



## Strategic Path for Developing China's Low-Carbon Energy

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### Abstract

Low-carbon economy influences all aspects of a country. Therefore, every country must face up to low-carbon economy actively, not excepting China. It is universally acknowledged that low-carbon economy is based on the perfect energy system. However, in general, China's energy situation is now facing a grim situation. On the base of energy situation analysis, this paper considers that the perfect energy system is the foundation of China's low-carbon economy, energy conservation and energy efficiency improvement are the most effective ways to develop low-carbon economy in China, development and application of new and renewable energies is the key of optimizing energy structure and raising energy reserves, furthermore proposes the safeguard system and incentive mechanisms of new energy industries. Finally, this paper constructs a systematic framework of China's renewable energy development. Only by speeding up these steps consistently can renewable energy be successful in China.

**Key words:** Low-carbon economy; New and renewable energy; Strategic path; Systematic framework

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### INTRODUCTION

The urgent need to combat climate change is becoming a key determinant of the economic development path of all nations. It is no exaggeration to say that, if we fail to create sustainable, low carbon economies, humanity's future looks bleak (Sam Nader, 2009). In recent years, with a series of climate change conferences held by the United Nations, for example, Bali climate change conference 2007 in Indonesia, Copenhagen climate change conference 2009 in Denmark, Tianjin Climate talks 2010 in China, Cancun climate conference 2010 in Mexico, the low-carbon economy is becoming more and more important for the whole world.

As the largest developing country, economic growth remains a priority for Chinese government because China is at the middle stage of industrialization, urbanization and modernization. However, accompanied with the environmental pollution, ecological deterioration and the high increase rate of Greenhouse Gas (GHG) emissions, this growth is, increasingly, being measured by the effectiveness of the steps taken to against the climate change and protect the environment. So, the growth of economy should not be pursued at the expense of environmental pollution in China.

In 2007, at the 15th APEC Economic Leaders' Meeting, President Hu Jintao pointed out that climate change is fundamentally a development issue; so it can only be resolved by means of sustainable development, which requires the coordination among economy growth, society development and environmental protection. Neither stopping the development to deal with climate change nor developing the economy without considering the climate change is acceptable. We should establish the mode of production and consumption adapting to sustainable development requirements so as to optimize the energy mix, upgrade industries, build resource saving and environmental friendly society, address the challenges of climate change fundamentally. It is clear that low-

carbon economy is the central part of China's sustainable development strategy now, it is high time that Chinese government put considerable emphasis on and implement it as soon as possible.

In 2008, Wu Xiaoqing, Vice Minister of Ministry of Environmental Protection of China emphasized that whether China can stand the world's forefront in future decades, may be largely determined by China's adjustable ability to low-carbon economy development, China must take active action promptly to address the global low-carbon economy challenge.

At present, China is the world's largest emitter of carbon dioxide (CO<sub>2</sub>), the significant increment of CO<sub>2</sub> emissions accounts for 57% of the global CO<sub>2</sub> emissions increment from 2000 to 2006. In contrast, India is 6.03%, US is only 0.22%. On the other hand, as far as total emissions are concerned, in 2006, the amount of CO<sub>2</sub> emissions related to the energy industry is 5.65 Gt in China, which is 20% of the global CO<sub>2</sub> emissions and a little lower than the 5.67 Gt of the US (Jiang, Sun. & Li, 2010).

Therefore, China must follow the way of low-carbon economy for coping with climate change, promoting sustainable development, expediting transformation of the economic development pattern, safeguarding national energy security and building the resource-saving and environment-friendly society.

## 1. THE FOUNDATION OF LOW-CARBON ECONOMY: PERFECT ENERGY SYSTEM

China is at the medium term of industrialization and urbanization, economic growth rapidly will last a long time. However, energy system has been becoming the "bottle-neck" of economic expansion because the second industry proportion is too high, coal continues to dominate energy system and energy demand depends on oil import heavily. So, these basic steps of realizing low-carbon economy must be speeded up energetically such as improving energy system, cutting energy intensity, enhancing energy efficiency, developing renewable energy so as to propel energy conservation and emission reduction.

