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Case study

## **CHINA**

### **INDUSTRIAL ENERGY EFFICIENCY POLICIES**

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# **I Introduction**

## **(I) China's Economic and Social Development during "the 11<sup>th</sup> Five-Year Plan" Period**

### **1. The national economy maintained steady and relatively fast growth<sup>1</sup>**

The economy witnessed steady and relatively fast growth. During the earlier stage of "the 11<sup>th</sup> Five-Year Plan" period, our economy maintained rapid annual growth. In 2006, it increased for 12.7% while it accelerated to 14.2% in 2007, which was second only to that in 1984, the highest after reform and opening up. In 2008, by the huge impact and influence of the international financial crisis in generations, growth suddenly dropped to 9.6%. Facing severe situations both at home and abroad, the Party Central Committee and the State Council made resolute decisions, developed rapidly and perfected ceaselessly a package programs in response to the international financial crisis. Therefore, the economic growth of our country rebounded at first among countries all over the world. In 2009, China's annual economic growth was 9.2%, in sharp contrast to the decrease of 0.6% for world economy. In 2010, the economic growth further rebounded to 10.3%, which was obviously faster than the average acceleration of major countries in the world. From 2006 to 2010, the average annual growth of our GDP reached 11.2%, which was not only higher than the simultaneous world average annual growth but also faster than the average annual growth during "the 10<sup>th</sup> Five-Year Plan" period for 1.4%, thus forming one of the periods with fastest economic growth after the reform and opening up.

The economic aggregate was reaching a higher stage ceaselessly. In 2008, our GDP exceeded that of Germany, ranking the third in the world. In 2010, our GDP reached USD 5.8791 trillion after converted at an average rate, exceeding that of Japan and becoming the second large economic entity in the world, only second to USA. Contributions of our economic growth to the world economy improved continuously.

### **2. People's livelihood improved significantly**

The employment scale enlarged continuously. During "the 11<sup>th</sup> Five-Year Plan" period, the number of urban and rural employment was increased from 758.25 million at the end of 2005 to 779.95 million at the end of 2009, increasing 21.7 million with an average annual increase of 5.43 million. As the acceleration of urbanization and

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<sup>1</sup>Note: data from Integrated Statistics Division of National Economy of National Bureau of Statistics of China

industrialization, the ability to absorb employment in cities and towns has been increasing, the growth of which was over that of the whole country. Its employment accounted for 39.9% at the end of 2009 increased from 36.0% at the end of 2005. The urban employment accelerated rapidly. New employment continues to over 11 million people. Abundant rural labour forces were transferred to urban area ceaselessly. The total number of migrant workers reached 242.23 million in 2010.

Income of urban and rural residents increased vigorously. During “the 11<sup>th</sup> Five-Year Plan” period, the income of our urban and rural residents increased rapidly. In 2010, the per capita disposable income in urban area was RMB 19109 Yuan, increasing for 82.1% compared with that of 2005 with an actual average annual growth of 9.7% after adjusting for inflation. Moreover, the per capita net income in rural area was RMB 5919 Yuan, increasing for 81.8% with an actual average annual growth of 8.9% after adjusting for inflation, where the actual growth of rural residents per capita net income in 2010 was 10.9%, which was the fastest year since 1985, higher than that of urban for 3.1%. It was also the first time that the rural growth was faster than that of urban area since 1998.

The livelihood of urban and rural residents improved significantly. As the substantial rise of consumption level of urban and rural residents, the consumption expenditures of urban and rural residents witnessed sustainable growth with obvious improvement of living standard. In 2010, the per capita non-productive expenditure of urban and rural residents was RMB 13471 Yuan, increasing for 69.6% compared with that of 2005 with average annual growth of 11.1%. Meanwhile, the per capita non-productive expenditure of rural residents was RMB 4382 Yuan, increasing for 71.5% compared with that of 2005 with average annual growth of 11.4%. The consumption structure of urban and rural residents was transferred to development and enjoyment orientation, which was shown in three aspects, namely the continuous decrease of food expenditure percentage, the sharp increase of transportation and communications expenditure, the doubled increase in holding quantity of main durable consumer goods.

### 3. The environmental quality was improved continuously

The environmental quality witnessed continuous improvement. In 2010, water quality sections achieved Categories I to III, among the water quality monitoring section of seven major water systems, accounted for 59.6%, increasing for 18.6% compared with that of 2005. Cities with air quality reaching up to Level II (including) accounted

for 82.7% of those under monitor, increasing for 22.4% compared with that of 2005. At the end of 2010, the daily processing capacity of urban sewage treatment plants was up to 102.62 million m<sup>3</sup>, increasing for 79.2% compared with that of 2005 year-end. In addition, the treatment rate of domestic sewage reached 76.9%, increasing for 24.9%.

The total pollutant emissions were controlled step by step. The national chemical oxygen demand in 2010 decreased for about 12% compared with that of 2005 while emission of sulphur dioxide dropped for about 14%, both of which satisfied the emission reduction tasks specified in “the 11<sup>th</sup> Five-Year Plan”.

All in all, our economic and social development withstood all kinds of challenges and trials during “the 11th Five-Year Plan” period, and the social productive forces witnessed rapid development. Furthermore, the comprehensive national strength was improved greatly, people lived a much better life and the social undertakings underwent overall development, the international prestige and influence improved remarkably. Besides, new and tremendous achievements were scored regarding reform and opening up as well as socialist modernization. Especially, we adhere to the scientific outlook on development as guidance, and quicken the transformation of economic development mode and strategic restructuring of the economy when facing the huge shock of international financial crisis simultaneously. We paid more attention to the improvement of the people’s livelihood and development of social undertakings to lay solid foundation for the long-term and sustainable development of our economy and society.

## (II) China’s Energy Production and Consumption during “the 11<sup>th</sup> Five-Year Plan” Period<sup>2</sup>

“The 11<sup>th</sup> Five-Year Plan” period is critical in the history of our energy development. As the continuous and rapid growth of national economy, our country is rapidly emerging as the world energy-rich country. We ranked the first and second in terms of total primary energy production and total consumption respectively, thus resulting in remarkable improvement of influence in international energy affairs.

“The 11<sup>th</sup> Five-Year Plan” period is the five-year for accelerate development of our urbanization and industrialization. The total primary energy production ascended to

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<sup>2</sup>Note: data from National Energy Administration

2.97 billion tons of standard coal (tce) in 2010 from 2.16 billion tce at the end of “the 10<sup>th</sup> Five-Year Plan” period with an average annual growth of 6.6% and a self-sufficiency rate of about 90%. Besides, total primary energy consumption ascended to 3.25 billion tce from 2.36 billion tce with an average annual growth of 6.6%. The energy demands in the rapid development of national economy, therefore, were guaranteed well.

### (III) China’s Energy Utilization Efficiency during “the 11<sup>th</sup> Five-Year Plan” Period

The average annual growth of national economy for 11.2% was realized with the support of average annual growth for 6.6% of energy consumption during “the 11<sup>th</sup> Five-Year Plan” period and the energy consumption elasticity coefficient dropped to 0.59 from 1.04 in “the 10<sup>th</sup> Five-Year Plan” period (2001-2005), thus relieving the energy supply and demand contradiction<sup>3</sup>.

From 2006 to 2010, the energy consumption of our GDP decreased accumulatively for 19.06%, realizing the goals of energy conservation and consumption reduction of “the 11<sup>th</sup> Five-Year Plan” period. Energy consumption per unit of main energy-using products dropped remarkably. During “the 11<sup>th</sup> Five-Year Plan” period, full energy consumption per unit of copper smelting, caustic soda production and per ton of cement as well as crude oil processing decreased for 35.9%, 34.8%, 28.6% and 28.4% respectively. The standard coal consumption of thermal power generation decreased for 16.1%. The full energy consumption per ton of steel, per unit of electrolytic aluminium and ethylene production decreased for 12.1%, 12.0% and 11.5% respectively<sup>4</sup>.

## II Characteristics of China’s Industry

### (I) China’s Industrial Economic Development during “the 11<sup>th</sup> Five-Year Plan” Period<sup>5</sup>

#### 1. The industry witnessed rapid development

##### (1) The industrial economy maintained steady and rapid growth

During “the 11<sup>th</sup> Five-Year Plan” period, China’s economic aggregate was reaching new levels constantly. In 2010, China’s gross domestic product (GDP for short)

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<sup>3</sup>Note: data from China News Service

<sup>4</sup>Note: data from National Bureau of Statistics of China

<sup>5</sup>Note: data from *China Industrial Energy Efficiency Report 2011*

reached RMB 40.12 trillion Yuan after adjusting for inflation, increasing for 69.9% compared with that of 2005 with an average annual growth of 11.2%.

