DEVELOPMENT OF ENERGY EFFICIENCY STANDARD IN CHINA

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1. STATUS OF ENERGY CONSUMPTION IN CHINA

China is a developing country with a rapid increased economy. The characteristic of its energy consumption is: industrial sector consumes 70per cent more of all the electricity consumption of the whole nation (see figure 1), residential consumption is about 11per cent.

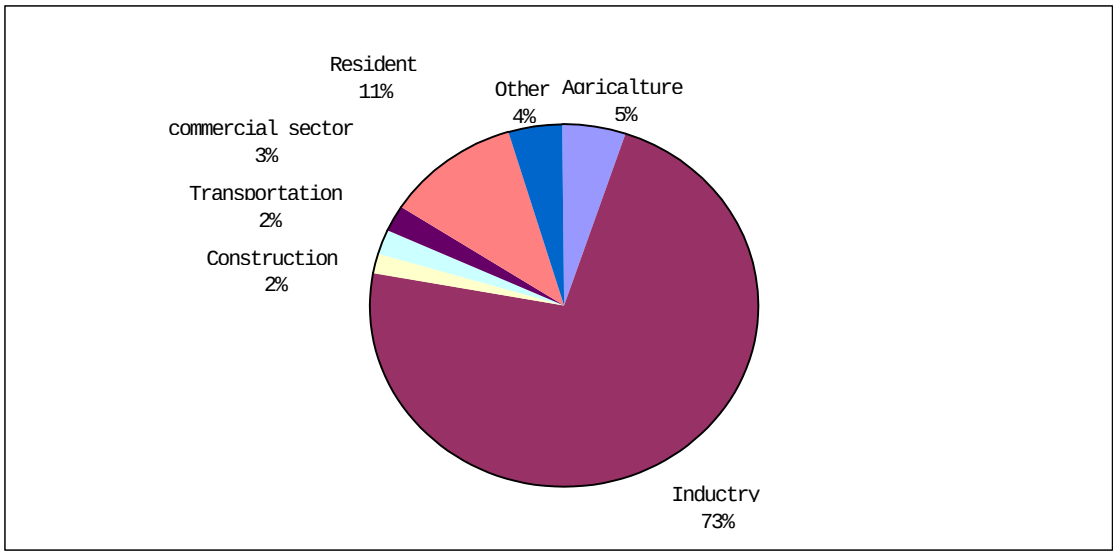

Figure 1. Electricity consumption in 1998, China

In industrial sector, the energy efficiency of key energy consumption equipment is comparative low and the energy consumption per unit for producing major industrial product is about 20 per cent more than the international advanced level (see figure 2).

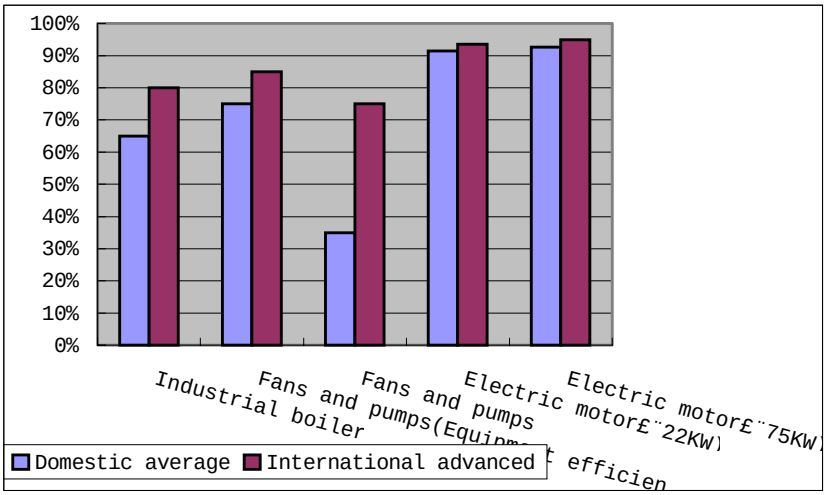

Figure 2. Comparison of the efficiency of key industrial equipment

On the other hand, as the development of the economy, the living standard of people is raised rapidly; the amount of production and possession rate for household appliances is in the state of constant increasing (see figure 3). China has become a major household appliances producing country. From 1986 to 1996, the total production value of household appliances increased by 32.1per cent yearly, the amount of production for major household appliances was listed at the front row of the world market, resulting in a 10-15per cent yearly increase of electricity consumption in residential sector. Statistic data shows, the growth rate of total energy consumption in residential sector is 8.43per cent in 1998, but the growth rate of total energy consumption for the whole nation is only 2.58per cent. There is an obvious increase in the proportion of energy consumption in residential sector (see figure 4).

