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# Study on Renewable Energy Development and Policy in China

Gao Xinyu<sup>a,b</sup>, Jin Bo<sup>c\*</sup>, Li Bin<sup>a,b</sup>, Yang Kai<sup>a</sup>,  
Zhang Hongguang<sup>a</sup>, Fan Boyuan<sup>a</sup>

<sup>a</sup>College of Environmental and Energy Engineering, Beijing University of Technology, Beijing100124, China

<sup>b</sup>Energy Department, Beijing Municipal Commission of Development and Reform, Beijing100031, China

<sup>c</sup>Beijing District Heating Group, Beijing100026, China

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## Abstract

Energy and environmental problems have been the hot issues nowadays. Energy is not only the material base of economic development, social improvement and enhancement of people's living standard, but also the significant factor which influences human being's living environment. A scientific and practical energy planning is the important guarantee to realize the country's future energy development strategy. This paper analyzed the current situation of renewable energy source, the developing strategy and the relevant policies, and made up suggestions about how to develop renewable energy source better. That will contribute to the renewable energy research approach in the future.

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*Key words:* renewable energy, policy, research programme, China

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## 1. Research status of renewable energy

### 1.1. Development background of renewable energy

The conception of renewable energy was proposed at the New Energy and Renewable Energy Conference by United Nations at Nairobi in August 1981. There were more than 150 member countries attended. The Nairobi Programme of developing and utilizing new energy and renewable energy was passed in the conference. Renewable energy was defined clearly that the renewable energy was developed

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\* Corresponding author. Tel.: 13426129295; fax: 01067392774.

E-mail address: [jinbo\\_yoyoe@sina.com](mailto:jinbo_yoyoe@sina.com).

and utilized by using new technology and new materials. Renewable energy is different from other fossil energy for its sustainable development, restoring ability and Environment friendliness. There are some main types of renewable energy. Such as solar energy, wind energy, geothermal energy, ocean energy and the secondary energy produced from ocean and so on [1,2].

## *1.2. Current Situation of Renewable Energy*

According to the annual report stated by the United Nations Environment Programme, China firstly exceeded the United States to be the country which made the most investments in renewable energy area in 2009. The United States and Europe invested more money in clean energy than traditional energy for the last two years. The investment that Europe made for renewable energy was 43.7 billion dollars with a reduction of 10%, and 20.7 billion dollars with a drop of 38% in the United States in 2009, while the investment of Asia and Oceania has increased 30% to 40.8 billion dollars. With a result of that, the gross investment of whole world is 162.0 billion dollars with a decrease of 7% [3].

In accordance with National Bureau of Statistics of China, the structure proportions of coal, petroleum and natural gas, renewable energy over the first energy are 68.7%, 21.4% and 9.9% in 2009. In recent years, new energy, renewable energy and clean energy has been rapidly developed in China. Moreover, the energy structure is also being optimized.

### *1.2.1 Solar Energy*

Solar energy is an inexhaustible clean energy that provides 99.98% energy for renewable energy. Currently, methods of using solar energy are mainly: solar photovoltaic power generation system, solar collector system, solar water heating system, solar refrigeration and air conditioning system, passive solar houses and so on.

In China, the solar energy is mainly used as photovoltaic power generation and heat utilization. In the year of 2008, the total production of poly-silicon materials has exceeded 6,000 tons. The production of photovoltaic cells reached 2 million kilowatt, accounted for 15% of global production. The annual production capacity of solar water heater was 40 million square meter, the coverage of solar water heating panels was 125 million square meter, and the usage amount and annual production was more than 50% of world's gross. In the end of 2009, the solar photovoltaic power generation was over 200,000 kilowatt. At present, China is the leader in solar energy engineering and area of solar energy utilization.

### *1.2.2 Wind Energy*

Wind energy has been used for a long time. Sweep and windmill was the most important power device before steam engine appearing. Now, wind power generation is the crucial way of using wind energy, with the advantages of efficiency, purity, recyclability.