China's industry continued to maintain steady and rapid growth. In 2010, the overall industrial added value broke through RMB 16 trillion Yuan, increasing for RMB 8.3 trillion Yuan compared with that of 2005 and increasing for 73.7% calculated at constant prices. During "the 11<sup>th</sup> Five-Year Plan" period, the average annual growth was 11.7%, exceeding that of China's GDP for 0.5%.

## (2) Main industrial production increased sharply

Since ushering into new century, production of China's industrial raw materials, such as steel, non-ferrous metal, cement, caustic soda, sodium carbonate and ethylene, etc. has expanded for several times. In details, production of steel, ten kinds of non-ferrous metals, cement, caustic soda, sodium carbonate and ethylene of 2010 increased for 112.5%, 90.1%, 76.0%, 80.0%, 43.0% and 88.1% respectively compared with that of 2005 with average annual growth rates of 16.3%, 14.0%, 12.0%, 12.4%, 7.4% and 13.5% respectively during "the 11<sup>th</sup> Five-Year Plan" period.

## 2. High energy intensive industrialization trend slowing and industrial structure adjusting steadily

During "the 11<sup>th</sup> Five-Year Plan" period, China's heavy industry still occupied important proportion in national economy with development speed considerably higher than that of light industry. On one hand, the rapid promotion of China's urbanization called for abundant infrastructure construction, which would inevitably push forward the preferential development of heavy industry; on the other hand, the residents' consumption upgraded from taking eating, clothing and daily necessities as the main line to taking shelter and transportation as the main line, especially such consumption expenditures as housing and automobile, etc. were increasingly becoming the major part of household consumption.

In general, the proportion of heavy industrial added value in China's industrial added value during "the 11<sup>th</sup> Five-Year Plan" period ascended compared with that of "the 10<sup>th</sup> Five-Year Plan" period with a slowed down growth nevertheless. As data shown, growth of heavy industry proportion dropped to 1.4% in "the 11<sup>th</sup> Five-Year Plan" period from 6.1% in "the 10<sup>th</sup> Five-Year Plan" period, decreasing for 4.7%.

During "the 11<sup>th</sup> Five-Year Plan" period, China's industrial sectors realized different levels of development, which was mainly shown in: retarded growth of energy-intensive sectors, accelerated structure optimization of energy industry,

remarkable improvement of equipment manufacturing capacities and ceaseless scale-up of high-tech manufacture.

### 3. Innovation capability increased and technology upgraded

During “the 11<sup>th</sup> Five-Year Plan” period, the country adhered to market-oriented guidance and took enterprises as main body. It also enhanced the capability of independent innovation as the core, increased the input of scientific research funds and implemented the special project of technical upgrading to promote the technical progress and innovation capability of China’s industrial enterprises.

As of the end of 2009, 127 national engineering centers, 636 national enterprise technical centers and 5011 provincial enterprise technical centers were constructed relying on the industrial enterprises. The R&D expenditure of industrial enterprises above the designated size<sup>6</sup> accounted for 0.61% of sales income. The number of enterprise patent applications has accounted for 50.7% of total domestic patent applications. Furthermore, the major scientific and technical achievements accomplished by industrial enterprises accounted for 37.0% of total national ones.

A batch of important technique equipment and key technologies obtained key breakthroughs and the autonomy manufacture and localization of major equipment increased ceaselessly.

### 4. Informationization level enhanced and technical level upgraded

Informationization is the important symbol for industrial modernization. The information technology has been become the growth point for economic development, the application of which in fields such as industrial R&D design, process control and enterprises management, etc. is increasingly deepening. During “the 11<sup>th</sup> Five-Year Plan” period, traditional sectors were further transformed with information technology to promote the industrialization with informationization. At present, 89% machinery enterprises have established financial management system while more than 90% iron and steel enterprises have applied purchasing, financial and sales system, etc. Moreover, application of information systems such as ERP (Enterprise Resources Planning), SCM (Supply Chain Management) and CRM (Customer Relationship

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<sup>6</sup> Note: Before the year 2010 (including 2010) industrial enterprises above designated size refers to corporate industrial enterprises whose main business income accounts for 5 million Yuan or more, however, refers to those whose main business income accounts for 20 million Yuan or more after the year 2011(including 2011).

Management), etc. in petrochemical industry, building materials industry and light industry, etc. is deepened continuously.

“Benefits Coming from Management” has become the common view of governments and enterprises. In 2008, the Ministry of Industry and Information Technology of the People’s Republic of China (hereinafter referred to as the MIIT) was established for the purpose of further strengthening the industrial management and integrating responsibilities of related departments. After establishing, six fields of industrial department are administrated by the MIIT, i.e. raw material industry, equipment industry, consumer goods industry, electronic information industry, software service industry and communication industry. The MIIT and government departments in charge of industry at all levels will formulate management policies regarding industrial development, resource development, investment & construction, production operation, import/export adjustment, energy conservation and emission reduction, scientific-technical progress and safety production, etc. according the types of sectors. For the enterprises management, Chinese industrial enterprises have made some progress in safety production management, risk management and quality management, etc. along with the gradual penetration of advanced management concept and ceaseless deepening of management tools.

## (II) China’s Industrial Energy Consumption during “the 11<sup>th</sup> Five-Year Plan” Period

### 1. Total industrial energy consumption<sup>7</sup>

During “the 11<sup>th</sup> Five-Year Plan” period, total energy consumption in China increased relatively fast along with the steady and rapid growth of China’s economy. During the past five years, the annual growth of total energy consumption in China was up to 6.6%. In 2010, total energy consumption in China has broken through 3.2 billion tce, accounting for about 20% of the world’s energy consumption. Therefore, it can be expected soon that China will become the No.1 energy consumption country in the world.

During “the 11<sup>th</sup> Five-Year Plan” period, China’s industry continued to serve as the major power for promoting the energy consumption, which was manifested chiefly by the uninterrupted rising of total industrial energy consumption and carryover of

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<sup>7</sup>Note: data from *China Industrial Energy Efficiency Report 2011*

industrial energy consumption proportion. In 2010, China's industrial energy consumption was about 2.4 billion tce, increasing for over 40% than that of 2005. The annual growth of China's industrial energy consumption was about 7%, higher than that of total energy consumption in China simultaneously. After maintaining as 71.5% for four years, China's industrial energy consumption proportion was increased to 73.8% suddenly in 2010, increasing for 2.3% than that of 2005.

## 2. Industrial energy utilization efficiency<sup>8</sup>

During "the 11<sup>th</sup> Five-Year Plan" period, China's industrial energy consumption elasticity coefficient dropped to 0.784 of 2010 from 0.916 of 2005. View from annual changes, the industrial energy consumption elasticity coefficient dropped continuously to the lowest point— 0.441 in 2008 from 0.975 of 2006. Henceforth, as the growth rate of China's industrial added value decreased to the minimum in 2009, the industrial energy consumption elasticity coefficient rebounded anyway at the same year and it was affected by carryover effect of industrial energy consumption at the end of the period.

Energy consumption per industrial added value serves as one of the important indicators for reflecting the industrial energy consumption utilization efficiency. From 2005 to 2010, China's energy consumption per industrial added value decreased to 1.92tce/10-thousand Yuan from 2.59tce/10-thousand Yuan with an accumulative falling range of 26% and annual decrease of 5.8%, higher than that of simultaneous China's energy consumption per unit of GDP.

Considering the energy consumption per industrial added value of energy-intensive sectors, this consumption of iron and steel, petrochemical, building materials and non-ferrous metal sectors decreased for 23.2%, 13.5%, 44.9% and 24.9% in 2009 compared with that of 2005 respectively.

During "the 11<sup>th</sup> Five-Year Plan" period, the energy consumption per unit of main energy-using products in China dropped remarkably. From 2005 to 2010, the full energy consumption per ton of iron and steel enterprises under key statistics decreased for 12.88%. The full energy consumptions of crude oil process, ethylene, synthesis ammonia, caustic soda, sodium carbonate and calcium carbide in petrochemical industry and cement decreased for 4.89%, 10.65%, 6.64%, 20.16%, 16.21% and 9.04% as well as 32.54% respectively. In the aluminium industry, the full energy

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<sup>8</sup>Note: data from *China Industrial Energy Efficiency Report 2011*

consumption of aluminium oxide decreased for 40.8%, the AC power consumption of aluminium ingot (electrolytic aluminium) dropped for 4.19%. Moreover, the full energy consumptions of other on-ferrous metals, such as copper smelting, lead smelting and zinc hydrometallurgy decreased for 45.6%, 35.67% and 48.95% respectively. The coal consumption per unit of power supply of thermal power generating units of 6000 kW or above in China's power sector decreased for 10% and the per power generation coal consumption decreased for 9.04%.

