corresponding policies shall be perfected so as to speed up the hydropower development and to promote the sustainable development of the society.

#### **3.1 To establish and perfect the mechanism of diversified investment and to make the policy of sharing the investment in light of beneficiary**

The involvement of different parties should be encouraged to develop hydropower and the interaction among the country, enterprises and locals should also be formed. The establishment and perfection of investment mechanism is by every means very important. From the point of view of state strategy, state shall control the water project on important rivers and the investment and development of this kind of river shall be done mainly by state-owned corporations to maintain the sole investment or sharing holding by state. The development of medium and small-scale hydropower, the diversified

investments should be encouraged and to attract investment by local government and private persons, which shall play an active role on investment in hydropower, speed up ing the construction of hydropower, benefiting local interests and promote social beneficial results.

Hydropower projects benefit not only power generation, but also flood control, water supply, breeding, and tourism. It is very important to make the policy of sharing investment in hydropower development. According to the principle of the investor is to be the beneficiary, the investment shall be shared by the corresponding areas and departments. Especially the sum for the flood control, which is the kind of public welfare, can be shared by state, by departments and by areas according to the sum of their beneficiary. The establishment of the system of rational and reasonable sharing is of great importance to the promotion of hydropower development and the realization of comprehensive benefits of hydropower.

### **3.2 To enhance the coordinated development of power grid construction and hydropower development, optimize and give priority to the dispatching of hydropower and take full advantage of hydropower**

With the deepening of power sector reform and the formation of segregation of power plant and power grid, the main investment body can be identified for the investment of power sources construction and power grid construction. State has also made it clear that the transmission of power shall be responsibilities of power grid corporations. Under this situation, more emphasis shall be put on the coordinated construction of power sources and power grid to guarantee the safety of power transmission and power supply. Consequently, state should further clarify the unified planning and coordinated development of power sources and power grid for the development of basin development of large rivers.

It is a basic principle to optimize and give priority to the dispatching of hydropower. The development of hydropower shall be open, fair and square. The priority of taking advantage of hydropower needs also to be enhanced and to combine power grid dispatching and basin cascade dispatching. In light of the dispatching principle of “basin-trans-basin-trans-region”, taking full advantage of adjustment function of hydropower, the optimization of comprehensive usage of hydropower can be realized. Meanwhile, by means of trans-basin dispatching and trans-regional dispatching, the process of “power transmission from western China to eastern China, mutual supply between northern China and Southern China and nationwide power grid interconnection” shall be speeded up to facilitate the development and usage of hydropower.

### **3.3 To establish as soon as possible the fair and favorable hydropower pricing policy**

Hydropower development is no doubt a huge investment project with multiple functions of bringing about social benefits, fuelling local economy, protecting the environment and benefiting local residents. Therefore, accelerating hydropower development calls for not only establishing as soon as possible the investment dispatching mechanism but also fair and favorable policies as a guaranteeing precondition. Unfortunately the existing pricing mechanism is not fair nor favorable for hydropower so it is no longer good for the vigorous promotion of hydropower development. With the perfection of power market, tariff to grid shall be transformed to the mode of “tariff preset, cost reduced and return differentiated”. The two-way tariff, peak-valley tariff and high-flow and dry season tariff are doomed to be carried out.

The two-way tariff means that the tariff consists of capacity tariff and volume tariff. The capacity tariff is considered and the characteristics of hydropower can be reflected by doing so. The day-of-time tariff and seasonal tariff can be applied in two-way tariff. The day-of-time tariff and seasonal tariff consist of peak-valley tariff and high-flow and dry season tariff.

### **3.4 To stipulate the policy of value-added tax of hydropower**

According to the existing tax policy, compared with the value-added tax of primary energy, hydropower is 17%, oil and natural gas is 10.20%, coal industry is 8.08%, wind power is 8.5%. And it easily be seen that hydropower is experiencing the highest tax in energy industry. In order to speed up the development and take advantage of hydropower, the value-added tax of hydropower shall be reduced appropriately, say, the value-added tax of hydropower can be levied at 17%, then the 6%-8.5% of that sum can be returned by government according to its production type.

## **4 China Huadian Corporation is willing to contribute to speeding up the development of hydropower.**

China Huadian is a large state-owned power generation corporation, which shoulders the responsibility of adjusting and optimizing the energy structure and speed up the development of power sources construction in China. Guided by scientific developing concept, China Huadian is willing to contribute to speeding up the development of hydropower. Based on emphasizing the rolling development of Wujiang river basin, we are to enhance the investment at preparatory period and involve actively in the development of the other large rivers.

The cascade development of Wujiang River is now at a key stage. In 2003, two units of Wujiangdu hydropower station extending project was put into operation ahead of schedule. Hongjiadu hydropower station shall have three units put into operation this year. In addition, Suofengying hydropower station and Goupitan hydropower station are to have the first unit put into operation in 2005 and 2009 respectively. Wujiang Hydropower Development Corporation Ltd. is actively promoting the preliminary preparatory works of Silin hydropower station, Shatuojiang hydropower station and Qingshuihe basin, Wujiang tributary, the construction of which shall be started in 2005 and 2006 respectively. Our target is as follows: The cascade development of Wujiang main stream in Guizhou province shall have been completed by the year 2011, the total capacity installed shall have reached 8500MW. By doing so, the small-scale hydropower station of Wujiang tributary and other river basin may be driven to be developed. By 2015, the total installed capacity shall have reached 10GW and Wujiang basin shall be identified as the hydropower base and energy base in southern China.

While emphasizing on the development of Wujiang basin rolling development, China Huadian is to make great effort in the preliminary work of developing other rivers in China and to develop rivers suitable to be developed scientifically and reasonably to make hydropower resources serve social economy sooner.

At present China Huadian Corporation together with its partners is aggressively progressing in preliminary work of hydropower projects in the middle reaches of Jinshajiang River, Nujiang River and other regions under the coordinated guidance of state government bodies responsible for macro control, including feasibility argumentation of development and environmental protection planning, promoting design and necessary preliminary preparatory work.



China Huadian is also keeping close track of international develop trend of hydropower. On one hand China is promoting local hydropower projects in cooperation with their local partners in some foreign countries and regions and other hand is more than pleased to promote cooperation with domestic and foreign enterprises concerned in capital and technology in developing domestic large and super-large hydropower projects.

Distinguished guests, ladies and gentlemen, To speed up the rich water resources development and its usage in China and to change the existing situation of “one river runs to the east with all the coal and oil”, which means that we now mainly depend on coal and oil energy answer the call of economy development in China. It is decided by optimizing energy structure in China. It is the responsibility of working staff of hydropower in China. Making the running river endless energy and making the beautiful rivers more beautiful while constructing hydropower projects is now both the expectation of people and the way of building stronger china. Let us contribute more to speeding up hydropower development and promote the sustainable development of social economy by the guidance of scientific developing concept.

Thank you!