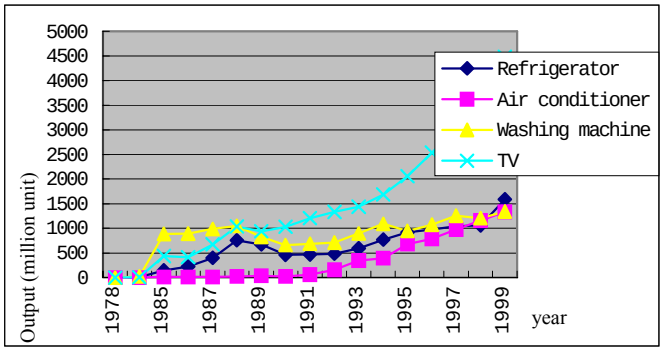

Figure 3. Production of key household appliances, 1978-1999

The constant increase in energy consumption resulted in serious environmental problems. From 1990, China has a yearly increase of 16 GW in electric power generating ability. Because coal is the major fuel used in electric power plants, this will result in more emission of CO_2, SO_X, NO_X and some other solid, thus severely worsen the environment.

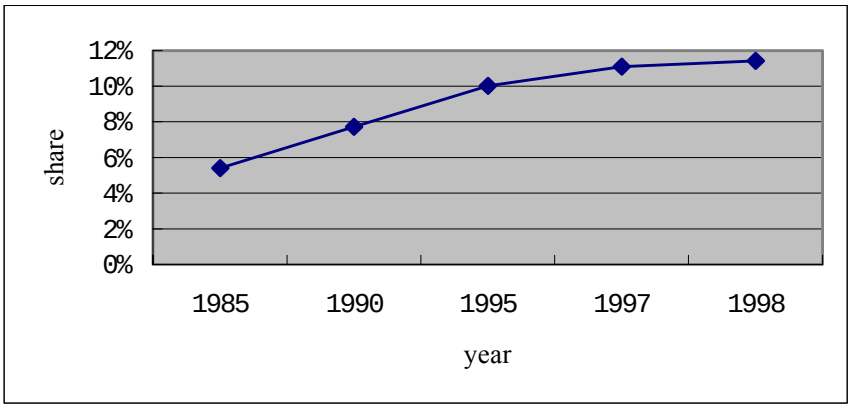

Figure 4. the share of residential consumption in whole electricity consumption

And so it is urgent to utilize energy reasonably, save energy, increase the overall energy efficiency level for various energy-consuming products, especially the industrial energy consuming equipment and household appliance. It has been proved by successful experience from other countries that the main and effective approach is to strengthen the development of energy efficiency standards and promote the application of energy labels.

Chinese government also realized that this is a good way to solve these problems. In the clause 16,17,18 of "*Energy Conservation Law of the people's Republic of China*", it stipulates:

1. Set energy consumption limit for products that consumes comparatively more energy in the production process;
2. Practice elimination system for equipment with low energy efficiency;
3. Practice certification for energy conservation products to promote the constant progress of energy conservation technology for energy consuming product and equipment, improve energy efficiency, protect environment, increase economic and social benefit and market competition ability.

2. THE DEVELOPMENT AND PRESENT STATUS OF APPLIANCES ENERGY STANDARDS IN CHINA

2.1 THE FIRST BATCH OF ENERGY EFFICIENCY STANDARDS

In China, since the implementation of reform and opening policy in the late 1970's, national economy developed rapidly, the amount of household appliances became enlarger and the electricity consumed increased rapidly. For this reason, China National Technical Standardization committee for Energy Basis and Management developed the first batch of energy efficiency standards, including: energy efficiency standards for household refrigerator, room air conditioner, washing machine, etc (8 standards, see table 1).

Table 1. Standard list and main contents for the first batch energy efficiency standards on household appliances in China

Standard Code	Name of Standard
GB12021.2-1989	The limited value and testing method of the energy consumption for household refrigerators
GB12021.3-1989	Limited value of energy consumption and method of testing for room air conditioners
GB12021.4-1989	The limited value and testing method of the energy consumption for household electrical washing machines
GB12021.5-1989	The limited value of energy consumption and method of testing for electrical iron
GB12021.6-1989	The limited value and testing method of efficiency and warming energy consumption for automatic rice cookers
GB12021.7-1989	The limited value and testing method of electrical energy consumption for broadcasting receiver of color and monochromic television
GB12021.8-1989	The limited value of efficiency and methods of measurement on radio receivers and recorder
GB12021.9-1989	The limited value of energy consumption of electric fans and its measuring method

These standards were approved and issued by former China State Bureau of Technical Supervision (now its name changed to China State Bureau of Quality and Technical Supervision) on 25th, December 1989, and implemented formally on 1st, December 1990.