In the year of 1891, the first power generation turbine was invented at Denmark. After that, with the increasing attention to the environment protection, development of wind energy has been further inspired as a clean energy. In 1950s, China started to study on mini-type wind water pumping machine and wind driven generator. Wind power generation has grown by double-digit especially in recent years. In June 2008, China made her first 1.5MW wind driven generator with completely independent intellectual property in Haerbin. In 2009, there was more than 10 billion kilowatt of wind power appended, which leads in the world. By the end of 2009, there were more than 10,000 wind generation sets, more than 200 winds farms and accumulated over 20 billion kilowatt of wind power. That was the third of the world.

### *1.2.3 Biomass Energy*

Biomass energy is the only one that is renewable green energy resource. It barely discharges any carbon dioxide during burning process, so it can remit greenhouse effect efficiently. The technologies of biomass energy used in China mainly contain: stove combustion technology, gasification and power

generation technology, pyrolytic technology, biogas technology, biomass liquid fuel technology and compression molding.

For the part of gasification and power generation technology, the total capacity of biomass energy in China was about 2.2 million kilowatt until 2006. Among that, about 400,000 kilowatt energy was made by garbage, and about 1.7 million kilowatt energy was made by bagasse, the other 100,000 kilowatt energy was from marsh gas and farming and forestry residues. At biogas technology field, there were 28 million personal biomass pools, more than 8,000 large and medium-size biomass facilities, and total annual utilizable biomass was about 12 billion cubic meters by 2008. As to the aspect of biodiesel, the main raw materials are corn, aging wheat, sugarcane and cassava. With the approaching of government's policies, it has been widely expended that the experimental work with ethanol gasoline for motor vehicles. By the year of 2008, the annual biodiesel production in China was 50,000 ton.

#### *1.2.4 Hydro Energy*

With abundant water resource, both reserves and exploitation ability of China are on the top of world. However, the modern hydroelectric in China was started late. Until 1912, the first hydroelectric power station was built with 472 kilowatt capacity in Yunnan Province. Having been through researched and developed for decades, the hydroelectric in China grew vigorously. By 2009, the hydroelectric power capacity had been 197 million kilowatt which increased by 0.74% compared with that in 2008. The hydroelectric system in China has been complicatedly built and it has already caught up with advanced world level.

#### *1.2.5 Geothermal Energy*

Geothermal energy comes from deep layer of the earth. It is a renewable energy resource with zero emission and no secondary pollution. It is a long history in using geothermal energy, which we can see from hot bath being popular since the Roman Empire. An Italian guy named Ladd Ruiluo lightened four small bulbs with geothermal steam in 1904. Although the power was only 550 watt, but it made a start to the world of geothermal energy. Now, people can do so many stuffs using geothermal energy, such as generating, heating, cooling, drying, aquaculture and so on.

China is the biggest country of utilizing geothermal energy in the world with a 3.69 million kilowatt of power capacity and a 12.6 billion kilowatt of geothermal potential until March 2009. Due to the limitation of high temperature geothermal resources suit for generating, geothermal power generation has been developed in low-grade for these years. The speed of geothermal energy development is much slower than solar energy, wind energy, biomass energy and other renewable energy resources. It is mainly because that there are several constraints in resource distribution, resource quality and environment [4].

#### *1.2.6 Ocean Energy*

Ocean energy refers to renewable resource stored in ocean, such as tidal energy, ocean currents energy, wave ocean, temperature-difference energy and salinity gradient energy.

In China, among the ocean energy resources, tidal energy exploitation has been laid stress on. Since 1955, 76 mini type tidal power stations have been built, and 8 of them are medium to long-term stations. For now, China is leading the area of tidal power generation technology in the world. But at the same time, there are also some problems. For instance, the integral development and capacity of generating unit is still small; hydraulic construction style and construction methods are not advanced; the unit installed cost is higher; majority of tidal power generation stations play roles with social benefits and do not have abilities of competition.

### *1.3. Problems of renewable energy development*

There are still several problems with renewable developing, though it has been proposed clearly in planning that we should accelerate the renewable development, and the goal which is medium and long-term development of renewable has been made out explicitly in low.

### *1.3.1 The controlling nature of Renewable Energy Law is not strong*

Although government has already made up the plan of renewable energy development, but it still does not have a substantive strategic positioning in general energy developing. Besides that, there is no legal binding for long-term renewable energy development, so it goes against with leading the requirement and developing of market. And also, there is not project or embodiment in the plan of national economy and social development.

