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2、 the importance of mid- and long- term development strategy from the perspective of existing problems of our country, the construction of innovative country and intellectual property rights strategy,2007-11

3、 The modification of resource strategy and transition of industry structure in the new stage of our economic development, Chinese Economic Strategy — Resource and Strategy ,2008-6

## **China's Energy Development Strategy and Trend**

**[CN] Lie SHANG**

The world crude oil price has been fluctuating violently in recent years from less than US \$20 per barrel in early 2002 to US \$147 per barrel in July, 2008, which has, to a certain extent, stepped up the process of global economic crisis and enhanced its influence scope and degree as well, and which has made people aware that it is hard to maintain the economic development mode relying on non-renewable energy resources and the world would witness another energy revolution and transformation. This would also prompt China to reinforce energy structure regulation, making a difference on the world energy development and economic growth pattern. Through observing China's energy regulation in recent years, we are able to predict the future regulation scope, scale and degree, seize upon

opportunities and trigger in-depth thinking and understanding.

## **I.Current Situation of China's Energy Development**

Since the 1980's, the demand for energy has been growing at high speed in China, in particular, after entering the 21st century, a new round of domestic economic development at high speed in China has triggered expanding demand for energy. Meanwhile, the energy demand-supply gap is widening and China is increasingly depending on imported energy resources (such as petroleum). China's crude oil apparent consumption was 346 million tons in 2007, including domestic crude output of 186.657 million tons, up by only 1.6% over the previous year, and net import of crude oil of 159.28 million tons, up by 14.7% over the previous year. The share of imported crude oil jumped from 30% in 2003 to 46.05% in 2007 and 48.5% at the end of 2008. Foreign organs predicted that, by 2020, 70% of China's petroleum demand would be met through import if this trend continues. At the same time, the coal is reinforcing its principal status in China's energy consumption structure. According to the data released by China National Energy Administration in August, 2008, the share of coal in the whole domestic energy structure jumped from 72% in 2000 to 76% in 2008, creating an unbalanced energy structure.

This would undoubtedly threat China's energy security. The sustained rise of world crude oil price since 2002, especially after 2004, has a great impact on China's economy. In 2004, China paid extra US \$8 billions for petroleum import and this lead to a trade deficit more than US \$30 billions. The further rise in the world crude oil price in 2007- 2008 brought along greater pressure to the Chinese economy. Some experts estimated that China would pay an extra US \$1.23 billions if the world crude oil price rose by US \$1 if the petroleum import volume in 2007 (160 million tons) is adopted. If the price of crude oil per barrel rises by US \$10 and is kept for one year, China's GDP growth rate would be down by more than 0.5% if computed according to the input-output production table in 1997. Related data shows that the rise in the price of crude oil by US \$10 per barrel would drag down China's economic growth by 0.8% and push up CPI by 0.4%. The sharp CPI rise in the first half of 2008 was partly due to the delayed rise in the price of alternative energy sources of crude oil, coal for instance, and other raw materials triggered by the rise in world oil price over the last few years.

Coal is the foremost energy source in China in the long run. The rise in world oil price in recent years has driven the rise in the price of coal, an alternative energy source of petroleum, and therefore has an impact on China's electric power industry. Of course, China's electric power industry also suffers from other problems, such as unbalanced structure and overuse of non-renewable energy resources. Just because China heavily depends on non-renewable energy resources during its development, the energy price has

become a strong wave signal influencing Chinese economy.

The rapid growth of Chinese economy leads to growing demand for electric power, especially after the entry into the 21st century. The installed power generating capacity has grown by nearly 100 million KW yearly since 2006 and it jumped from 440 million KW in 2004 to 793 million KW at the end of 2008, up by 80%. Of the total, the installed thermal power generating capacity grew from 320 million KW in 2004 to 600 million KW in 2008, up by 88%. By the end of 2008, of the total installed power generating capacity, thermal power took 75.87%, hydropower 21.64% and other power supplies, including nuclear power and wind power only 2.49%. Thermal power is holding an absolute principal position in the electric power structure.

