

## Science and Technology Trends

# *Renewable Energy Policy in East Asia*

## CHINA

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China's rapid industrialization and urbanization signifies huge energy demand. In 2010, China's primary energy consumption perhaps reached 2.43 billion tons of oil equivalent to 20.3% of the world's total energy consumption. Among the different energies, coal consumption accounted for 70% of total energy consumption. At the same time, about 55% of the crude oil used was imported. Consequently, China has taken renewable energy as an important way to increase energy supply and reduce the emission of carbon dioxide. To speed up the development of renewable energy, China has issued a series of renewable energy policies.

Due to the Renewable Energy Law and the relevant policies, the development of renewable energy accelerates. By 2009, China's installed capacity of hydropower reached about 0.2 billion; the installed capacity of grid-connected wind power was 25.8 million kW; the installed capacity of solar power was 0.3 million kW with the annual output of 360 million kWh. As a whole, the electricity generated by renewable energy was 662 billion kWh, accounting for 18% of the electricity consumption that year.

### 1. Renewable Energy Law

The Renewable Energy Law of the People's Republic of China (the Law) was issued on February

28th 2005. The Law aims to define the target, improve the energy technology, reduce cost, and speed up the commercialization of renewable energy technologies. The Law includes five main regulations to support renewable energy industry development.

#### *(1) National Renewable Energy Target*

The Law stipulates that the government should set the renewable energy development targets in a specific period according to the legislation, based on the conditions of energy resources, GDP, energy demand. In addition, other regulations, such as the renewable energy plans, will be developed to ensure the achievement of the national target. And specifically, the state energy administrative authority should propose the national target for the medium and long term renewable energy development. The regional governments should also develop and enforce the regional renewable energy targets, according to both the approved national target and the regional economic conditions.

#### *(2) Feed-in Tariff*

There are two key points about the feed-in tariff. One is full purchase of the renewable energy power, and the other is facilitating the power connection into the grid. The Law requires that grid enterprises should not only purchase all the renewable energy power, but also ensure the infrastructure construction for the power accession.

#### *(3) On-grid power prices*

According to the Law, governments should set the prices of renewable power in a specific period based on the different technical and regional characteristics of various renewable energy technologies. Further, they

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should adjust the prices at appropriate times according to the situation of development of renewable energy technologies. For concession power projects, the bid-winning price shall be adopted as the renewable energy power price and may be subsequently adjusted according to the market situation.

#### *(4) Cost Sharing*

Cost sharing is a widely used method in many countries' renewable energy policy. In China, the distribution of renewable energy resources is uneven, for example, the solar power is very rich in the northwest, and it may be unfair to put the additional cost burden on local people who live in the resource abundant area. To solve this problem, provision 20 and 21 of the Law requires that grid enterprises can add the additional cost into the power price, which is caused by the higher cost of renewable energy power than conventional energy power. The expense for additional grid infrastructure can also be calculated in the transmission cost and compensated through the power price.

The regulation of cost sharing can well combine the obligations of the consumer and the government. It requires that all the regions evenly share the additional cost. Every provincial grid enterprise prepays the renewable energy power, and at the end of the financial year, the additional cost is shared within all the provincial grids. Finally all of the excess expense of renewable power over conventional power borne by the grid enterprises in their purchase of renewable power will be passed on to all the consumers.

#### *(5) Renewable Energy Fund*

The financial capital is an essential factor for almost every emerging industry. The Renewable Energy Fund is established to support the fields that the cost sharing mechanism cannot cover. For instance, the areas include:

- ① renewable energy technology R&D and pilot projects
- ② renewable energy projects in rural areas
- ③ renewable power distribution for remote areas and islands
- ④ renewable energy resource investigation, assessment, and database

## **2. Renewable Energy Law Amendment**

After the Law was enacted, renewable energy in China grew rapidly. But there were still some serious problems:

First, there was no proper renewable power pricing mechanism yet. For wind power, China adopted the concession bidding system. And there were many pricing patterns adopted, even the prices for the projects with the similar wind energy resource may be very different. To some extent, the competition was irrational and the projects may have won the bid with the lower price than its real cost.

