Current Status of Energy Conservation in China◆

– The Case Study for Energy Efficiency Standard and Labeling of Appliances and Equipment –

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Summary

In recent years, China has become one of world's biggest producers and consumers of household appliances and equipment. China's energy consumption is rapidly increasing as the economy is growing fast. With sustained economic growth and rising living standards, it is estimated that energy consumption will increase continuously. The NDRC (National Development and Reform Commission) proposed and announced the first mid-long term special energy plan on June 2004. The plan specifically states clearly that energy efficiency of products should achieve the world's highest level in 2020.

China clearly overtook the USA as the world's leading emitter of CO_2 in 2008. To tackle the climate change issue, the Chinese government announced that the reduction target of CO_2 emissions per GDP would be to cut 40-45% of 2005 levels by 2020.

Under this condition, energy efficiency standards and labeling have an increasing significance. This paper points out several shortcomings of Chinese S&L (Standard and Labeling) policies that prevent the realization of full energy saving potential, which include the time lag between standard setting and implementation, inconsistent efficiency evaluation methods, not incorporating regional differences, limitation in the items covered by labeling scheme, and lack of sales promotion. Based on these observations, authors suggest modifying the way of setting energy efficiency standards, using regional coefficients, streamlining evaluation methods, including more items under the labeling scheme, and introducing the energy-efficient appliance best-sellers program to promote sales of highly energy-efficient appliances and equipment.

1. The Electricity Consumption of Major Appliances and Equipment

During China's transition to a market-based economy, China's electricity consumption increased significantly. In 2009, total electricity consumption reached 3,297 TWh in China, which is 14.6% of total energy consumption of the whole country.

This is 5.96% higher compared to the preceding year, with the growth rate also increasing, 0.47% higher than the growth rate of the last year. The electricity consumption of 15 major energy

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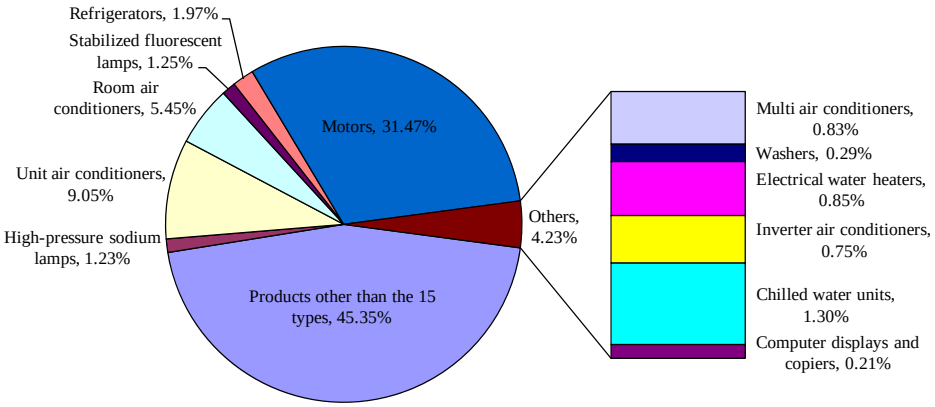
using products[1] including appliances and equipment in 2009 was about 56% of the total electricity consumption.

Fig. 1 Electricity Consumption of Major Energy-Consuming Products in China in 2009



Source : White Paper on Energy Efficiency Conditions of Energy-Consuming Products in China (2010)

The amount of electricity consumption of motors (small and medium three phase asynchronous motors in industry), unitary air conditioners (commercial), and room air conditioners accounted for 31.47%, 9.05% and 5.45% respectively of the total amount of electricity consumption in China (Fig. 1).

China has implemented a series of Minimum Energy Performance Standards (MEPS), including mandatory standards, which has been strengthened substantially. The strengthening of energy efficiency standards has a great potential to promote energy conservation. In addition, energy efficiency labels can promote the popularization of energy-saving products by passing the information on energy-saving and energy efficiency to consumers. Nowadays, both developed and developing countries have introduced energy efficiency standards and labeling program. In China, it is not only regarded as energy-saving policy but also as a means to strengthen international competition and to attain the goal of reducing CO_2 emissions. Therefore, China is engaged in introducing and implementing the system positively.

[1] 15 major energy using products are room air conditioner, refrigerators, storage electric water heaters, inverter room air conditioner, washing machines, copy machines, computer display, unitary air conditioner, multi-connected air conditioner (heat pump) unit, water chillers, small and medium three phase asynchronous motors, compact fluorescent lamps, double-capped fluorescent lamps, high-intensity discharge lamps.

2. The Current Situation of Energy Efficiency Standard and Labeling

2-1 Energy Efficiency Standard

At the end of the 1970s and the beginning of the 1980s, many countries introduced energy efficiency standards and labeling. According to the statistics of IEA, 34 countries implemented the S&L and obtained economic benefit. The General Administration of Quality Supervision Inspection and Quarantine of China promulgated the first energy efficiency standards of 9 products including room air conditioner, washing machine, etc on December 1989, and implemented on December 1990. The energy efficiency standards detail specifically a number of performance requirements for an energy-using device, and effectively limit the maximum amount of energy that may be consumed by a product.