Suppose China's annual GDP growth rate is kept at 8-9% and there is no significant industrial structure regulation before 2020, China's installed power generating capacity would grow by about 100 million KW yearly in this period, but the installed thermal power generating capacity would see a declining share, as China's coal production growth is close to the peak and unable to support high-speed development of thermal power. Currently 50% of raw coal produced in China is used for thermal power generation and this share is still on the rise. The newly-added installed thermal power generating capacity has used up all newly-added coal yield in recent years and the demand is still rising. For instance, 65.75 million KW of thermal power was generated in China in 2008, which required 164 million tons of coal, nearly the same as China's annual coal output (170 million tons). Considering the growing demand of other industries for coal in the same period, especially the tripled demand of the iron and steel industry, it is easy to understand why China saw short supply of coal and rise in coal price in the last few years.

Such data makes us aware of two facts: one is that the heavy dependence on coal during China's electric power development has come to the end. As to raw material supply capacity, the gap between coal yield and the demand for electric power is widening, and the huge power demand can't be satisfied although the productive capacity of some coal enterprises and use efficiency of some power plants could be improved through technological advance and capital input. The other is that the heavy dependence on thermal power goes against coordinated development of China's electric power industry and would affect the orderly development of Chinese economy, environmental improvement, health level promotion of the people and harmonious development of the society, thus this problem needs to be changed and solved as soon as possible.

## **II. Regulating Orientation and Enforcement Degree**

The Chinese government, experts and scholars as well as people of all circles have fully recognized the seriousness of energy unbalance. Since the 1980's, they have adopted different measures to seek for solutions and have thrown attention to the development of

renewable energy sources. In the 21st century, such efforts have been reinforced. The world energy price climbed up quickly after 2004, leaving a marked impact on Chinese economy, and the Chinese government, in order to ensure energy security, protect environment and achieve sustainable development, has speeded up the development of renewable energy sources through legislation and establishing strategies and plans. The Renewable Energy Law was passed in 2005 and enforced as of January 1, 2006, then the Mid - Long Term Development Plan for Renewable Energy was promulgated in September, 2007 and the 11th Five-Year Plan for Development of Renewable Energy in March, 2008.

So far, China has clarified its energy development objectives, while there are still problems related to implementation and people hold different views towards the focus of development, amount of investment and rate of advance.

It is seen from China's wind power development in the last few years that the governmental agencies still hold old-fashioned ideas. Although the research and decision-making sectors of the central government think highly of the prospect of wind power as shown from the publicized documents in the last few years, they seem to be not determined enough to adjust the domestic energy structure as soon as possible.

The decision-making sectors are not fully prepared in thoughts, which is reflected in the comparison between the governmental predicted data and the reality. For instance, it is forecasted in the Mid - Long Term Development Plan for Renewable Energy that the installed wind power generating capacity would reach 5 million KW by 2010 and 30 million KW by 2020. Actually data shows that the wind power generation has doubled year after year. The installed wind power generating capacity reached 4.03 million KW in 2007 when this document was formulated and released, and another 8 million KW of wind power was added in 2008, building the total installed wind power generating capacity to 12 million KW. The added installed capacity in 2008 outclassed that in 2007 and doubled the total sum of China's installed wind power generating capacity in the last two decades.

The disparity between the planning data and actual state is caused by three reasons: first, the hysteretic data (outdated data two years ago) is adopted in documents; second, the world average annual growth rate (30%) is adopted. Third, composite factors at home and abroad and the development environment are not fully considered.

If the average annual growth rate (100%) of China's wind power in recent years is maintained, the wind power is expected to reach 10.08 million KW by 2008 with 1.26 million KW in 2005 as the base figure, which is close to actual conditions and much higher than the result worked out according to the world average annual growth. At this rate, the wind power would reach 40.32 million KW by 2010 and around 160 million KW by 2012.

This forecast may still be conservative given the actual growth rate of China's wind power since 2005. In December, 2008, China released the plan of building 10-million KW wind farms in 5 provinces at the same time, showing that the wind power development in China has taken the express way. The writer hereof deems that the rapid growth of wind

power in 2008 is only a prelude. China is likely to achieve an installed wind power generating capacity of 100 million KW within 2-3 years and an capacity of 200-300 million KW or more by 2015 in accordance with the development status at the end of 2008 and the beginning of 2009.

Thanks to diversified factors favoring the development of renewable energy sources in recent years, China's wind power has been developing at ultra-speed and the scale expansion and growth momentum are beyond the expectation of many organs and experts.