### *1.3.2 Incomplete preferential policy*

The enterprises and projects have the characteristics of small scale, low profit and high risk, so they are in the unfavorable state. Such as, unfair competition, insufficiency of marketing circumstances, incomplete government policies, lacking of continuity and stability, no regular financing channels, deficiency of long-term and efficient price support, financial support, tax concessions and other preferential policies.

### *1.3.3 Technology innovation and mechanism is lacking relatively*

The science and technology research is not enough in China, and those immature technologies do not have development potential. Besides that, the national standard and industrial standard of technology and product is not complicated, and the same for security architecture of product and facility. It is lacking of institutions of sound project approval and new product introduction and so on in Chinese energy market.

## **2. Development policy and opportunities of renewable energy in China**

### *2.1. Development planning of renewable energy*

There are plenty of researches about renewable energy having been done in other countries and they also have some great experiences. The thinking of renewable energy for many developed countries is that, the government will make some specific aims and programs about renewable energy, and then, under those developing frames, a series of preferential policies will be made out. Furthermore, it will be encouraged if some comities invest or make use of renewable energy by market economic instruments. In view of successful experiences from those countries, the Chinese government drew up some planning and polices of renewable energy which were suit for Chinese society conditions progressively.

### *2.2. Development strategy planning and policy of renewable energy in China*

In 1996, the State Development Planning Commission associated State Science and Technology and the State Economy and Trade Commission made *The Outline of New Energy and Renewable Energy Development in China of 2010*.

*The Law of Renewable Energy in People's Republic of China* has been become effective since January 2006. Chinese government has made some policies of pricing of electricity, tax, investment and so on to support the development of renewable energy. In addition, the government also set up a special found for renewable energy development and a subsidy system which can make the renewable energy's pricing of electricity apportioned.

June 2007, the *China's national programme to address climate change* has been published. According to that, the major measures reacting to climate change and greenhouse gases' reduction are developing wind energy and biomass.

September 2007, Chinese government promulgated *the medium-and Long-term Program for Renewable Energy Development*, putting forward the goal of increasing renewable energy consumption to 10% of the total energy consumption by 2010 and 15% by 2020.

December 2007, Chinese government has published the white paper of *China's Energy Conditions and Policies*. In that book, the planning of developing energy diversification has been put forward, which that striving to develop the renewable energy will be one crucial part of the national energy development strategy.

The Chinese President Hu Jin-tao pointed it out in the report of 17<sup>th</sup> People's Congress that, we should develop clean energy and renewable energy, protect land and water resource, build a reasonable and scientific system of utilizing energy resource, enhance the efficiency of using power resource,..., strengthen the ability of reacting the climate change and make contributions to protect the global climate.

### *2.3. Opportunities of renewable energy in China*

#### *2.3.1 The establishment of national energy committee will accelerate the pace of construction of renewable energy.*

The new National Energy Commission is a high-level institution of energy decision making. It is responsible for assembling every department head together and discussing the crucial issues about energy resource. The National Energy Commission is going to strengthen the researches about energy strategy, energy structure, energy layout, energy policy, energy price and other international cooperation with energy research, clear and definite the development target, clear off the development thinking and direction. In addition, it will also take the lead to draw up the national energy strategy planning. The focal point of energy development structure was turned to diversification. The energy strategy planning will direct exploitation and construction for medium and long-term energy resource, and over 20 years availability was predicted.

#### *2.3.2 New energy industries will become the important driving force of global economic growth in the future gradually.*

With the impacting by global financial crisis, U.S., European Union and other developed countries and regions began to stimulate economy with developing new energy resource. The government of Obama plans to invest 150.0 billion dollars to promote proportions of new energy automobiles and renewable energy generation and encourage the economy in America. At the same time, it also can seize the commanding height of future development as a national crucial industry strategy. In the near future, the China State Council promulgated the opinions about promoting the economy development steadily and quickly with the support of science. In line with that, the new energy resource and environmental industries are going to be prioritized to be high technology industries. Meanwhile, the programming of promoting the new energy resource is under proceeding.