### 1.1 China's Energy Mix Is Now Facing a Grim Situation

As the world's largest coal producer and consumer China's economy growth depends heavily on the coal, coal's consumption is about twice as much as that of America, the world's second largest coal producer and consumer.

Firstly, China's energy consumption structure is unreasonable, the proportion of coal consumption is too high. Compared with world's average value of 27.8% in the world's primary energy consumption system, lower than 20% in developed countries in 2007, coal

consumption is as high as 69.5% in China's primary energy consumption system. Excessive Coal consumption leads to high "carbon intensity" and obvious "high carbon" feature in the process of economy development. As the world's largest emitter of carbon dioxide now, China's CO<sub>2</sub> emission increment shows a significant increase. At present, 85% of the CO<sub>2</sub>, 90% of the sulfur dioxide (SO<sub>2</sub>) and 73% of the smoke dust are resulted from coal combustion. Economic losses caused by the CO<sub>2</sub> emission account for 2.2% of GDP (National Bureau of Statistics, 2008). In 2007, China substituted for America became the world's largest emitter of CO<sub>2</sub>. Moreover, as the fifteenth oil producer, China is the second largest oil consumer, oil import dependence will increase from nearly 50% today to 80% in 2030 (National Energy Administration, 2007). Large amount of energy resources have to be imported to meet the requirements of economic development in the future.

Secondly, China's energy efficiency is only half of the world's average value. Compared energy efficiency with Japan, the highest energy efficiency country, "China's energy usage efficiency is only one quarter of that of Japan, that is to say, China's energy cost is four times that of Japan under the same output value of \$100" said Wang Jianguo, the Director of China low carbon Development Research Centre, Peking University.

According to the report "Climate Change Solution-Prospect of the Year 2050" of WWF (World-Wide Fund for Nature ), China's current total energy efficiency is about 33%, which is about 10% lower than that of the developed countries. The average energy consumption in power, steel industry, nonferrous metals industry, petrochemical engineering, building materials, chemical engineering, light duty industry and textile industry is 40% higher than the international advanced level. Taking coefficient of energy mining into consideration, total mineral resources recover is 30%, which is about 20% lower than the international advanced level. Take the case of coal exploitation, the average rate of the coal mining is only 30% (Gong, 2009).

Lastly, the effect of energy conservation and emission reduction is still not optimistic. For pursuing "GDP Political achievement", many provinces did not attach importance to energy conservation and emission reduction. By September 2010, most of provinces have not completed the target of energy consumption per unit GDP is decreased by 20% in the 11th Five-Year Plan, merely Beijing and Tianjin fulfilled the task (Liu, 2010). Furthermore, there are still big differences in energy-saving performance among the 30 Chinese provinces. Average energy consumption value per unit of GDP of the whole country is 1.077 tons of standard coal per million yuan in 2009; however, there were 18 provinces whose energy-saving performances were lower than the national average value. Energy consumption per unit of GDP of

Ningxia was as high as 3.454 that was about 6 times as much as the lowest 0.606 of Beijing. In terms of energy intensity cutting, Gansu took the lead, cutting its energy intensity by 6.9% that was 4.6 times as much as the lowest 1.53% of Xinjiang (National Bureau of Statistics, National Development and Reform Commission, National Energy Administration, 2010). Moreover, it was reported that many provinces still insisted on “GDP worship” in the 12th five-year plan, for example, Fujian, Heilongjiang, Guangxi and Guizhou proposed to double the per capita GDP.

Facts have shown that there are still a big gap between China and developed countries on energy mix and energy efficiency, this is the important root cause of becoming the largest emission country. Therefore, improvements of energy structure and energy efficiency are the essential prerequisite for the low carbon economy development of China.