First, China presented the 4-trillion-yuan investment plan at the end of 2008, which will drive the domestic demand for electric power and boost the development of new alternative energy sources, because it is difficult to enhance the installed capacity of thermal power continuously by 60 million KW per year. So far, wind power seems to be a preferred option and could make up for the deficiency of electric power in the near term. Given the available technologies, recent development of science and technology and scale of capital input, it is possible to increase the installed wind power generating capacity to 200 million KW within 3-5 years. So the wind power would take up 40% of the newly-added power in China and thus greatly relieve the energy pressure brought along by the fast-growing Chinese economy.

Second, the thermal power is not economic and competitive any more owing to the constantly rising cost in recent years, which encourages power generation enterprises to seek for new alternative energy sources and profiting points and transfer investment in large scale.

Third, the wind power benefits are becoming apparent. To begin with, the wind power purchase price is falling and close to that of thermal power now, and it may even be lower than that of thermal power in the future. Given such factors as prevention of environmental pollution and reduction of carbon emission, the benefits of wind power are more obvious. In the second place, the construction period is shorter and wind power projects would start operating only after about 10 months since ground breaking. Finally, as compared with hydropower, nuclear power and biomass power, the wind power would cause relatively fewer external problems.

Fourth, the large-scale construction of China's power transmission industry has paved the way for rapid growth of wind power.

Fifth, the wind power generation would fuel the development of local economy. The wind power projects in west China and some underdeveloped areas would drive local economic development and increase the fiscal revenue there.

Sixth, the domestic automotive industry is accelerating the development of mixed motor vehicles and electric cars, which also boosts the development of wind power.

Therefore, driven by the composite force from various sides, China's wind power industry is likely to achieve rapid growth in the next few years like China's steel industry and reach the scale of hundreds of million KW, becoming the fastest-growing part of

China's renewable energy power generation.

In the meanwhile, the demonstration effect of wind power will drive the development of solar power that enjoys greater development potentials.

Actually, the solar power has presented a powerful development momentum in China.

China's photovoltaic industry has been growing at an annual rate of 300% in the past 5-6 years. China's solar battery yield reached 1.188 million KW in 2007 (or 2 million kW according to other report), No. 1 in the world by overtaking Japan and Europe. So far, China has become the No. 1 producer of photovoltaic products and established a complete industry chain covering such links from raw material production to photovoltaic system development, in particular, China has made great progress on multi-crystal silicon production by topping the annual output of 1,000 tons, which breaks the raw material bottleneck and lays the foundation for large-scale development of photovoltaic systems in China.

Seen from the development trend of solar power in China in recent years, the photovoltaic power generation is likely to become a sector enjoying leap-forward development in China after wind power. The construction of synchronized photovoltaic power plants has been accelerated in China. Relevant data shows that, by the end of 2008, the accumulated installed photovoltaic power generating capacity reached 200,000 KW. In December, 2008, the construction of two large photovoltaic power plants started in China, one is in Shilin, Kunming, Yunnan province, whose gross installed capacity is 166 thousand KW, to be completed within 22 months, and the other is based on a cooperative agreement concluded at Qinghai Tsaidam Basin between the people's government of Haixi Mongolian and Tibetan Autonomous Region, Qinghai Province and China Science and Technology Development Group Corporation and Qinghai New Energy (Group) Co., Ltd. This project declares that the first million-KW solar power station in the world would be constructed in west China, marking that the development of solar power in China would outclass the estimation in the Mid- Long Term Development Plan for Renewable Energy. At this rate, the grid solar power generators in China may gain the capacity of 5 million KW by 2010 and 300 million or more by 2020.

### **III. Conclusions**

Major non- renewable energy sources in China are exhausting at a faster rate than the global average; China is depending on non- renewable energy more than developed countries; China's economy is developing at a faster rate than other countries; in the future, China would have a growing demand for energy. The above factors determine that China must adopt unconventional methods and modes to develop renewable energy at a high speed.

China's energy structure is undergoing great changes and renewable energy sources,

mainly wind power and photovoltaic power, are growing at a speed beyond expectation. With adequate support and favorable policies, the wind power would grow by 100-200% yearly in the next few years and take up 20% of the total power output in China around 2015. The development of photovoltaic power should not be underestimated, and it will grow at a faster rate than wind power if winning close attention of the government and take up more than 20% of the total power output by 2020.

The explosive growth of renewable energy and its growing share in the power supply structure will drive the instant development of related science and technology and industries and will lead to change of social consciousness and people's way of life. The combined effect would cause greater changes and plow the soil for social reforms.

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