Secondly, China's renewable energy policies focused on the energy producer, but some stakeholders did not receive the appropriate compensation for their loss. For example, wind power is intermittent. Thus, it will affect the power grid scheduling, the grid frequency control and the power quality. However, the grid enterprises did not get the corresponding compensation for the damage. Furthermore, there are six local power grids in China, and the six power grids operate rather independently. Affiliated local power grids, such as Xinjiang power grid, within the northwest area still operates independently. Therefore, the national power grid cannot play its role like the European or US power grid, which is more synchronized. It will be the largest barrier to renewable energy if the power grids synchronization cannot be addressed.

Thirdly, China has not established a new industrial innovation system for renewable energy, including absence of basic research, and key technologies. The overall investment in renewable energy R&D is far from enough. The percentage of China's Energy R&D expenses is only one seventieth of Japan's. China has to introduce the technologies from other countries for the lack of the basic core technology of renewable energy.

Finally the government revised the Law and the Amendment was approved by the Standing Committee of the National People's Congress on December 26th 2009. Based on the original Renewable Energy Law, the revision bill reinforced three key issues including the plan of the exploitation and utilization of the renewable energy, full price safeguard purchase system

of renewable energy power and the establishment of a renewable energy fund. Specifically they are:

(1) The energy administrative authorities and the related agencies of the state council should compile a renewable energy development plan, set the national targets, and formulate the strategy for renewable energy. Along with the overall plan of the central government, the local governments are expected to make their own medium and long-term plans for renewable energy.

(2) The renewable energy fund will be set up. The Amendment states that “the sources of the fund include the special fund annually arranged by the government budget and the income of the renewable energy surcharge which is levied according to the law.” The scale of investment in the fund will be determined according to the requirements for developing renewable energy and the financial strength of the nation. At the local level, the financial authority should, according to local circumstances, allocate the necessary funds to support renewable energy development.

(3) China will establish the full price safeguard purchase system of renewable energy power. The original Renewable Energy Law stipulated full purchase of renewable energy power, but the enforcement mainly depended on the negotiation between power plants and the regional power grid enterprises. With the increasing production, the regional power grid can't accommodate all the renewable energy power. Thus, the regulation of full price safeguard purchasing is of great importance. The amendments stipulated that state energy authorities including the State Electricity Regulatory Commission and the Ministry of Finance should determine the objective of the certain ratio of the renewable energy power upon the total electricity production, and provide concrete procedures for full purchase of renewable power.

### **3. Relevant Policies**

After all, the Law lays the legal basis for renewable energy policies, and needs more specific executing and supporting policies. In order to promote renewable energy, several important policies should be developed

such as the renewable energy target, feed-in tariff, categorized pricing, cost sharing, special fund, tax credit system, etc. Since the law was promulgated in 2005, the government agencies including the National Development and the Reform Commission (NDRC), the Ministry of Finance (MOF), the State Electricity Regulatory Commission (SERC), the Ministry of Science and Technology (MOST), the Standardization Administration of China (SAC) and the Ministry of Housing and Urban-Rural Development (MHURD), issued more than 40 relevant policy documents one after another. The framework of renewable energy policy in China has basically formed.

(1) The National Development and Reform Commission promulgated The Medium and Long-Term Plan of the Renewable Energy in September 2007 and The Renewable Energy Development Plan during the 11th Five Year Plan Period in March 2008. The two plans set the guidelines and principles for the development of renewable energy, and the national renewable energy target was identified.

(2) According to the Law and the two plans, the National Development and Reform Commission issued a series of policies, for instance, the Regulations for Renewable Energy Power Generation, the Management Measures for Renewable Power Pricing and Cost Share, The Ordinance on the Full Purchase of the Renewable Energy Power, etc. Due to these policies, the mandatory full purchase of renewable energy power was ensured. On the other hand, China formed the categorized pricing mechanism. Moreover, the Trial Management Measure for Allocation of Renewable Energy Power Surcharge established the cost sharing system for renewable energy power, which greatly expanded the renewable energy market. On July 20th 2009 the National Development and Reform Commission set the benchmark on-grid prices of wind power of China's six regions. Later on November 18th it adjusted the prices, by raising the additional fee to 0.4 cents per kWh. Though these policies, the higher feed-in rates will provide a bigger market for renewable energy technology and attract more entrepreneurs to set up renewable energy power plants.

