

Function of the United States Federal Government in Hydroelectric Development and its Inspiration for China

Zhi LI^{1,a,*}

¹School of Public Administration, Hohai University, No. 1, Xikang Road, Nanjing, Jiangsu, China, 210098

^alzhume1210@gmail.com

*Corresponding author

Keywords: Tennessee Valley Authority, *Endangered Species Act*, Watershed management, Environmental impact assessment

Abstract: At present, the hydroelectric development shall consider both economic benefit and ecological efficiency, and the United States Federal Government has its unique experience in balancing the two. Chinese government can refer to the administration mode of Tennessee Valley Authority and establish integrated watershed management organization, so as to carry out the comprehensive development for hydropower. On the other hand, it can also refer to the experience and practice of the United States Federal Government in protecting endangered species act, so that China's environmental protection administration can get involved in the hydroelectric development truly and essentially, and environment impact assessment can become a significant link in hydroelectric development.

Introduction

According to the statistics of year 2003 of Chinese National Committee on Large Dams, the average exploitation of hydroelectric resource in developed countries is above 60%, among which, America is about 82%, Japan 84%, Canada 65%, Germany 73%, France, Norway and Switzerland above 80%.[1] As a developing country, China is only 35%, which is far behind the western developed countries, and it still has a huge hydroelectric development potential. Furthermore, in the report to the Eighteenth National Congress of the Communist Party, it proposes to promote the ecological civilization construction explicitly, 'to protect the ecology positively, and to step towards a new age of ecological civilization'. Consequently, China shall not only develop hydroelectric resource to promote the economic development, but also respect and protect the ecology in hydroelectric development, thus to realize the harmonious coexistence of human and nature. In this paper, how does the United States Federal Government give considerations to both in hydroelectric development and its inspiration for China will be analyzed.

Comprehensive hydroelectric developer in the United States

The United States Federal Government is the main producer of America's hydropower. According to the *Catalogue and Statistics Report of Year 2002* released by American Public Power Association, the hydropower installed capacity of the United States Federal Government is 40787 M, ranking the first, while the hydropower installed capacity of other organizations is: private sector 27626MW, public sector 20202 MW, and cooperative agency 1184KM.[2] Besides, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation and Tennessee Valley Authority are the main hydropower developers of the United States Federal Government. At present, the Army Corps of Engineers takes charge of 75 hydropower plants[3], Bureau of Reclamation has 58 hydroelectric facilities[4], and Tennessee Valley Authority runs 29 hydropower stations[5]. The generated energy of the three organizations also ranks the top three among the main hydroelectric producers in America (data of 2002)[6]. The United State Federal Government pays much attention to the comprehensive development during the hydroelectric development process. For instance, the main objective of the initial establishment of Bureau of Reclamation is to develop the water resources in

17 states of the western America, and it sells cheap electricity to each state of America, which greatly promotes the economic development and people's living standard in each state in the west. Army Corps of Engineers was authorized to carry out hydroelectric project development in the 1920s, which also greatly promoted the economic level in its drainage basin. Comparatively speaking, the comprehensive hydroelectric development of Tennessee Valley Authority is the most characteristics.

At first, the unique organizational setting is a premise of the comprehensive development of Tennessee Valley. Since the drainage basin of America's hydroelectric development usually covers several states, and each state will develop independently, it is difficult to make use of the hydro-power resources in the basic, and furthermore, it may result in the conflicts of hydroelectric development. But if it is dominated by the United States Federal government, it can consider comprehensively and conduct integrated development. Since America is a country with federal system, and there is an explicit division of power between the federal government and state government. Besides, water resource ownership is governed by each state, and federal government cannot use it freely. Therefore, in order to conduct hydroelectric development, federal government shall be endowed with development right. In 1993, United States Congress approved *Tennessee Valley Management Act*, which endows the Tennessee Valley Authority with the mission: 'representing the federal government to manage the complete natural resources in the basic, and solving various problems encountered in the resource development and savings, so as to control the flood, improve the shipping, provide electricity, protect the environment, promote regional economic development and enhance people's living standard to a maximum extent.' [7] In order to realize the mission, *Tennessee Valley Management Act* endows Tennessee Valley Authority with the land expropriation and transfer right, river development right, electrical production and sales right, electricity pricing right, bond distribution and debt repayment, financial management and income distribution right, etc. To exercise these rights fully, Tennessee Valley Authority is set as a unique organization 'combining government function and enterprise management. It is a primary organization of the federal government, funded by the Congress directly and responsible for the president directly, as well as an economic entity, with the flexibility of private enterprises. Just owing to the uniqueness of function set, Tennessee Valley Authority can carry out planning, development and management in specific basic, and cooperate with the local government, thus to realize the cross-regional comprehensive hydroelectric development.