### **1.2 Energy Conservation And Energy Efficiency Improvement Are The Most Effective Ways To Develop Low-Carbon Economy**

On the one hand, China carries out the energy development strategy and gives importance to energy conservation and exploitation, but energy conservation should be given priority. In the meantime, energy efficiency improvement contributes to about 54% reductions, is vital to emission reduction (Jiang, Sun, & Li, 2010). Chinese government has taken many effective measures to propel these works. China has adopted and is implementing the National Climate Change Program, which includes mandatory national targets for reducing energy intensity and the discharge of major pollutants, and increasing forest coverage and the share of renewable energy for the period of 2005 through 2010. By reducing energy intensity alone, China can save 620 million tons of standard coal in the five-year period, equivalent to cutting 1.5 billion tons of carbon dioxide emissions (Hu, 2009).

Energy efficiency improvement is announced as the first priority of China's energy policy in the 11th and 12th Five-Year Plan, the revised Energy Conservation Law of China on October 2007 proclaims that energy conservation is a national policy, and so on. In April 2006, China established the “Top 1000 Enterprises Energy Conservation Action Program”. These enterprises consumed 33% of the national total and 47% of industrial energy consumption in 2004. The program aims to save 100 million tce cumulatively during the period 2006–2010, thus making a significant contribution to China's overall goal of 20% energy intensity improvement (Zhang, 2010).

In addition, governments encourage people to buy energy saving and new energy vehicles, build new energy saving civil buildings through strictly implementing energy efficacy standard. In addition, Chinese government

adjusts vehicle purchase tax or excise tax, carries out automobile rural discount policy and household electrical appliances to rural areas.

On the other hand, Chinese government speeds up “close down, suspend operation, merge with others or shift to different line of production” and “eliminate backward production capacity”, encourage construction of large, more efficient and cleaner units. On August 8th 2010, Ministry of Industry and Information Technology of China (MIIT) proclaimed the list of 2087 “eliminate backward production capacity” enterprises of 18 industries and demanded these enterprises to be closed before the end of September. The minister of MIIT, Li Yizhong pointed out: “only by speeding up to eliminate backward production capacity, can extensive mode of economic growth of high input, high pollution, high consumption and low output be changed, can industrial structure be optimized, can international competitive ability be enhanced, and can large industries to grow stronger. Those enterprises that don't observe the regulations to eliminate backward production capacity will be withdrew the sewage discharge permission licenses, banks and financial institutions can't provide them for any forms of additional credit granting support, investment management departments can't examine and approve and the new investment projects, land resource management departments can't approve additional land and related departments refuse to transact the production permit for them. Those enterprises with heavy tasks and fulfill them smoothly would be offered support funds for technological transformation, energy conservation and emission reduction, land development and utilization, financing support, and so on.

### **2.3 Structure Developing and Utilizing New and Renewable Energy Is the Key of Optimizing Energy Structure and Raising Energy Reserves**

Development of new and renewable energies is the important means for energy conservation and emission reduction, environment protection and addressing climate change. In November 2009, Premier Wen Jiabao issued a speech of “Let the Science and Technology Lead China's Sustainable Development”, Wen pointed out that the emerging strategic industries gradually should become the leading force in economic and social development. He stressed that the scientific selection of the emerging strategic industries is very important. China's development of new strategic industries, have a certain degree of comparative advantage and broad space for development, can make a difference. China must attach great importance to the development of new energy industries, innovation and development of renewable energy technologies, energy conservation and emission reduction technologies, clean coal technology and nuclear technology. Premier Wen Jiabao's speech provided a vital guide for China's development of new energy and renewable energies.