(3) The tax credit system was introduced in 2006 to support the renewable energy. The relevant

**Table 1** Major renewable energy policy documents in China

Approval Year	Name
2005	The Renewable Energy Law of the People's Republic of China, The Standing Committee of the National People's Congress
2005	The Regulations for Wind Power Projects, NDRC
2005	The Technical Regulations for Solar Water Heater Building (GB 50364-2005)
2006	The Management Measures for Renewable Power Pricing and Cost Share, NDRC
2006	The Regulations for Renewable Energy Power Generation, NDRC
2006	Ordinance on the Special Fund of Renewable Energy, MOF
2006	Implementation Notes of Promotion of Wind Power Industry, NDRC
2006	The Trial Management Measure for Allocation of Renewable Energy Power Surcharge, NDRC
2006	The Trial Management Measure for the Special Fund of Renewable Energy Buildings, MOF
2006	The Technical Regulations for Connecting Wind Power plant into the Electricity Grid, the State Grid Corporation of China
2007	The Medium and Long-Term Plan for Renewable Energy, NDRC
2008	The Renewable Energy Development Plan during the 11 <sup>th</sup> Five Year Plan Period, NDRC
2008	Import Tariff Adjustment for Large Wind Turbines, Key Components and Raw Materials, MOF
2008	The Trial Management Measures for the Special Fund of Wind Power Equipment Localization, MOF
2009	Decision of the Amendment of the Renewable Law of the People's Republic of China, The Standing Committee of the National People's Congress
2009	Notice on the Price Policy of the Grid-Connected Wind Power, NDRC
2009	Notice on the Policies of Promotion of the Bio-tech Industry, the State Council
2009	Notice on the Implementation of the Photovoltaic Pilot Projects, MOF
2009	Notice on Preventing Over-Capacity and Leading the Stable Development in Some Sectors, NDRC
2010	Notice on the Establishment of the National Energy Commission, the State Council
2010	Notice on the 2010 Renewable Energy Buildings Pilot Projects, MOF

policy documents include the Opinions on the Fiscal Allowance for Biomass Energy and Biochemical Industry promulgated by the Ministry of Finance in September 2006, the Notice on Income Tax Credit for the Innovative Enterprises by the Ministry of Finance and the State Administration of Taxation in September 2006, Import Tariff Adjustment for Large Wind Turbines, Key Components and Raw Materials by the Ministry of Finance in 2008, etc.

(4) The national renewable energy target can also be taken as an important policy tool for industry development. The Medium and Long-Term Plan for Renewable Energy promulgated in August 2007 stated clearly about the targets of the non-hydro renewable energy: the proportion of non-hydro renewable energy

in electricity supply will reach 1% by 2010, and 3% by 2020.

On September 22 2009, President Hu Jintao promised at the UN Climate Change Conference that non-fossil fuels would account for 15 percent of China's energy consumption in 2020, and the country would make it a binding target to cut carbon dioxide emissions per unit of GDP by 40 percent to 45 percent by 2020 from 2005 levels. Now the targets are incorporated into the country's long-term economic and social development plan.

(5) Considering the difference between different types of renewable energy, China also released several policies to address the issue of financial support, which included the Ordinance on the Special Fund of

Renewable Energy, Notice on the Implementation of the Photovoltaic Pilot Projects, the Trial Procedures of the Fiscal Allowance for the Application of the Photovoltaic Buildings, etc. Hence, these policies established a supporting system for the renewable energy R&D, production and utilization.