Secondly, the unique development is a guarantee for the comprehensive hydroelectric development in Tennessee Valley. It is well-known that besides the electricity generating function, it can also prevent flood, supply water, transport and even drive the local economic development. Therefore, the evaluation of a certain hydroelectric project should not only focus on the electricity generation function, but also pay attention to its promotion of social effect and regional economic development. Tennessee Valley Authority shall carry out cascade development for the basic according to the mode 'with overall planning and by-step implementation, driving downstream small reservoirs with the upstream large reservoirs, and taking advantage of various favorable factors comprehensively to maximize the profit', and it finally becomes an example of successful basic development. Before the overall development, it took three years for Tennessee Valley Authority to conduct planning for the basin and make a series development construction plans. However, during the development process, in order to reach an optimal effect in hydroelectric development, cascade development is implemented. Among the 50 large dams administrated by Tennessee Valley Authority, many large dams are not used to generate electricity, but to store water for preventing flood and enhance the potential energy accumulation required by the hydropower, so as to increase the electric energy production of the downstream dams. In addition, Tennessee Valley Authority also pays attention to the combination of flood prevention, water consumption, shipping and entertainment, for driving the economic development. Tennessee Valley used to be one of the poorest regions in America, and its annual per capita income was only about 100 USD, accounting for 45% of the national average amount. Within the basin, 62% of the agricultural population and 12% of the industrial population live in poverty. Tennessee River was called 'Demoniac River' and

‘destroyer of life and property by people.[8] The hydroelectric project development of Tennessee Valley Authority changes the living condition of residents. For instance, in Alabama, Tennessee Valley Authority provides substantial electricity for the emerging iron and steel plant, as well as the aluminum plant, which enables it to get rid of the long-term poverty and to become the most prosperous region in this state.[9]

Conservationist of hydroelectric development in America

After the 1950s, environmental protection grew to be a significant problem focused by people. Just since it fails to reach the requirements of ecological environmental protection, the hydroelectric development in some countries is quite slow. For instance, at present, India only develops 30% of its hydroelectric resources, and about 7% is being planned, designed or constructed, but more than 60% of the hydroelectric resources are not developed yet. It is the ecologic factor that is restricting the hydroelectric development of India. Ever since the 1960s, America’s environmental protection movement rose, and people’s consciousness of environmental protection was enhanced, which promoted related legislative work. United States Congress passed *Clean Air Act* (1963), *Water Quality Act* (1965), *National Environmental Policy Act* (1969), *National Environment Improvement Act* (1970), *Endangered Species Act* (1973), etc. successively. In order to supervise the hydroelectric project and strengthen the protection of ecological environment, the United States Federal Government establishes a lot of practical and feasible systems and practices according to these laws, among which, the negotiating system and license system established for protecting the endangered species are the most typical.

As mentioned previously, the United States hydroelectric projects consist of federal hydroelectric project and non-federal hydroelectric project. In federal hydroelectric project, negotiating system is mainly implemented for protecting the endangered species. According to the second article of the seventh chapter of *Endangered Species Act*, any federal organization must negotiate with the Interior Ministry, Ministry of Commerce or Ministry of Agriculture, to guarantee that projects authorized, funded or implemented by federal government shall not endanger the existence of species, destroy or change the inhabits.[10] Consequently, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation and Tennessee Valley Authority shall be responsible for negotiating with the Fish and Wildlife Service of the Interior Ministry to protect the land animals and Freshwater Fishes before hydroelectric development, thus to guarantee that the protected animals are on the list. If there are such kind of animals, ecological evaluation shall be carried out before official development. If it is believed that the species may be impacted according to the ecological evaluation, it shall be negotiated with the expert authority. After negotiation, the expert authority must submit a piece of written materials demonstrating its opinions, or propose the substitutable plans. In practical development process, the United States hydroelectric project usually follows suggestions from the United States Fish and Wildlife Service for protecting the endangered species. For instance, when developing Missouri River, U.S. Army Corps of Engineers followed suggestions from the expert group of the United States Fish and Wildlife Service Center, and built 485 hm² shallow water habitat for a kind of sturgeon included as the endangered species by federal government.[11] If there are no substitutable plans, the project organization has to cancel the project. Of course, it can also turn to Endangered Species Committee for seeking exemption. The Endangered Species Committee has the right to endow exemption when major federal plan or behavior is prevented by *Endangered Species Act*. However, the committee is quite cautious for the exemption of hydroelectric project, and till now, it only holds four meetings.