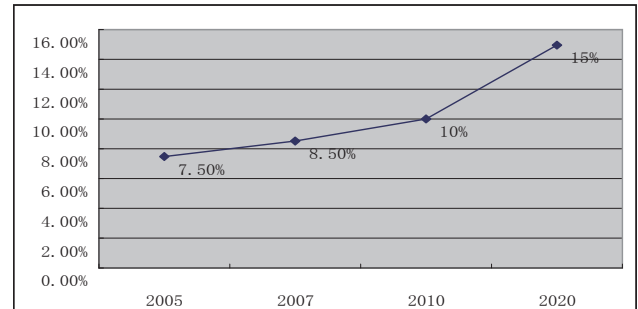
Overall, China's energy situation is "rich coal, poor oil and lack gas". However, China's renewable energy is very plentiful. Wind power is currently enjoying the fastest growth in all power generation technologies in China, almost doubling the installed capacity every year since 2004. As a result, it has grown from 0.76GW in 2004 to 13.24GW in 2008. Some believe that China is on track to beat the government's current wind power target (30GW by 2020) by 200%. China now has the world's fourth largest wind power capacity after US, Spain and Germany. It is believed that China could reach 100–120GW by 2020 and up to 270GW in 2030 (Wang & Watson, 2010).

Meanwhile, Hydropower resource to be exploited in China is at the top of the world, wind power, biomass power, hydrogen energy and ocean energy are in the leading position as well. However, except hydropower is relatively well developed and utilized, the proportion of renewable energy is only 2%, far below the average value 8% of the international advanced level. Therefore, China should improve energy structure and develop cleaner energy and renewable energy energetically, such as wind energy, solar energy, biomass power, geothermal energy, tidal energy and nuclear energy so as to realize resources to be achieved lastingly and supplied sustainably.

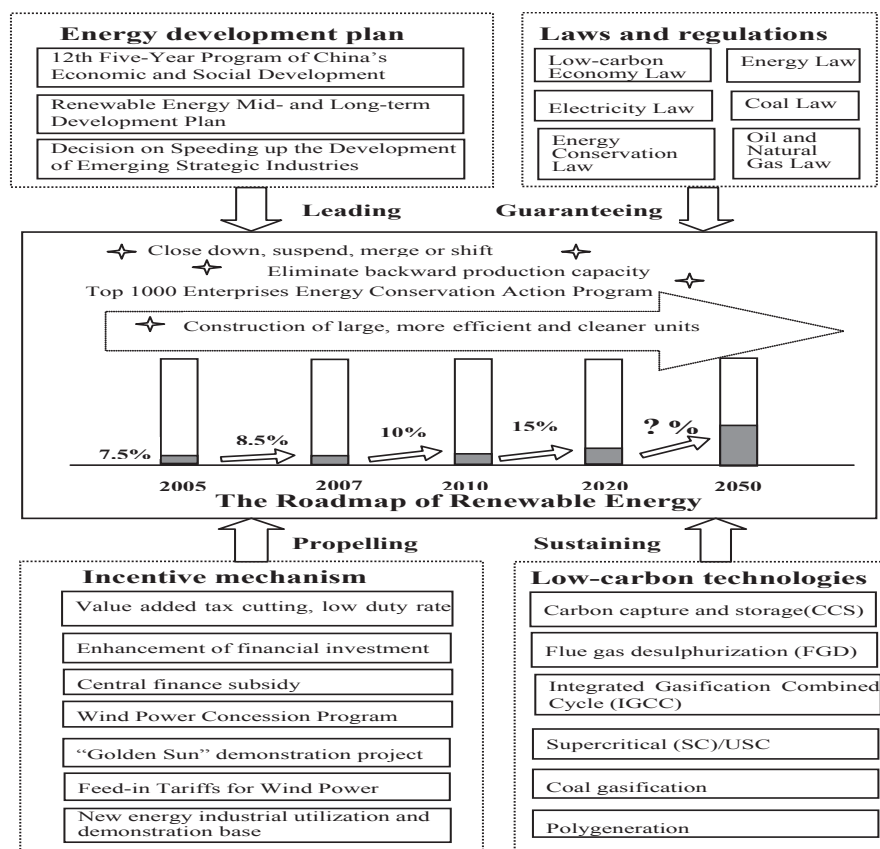
**Table 1**  
**China's Renewable Energy Mid and Long-Term Development Plan**