### (III) China's Industrial Greenhouse Gas Emission during "the 11<sup>th</sup> Five-Year Plan" Period

During "the 11<sup>th</sup> Five-Year Plan" period, the total emission of carbon dioxide generated in industrial energy consumption activities in China was about 22 billion tons<sup>9</sup>, accounting for 70%<sup>10</sup> of China's total carbon dioxide emission during "the 11<sup>th</sup> Five-Year Plan" period.

## III Previous Energy Efficiency Policy Framework

### (I) China's Previous Energy Efficiency Policies Overview

The introduction of energy efficiency policies of China was nearly synchronous with the reform and opening up, which can be divided into three stages in chronological order, namely 1980s, 1990s and early stage of 21<sup>st</sup> century. Energy issues occurred at each stage had their own characteristics. Therefore, the introduced energy efficiency policies were adjusted in terms of effects and objects. In general, the legal status of energy conservation is increasingly higher and the energy efficiency policies are penetrating to various aspects of social and economic life step by step.

#### 1. 1980s

At the preliminary stage of 1980s, our economy began to develop rapidly with critical energy shortage. "Energy Shortage" became the maximum momentum for "Energy Conservation". In 1980, the State Council endorsed the National Economic Council and State Development Planning Commission with *Report on the Work of Strengthening the Energy Conservation and Notice of Building up the Full energy Consumption Evaluation System*. Energy conservation, as one special work, was

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<sup>9</sup>Note: convert in accordance with total industrial energy consumed during "the 11<sup>th</sup> Five-Year" with the conversion coefficient of 2.5

<sup>10</sup>Note: total carbon dioxide emissions were about 31.4 billion tons during "the 11<sup>th</sup> Five-Year" according to *Annual Review of Low-Carbon Development in China* (2011-2012)

incorporated in the range of state macro management. Meanwhile, dedicated energy efficiency management department was established by the country and such guideline as “adhere to both development and conservation, put the conservation at the first place recently” was also established. In 1981, the State Development Planning Commission, National Economic Committee and National Energy Commission jointly issued *Several Specific Requirements for Industrial and Mining Enterprises and Urban Energy Conservation (trial implementation)* (i.e. “Article 58”). At the same year, the State Development Planning Commission, National Economic Committee, National Energy Commission, MOF of the People’s Republic China and State Reserves Bureau jointly issued *Implementation Measures of Mark-up Charge for Over-rate Fuel Consumption*. These prescriptive provisions incorporate actual situations fully with strong operability. In 1984, the State Development Planning Commission, National Economic Committee and State Scientific and Technological Commission jointly compiled *An Outline of China's Policies on Energy conservation Technologies* and revised the *Outline* in 1996 and 2006 respectively. In 1986, the State Council issued *Provisional Regulation on the management of Energy efficiency* which serves as the first administrative regulation for overall guiding the energy conservation work of the country and played the role as the normative regulation for energy conservation before promulgating the *Law of the People's Republic of China on Energy Conservation* in 1997. In September 1987, the former Ministry of Urban and Rural Construction and Environmental Protection, the State Development Planning Commission, National Economic Committee and the State Bureau of Building Materials Industry issued *Application Notice about “Energy Conservation Design Standard of Civil Building (Heating Residential Building)”*. Henceforth, energy conservation of civil building of our country attracted attentions from competent departments from place to place and they introduced implementation rules of building energy conservation design in succession. At the same year, *Provisional Regulation on the Upgrading (gradation) of Enterprise Energy efficiency management* was issued. It proposed to promote the enterprise upgrade on the basis of energy conservation upgrading.

## 2. 1990s

In 1990s, the energy shortage of our country was still not relieved. The outstanding achievement of energy efficiency policies in 1990s was the *Law of the People's Republic of China on Energy Conservation* (hereinafter referred to as the Law) issued

in 1997. The promulgation and implementation of the Law specified the important role of energy conservation in the economic and social construction of our country. It defined “energy conservation is a long-term strategic policy for economic development of the country” in the form of law, thus providing the legal protection for promoting the energy conservation activities in our country. To coordinate the implementation of the Law, our government formulated supporting regulations and policies soon afterwards, such as the *Management Measures for Certification of Energy Conservation of China* and *Management Measures of Energy Conservation for Key Energy-using Units*, etc. published in 1999.

### 3. Early stage of 21<sup>st</sup> century

Since entering into the 21<sup>st</sup> century, our country entered a dense period of developing energy efficiency policies along with the continuous increase of energy consumption and increasingly severe energy situation of our country. In 2000, the country formulated 27 energy conservation design specifications, nearly 100 national energy conservation standards and 610 catalogues in 17 batches of eliminated mechanical and electrical products. In 2004, the National Development and Reform Commission (NDRC) proposed the first medium and long term planning regarding energy conservation. It also formulated the *Medium and Long Term Development Plan for Energy* (draft) in 2004.

Meanwhile, our country made certain achievements in terms of sectors energy conservation. For the industry energy conservation, since 2004, the country formulated series of policy documents for guiding the industrial development, enhancing the adjustment for industrial structure, standardizing the industrial access conditions and promoting the industrial revitalization regarding such energy-intensive sectors as coke, steel, cement and electrolytic aluminium, etc. For the building energy conservation, *Regulation of Civil Building Energy Conservation* was promulgated in 2000. For the transportation energy conservation, implementation rules in detail in the transportation industry for *Law of the People's Republic of China on Energy Conservation* were developed in 2000.

## (II) Challenges for China's Energy Conservation Work

### 1. Relationship between economic development and energy conservation & emission reduction is in urgent need of rationalization

The purpose of energy conservation and emission reduction is to transform the economic development mode and improve the quality and efficiency of economic development. The goals of energy conservation and economic development are consistent in long term. However, since China is in the stage of industrialization, the growth mode of traditional industry focusing on the investment and scale-up can still result in considerable economic benefits. Therefore, the provincial and municipal departments in the different stage of development will be confronted with certain problems in handling the relationship between development and energy conservation & emission reduction. In order to realize the goal of energy conservation and emission reduction, provisional measures for steel and cement, etc. in energy-intensive enterprises are adopted in some areas. "Power rationing" is even taken aiming at residents in partial area. This shows that it's difficult to realize the established energy conservation and emission reduction goals in some areas on one hand; on the other hand, the government at each level should improve the understanding for energy conservation and emission reduction which will be taken as the effective methods for transferring the economic development mode and optimizing the industrial structure. When striving to economic development, the energy conservation and emission reduction shall be conducted more scientifically.

### 2. Effect of market means needs to be further tapped

Since the Chinese government plays leading role in economic operation, the promotion of industrial energy efficiency is mainly realized through administrative means. The energy conservation market mechanism, therefore, calls for further development. At present, the resource and energy prices are still not fully rationalized and the tax regulation effects are still not obvious. In addition, the financing channel for enterprises energy conservation is still restricted and the supports of financial institution for the energy conservation projects call for further improvement. Specification for energy conservation service market is lack anyway and deceit occurs occasionally. Considering the long-term effects, the energy conservation is not only depending on the administrative means and national finance input but also the comprehensive utilization of market means and perfection of energy conservation

technologies, finance and service market. Moreover, the enthusiasm of relevant financial and investment institutions should be fully motivated. The market mechanism should be adopted to promote the energy conservation and long-term effective mechanism shall be established for energy conservation.

3. The implementation force of energy efficiency policies is in urgent need of strengthening

Several energy conservation mechanisms specified in relevant laws are still not put into practice. Some supporting laws and regulations are still under formulation. Meanwhile, series of energy conservation standards are in urgent need of supplement. With consideration to some established basic policies, their perfection and detailing still need time after their introduction, otherwise, the specific implementation of local governments and enterprises might be contrary to the original intention of formulation. Besides, insufficient implementation capacity will also influence the effects of those policies. In some areas, the energy efficiency management capacities and work foundations are weak in general and the energy conservation working institutions are overloaded to treat with problems. Effects of some measures, moreover, are difficult to be guaranteed. Thus, the first concerning in the industrial energy efficiency at present is accelerated formulation and perfection of some important energy efficiency management policies and strengthened implementation force of relevant policies.

4. The focus of energy conservation work needs to be further upgraded

From the development of end energy-using products and equipment energy efficiency standards to the promotion and application of key energy conservation technologies, the key point of energy conservation is still restricted in single energy conservation. As the deepening of energy production and management practice, the advanced unit production equipment and special energy conservation technologies can only maintain the partial energy efficiency advancement. The application of system analysis and control measures can realize overall energy conservation and consumption reduction. The productivity of partial energy-intensive sectors increased too quickly, thus multiplying the difficulties of China's energy conservation and emission reduction. Therefore, for the industrial energy conservation and emission reduction, attentions should not only paid to the usage of process technology and equipment but also the source control, i.e. consider the production technology and energy management, thus improving the comprehensive utilization efficiency of energy.