However, for non-federal hydroelectric project (hydroelectric projects developed by the public utility corporation owned privately, public utility corporation and cooperation), negotiating system and licensing system are mainly implemented, which will be monitored by Fish and Wildlife Service and Federal Energy Regulatory Committee, to see if it is responsible for protecting the endangered animals. The Federal Energy Regulatory Committee is mainly responsible for releasing and changing the operation license of hydropower. But non-federal hydroelectric project shall also negotiate with Fish and Wildlife Service before applying for license from Federal Energy

Regulatory Committee, thus to guarantee if there are endangered species, and if there are, what kind of measures shall be taken for protecting the endangered species. Only after receiving the permission from Fish and Wildlife Service, can it submit detailed application form to the committee, including the descriptions about the impact of project development on the wildlife, as well as the specific measures for alleviating impact, protection and improvement. Aiming at the content of this report, Federal Energy Regulatory Committee will hire related experts, such as fish biologist, wildlife biologist, botanist, etc. to evaluate. And then, the Federal Energy Regulatory Committee will raise related requirements, while the applicant must make commitments. The procedures of applying renewal is nearly the same as the procedures of certificate handling for new projects, which requires three stages, including pre-stage negotiation, preliminary examination and environmental review. Besides, the protection of endangered animals is a significant inspection content. In November 1997, the Federal Energy Regulatory Committee refused the license renewal of an old hydropower station in Maine, and required it to remove related hydraulic structures for protecting the migration of fishes.

Inspirations for China

At present, the drainage basins in China, such as Wujiang River, Lantsang River, Ya-lung River, etc. are mainly developed and operated by a certain company. For instance, Ya-lung River Hydroelectric Development Co., Ltd. is mainly responsible for the hydropower resource development, as well as the construction and management of cascade hydropower station, mainly the hydroelectric generation, according to the authorization of National Development and Reform Commission and National Energy Administration.[12] However, it is difficult to reach the objective of 'integrated' development, for 'integrated' development requires the coordinated development and management of every aspect of the social and economic environment, as well as the extensive power obtained by the developing subjects. However, at present, the general power of the developing subject is too small. Actually, there are quite a lot of problems about the management subjects in the current basic management. Horizontally, forestry, land, transportation, electricity and water conservancy departments execute management right independently, while horizontally, each administrative region has certain management right. It can be said that at present, China's drainage basin is in a state of 'block management, and manage in its own way'. Consequently, conducting overall planning and management for a complete unit is a premise of the comprehensive hydroelectric development. In order to realize the comprehensive management of basin, the experience of Tennessee Valley Authority shall be referred. Furthermore, compared to America, China is superior in establishing the independent organization like Tennessee Valley Authority, for it is a socialist country implementing unitary system. Since socialist system is implemented, it is explicitly ruled in the ninth article of *Constitution* that 'Mineral resources, waters, forests, mountains, grassland, un-reclaimed land, beaches and other natural resources are owned by the state, that is, by the whole people, with the exception of the forests, mountains, grassland, un-reclaimed land and beaches that are owned by collectives in accordance with the law. According to the third article of China's *Water Law* 'Water resources shall be owned by the state, that is, by the whole people, and it shall be executed by the State Council', rules about that natural resources like water belong to the country provide legal guarantee for the comprehensive development of hydropower by the central government. Furthermore, the structural form of state with unitary system endows the central government with huge power, and local government must follow the orders from central government, which provides system basis for the comprehensive hydroelectric development. Specifically, as for the setting of organizations, it should establish powerful management agency like Tennessee Valley Authority, and endow it with coordinating function and practical function. The management rights of each administrative region, such as the water conservancy, electricity, land and transportation, etc. shall be combined for implementing the unified planning management and operation right.