Year	Hydropower/ GW	Biomass power/ GW	Wind energy/ GW
2005	117	2.0	1.26
2007	145	3.9	12.2
2010	190	5.5	5.0
2020	300	30	30

Note: GW is a unit of capacity in power generation, 1GW =1000MW (Jiang, Sun & Li, 2010)



**Figure 1**  
**The Proportion of Renewable Energy in China's Primary Consumption System**  
 Sources: National Energy Administration (NEA), 2012



**Figure 2**  
**Strategic Path and Systematic Framework of China's New and Renewable Energy Development**  
 Sources: Author's own photograph



According to renewable energy mid and long-term development plan, China has targeted alternative energy sources to meet 15% of the nation's energy requirements by 2020, up from 8.9% in 2008. This is a big step up from the previous goal of 10% by 2020. Under this ambitious government plan, China aims to have an installed capacity of 300 GW for Hydropower, 30 GW for wind power and 30 GW for biopower and to produce 10 million ton of ethanol and 2 million ton of biodiesel by 2020 (Zhang, 2007b). It can be seen from the Table 1 and Figure 1, renewable energy proportion will account for 15% of the nation's primary energy consumption system by 2020, twice as much as that of 2005.

### 3. SAFEGUARD SYSTEM OF NEW ENERGY INDUSTRIES: LAWS, REGULATIONS AND INCENTIVE MECHANISMS

First, China has enacted a series of related laws and regulations to lead and propel development of new energy industries, such as Energy Law, Mineral Resources Law, Coal Law, Electricity Law, Cleaner Production Promotion, Low-carbon Economy Law, Oil and Natural Gas Law, Civil Nuclear Energy Law and Energy Public Utility Law. Meanwhile, the supporting regulatory documents of Renewable Energy Law, Energy Conservation Law (have been revised) is going to be constituted soon.

From October 15th to 18th, 2010, the fifth plenum of the 17th CPC central committee was held in Beijing. The plenum adopted the "CPC Central Committee's Proposal for Formulating the 12th Five-Year Program for China's Economic and Social Development (2011-2015)". The plenum underscored the importance of developing strategic emerging industries and constructing modern energy industry. Moreover, in October 2010, China enacted the "The decision on speeding up the development and cultivation of emerging strategic industries" and defined 7 industries, namely, energy saving and environmental protection, new energy, new energy vehicles, new generation of information technology, biology, high-end equipment manufacturing and new material. Most of them are related with new and renewable energies.

Second, China's investment for new energy industries is increasing obviously in recent years. According to the research finding of Climate Change Research Institute of Australia, China has invested \$35 billion for clean energy in 2009, far higher than America's \$18 billion. Other findings also indicated that China's clean energy investment accounted for \$13.5 billion in the global \$38 billion, but America's investment decreased to \$4.4 billion in the third quarter of 2010.

Third, there are many incentive mechanisms to promote development of strategic emerging industries

in China. In July 2009, China implemented "the Golden Sun" demonstration projects to promote the solar energy industry. Through this program, the government will subsidize 50% of investment costs for more than 500 MW of solar power capacity by 2011.

For developing wind power, Chinese government has carried out lots of encouraging mechanisms, include value added tax being cut in half, low duty rate, and duty free for equipments imported for renewable energy technologies. These measures made a large number of domestic wind power enterprise rise in the world, such as Sinovel Wind, Goldwind Science and Technology and Dongfang Electric. Meanwhile, China has carried out "Wind Power Concession Program" and "Feed-in Tariffs for Wind Power" as its basic strategy to further propel wind power development.