2.2 ENERGY EFFICIENCY STANDARDS NEWLY REVISED AND DEVELOPED

In recent years, as the constant improvement of science and technology, the potential of energy saving is also quite considerable. Besides, Chinese government began to strengthen its management on energy conservation in the middle of 1990's. China started revising and developing its overall energy efficiency standards. Since 1995, approved by China State Bureau of Quality and Technical Supervision, China National Institute of Standardization has revised two of the first batch of energy efficiency standards and develop some new energy efficiency standards for lighting products. three national standards were finished as follows:

1. GB12021.2 The maximum allowable values of the energy consumption and evaluating values of energy conservation for household refrigerators
2. GB12021.3 The limited values of energy efficiency and evaluating values of energy conservation for room air conditioners;
3. GB17896 The limited values of energy efficiency and evaluating values of energy conservation of ballasts for tubular fluorescent lamps.

The newly developed energy efficiency standards are also mandatory. The contents of the standards were adjusted according to the demand of China's energy conservation work and appliance market in China. The mainly performance requirements are:

1. the limited value of energy efficiency (energy consumption)
2. the evaluation value of energy conservation

Among which, the limited value for energy efficiency (consumption) is mandatory, aiming to eliminate the low efficiency products off the market; the evaluation value of energy conservation is voluntary, and can be used as the energy conservation target for enterprises. The evaluation value of energy conservation also provides the minimum requirement for energy conservation product certification formally started in 1998. At the same time, engineering/economic analysis are done, such as : cost-benefit analysis, impact

on consumer impact analysis, national energy saving prediction , impact on environment protection (emission reduction).

2.3 MAIN EFFECT OF THESE NEWLY DEVELOPED STANDARDS

2.3.1 Household Refrigerators

The amount of household refrigerators possessed in China is rapidly increasing to 100 million units. In 1999, the percentage of urban families with refrigerators is 77.74per cent,that of rural families is 10.64. The electricity consumption of refrigerators takes about 50per cent of all the electricity consumption in a family.

Based on the market development level and engineer analysis, there is a huge potential for refrigerators. The new standard specifies a strict requirement: the limited value of energy consumption and evaluation value of energy conservation respectively. This will eliminate nearly 15per cent of the high-energy-consuming products off the market.
A survey made in 1999 revealed that the energy consumption of major refrigerator products decreased by 8.5per cent(see figure 5).

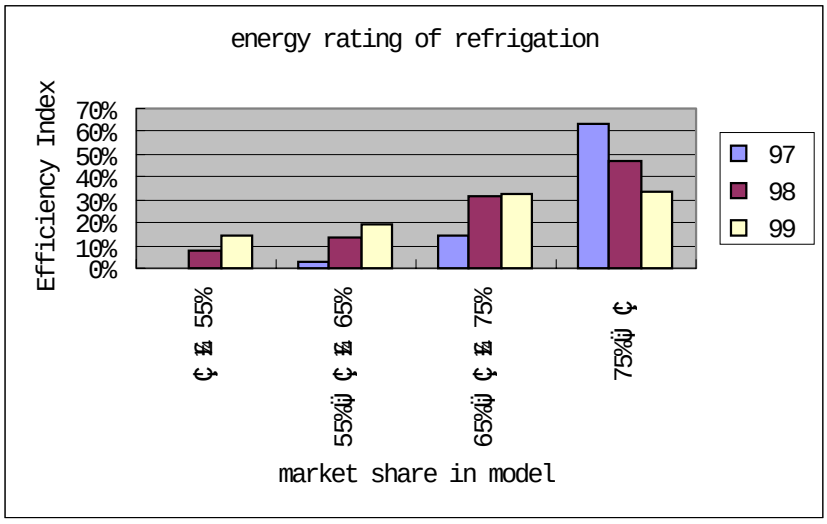

Figure 5. change of market share of household refrigerator in 1997~ 1999, China

According to the development plan of Chinese government, the energy efficiency for refrigerator will be increased by 40per cent in the coming 10 years, this will save about 1.2 billion US$ for the government and 72 billion US$ for consumers. The electricity consumption will be decreased by 120 billion kWh, thus will considerably reduce the emission of green house gas by 21 million ton(counted by carbon).