Of course, the establishment of basic management agency with strong independency does not mean that it can do anything it wants, and each management organization shall also obey the

specific rules concerning the ecological environment protection. But what is a pity is that related environmental protection administration fails to undertake the responsibility of environmental protection. Firstly, the environmental protection department has not compulsory execution right endowed by the law, and it cannot implement effective supervision for environmental protection. ‘according to related data released by the State Environmental Protection Administration, the segmented department, discrete space, thick administrative color and high management cost usually makes it difficult for Chinese government to carry out the supervision of hydroelectric development, which greatly reduces the effect of constructing water conservancy project.’[13] Secondly, environmental protection department fail to get involved in the hydroelectric development process. According to the rules in *Environmental Impact Assessment of the People’s Republic of China*, environment impact evaluation shall be conducted for any hydroelectric project. However, in reality, a lot of hydroelectric development projects determine the project first and conduct evaluation later. Environmental impact assessment is usually conducted by the project construction unit or related agency entrusted by the competent department, and environmental impact evaluation is of significant meaning in procedures. In order to give full play to the environmental impact evaluation in hydroelectric development in China, it can refer to the practice of the United States Federal Government in protecting the endangered species. Since America stipulates explicitly the mutual relation, rights and obligations of federal government in protecting endangered species, it has strong operability. Aiming at the hydroelectric project, before the beginning of the project, experts shall be organized by environmental protection department to carry out investigations for the regions conduct evaluations for the impact on ecology, species and environment, and propose suggestions. The hydroelectric project shall put forward specific implementation plans according to the suggestions, and carry out hydroelectric project officially after obtaining the permission from environmental protection department. Of course, considering the urgent demands of hydroelectric development in China, the exemption system implemented in protecting the species in America can be introduced, for giving exemptions for the large hydroelectric projects. Certainly, it should be implemented strictly for preventing it from being abused, and make the environment impact assessment invalid.

In conclusion, by referring to the practices of U.S. Federal Government during the hydroelectric development process, it will reach the comprehensive effect, promote the social and economic development in places surrounding the drainage basic and improve people’s living standard on one hand, while on the other hand, it can protect the surrounding environment and ecology, and realize the objective of green hydropower, so as to realize the balance between economic development and ecological protection.

Reference

- [1]Chinese Society of Hydroelectric Engineering, etc. Inspiration of Foreign Hydroelectric Development for China [J]. 2001 (5). 34-43.
- [2]Mark R. Stover etc. translated by Zhao Jianda, etc. American Hydroelectric Development [J]. Small Hydropower, 2005 (4). 7-16.
- [3]Committee on Hydrologic Impacts of Forest Management. Hydrologic Effects of a Changing Forest Landscape[M]., National Academies Press, 2008:146.
- [4] Bureau of Reclamation Hydroelectric Power Plants Listed By Name [EB/OL]. <http://www.usbr.gov/power/data/fac/name.html>
- [5]TVA Reservoirs and Power Plants [EB/OL]. http://www.tva.gov/sites/sites_ie.htm
- [6]Major Producers of Hydropower in the United States [EB/OL]. <http://www.usbr.gov/power/edu/majprod.html>
- [7]Tang Zhengsheng, Sun Rongbo, Pan An, Characteristics of the Tennessee Valley Management

System [J]. Water Resources & Hydropower of Northeast China, 2000(5):52-53.

[8]Yan Yongyu, Development of Tennessee Valley in America [J]. Study on Natural Resources, 1983 (1): 75.

[9]Xu Zhenwei, Tennessee Valley Authority and American Regional Development [J]. History Teaching, 2010 (24): 64-70.

[10]Fu Lu, Requirements of America's *Endangered Species Act* on Federal Organization [J]. Environment Protection of Inner Mongolia, 2003 (2): 6-10.

[11]Ma Yuaning, Disputes Caused by the Plan of Governing Missouri River of the Army Corps of Engineers [J]. Express Water Resources & Hydropower Information, 2005 (2): 28.

[12]Announcement of the Renaming of Er'tan Hydroelectric Development Co., Ltd. [EB/OL]. <http://www.ehdc.com.cn/new/notice.htm>

[13]Institute for Urban and Environmental Studies Chinese Academy of Social Sciences, China Environment and Development Review [M]. Beijing; Social Sciences Academic Press, 2004: 25.