#### *2.3.3 Renewable Energy Law amendment will provide the legal support for the standard development of renewable energy.*

The 11<sup>th</sup> NPC Standing Committee has passed the decision about modifying the law of renewable energy resource in the 12<sup>th</sup> conference. The new one will take effect on 1<sup>st</sup> January of 2010. Compared with the old one, the keynote in it is to harmonize the problems appeared in congress of developing rather than to promote new energy resource. The amendment can not only be in favor of getting rid of low-quality productions in new energy equipment industry, but also lay the foundation for achieving the goal of energy saving and emission reduction. The government will set up a renewable energy development funds to compensate the price spread in new energy industry directly and support new energy industry.

#### *2.3.4 Developing new energy becomes the important mean of adjustment of energy structure.*

The utilization ratio goal of non-fossil energy resource has been made to 15%, it necessarily will depend on developing solar energy, wind energy and other renewable energy resources. According to the introduction from Zhang Guo-bao who is director general of The National Energy Bureau, during the period of “The 12<sup>th</sup> Five Years Plan”, under the spirit of implementing the Scientific Outlook on Development and speeding economy development up, quickening the change of energy development method has been put to the first over all work. In accordance with commitment which the government made to international society in Copenhagen Conference, we should make efforts to develop renewable and nuclear energy, adjust energy structure, weed out behindhand capacity, make more cooperation with other countries, and intensify energy research and so on.

### **3. Policy recommendations of promoting the renewable energy development of China**

Through the analysis above, the significance of renewable energy resource has been recognized by many countries since 1970s. Although we have made some researches on renewable energy resource, but within the increasing of environmental pressure and shortage of fossil energy, we must take further step on the planning of renewable energy. Furthermore, some necessary actions have to be taken from politics, economy and technology to accelerate the industrialization and commercialization of renewable energy and to impel the renewable energy becomes one important part of social energy supply. We consider that, the development of renewable energy in China should not only improve the occasion and give judicious guidance according to circumstances, but also seize the moment and explore the way to go.

#### *3.1. Carry out the Renewable Energy Law seriously*

The local governments should set out local provincial rules and regulations about facilitated development of renewable energy resource by their own conditions. Especially, under the frame of local Renewable Energy Law, making the relative rules and regulations is not only the part of Renewable Energy Law, but also can make up the disadvantages that the national renewable energy planning had, like low operability, poor pertinence and so on.

#### *3.2. Expand the use of renewable energy steadily*

Learning from other countries, we will put the city planning to renewable energy development and develop renewable energy resource by some other strategic measures, for example buying green power. Besides that, we also have to determine the goal of renewable energy power generation over the whole city's power demands and require those new buildings which surpassed the specified scale equipping the renewable energy facilities and so on.

#### *3.3. Further study the new energy industry and take all factors into consideration*

Considering with revitalization plan of national renewable energy resource, according to national overall scheme, we have to make further study on local natural resource, advantage and characteristic, and then arrange the new energy industries reasonably. Meanwhile, we will increase the renewable energy utilization and improve the level of renewable energy equipments, so as to establish a regional industry accumulation area.

#### *3.4. Develop reasonable policy of tax supporting and financing incentives*

Optimizing the development circumstance of renewable energy industry will impel the innovation of government mechanism and service model. By the way of giving allowance to investments, equipments and consumers, we can quicken the facilities updating and sustaining the development of new energy industrialization. Give some risk and financial support to those companies who bought the first equipment with core technology. Try to establish an evaluation identifying system of green energy source, providing financial stimulation on cost of scientific research and soft loan. Construct diversifying system of investment and financing, encouraging policy banks to support new energy industry and broaden their way of financing.

### *3.5. Perfect the management system*

Normalizing the market of new energy technique conversion will provide a support to new technology pricing and conversion. Strengthening the supervising over market of new energy production and accelerating the institution building of relative standard and admittance to ensure the new energy market could develop orderly and healthy. Meanwhile, consummating the whole set of service mechanism of technology research, mass production, market and late operation will make sure that new energy industry could develop continuously.

### *3.6. Consolidate and develop the location advantage, and train high-level creative talents*

Implementing the opinions about importing talents abroad well, making those overseas students playing a central role sufficiently and providing a whole course agency service for those overseas talent students; getting more strategic scientists who are working on new energy industry and with advanced world standard to set up multilevel system of cultivating talents and gathering a group of advanced technology led by innovative talents; strengthening to develop the base, innovation park and incubator for high level overseas talents and making further efforts to improve the work environment and living environment for high level innovative talents too.

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