Last, Chinese government can promote development of new energy industries by building of new energy industrial utilization and demonstration bases so as to summarize the rule, realize scientific deployment and provide support for low-carbon economy. At present, there are many windmill and solar PV product bases in Xinjiang, Inner Mongolia, Shandong, Hebei, Tianjin and Wuxi. At the same time, China had planned 13 large hydropower bases, including upriver of Changjiang River, Wujiang River, Nanpanjiang Hongshui River, downriver of Yellow River, Western of Hubei province, Fujian, Zhejiang and Jiangxi district, and northeast seven hydropower bases with deep exploitation (Jiang, Sun, & Li, 2010).

Recently, Ministry of Finance, Ministry of science and technology, Ministry of Housing and Urban-Rural Development, and National Energy Administration promulgated the first 13 demonstration zones of centralized application on photovoltaic power generation, the list includes Beijing Yizhuang Economical Development Zone, Shanghai Zhangjiang High-tech Park, Sino-Singapore Tianjin Eco-city, Shenzhen High-tech Industrial Park, and so on. Chinese government will enhance the policies support strength to those application and demonstration projects of Golden Sun and Building Integrated Solar PV, the central finance will subsidize 50% of the agreement price to critical equipment.

### CONCLUSION

In summary, at present, nothing is more important than to promote low-carbon economy in China. It is high time to construct system framework and provide ideas and countermeasures for creating low-carbon economy ways with Chinese characteristics. Taking into account all systemic factors, we may safely reach the conclusion that the energy development system in China for low-carbon economy is fundamental. It is high time that governments put considerable emphasis on it and implement it as soon as possible.

From what has been discussed above, we may construct the strategic pathway of the energy development system for low-carbon economy in China. As is shown by Fig.2, lots of essential factors with different functions jointly provide support and guarantee for China's low carbon energy system. Among these factors, energy development plan leads the China's renewable energy, laws and regulations provide guarantee, and incentive mechanism propels the development of renewable energy. At the same time, low-carbon technologies will sustain the whole system. Only by improving these factors continually, can China's renewable energy system will make great progress in a forward direction.

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## REFERENCES

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- Gong, J. W. (2009). Low-carbon economy: China's realistic choice. *Jiangxi Social Sciences*, (7), 27-33.
- Hu, J. T. (2009). Join Hands to Address Climate Challenge at the opening plenary session of the United Nations Summit on Climate Change. Retrived from: [http://news.xinhuanet.com/world/2009-09/23/content\\_12098887.htm](http://news.xinhuanet.com/world/2009-09/23/content_12098887.htm).
- Jiang, B., Sun, Z. Q. & Li, M. Q. (2010). China's energy development strategy under the low-carbon economy. *Energy*, 35(11), 4257-4264. doi:10.1016/j.energy.2009.12.040.
- Liu, F. Y. (2010, Dec. 2). Such action of energy conservation and emission reduction, what can we do in the 12th Five-Year? *Chongqing Economic Times*, p.23.
- Nader, S. (2009). Paths to a low-carbon economy—the Masdar example. *Energy Procedia*, 1(1), 3951-3958. doi:10.1016/j.egypro.2009.02.199.
- National Bureau of Statistics, National Development and Reform Commission, National Energy Administration. (2010). The energy consumption communique of the provinces, autonomous regions and municipalities of per unit of GDP in 2009, Retrived from: [http://www.stats.gov.cn/tjgb/qttjgb/qgqttjgb/t20100715\\_402657560.htm](http://www.stats.gov.cn/tjgb/qttjgb/qgqttjgb/t20100715_402657560.htm).
- Wang, T., & Watson, J. (2010). Scenario analysis of China's emissions pathways in the 21st century for low carbon transition. *Energy Policy*, 38(7), 3537–3546. doi:10.1016/j.enpol.2010.02.031.
- Zhang, Z. X (2010). China in the transition to a low-carbon economy. *Energy Policy*, 38(11), 6638-6653. doi: 10. 1016/ j.enpol.2010.06.034.
- Zhang, Z. X. (2007b). China is moving away the pattern of “develop first and then treat the pollution. *Energy Policy*, 35(7).