2.3.2 Room Air conditioner

The air conditioner market is a newly developed market, the demand of air conditioners is steadily increasing. China now has the third biggest air conditioner market in the world, next only to US and Japan, taking 12per cent in the world market of air conditioner.
Similar to the other energy efficiency standards, this standard for room air-conditioners mainly specifies the limited value of energy efficiency and the evaluation value of energy conservation.

Statistics shows that the energy efficiency level for air conditioner will be increased by 10per cent after the implementation of this standard. The implementation not only reduces the electricity demand, electricity load in peak time and save the infrastructure investment of power plant, but also had a sound economic effect, the yield of energy conservation reached 1.43(not include the benefit from emission reduction).(see figure 6)

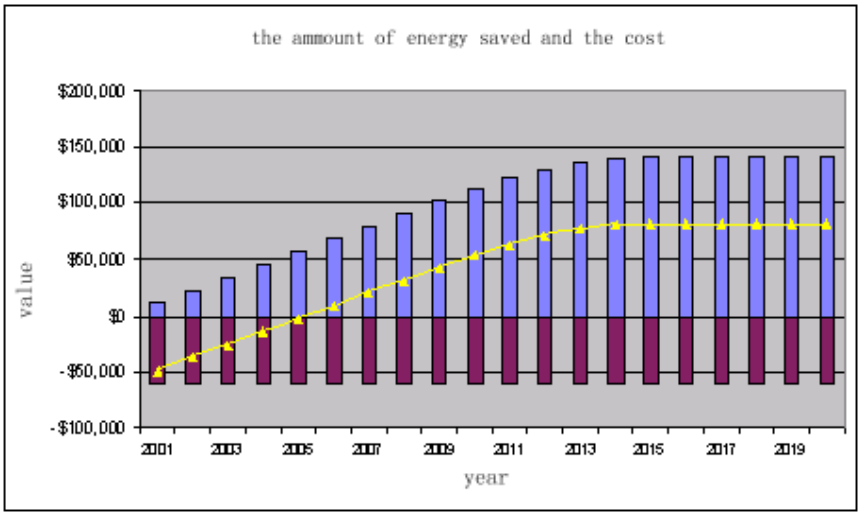

Figure 6. Prediction of the benefit of energy conservation after the implementation of energy efficiency standard for room air conditioners

2.3.3 Tubular fluorescent lamp ballast

As the rising of people's living standard and the improvement of lighting quality, together with the push of China Green Light Project, fluorescent lamps are used in more places. Ballast, which is a key element to combine with fluorescent lamp, is produced with an increase in 10per cent yearly. The development and implementation of ballast energy efficiency standard is a powerful approach to improve the energy efficiency level for fluorescent lamp ballast, and to reduce the demand of electricity used by fluorescent lamp. The ballast energy efficiency standard emphasizes mainly on the limited value of energy efficiency and evaluation value for ballast.

By analyzing and calculating, the implementation of this standard will increase the average magnetic ballast efficiency factor from 2.05 to 2.059, and electronic ballast efficiency factor from 2.372 to 2.402. From 2000 to 2009, the electricity saved for the whole nation will be 5.132 million kWh, the raw coal burnt will be reduced by 2.71 million tons, the emission of CO_2 will be reduced by 1.354 million tons (counted by carbon). The electricity saved is predicted as figure7.

