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# The status quo analysis and policy suggestions on promoting China's hydropower development

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## ABSTRACT

Hydropower is known as a typical renewable energy with maturely developed technology as well as large-scale exploitation. The average hydropower exploitation has exceeded 60% of the total resources in developed countries. With plentiful water energy and an exploitable hydropower of 542 million kW h, China ranks the world's first of hydropower resources. By the end of 2012, the installed capacity of China's hydropower had reached 249 million kW h, accounting for 46% of total exploitable amount. Due to the gradual deficiency of fossil energy and serious concern of environmental protection, hydropower was defined as one of the key power sources for the power industry development during the 12th Five-year Plan Period. However, owing to the influence of project approval system, relocation policy, on-grid price, taxes and development costs, China's hydropower development still did not achieve the expected target during the 11th Five-year Plan Period. To overcome the current challenges and promote a rapid and sound development of the industry, it is necessary to comprehensively carry out investigations on the systems, working procedures and protective policies for hydropower development at the state level.

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## 1. Introduction

Hydropower is clean and renewable. Technically, it is the only clean energy source that can be commercially developed on a large scale at present. Furthermore, it accounts for about 20% of all electricity generated in the world and is utilized in more than 150 countries. Even in developed countries, the average hydropower exploitation has reached up to 60% of the total resources, with about 82% hydropower resources exploited in the US, about 84% in Japan, 73% in Germany, and over 80% in France, Norway and Switzerland [1]. China has an exploitable hydropower of 542 million kW h, which ranks the first place all over the world. Nevertheless, China's hydropower installed capacity only accounts for 46% of the total exploitable amount [2].

In China, the operation and management of hydropower remain ineffective to some degree. There still are some challenges and restrictions, such as the lack of sufficient scientific understanding and effective coordination mechanism, unreasonable on-grid price etc., which impedes China's hydropower development reaches the expected speed during the past 11th Five-year Plan Period. The public hold different opinions to hydropower development, especially to its influences on ecological environment. The increasing difficulty in relocation, requirements in environmental protection, competitions among exploitation enterprises and benefit claims of local government bring new challenges to hydropower development. Because of those challenges, the development costs of hydropower have been rising continuously. Moreover, as a sort of renewable energy, hydropower industry does not enjoy the same preferential policies as other renewable energy. On the contrary, it is heavily taxed and the generated electricity is sold at a very low on-grid price. Particularly, the construction cost for medium- and small-sized hydropower stations is unreasonable. All these factors have become considerable barriers to the development of hydropower [3].

On the background of growing shortage of fossil energy, hydropower was defined as one of the key power sources for the development of power industry during the 12th Five-year Plan Period. Active development of hydropower is of great significance for China's efforts in climate change response, energy-saving and emission reduction, energy safety, comprehensive utilization of water resources and Western Development. According to China's energy development plan during the 12th Five-Year Plan Period, China's installed hydropower capacity will be increased from 220 million kW h (in 2010) to 290 million kW h by 2015, with an annual growth rate of 5.7% [4]. By the end of 2011, China's installed hydropower capacity reached 230 million kW h. According to incomplete statistics, China's new installed hydropower capacity reached 13,150 MW in 2012 [5,6]. In the upcoming three years, China will increase the hydropower capacity by 16,000 MW. The research on state-level strategies about hydropower development systems, mechanisms, working procedures and protective policies will greatly promote the rapid and sound development of China's hydropower industry. This paper introduces the development of hydropower in Sections 1 and 2, and the proposed problems and recent policies in Sections 3 and 4, respectively. Section 5 gives

some suggestions on promoting hydropower development and a brief conclusion is made in Section 6.

## 2. Distribution and development status of China's Hydropower Resources

### 2.1. The status quo of hydropower resources

Because of its vast territory and numerous rivers, China boasts abundant hydropower resources. According to the Aggregate of Confirmed China's Hydropower Resources issued by the National Development and Reform Commission in 2005, there are 3886 rivers with a theoretical hydropower storage of more than 10 MW in the mainland of China. China's hydropower ranks the world's first in theoretical storage, technical exploitability and economical exploitability [7].

### 2.2. Distribution characteristics of hydropower resources

China has plentiful hydropower resources with impressive distribution characteristics as follows.

Firstly, the regional distribution is rather uneven. In general, hydropower resources are considerable in southwestern China while very limited in eastern China. According to the statistics of technical exploitable capacity (Fig. 1), the hydropower resources in the 12 western provinces, autonomous regions and municipalities account for 81.46% of the national total such as Yunnan, Guizhou, Sichuan, Tibet, Chongqing, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang, Guangxi and Inner Mongolia. In central China, eight provinces account for 13.66%, namely Heilongjiang, Jilin, Shanxi, Henan, Hubei, Hunan, Anhui and Jiangxi. While the share of the 11 eastern provinces and municipalities, i.e. Liaoning, Beijing, Tianjin, Hebei, Shandong, Jiangsu, Zhejiang, Shanghai, Guangdong, Fujian and Hainan is merely 4.88%. The uneven distribution of hydropower resources and imbalanced regional economic development make the West–East power transmission project necessary [8].

Secondly, great rivers are the main sources of hydropower resources. China's hydropower resources mainly lies in the 13

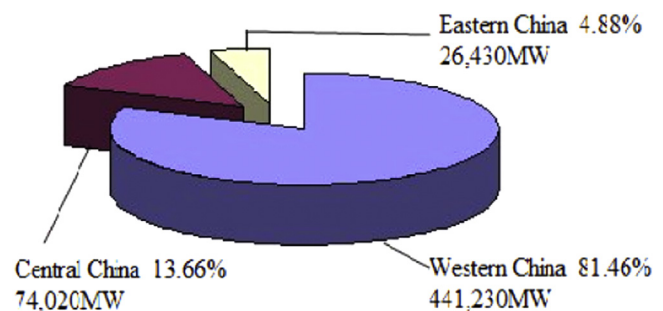


Fig. 1. Regional distribution of technical exploitable capacity of China's hydropower.

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