5. The construction of energy conservation mechanism and capacity building are to be further perfected

One of the important topics for China's energy conservation is to establish the "long-term mechanism of energy conservation". However, the energy conservation mechanism is still not sound. It has not fully played its due role in energy conservation. Despite its relatively late start, another important cause for the said insufficiency is the lack of capacity building which is mainly indicated by the weak foundation of energy conservation, difference in talents team and restricted information spreading and technology diffusion. Therefore, in order to perfect the long-term mechanism of energy conservation, intermediary organs for energy conservation should be cultivated actively and talents of energy conservation should also be trained, etc. except the further enhancement of government guidance and establishment of market specifications.

## **IV Summary and Analysis of New Energy Efficiency Policies**

### **(I) System of Responsibility for Achieving Energy Efficiency Goals**

#### **1. Executive summary**

In September 2006, the State Council issued *Approval for Energy Consumption Reduction Indicator Plan per Unit of GDP at Each Region during "the 11<sup>th</sup> Five-Year Plan" period by the State Council* and agreed the Plan in principle. It also required each provincial (autonomous region and municipality directly under the central government) people's government to incorporate the specified energy consumption reduction indicator plan per unit of GDP into their "11<sup>th</sup> Five-Year" and annual plan for local economic and social development, and further practices them in each municipality (district), county and relevant sectors and key enterprises. To practice the responsibility division and tracking evaluation for implementing the system of responsibility for achieving energy efficiency goals, the State Council made specific arrangement and system guarantee. In details, the first is that the National Bureau of Statistics of China, NDRC and National Energy Administration Office formulated evaluation indicator system and announce the energy consumption indicator per unit of GDP of each province (district, municipality) to the public; the second is that the supervisory department is required to check and evaluate the implementation situation of energy consumption indicator plan per unit of GDP of each region and report it to the State Council promptly.

As early as two months before the State Council issued *Approval for Energy Consumption Reduction Indicator Plan per Unit of GDP at Each Region during “the 11<sup>th</sup> Five-Year Plan” period*, i.e. July 2006, NDRC had signed *Responsibility Document for Achieving Energy Efficiency Goals* with 30 provinces, autonomous regions and municipalities directly under the central government and 14 central enterprises in succession. The Document specified the energy conservation indicator of local key enterprises during “the 11<sup>th</sup> Five-Year Plan” period, such as the document signed with Shandong Province includes the energy conservation indicator of 103 local key enterprises during “the 11<sup>th</sup> Five-Year Plan” period. Henceforth, each local government signed responsibility document with the local key energy consumption enterprises to form a complete set of accountability system.

## 2. Implementation effects

The system of responsibility for achieving energy efficiency goals constituted the effective restraint for the energy-using actions of China’s local governments at different levels and enterprises. The local government at different levels took the energy conservation of key energy consumption enterprises as the main measures, thus greatly promoting the energy conservation level of those enterprises. Under the influence of the system of responsibility for achieving goals, government at five levels, i.e. from the central government to province, municipality, county and town, and key energy-using enterprises at different levels established organs in charge of energy conservation and developed the corresponding energy efficiency management measures, thus laying solid organizational foundation for realizing the long-term energy conservation goal in China.

### (II) Financial Funds Reward for Designated Energy Efficiency Projects

#### 1. Executive summary

In August 2007, the Ministry of Finance of the People’s Republic of China (MOF) and NDRC jointly promulgated *Interim Measures of Financial Rewards Management for Energy Conservation Technical Transformation* (No. 371 [2007] of MOF). According to this Interim Measures, the central financial department would arrange necessary guiding funds and adopt the way of “substitute subsidies with rewards” to give support and rewards to ten major key energy conservation programs. The rewards would be in accordance with the actual energy savings after completing the technical transformation and specified standards. The technical transformation

projects of energy conservation with financial rewards refer to such projects as fuel coal industrial boiler (furnace) transformation, excess heat and pressure utilization, oil conservation and substitution, energy conservation in motor system and energy optimization system, etc. specified in *Notice of Implementation Opinion about Ten Major Key Energy Conservation Programs* (No. 1457 [2006] of Department of Resource Conservation and Environmental Protection in NDRC). The objects of financial rewards are key energy consumption enterprises implementing the technical transformation projects of energy conservation with annual energy savings over 10000 tce. The rewarding standards are RMB 200 Yuan and 250 Yuan per tce at eastern region and central & western regions respectively. The expiring date of the Provisional Measures is specified as December 31, 2010 temporarily.

In June 2010, the MOF and NDRC jointly promulgated *Temporary Method of Financial Incentives Fund Management in Energy Management Contract* (No. 249 [2010] of MOF). The central financial department decided to arrange RMB 2 billion Yuan in 2010 to support the energy service companies (ESCOs) to adopt the energy management contract methods in fields of industry, building and transportation, etc. and for the implementation of energy conservation transformation for public buildings.

To quicken the structural adjustment and promote the phasing out backward production capacity, the central financial department set special funds during “the 11<sup>th</sup> Five-Year Plan” period and adopted the special transfer payment to give rewards for phasing out backward production capacity in economic less-developed areas. In December 2007, the MOF issued *Temporary Method of Central Financial Incentives Fund Management in Phasing out Backward Production Capacity* (No. 873 [2007] of MOF) to give proper rewards for phasing out backward production capacity in those areas with heavy phasing-out task and weak financial resources. The main applicable sectors include 13 sectors, such as electric power, iron-making, steel-making, electrolytic aluminium, iron alloy, calcium carbide, coke, cement, glass, paper-making, alcohol, monosodium glutamate and citric acid, etc. specified in the *Notice of the State Council on Printing and Distributing the Comprehensive Work Scheme of Energy Conservation and Reducing the Discharge of Pollutants*.

In January 2008, the MOF and NDRC jointly issued *Interim Measures on Administration of Financial Subsidies for Promoting High-Efficiency Lighting Products* (No. 1027 [2007] of MOF). The financial subsidies are used for supporting

the substitution of incandescent light and other low-efficiency light products with high-efficiency lighting products. The subsidies will be granted to the enterprises won the bidding by the financial sector other than directly to the end users. For example, the enterprise won the bidding of the T5 double-capped fluorescent lamps shall sell the T5 lamps to the end users with the price such as 5 Yuan for each, which is calculated out by supply price specified in bidding agreement (such as 10 Yuan for each) deducting the financial subsidies for T5 lamps which are defined by the authorities (such as 5 Yuan for each). Then after a period of time, the authorities will check the total number that the enterprise sold to end users, such as 10,000, and then 50,000 Yuan will be granted to the enterprise. The Interim Measures defined the objects of subsidized products and benefits, made requirements for enterprises and products won the bidding, specified the subsidy standard, process for funds application and allocation and proposed requirements for fund supervision.

In order to accelerate the promotion and usage of high energy efficiency products, the country incorporated those high energy efficiency products with wide usage, great energy-using and obvious potential for energy conservation into the promotion range of financial subsidies. In May 2009, the MOF and NDRC issued *Notice on Developing "Energy Efficiency Products & People-Benefit Program* (No. 213 [2009] of MOF). The indirect subsidies were adopted for implementing the financial subsidies for 10 types of products with level 1 or 2 energy efficiency, namely air conditioner, refrigerator, washing machine and motor, etc. Just like the way that subsidies for high-efficiency lighting products works, the central financial department will grant subsidies for manufacturing enterprises of high energy efficiency products at first, and those enterprises, sell products with price after deducting granting subsidies to the consumer. The manufacturing enterprises should mark "Energy Efficiency Products & People-Benefit Program" logo on the body and package of promoting products. The country will no longer promote with subsidies when the market share of high energy efficiency products reaches certain level.

In January 2009, the MOF and Ministry of Science and Technology (MOST) jointly issued *Interim Measures on Administration of Financial Subsidies for Demonstrating and Promoting Energy Efficiency and New Energy Vehicle* (No.6 [2009] of MOF) for the purpose of developing demonstration trial works of energy efficiency and new energy vehicles in 13 cities, such as Beijing, Shanghai, Chongqing, Changchun, Dalian, Hangzhou, Jinan, Wuhan, Shenzhen, Hefei, Changsha, Kunming and

Nanchang. Application of the energy efficiency and new energy vehicles is encouraged with the assistance of financial policies in the public service sectors, such as bus, taxi, official business, environmental sanitation and postal service, etc. Meanwhile, the popularity and market share of energy efficiency vehicles will be improved.