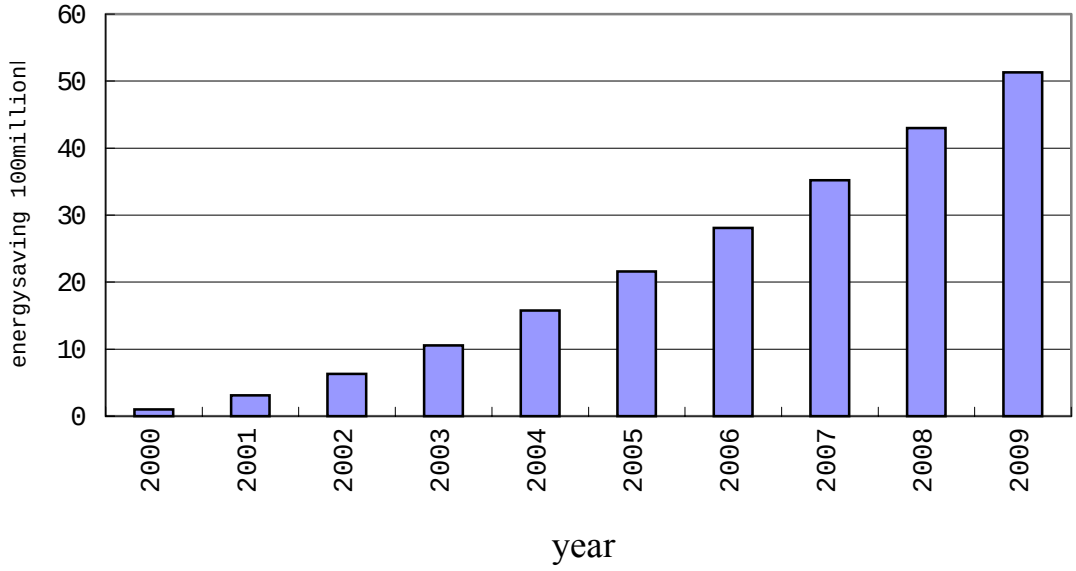

Figure 7. Annual energy saving prediction for Ballast

2.4 ENERGY EFFICIENCY STANDARDS CURRENTLY BEING DEVELOPED AND REVISED

Energy efficiency standards are currently being developed:

1. Energy efficiency standards for lighting equipment, including double- capped tubular fluorescent lamp and compact fluorescent lamp etc;
2. Energy efficiency standards for industrial energy consuming product, including Central air-conditioners, electric motors etc.
3. Energy efficiency standards for household appliance, including washing machine, TVs.

3. PROBLEMS EXIST AND MAIN OBSTACLES

1. The development and revision cycle of energy efficiency standards is relatively long; there exist certain difficulties in data collection, lack of fund for data analysis;
2. Not enough effort made in the propaganda and publication; lack of basic training for manufactures, sale persons and consumers; lack of sufficient awareness and understanding for energy conservation standards; urgently need to strengthen exchange for technical outcomes, still need to make effort in promoting the selling potential of energy conservation product;
3. Because of the high-tech contents in energy conservation products, manufactures need to invest more money in the developing and producing process of these products, it is natural that energy conservation products are more expensive than ordinary ones. Chinese government encourages the development of energy conservation product, but the favorable policy for energy conservation product has not come out yet, manufactures are not so active in developing energy conservation product. The strength of market push is also not strong enough;
4. As the further expansion of the work for energy conservation product, and the start of information labeling program (will be launched shortly after), it becomes more and more important to summarize and analyze certification results. But because of the restriction of experience, method, and fund etc, the analysis is not enough in both deepness and extent.
5. International exchange and cooperation is an important mean to promote the Global Energy Conservation and environmental protection. As the impendent of China's joining into WTO and the constant development of Global trade, energy efficiency labels become more and more

important in international multi-lateral recognition. It can not only promote the sustainable development of Global economy, but also reduce trade barriers. However, there are still difficulties exist and we need supports from relative parties;

4 FUTURE PLAN

4.1 CONTINUE WORKING ON THE RESEARCH OF TARGET ENERGY EFFICIENCY STANDARDS

In order to provide better service to manufactures producing household appliances, lighting equipment, industrial equipment, commercial equipment and office equipment, we should refer to method used in developed countries to develop target energy efficiency standards. These kind of standards can set energy conservation target for enterprises, leaving enough time for enterprises to adjust their product design and production, thus arrange their technical improvement more reasonable.

4.2 SYSTEMATICALLY DEVELOP AND REVISE SERIES OF ENERGY EFFICIENCY STANDARDS ON INDUSTRIAL/COMMERCIAL EQUIPMENT, HOUSEHOLD APPLIANCES, ETC, PROMOTE THE RESEARCH AND IMPLEMENTING PROCESS OF ENERGY EFFICIENCY STANDARDS

4.3 RESEARCH AND DEVELOP ENERGY CONSUMING RESTRICTION STANDARDS FOR HIGH ENERGY CONSUMING PRODUCTION PROCEDURES IN PRODUCTION PROCESS

High-energy-consuming product refer to a product which consumes large amount of energy in its production process, mainly including the steel, iron, coke, cement, synthetic ammonia, ethylene and electrolyte aluminum etc.

4.4 RESEARCH AND IMPLEMENT INFORMATION LABELING SYSTEM

We will refer successful experience of other countries. We will also develop our information labeling regulation and rules for implementation.
Upon finish of the above research, we will promote the information labeling for products such as refrigerators, room air conditioners, lighting equipment, and some industrial energy consuming equipment.

REFERENCE

Zhou Fengqi, 1999. Study on Long Term Energy Development Strategies of China(Beijing, China Planning Press)
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