#### 4. The Management Framework of Renewable Energy

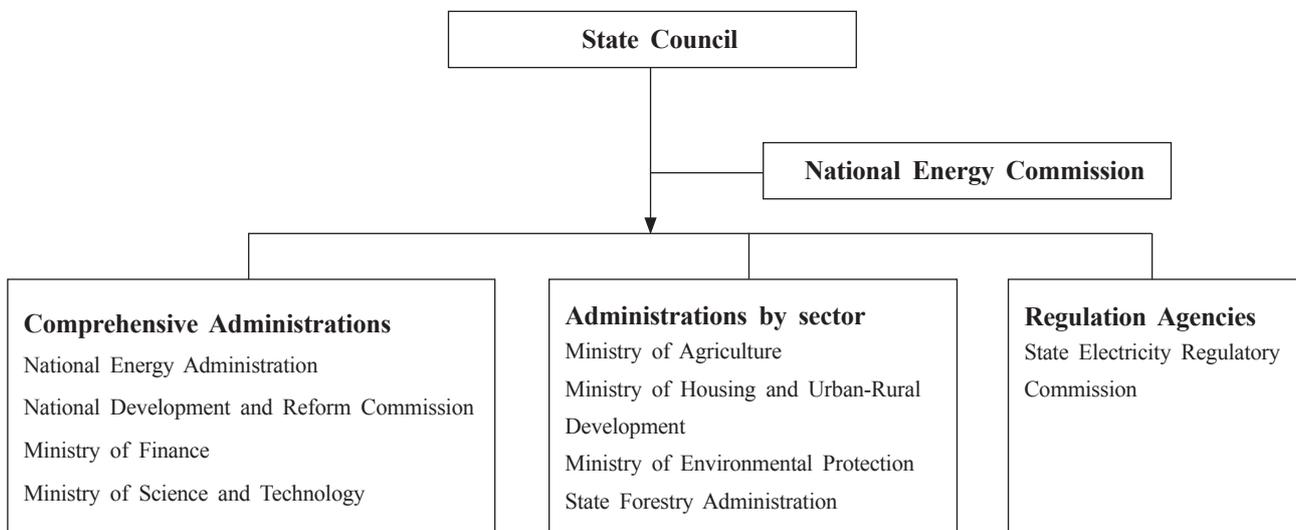
To execute the renewable energy policies, China has established an enforcement and supervision system which consists of the local and supreme organs of the state power, the executive branches.

First, the Standing Committee of National (or local) People’s Congress should recognize the implementation status of the Law and other relevant policies, and then urge the government agencies to improve their regulations and implementations.

Secondly, with regards to the administrative management, the national and local Development and Reform Commissions takes the lead in implementing the renewable policies (see Figure 1). Departments of the NDRC including the National Energy Administration (NEA), Bureau of Economic Operation Adjustment, Department of Price, Department of Industry, and Department

of High-tech Industry are in charge of renewable energy planning, projects approval, energy allocation, price regulation and industry promotion respectively. Moreover, the Ministry of Finance undertakes budgeting and the allocation of the Renewable Energy Fund; the Ministry of Science and Technology compiles and implements plans on national laboratories, national S&T programs, and research conditions so as to promote development of renewable energy; the State Electricity Regulatory Commission is responsible for regulating the market of renewable energy power.

In 2010, China’s State Council set up the National Energy Commission (NEC), with Premier Wen Jiabao as head, to step up strategic policy-making and coordination. Now Vice Premier Li Keqiang acts as the commission’s deputy head. Zhang Ping, head of the National Development and Reform Commission works as the head of the general affairs office of NEC, and the head of the National Energy Administration serves as the office’s deputy head. The NEC committee is composed of 21 members from various government agencies. The commission is responsible for drafting national energy development plans, reviewing energy security and major energy issues and coordinating domestic energy development and international cooperation.



**Figure 1** Government agencies involved in renewable energy management

## 5. Comments

Reducing fossil fuel consumption and developing renewable energy will be the best way to ensure a secure energy supply, and the Chinese government has given high priority to renewable energy as part of a future sustainable energy system. The Renewable Energy Law and other policies show good promise in providing a coherent framework, which would act to significantly increase the share of renewable energy within the energy system and drive development of renewable technologies. Although there are still some imperfections in the renewable energy market, China should continuously improve the implementation of the policies to accelerate the development of renewable

energy and better cope with climate change.

## References

- Zhongying Wang, Dongming Ren and Hu Gao (2011), *The Renewable Energy Industrial Development Report 2010*, Beijing: Chemical Industry Press.
- Minxuan Cui (2011), *Annual Report on China's Energy Development 2010*, Beijing: Economy and Management Publishing House.
- Zhiguo Xie, Huakai Hu and Feng Zhang (2005), Research on China's Renewable Energy Policies, *China Soft Science*, 9: 50-57.
- Institute of Industrial Economics of Chinese Academy of Social Sciences (2008), *China's Industrial Development Report 2008*, Beijing: Economy and Management Publishing House.