In order to expand the demonstration of energy efficiency and new energy vehicles and quicken the promotion of industrialization of energy efficiency and new energy vehicles, the MOF, MOST, the MIIT and NDRC jointly released *Notice on Expanding the Demonstration of Energy Efficiency and New Energy Vehicles in the Public Services Field* (No. 227[2010] of MOF) on May 31, 2010, which decides to add Tianjin, Haikou, Zhengzhou, Xiamen, Suzhou, Tangshan and Guangzhou, etc. as 7 trial cities the basis of existing 13 ones. At the same year, the MOF, MOST, the MIIT and NDRC jointly released *Notice on Adding Trial Cities for Demonstration of Energy Efficiency and New Energy Vehicles in the Public Services Field* (No. 434 [2010] of MOF) which approved officially Shenyang, Chengdu, Nantong, Xiangfan and Hohhot as new trial cities. As of 2010, the trial cities for demonstration of energy efficiency and new energy vehicles increased to 25. The MIIT announced 18 batches of *Contents of Recommended Vehicle Type in the Demonstration & Application Program of Energy Efficiency and New Energy Vehicles*, in which 233 types of vehicles were involved.

Except the expansion of usage promotion of energy efficiency and new energy vehicles in the public services field, the country started to develop the trial work of subsidy for purchasing new energy vehicles in 2010. Furthermore, in June 2010, the MOF, MOST, the MIIT and NDRC jointly released *Notice on Developing Trial Work of Subsidy for Individual Purchasing New Energy Vehicles*, specifying Shanghai, Changchun, Shenzhen, Hangzhou and Hefei as five trial cities. Just like the way that subsidies for high-efficiency products works, the central financial department will grant subsidies for manufacturing enterprises of new energy vehicles at first, and those enterprises, sell those vehicles with price after deducting granting subsidies to the individual consumer.

To promote the development and usage of renewable energy sources, the central financial department set special funds for development of renewable energy sources in accordance with *Renewable Energy Law of the People's Republic of China*. In order to standardize the management of special funds for renewable energy

development, the MOF issued *Interim Measures for Management of Special Funds for Renewable Energy Development* (No. 237 [2006] of MOF) in May 2006. “Special funds for renewable energy development” refer to those funds for supporting the development and usage of renewable energy which are set by the financial department of the State Council pursuant to the law. The Interim Measures described the range, key point, application and approval process, financial management, assessment and supervision, etc. of the special funds in details. Entities and individuals who conduct renewable energy related projects can apply for the special funds and the authorities will entrust special agencies to evaluate the filing materials they submitted and organize experts to review them. Those who qualified will get the funds.

## 2. Implementation effects

The central financial capital for energy conservation and emission reduction was up to RMB 200 billion Yuan that drove the social investment (non-governmental investment) of nearly RMB 2 trillion Yuan during “the 11<sup>th</sup> Five-Year Plan” period. The central government’s investment for only technical transformation of energy conservation was over RMB 30 billion Yuan, resulting in almost 450 billion Yuan social investments for technical transformation of energy conservation<sup>11</sup>. For the energy conservation effects, the financial funds for energy conservation played important role in the successful realization of national energy conservation goal during “the 11<sup>th</sup> Five-Year Plan” period. Take the financial rewards for technical transformation of energy conservation as example, it has supported the implementation of over 5100 “Ten Key Energy Conservation Programs” from 2007 to 2010, saving about 0.34 billion tce in accumulation<sup>12</sup>.

### (III) Governmental Compulsory Purchase of Energy Efficiency Products

#### 1. Executive summary

Since the implementation of “the 11<sup>th</sup> Five-Year Plan”, the Chinese government changed the “preferential purchase” to “compulsory” purchase towards energy efficiency products gradually. Pursuant to Article 64 of *Law of the People's Republic of China on Energy Conservation* revised in 2007: the governmental purchasing supervision management department, together with related departments, formulated the governmental purchasing list of energy efficiency products, in which those

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<sup>11</sup> Note: data from *China Energy Conservation Association*

<sup>12</sup> Note: data from *China Industrial Energy Efficiency Report 2011*

products and equipments with certificates should be preferentially listed. In July 2007, the General Office of the State Council released *Notice on Establishing System of Governmental Compulsory Purchase of Energy Efficiency Products* which required establishing the management system of governmental purchase list of energy efficiency products. The Notice specified the energy efficiency products of governmental preferential purchase and their types to guide governmental organs for energy efficiency products purchase. At the same year, the MOF and NDRC adjusted the original *List of Governmental Purchase of Energy Efficiency Products*. The types of energy efficiency products increased to 15087 kinds of 33 categories from 4770 kinds of 18 categories in the new list. So far, the Chinese governmental compulsory purchase of energy efficiency products was implemented officially.

## 2. Implementation effects

The governmental compulsory purchase of energy efficiency products promoted the usage of those products effectively and also manifested the model role of the governmental organs regarding energy conservation.

### (IV) Preferable Tax Policy for Energy Conservation

#### 1. Executive summary

To coordinate the execution of *Enterprise Income Tax Law of the People's Republic of China* and *Implementation Rules of Enterprise Income Tax*, the MOF and State Administration of Taxation and NDRC announced *List of Enterprise Income Tax Preference of Dedicated Equipment for Environmental Protection (2008 version)* and *List of Enterprise Income Tax Preference of Dedicated Equipment for Energy Conservation and Water Conservation (2008 version)* in August 2008. In September of the same year, the MOF and State Administration of Taxation jointly issued *Notice on Issues Concerning Implementation of List of Enterprise Income Tax Preference of Dedicated Equipment for Environmental Protection, Energy Conservation and Water Conservation*. According to the Notice, the abovementioned preferential policy should be implemented from January 1, 2008. It also described the calculation method of investment amount and payable tax in current year of the dedicated equipment.

According to those policies and regulations, for enterprises engaged in environmental protection, energy and water conservation projects that conform to the conditions of article eighty-six of *Enterprise Income Tax Law of the People's Republic of China*, from the first tax year to the third tax year, the production and operation income shall

be exempted from corporate income tax, and the corporate income tax for the fourth to sixth year shall be levied in half. For enterprise purchasing and actually using the catalog of special equipment for environmental protection, energy and water-saving, 10% of the equipment investment can be use as credit to offset the corporate income tax of the same year. If the credit exceeds the total corporate income tax of that year, the enterprise can keep using the credit within the following four years.

**Equipment Types in *List of Enterprise Income Tax Preference of Dedicated Equipment for Energy Conservation and Water Conservation (2008 version) of China***

	Main Equipment
Energy-conservation equipment	Energy efficiency small and medium-sized three-phase asynchronous timing machine, air conditioning equipment, ventilator, water pump, air compressor, frequency converter, distribution transformer, high-voltage motor, electricity-saving appliance, AC contactor, process optimization controller of power utilization, industrial boiler, industrial heating units and key components for oil-saving, coal-saving and gas-saving units
Water-conservation equipment	Washing machine, heat exchanger, cooling tower, irrigation machines and tools

2. Implementation effects

The preferable tax policy for energy conservation stimulated the initiatives of market R&D, production, sales and usage, also improved the market share of energy efficiency equipments.

(V) Top 1000 Enterprises Energy Conservation Action Program

1. Executive summary

To further intensify the energy efficiency management of key energy-using units, NDRC, National Energy Administration Office, National Bureau of Statistics of China, General Administration of Quality Supervision, Inspection and Quarantine of the People’s Republic of China and State-owned Assets Supervision and Administration Commission of the State Council issued *Notice on Printing and Distributing Implementation Plan for Energy Conservation Activities of 1000 Enterprises* in April 2006 to start to execute the “Top 1000 Enterprises Energy Conservation Action Program”. The top 1000 enterprises refer to enterprises with independent accounting above designated size<sup>13</sup> of 9 key energy consumption sectors, i.e. steel, non-ferrous metal, coal, electric power, petroleum and petrochemical, chemical industry, building materials, textile and paper-making, and the full energy

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<sup>13</sup> Note: See Note 6.

consumption of the year 2004 was above 180,000 tce. Based on the two thresholds, it turned out that 1008 enterprises were entitled, which were called “Top 1000 Enterprises” in general.

Since 2006, the country and local organs concerned adopted series of measures to promote Top 1000 Enterprises Energy Conservation Action Program.

First of all, NDRC signed Responsibility Document for Achieving Energy Efficiency Goals with top 1000 enterprises to specify goal and responsibilities. After issuing the *Implementation Plan of Evaluation System for Energy Consumption per Unit of GDP* in 2007, the country began to evaluate the completion of energy conservation goal of top 1000 enterprises and the implementation of energy conservation measures and announced them to the public.

According to the revised *Law of the People's Republic of China on Energy Conservation*, the energy utilization reporting system was executed. *Implementation Plan for Energy Utilization Reporting System of Key Energy-Using Entities* was formulated, according to which key energy-using units should submit their annual energy utilization reports.

