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Review of renewable energy industry in Beijing: Development status, obstacles and proposals



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ABSTRACT

Beijing is the capital of China, serving as the center of China's politics, culture and education. The exploitation and utilization of renewable energy has become an important developmental carrier for Beijing, which is also a key channel for optimizing energy consumption structure, building a high-efficiency and low-carbon energy system, relieving the environmental pressure and ensuring the energy secure of Beijing. In this paper, Beijing's renewable energy industry was analyzed. First, Beijing's renewable energy resources, which include biomass energy, solar energy, geothermal energy, wind energy and hydro energy, were introduced from two aspects of energy resource distribution and energy resource utilization. Second, the development status of Beijing's renewable energy industry (including biomass, solar and wind energy industry) was expounded. Then, the obstacles of Beijing's renewable energy industry were analyzed. Finally, some proposals for the healthy development of Beijing's renewable energy industry were put forward, which will contribute to build a clean, safe, efficient and low-carbon energy system for Beijing.

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1. Introduction

Energy is a necessity for the survival and development of a city, which is also the basic guarantee for the normal operation of a city [1]. The level and quality of energy supply in a city play a vital role in its economy development, people's living standards enhancement and ecological environment improvement [2,3]. Beijing city is the capital of China, serving as the nation's political, cultural, and educational center. Along with the development of social economy and people's living standard, the demand for energy continues to rise in Beijing. In 2012, the total energy consumption in Beijing has reached to 71.777 million tons of standard coal equivalent (tce), which is 2.5 times that in 1990 [4]. Currently, Beijing is facing a serious shortage of energy resources, and the energy external dependency degree is very high [5]. At the same time, Beijing's air pollution is becoming more serious with the rapid development of economy and urbanization, and the hazy weather days reached an amount of 124 days in 2012, which is the highest in the past ten years [6].

The energy utilization in Beijing city is facing the dual pressures from economic growth and environmental protection. Compared with the developed countries or cities, Beijing's energy consumption structure and pattern is relatively backward. Exploiting renewable energy resources instead of traditional fossil fuels can reduce pollutant emissions and optimize energy consumption structure, which can also solve the bottleneck in the process of economic development to some extent [7,8]. The renewable energy resources reserves, which include biomass energy, solar energy, geothermal energy, wind energy and small hydropower, amount to 38.6 million tce in Beijing, and the availability accounts for 18.65% [9]. At the end of 2012, the "12th Five-Year Development Plan of Beijing's Renewable Energy" was issued, which stated that the utilization volume of Beijing's renewable energy will increase to 5.5 million tce by 2015, which will account for 6% in total energy consumption. Therefore, exploiting and utilizing renewable energy resources have important strategic significance to promoting economic development and preserving the ecological environment.

In this paper, the renewable energy industry of Beijing city is studied. The paper is organized as follows: Section 2 provides an overview of Beijing's renewable energy resources; the

development status and obstacles of Beijing's renewable energy industry are analyzed in Section 3 and Section 4, respectively; some proposals for the coordinated and healthy development of Beijing's renewable energy industry are put forward in Section 5; Section 6 concludes this paper.

2. Overview of Beijing's renewable energy resources

2.1. The distribution of Beijing's renewable energy resources

There are several kinds of renewable energy resources in Beijing city, namely biomass energy, solar energy, wind energy, geothermal energy and small hydropower. However, the reserves of these renewable energy resources are relatively less compared with that of other great resource provinces, such as Hebei and Inner Mongolia provinces [10]. According to the preliminary surveys, Beijing's renewable energy resources reserve amount equals to 38.6 million tce, and the availability accounts for 18.65% under current technological development level [11,12]. Among these renewable energy resources, the availability of biomass energy accounts for the highest proportion, which is 39.5%, followed by solar energy (31.9%), geothermal energy (27%), wind energy (1.2%), and small hydropower (0.4%), respectively [12]. The amount and availability of renewable energy resources in Beijing city are listed in Table 1.

Table 1

The amount and availability of Beijing's renewable energy resources [11,12].

	Amounts (10^4 tce)	Proportion (%)
Renewable energy resources	3860	
Availability	720	100
Biomass energy	284.4	39.5
Solar energy	229.68	31.9
Geothermal energy	194.4	27
Wind energy	8.64	1.2
Small hydropower	2.88	0.4

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