The implementation of energy efficiency benchmarking activities was organized. In 2007, NDRC issued *Implementation Plan for Energy Efficiency Benchmarking Activities of Key Energy Consumption Enterprises* to arrange the implementation of energy efficiency benchmarking activities. As the promotional implementation of those activities in such sectors as steel, chemical engineering, cement and electric power, etc., energy efficiency benchmarking gradually became compulsory activities aiming at key sectors.

Actively promote the transformation of energy conservation technologies in top 1000 enterprises. The authorities strengthened supporting efforts to conduct transformation projects of energy conservation technologies in top 1000 enterprises. Full energy consumption indicators per unit of products of top 1000 enterprises decreased greatly through technical transformation.

Strengthen energy efficiency management. Over 95% top 1000 enterprises established dedicated energy management organizations based on their original organizational structures, allocated related energy management personnel and improved three-level

measuring instrument and meter provision<sup>14</sup>. Meanwhile, energy manager trial works were carried out in partial enterprises.

To perfect the foundation of enterprise energy conservation, NDRC organized to compile *Enterprise Energy Audit and Conservation Planning Case*, *Enterprise Energy Audit Report Guideline* and *Enterprise Energy Conservation Plan Approval Guideline* and organized to implement series of trainings regarding energy conservation.

## 2. Implementation effects

During “the 11<sup>th</sup> Five-Year Plan” period, energy utilization efficiency of top 1000 enterprises increased tremendously. Their energy consumption per unit of main products reached advanced level within domestic industries. According to preliminary statistics, such indicators as full energy consumptions per unit of alumina, ethylene production and caustic soda production, etc. in top 1000 enterprises decreased for over 30% while full energy consumption per unit of crude oil process, electrolytic aluminium and cement, etc. decreased for over 10%. Meanwhile, coal consumption per unit of power supply dropped nearly for 10% and indicators of partial enterprises reached international advanced levels. During “the 11<sup>th</sup> Five-Year Plan” period, 0.15 billion tce was saved by top 1000 enterprises, accounting for about 23% of China’s total energy savings, thus making outstanding contributions to the realization of national energy conservation goal.

## (VI) Ten Key Energy Conservation Programs

### 1. Executive summary

“Ten Key Energy Conservation Programs” have incorporated in *the 11<sup>th</sup> Five-Year Plan for National Economy and Social Development* which serves as an important engineering technical measure for realizing the goal of decreasing energy consumption per unit of GDP for about 20% during “the 11<sup>th</sup> Five-Year Plan” period. In the *Comprehensive Work Program for Energy Conservation and Emission Reduction* issued by the State Council, it was proposed to realize energy savings for 0.24 billion tce during “the 11<sup>th</sup> Five-Year Plan” period through implementing “Ten Key Energy Conservation Programs” while energy consumption indicator per unit of

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<sup>14</sup> Note: According to the mandatory national standard GB17176-2006, three-level measuring refers to energy-using units measuring, sub energy-using units measuring and energy-using equipment measuring.

main products in key sectors should reach or be close to international advanced levels in early 21<sup>st</sup> century.

In order to implement “Ten Key Energy Conservation Programs” well, NDRC, together with departments concerned, prepared *Implementation Opinions about Ten Key Energy Conservation Programs during “11<sup>th</sup> Five-Year”* (hereinafter referred to as *Implementation Opinions*) in July 2006. Energy conservation goal of “Ten Key Energy Conservation Programs” are described in detail and implementation body, personnel and expenditure are also specified in the *Implementation Opinions*. Meanwhile, it also incorporates the implementation schedule and performance into the annual performance appraisal system of related enterprises and public institutions. The funds required in “Ten Key Energy Conservation Programs” mainly depend on enterprise self-finance, loans from financial institutions and social capital investment. To mobilize the initiatives of enterprises, financial institutions and social capital for input, the central financial department arranges guide funds and adopts the way of “substitute subsidies with rewards” to give support and reward for “Ten Key Energy Conservation Programs” during “the 11<sup>th</sup> Five-Year Plan” period.

## 2. Implementation effects

During “the 11<sup>th</sup> Five-Year Plan” period, “Ten Key Energy Conservation Programs” obtained remarkable effects in energy conservation. The implementation of ten key programs enhanced energy utilization efficiency greatly, improved resource recovery rate and promoted the application of advanced energy conservation technologies and development of energy efficiency and environmental protection industry. As of 2010, funds of RMB 8.1 billion Yuan was arranged for investment within the budget of the central government and the central financial department arranged special funds of RMB 22.4 billion Yuan for energy conservation and emission reduction, which supported over 5100 projects under “Ten Key Energy Conservation Programs” and effectively led to investment of local governments and the society. According to preliminary statistics, about 0.344 billion tce was saved in accumulation by implementing “Ten Key Energy Conservation Programs” during “the 11<sup>th</sup> Five-Year Plan” period, thus providing important support for realizing the binding goal of

energy consumption per unit of GDP decrease for about 20%<sup>15</sup> during “the 11<sup>th</sup> Five-Year Plan” period and making great contributions<sup>16</sup>.

## **V Prospects and Benefits of New Energy Efficiency Policies**

### **Scale-up**

#### **(I) Opportunities and Challenges of New Energy Efficiency Policies Scale-up**

1. Continuous growth in industrial energy demand will increase pressure to China’s energy supply

“The 12<sup>th</sup> Five-year” is a critical stage for industrialization development in our country as before, the upgrading of resident consumption structure will continue<sup>17</sup>, the demand for industrial products will continue to grow, and growth of industrial economy will drive China’s industrial energy demand to increase steadily. During “the 11<sup>th</sup> Five-year”, annual growth rate of China’s industrial energy consumption was around 7%, and China’s industrial energy consumption would be about 3.4 billion tce at the end of “the 12<sup>th</sup> Five-year” with the same growth rate, which would almost account to 80% of China’s total energy consumption in 2015 assumed by National Energy Administration. Supposing that energy consumption of industrial added value reduces by 20%, and development speed of industry economy increases by 10% per year, China’s industrial energy consumption would be about 3.2 to 3.3 billion tce in 2015, which would increase by 0.8 billion tce compared to 2010.

Huge energy demand in China’s industry will increase pressure to China’s energy supply, and will have giant effects on coal production, transportation etc., bringing forth a series of social and environmental issues. Besides, growth in energy demands will expand foreign dependence of China energy and increase energy security threats. Data from National Energy Administration show that 12% in China’s primary energy consumption in 2010 was from import, foreign dependence of China’s oil has exceeded 55%, gas dependence has exceeded 16% and coal has been net import. International energy price fluctuation, supply risk will have great effect on China,

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<sup>15</sup> Note: Actually, energy consumption per unit of GDP decrease for 19.1% from the year 2005 to the year 2010, which was taken as successful achievement of the set goal.

<sup>16</sup> Note: data from *China Industrial Energy Efficiency Report 2011*

<sup>17</sup> Note: As mentioned in “Introduction” of this report that “The consumption structure of urban and rural residents was transferred to development and enjoyment orientation”, which was thought to be the signal of upgrading.

which makes energy security be the bottleneck limiting China's economic development.

## 2. Worldwide action towards climate change will bring new challenges to China's industrial development

Dealing with climate change has become an international hot-spot issue, a new round of economic form like low carbon economy is making profound impacts on international politics, economy and technology mode at present. As a great nation that is expanding influence, China is linked more closely with the world and its international responsibility is increasing gradually.

After Copenhagen conference, some developed countries have been consistently demanded that China take the responsibility of reducing emission. As a responsible developing country, China has been fulfilling its international obligations insisting on the principle of "common but differentiated responsibilities". But along with the condition that China's energy consumption and carbon emission has been increasing continuously, on one hand, China's total energy consumption has accounted for 20% of world's total energy consumption in 2010 (Liu Tienanin National Energy Administration, in 2011), and China will take the responsibility of reducing emission like many developed countries in future, which means that China's development space will be affected. On the other hand, as the world's largest exporter, China's industrial export will be faced with various kinds of "green barriers" created by developed countries in the name of developing low carbon economy. It is estimated that America would earn carbon tariffs revenue of 55 billion dollars annually from China's import cargoes if 45 dollars carbon tariffs were collected from CO<sub>2</sub> per ton, which will pose a great impact on world wide "made in China".

## 3. China's energy conservation and emission reduction of "the 12<sup>th</sup> Five-year" arranges new task for industrial energy conservation

China's "12<sup>th</sup> Five-Year Plan" identified the goal of reducing energy consumption per unit of GDP by 16% ( the year 2015 VS the year 2010). Preliminary estimates suggest that energy consumption of 10 thousand Yuan industrial added value will be reduced by 18% to 20% ( the year 2015 vs the year 2010)(Zhou Changyi in MIIT, in 2011), among which weighted average energy consumption of 10 thousand Yuan industrial added value of energy-intensive sectors will be reduced by 15%, weighted average energy consumption per unit of energy-intensive products will be reduced by 5% (Liu Wenqiang in MIIT, in 2011). Considering the condition that greater efforts had been

made to realize China's industrial energy efficiency in earlier stage, and the fruits easy to reach had already been eaten out, the remaining are more tough ones, it will be more difficult to complete the industrial energy conservation goal of "the 12<sup>th</sup> Five-Year Plan" period mentioned above.

Besides, total energy consumption controlling has been the focus of government so as to realize reasonable energy growth. According to the completed first draft of energy planning of "the 12<sup>th</sup> Five-year", total primary energy consumption in China in 2015 would be controlled within 4.1 to 4.2 billion tce (increasing corresponding GDP by 8.5% annually, reducing energy consumption per unit of GDP by 16%), which means China being in industrialization stages must continuously improve industrial development quality and efficiency through adjusting industrial structure and especially controlling rapid development of energy-intensive sectors so as to reduce overdependence of industrial economic development on energy.

#### 4. Energy conservation and emission reduction are in urgent demand for rapid transformation of industrial development mode

Being in strategic transition of economic and social development at present, China's insufficient energy resources and fragile ecological environment forms huge constraint to industrial development, and the task related to industrial transformation and upgrading and green development is huge. Energy conservation and emission reduction can act as an important task to transform industrial development mode in China. The extensive development mode that China developed its economy only depending on scaling-up investment and production other than mining potential for market transformation will be changed gradually by means of adjusting industrial structure, improving technology and efficiency of energy utilization substantially. New-type industrialized road should be taken to make great efforts to realize coordination and harmonization of sustainable economic development, all-round social progress, sustainable use of resources, and environment improving consistently and good ecological circle.

#### (II) Expected Benefits from Further Promotion of New Energy Efficiency Policies

##### 1. Facilitate the realization of energy conservation goal of "the 12<sup>th</sup> Five-Year"

*Energy conservation and emission reduction plan for "the 12<sup>th</sup> Five-Year"* put forward the goal that energy consumption per 10 thousand Yuan of GDP would be reduced to 0.869tce over the country in 2015 (based on 2005 prices), which reduced

by 16% compared to 1.034tce in 2010 (32% compared to 1.276tce in 2005), and total energy conservation goal of conserving 0.67 billion tce would be realized during “the 12<sup>th</sup> Five-Year”. Based on the above mentioned total goal, detailed to specific department goals, *the plan* put forward the industry goal that “energy consumption per unit of industrial added value (above-scale)” would be reduced by 21% in 2015 compared to 2010, which is further higher than other departments. Industry plays a decisive role in energy conservation and undertakes hard energy conservation task.

Industrial energy efficiency policies implemented during “the 11<sup>th</sup> Five-Year”, some of which are described as examples in chapter IV of this report, guaranteed the realization of industrial energy conservation goal, and accumulated experience for promoting relevant policies further. Further promotion of those industrial energy efficiency policies, for example, Top 1000 Enterprises Energy Conservation Action Program scaled up into Top 10,000 Enterprises Energy Conservation and Low-carbon Action Program, will provide powerful guarantee for realizing energy conservation goal during “the 12<sup>th</sup> Five-Year”.

## 2. Promote further development of energy conservation market mechanism

Industrial energy efficiency policies of “the 11<sup>th</sup> Five-Year” made great attempts in the innovation of energy conservation market mechanism and accumulated some experience. During “the 12<sup>th</sup> Five-Year”, the promotion of industrial energy efficiency policies will implement energy conservation and emission reduction based on market mechanism, which will change the phenomena such as “more input, less income” of energy conservation and emission reduction<sup>18</sup>, and make those enterprises that do well in energy conservation and emission reduction own new profit model, encouraging more enterprises to change development mode spontaneously, and stimulating energy conservation endogenous power of market.

## 3. Promote further adjustment of economic structure

The implementation of industrial energy efficiency policies played a positive role in promoting the adjustment of economic structure during “the 11<sup>th</sup> Five-Year”. Currently, the growth of heavy industry development in the country is still faster than

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<sup>18</sup> Note: Reasons for “more input, less income” is complicated. However, it is agreed that lack of market mechanism is one of the most important. Under the pressure of achieving energy saving goals, some state-owned enterprises rushed to invest inputs, wanting a quick return on energy-savings, hardly considering the sustainability. Related policies during “the 12<sup>th</sup> Five-Year” strengthen market mechanism, however, there is still long long way to go.

light industry, output of main energy-intensive products is still at a high level and energy consumption per unit of industrial product is still lagging behind international advanced level, so there is great potential in energy conservation. Meanwhile China's manufacturing industry is in the low-end of global industry value chain overall with high resources and energy consumption. In the condition that the world's action on climate change is becoming increasingly fierce, and green trade barrier is being created with high speed, China's export will be faced with enormous pressure. The further promotion of industrial energy efficiency policies can continue to increase energy conservation and emission reduction, improve industrial energy utilization efficiency and energy productivity further, transform and upgrade traditional manufacturing industry, which will play an active role in building up a resource-conserving and environmental friendly industrial structure and production mode, defeating energy, resource and environmental constraints, and creating a new road to industrialization with Chinese characteristics.

## **VI Conclusions and Recommendations**

### **(I) Conclusions<sup>19</sup>**

Due to the implementation of those policies mentioned above, China directly invested 846.625 billion Yuan (both government and non-government) for energy conservation which ranked top among countries over the world in the same period during "the 11<sup>th</sup> Five-Year". Good energy efficiency investment mode which takes government funds as guidance and seeds then participated actively by the whole society has been formed preliminarily from a small amount of central fiscal investment, small social capital distribution to the expanding investment of central and local government year by year, and a great deal of all kinds of social capital investment. Central and local government has spent 149.697 billion Yuan on improving energy efficacy for the five years, which accounted for 17.68% of total energy efficiency investment, among which energy efficiency investment such as budget fund of central government and special funds of central finance rewards was 101.653 billion Yuan, which accounted for 12.01% of the total energy efficiency investment; Each province (autonomous region, city government of special municipality) and municipal and local government adopted such methods as complementing central fund with local fund to enhance the

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<sup>19</sup> Note: data from *China Energy Efficiency Financing and Investment Report (2010)*

support strength on energy conservation work, accumulating fiscal fund investment of 48.044 billion Yuan, which accounted for 5.67% of the total energy efficiency investment.

With increasing investment of government energy efficiency fiscal fund year by year and supporting and promoting of implementation of energy conservation technologies and projects, benefit of energy efficiency investment was strengthened and enlarged effectively, and a great deal of social funds was absorbed to improve the investment of energy efficiency. Accumulative social fund investment was 696.928 billion Yuan for the five years, which accounted for 82.32% of the whole society energy efficiency investment. Leverage effect of fiscal fund investment and social fund investment was 1:4.7<sup>20</sup> with fund investment of bank green credit of 488.425 billion Yuan used for improving energy efficiency, own fund investment of energy-using enterprises of 169 billion Yuan, own fund investment of energy conservation service industry of 20.52 billion Yuan, fund investment of international agency in energy efficiency of 17.983 billion Yuan, and 1 billion obtained by means of equity financing, trust, factoring and other methods.

. During “the 11<sup>th</sup> Five-Year Plan” period, among the total scale of 846.625 billion Yuan of energy efficiency investment, 648.722 billion Yuan goes to industrial field, accounting for 80.7%. Among the 648.722 billion Yuan, the central government invested 52.41 billion Yuan, accounting for 8.1%; local governments invested 28.344 billion Yuan, accounting for 4.4%; social capital driven by the central and local financial capital invested 567.968 billion Yuan, accounting for 87.5%, being the main source of energy efficiency investment in industry field.

## (II) Recommendations

### 1. Technical progress became a major force in promoting industrial energy efficiency

As one of the important means of China’s industrial energy efficiency, technical progress plays a supporting role. During “the 11<sup>th</sup> Five-Year”, the country increased energy conservation technology input, encouraged independent innovation, and paid much attention to the selection, introduction, digestion, absorption and recreation of advanced technologies, making technical progress become a major force in promoting

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<sup>20</sup> Note: This means that the government investments and incentives at central and local levels of 149.697 billion Yuan drove the 696.928 billion Yuan of investments from non-government sources

China's industrial energy efficiency. In terms of independent innovation, breakthrough was made in a batch of important technique equipments and key technologies, and self-determination and localization level of important equipments has been improved continuously. In terms of technology selection, the modification and issuing of *Policy Framework of Energy Conservation Technologies* and three groups of *Catalogue of National Promoted Key Energy Conservation Technologies* expedited the popularization of key energy conservation technologies. In terms of popularization and application of advanced technologies, the country organized to implement transformation projects of energy conservation technologies represented by "Ten Key Energy Conservation Programs", improving energy conservation technologies' level of major industry sectors.

Studies show that technical energy conservation accounted for about 70% of China's total energy savings during "the 11<sup>th</sup> Five-Year Plan" period (He Jiankun in Tsinghua University, in 2010). Widespread popularization of large efficient production equipment, (for example, units over 0.3 million kw in power industry have become main type units of China's thermal power generation, and NSP production line in cement industry has obtained large-scale application) brought continuous reduction of energy consumption per unit of industry main products. A large number of energy conservation technologies such as CDQ (Coke Dry Quenching), HTAC (High Temperature Air Combustion), low-temperature cogeneration, frequency conversion, and new cathode aluminium reduction cell were commonly applied to such sectors as steel, cement and non-ferrous metal, producing huge energy conservation benefits.

2. Key sectors and enterprises became main force of industrial energy efficiency  
During "the 11<sup>th</sup> Five-year Plan" period, two key points of industrial energy efficiency were that on one hand, popularizing and applying advanced energy conservation technologies, processes, and equipments, increasing the intensity of phasing out backward production capacity and improving comprehensive utilization of industry resource with key energy consumption sectors such as steel, coal, electricity, non-ferrous metal, chemical industry and building material as breakthrough; on the other hand, taking key energy-using enterprises as breakthrough point, the country organized to implement "Top 1000 Enterprises Energy Conservation Action Program", thirty provinces in China organized to carry out energy conservation action program of key energy-using enterprises at provincial level. Energy consumption of "Top 1000 Enterprises" and "Key Energy-using Enterprises at Provincial Level"

accounted for 80% of industrial energy consumption in China (Xiong Huawen in Energy Research Institute of NDRC, in 2010). These key enterprises became leader of China's industry energy conservation and made great contribution to the realization of energy conservation goal by means of improving energy conservation technologies and strengthening energy efficiency management.

To strengthen energy efficiency management of key sectors and enterprises, national and local government carried out the following three kinds of work through comprehensive application of administrative, legal and economical methods. The first was carrying out assessment towards the system of responsibility for achieving energy efficiency goals according to energy conservation and phasing-out goals and starting to implement supervision and inspection for mandatory quota standard of products energy conservation. The second was encouraging enterprises to improve and promote energy conservation technologies, and carry out energy management center demonstration in the way of financial subsidy and reward. The third was building energy efficiency management capacity of industrial enterprises, which included strengthening of statistics, metering, monitoring and audit of energy, and preparing energy utilization report and carrying out training for energy management head of industrial enterprises and energy management position.

### 3. Adjustment of industrial structure was an important way to promote industrial energy efficiency

The basic solution to realize energy conservation and emission reduction is speeding up industrial restructuring and promoting the transformation of economic development mode. During "the 11<sup>th</sup> Five-year", the combination of energy conservation & emission reduction and adjustment of industrial structure, simultaneous development of incremental optimization and stock reform played an active role in improving overall industrial energy efficiency level. Firstly, strictly control "double high" and new projects of overcapacity sectors, take energy conservation and environmental protection standards as the factor of sectors permitting, effectively control the implementation of high energy consuming projects through energy conservation evaluating and examining of fixed investment projects, and strictly control blind development of energy-intensive sectors by adopting measures of cancelling preferential price and limiting the export of energy-intensive products. Secondly, enhance the strength of phasing out backward production capacity. During "the 11<sup>th</sup> Five-year", the country organized specific projects of

phasing out backward production capacity in several sectors such as electricity, coal and steel, carried out accountability mechanism, expanded the implementation strength of differential electricity price, and intensified law enforcement and punishment, which effectively promoted the completion of eliminating. Thirdly, level-up traditional industries. During “the 11<sup>th</sup> Five-year”, the country performed technical transformation in traditional industrial sectors such as electricity, steel, Non-ferrous metal, building material, chemical industry and oil processing, which not only was the adjustment of industrial products structure, but also facilitates energy conservation and emission reduction. Fourthly, promote the upgrading of industry structure. The country cultivated and developed the development of strategic burgeoning sectors such as energy conservation and environmental protection industry, new energy and new material, promoted energy conservation and emission reduction and technical progress of traditional sectors, and speeded up the optimization and upgrading of industrial structure.

4. Government leading was strong guarantee to realize energy conservation goal

In terms of economic attribute, energy conservation has obvious “externality” characteristic described by western economics. It would be difficult to effectively realize energy conservation goal of “energy consumption per unit of GDP reduced by 20%” in the country whose heavy industry develops rapidly in a short time by only relying on market without the pushing of government. During “the 11<sup>th</sup> Five-year”, Chinese government strengthened the awareness of energy conservation and emission reduction of all levels of government and enterprises by means of system of responsibility for achieving energy efficiency goals, and decomposing energy conservation goal and implementing energy conservation responsibility, and guaranteed the implementation of energy conservation goal further with mechanism of responsibility and “one ticket veto”<sup>21</sup>. Besides, the country established powerful leadership coordination mechanism for energy conservation and emission reduction, set up “*Leading Group of National Action on Climate Change and Energy Conservation and Emission Reduction Work*” led by Premier State Council, and defined tasks of central relevant ministries and commissions on energy conservation

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<sup>21</sup> Note: It’s a strict way to review the energy conservation works of governors or governmental agencies or state-owned enterprises, meaning that if they fail to achieve the set goals, no matter how good they do in other works, they will be considered as not qualified.

work. In terms of energy conservation classified regulation, MIIT was responsible for managing energy conservation, and government of all levels established industrial energy conservation administrative departments, monitoring centers and energy conservation centers so as to strengthen organization function.

5. National fiscal investment motivated the enthusiasm of enterprises to conserve energy effectively

During “the 11<sup>th</sup> Five-year”, central government spent about 100 billion Yuan on investing in energy conservation successively, and stimulated social investment of about 800 billion Yuan, which was used for fiscal reward of energy conservation technology transformation, transfer payment for phasing out backward production capacity, fiscal reward of contract energy management, people-benefit program of energy conservation product, and energy conservation and new energy vehicle pilot, producing great energy conservation benefits. Meanwhile the country enhanced the supporting strengthen of the research and development of industrial energy conservation technologies, issued special promotion planning for a number of key energy conservation technologies such as *Sintering Cogeneration of Iron and Steel Enterprise*, *Low-temperature Cogeneration of Cement Kiln*, and formulated *Catalogue of Key Sectors Energy Conservation Technologies*, *Manual of Energy Conservation and Emission Reduction Technologies of Key Sectors*. With the finance support of the state, MIIT launched demonstration programs for energy management center construction of industrial enterprises, which focused on the construction of key energy-using industry enterprises such as steel, non-ferrous metal, chemical industry and building material. These fiscal funds gave full play to the “well-leveraged” role, raised the enthusiasm of enterprises, and made enterprises benefit from energy conservation in time of realizing energy conservation goal, which enhanced competitiveness and sustainable development capabilities of enterprises.

6. Perfect relevant laws and policies were important guarantee for industrial energy efficiency

Good policy environment is important guarantee of carrying out energy conservation work effectively. Since entering “the 11<sup>th</sup> Five-year”, national competent authorities of energy conservation has combined industrial energy efficiency and transformation of economic development mode beginning with building sound policy environment benefit for energy conservation, and has continually strengthened and improved relevant laws and regulations and policy standards of energy efficiency management,

which guaranteed the smooth advancement of industrial energy efficiency. In terms of laws, *Energy conservation law* revised defined the strategic position of energy conservation, which further standardized industrial energy efficiency management, defined energy efficiency management and supervision subject, and strengthened relevant law responsibilities, laying a solid legislative base for the implementation of industrial energy efficiency, and becoming the foundation of issuing and implementing the industrial energy efficiency policies and measures. In terms of regulations, regulations of industrial energy efficiency were brewing. In terms of policies, industrial energy efficiency policies were continuously improved in adjustment of industrial structure, energy efficiency management, technical progress, financial and tax incentives. In terms of standards, industrial energy efficiency standards system was established, mainly including state compulsory standards of quota for energy consumption of energy-intensive products, compulsory energy efficiency standard of key terminal energy-using products and industrial energy efficiency monitoring, and economic operation standard, which put forward goals, defined duties, provided foundation and cleared obstacles for further development of industrial energy efficiency in terms of policies.

During “the 11<sup>th</sup> Five-Year Plan” period, the country probed some new energy efficiency mechanisms positively such as contract energy management, energy efficiency benchmarking, power demand side management and energy conservation voluntary agreement. Relevant financial institutions, investment organizations, research institutions and advisory bodies also participated in industrial energy efficiency, which solved obstacles that enterprises faced in technical consulting, project implementation, investment and financing, and consistently promoted China’s industrial energy efficiency.