In 1998, the implementation of the National Conservation Law of China became the basis of mandatory energy efficiency standards for energy-consuming products. According to article 16 and 17 of the National Conservation Law, the producers which manufacture energy-using products must comply with energy efficiency standards during the process of production. The products that can not meet energy efficiency standards will be eliminated from the market. In other words, the setting and implementation of energy efficiency standards entered into a new phase of regulation step upon promulgation of the National Conservation Law.

At present, there are mandatory and voluntary energy efficiency standards in China. In addition, the mandatory energy efficiency standards are the minimum allowable values of energy efficiency. The voluntary energy efficiency standards are the evaluating values of energy efficiency conservation. Limited value of energy conservation and energy efficiency grade is descried on the label. By the end of December 2009, China had implemented mandatory Minimum Energy Performance Standards, which cover 33 appliances and equipment, as well as voluntary energy efficiency standards.

2-2 Energy Efficiency Labeling

According to article 18 of the National Conservation Law, China implements energy-efficiency labeling for high energy consumption products including widely used products like appliances. The Department of State Council and Quarantine of China jointly promulgate and implement the list of labeling products and practices. According to article 19 of the National Conservation Law, producers and importers of energy consuming products, which are on a national list of products included in the energy efficiency labeling scheme, must affix the energy efficiency label on products and put explanation on products packages or manuals. At the same time, they must register the products with the authority. Producers and importers are held responsible for the reliability of the label and related information shown on the energy efficiency label. The sale of products will not be permitted if appropriate energy efficiency labels are not affixed.

Energy efficiency labeling is a seal put on products or packaging that shows consumers the information regarding energy efficiency grade and energy consumption.

On March 2005, the NDRC (National Development and Reform Commission), the General

Administration of Quality Supervision Inspection and Quarantine (AQSIQ) jointly promulgated the detailed implementation rules for energy efficiency labeling, which is just one measure for determining the magnitude of the energy efficiency level manufactured by different companies. The NDRC and AQSIQ jointly promulgated 'Catalogue of products to be implemented energy efficiency labels of China (the 7th batch)', the catalog of products subject to mandatory procurement was requested showing energy efficiency label.

The NDRC implemented a program of government energy efficiency procurement on room air conditioner and household refrigerator in 2005. By the end of 2010, China had promulgated energy efficiency labels for 22 product categories including appliances and equipment (household refrigerators were revised after the revision of the energy efficiency standards). Energy efficiency labels of 86,831 products from 1,667 manufactures passed the examination and were registered at the China Energy Label Management Center.

According to the governmental statistics, it is shown that the cumulative saving of electricity is more than 150 TWh in 5 years since the energy efficiency labeling program was implemented in 2005, which is equal to 140 million tons of CO_2 and 0.6 million tons of SO_2 emission reduction.

3. The Issues of Energy Efficiency Standards and Labeling --- the Gap between S&L Setting and Implementation

Energy efficiency standards and labeling have been adopted as effective methods of energy conservation policy. However, there are some problems in the current system and there exists a gap between standards and reality. Therefore, it has not fully achieved the expected energy saving. The following is a discussion regarding the standard formulation, implementation, and evaluation methods.

3-1 The Gap between Standards and Market

China's energy efficiency standards are minimum energy efficiency standards, which are determined by the energy efficiency of products manufactured by many manufacturers. However, it takes at least one year for the development of standards, and generally takes at least six months from announcement to implementation of the standard. Meanwhile, as the competition among enterprises increases, technological development advances, and by the time the standard is implemented, the level set in the standard is often lower than in the average levels of product in the market. Therefore, only limited numbers of products are phased out, and this leads to the gap between efficiency level of the products in the market and the energy efficiency standards.

In addition to the time lag in the development and implementation of the standard, there is also a long interval in the update of the energy efficiency standards. After the publication of the first energy efficiency standard, although there are revisions of standards for some products, there are also products that the standards have never been updated since the 1980s or 1990s. In the case of the TVs, the first limited energy consumption and test methods were developed for black-and-white TVs in 1989. In the late 1990s, urban area of China, where the TV ownership rate

is higher, had already shifted to color TVs. However, the test methods for color TV were only published 15 years later, in 2005. With the development of television technology, the market has converted into flat plasma and LCD TVs from conventional color TVs; however the revision of the energy efficiency standards for television has not yet been carried out. In addition, energy efficiency standards for ballasts for tubular fluorescent lamps still remain at the 1999 standard level.

3-2 Evaluation Method

The evaluation method for energy efficiency is not always consistent even for the same product with different specifications. Looking at the example of room air conditioners (AC) in China, the evaluation methods of the energy efficiency for fixed non-inverter AC and inverter AC differ, and the method for comparison of the efficiency between the two types has not been established. Therefore, when applied with the efficiency labeling schemes currently being implemented, it makes the energy efficiency of inverter AC looks low. In order to properly understand the characteristics of high performance energy-saving inverter technology, and for consumers to compare the efficiency between these different types fairly, there is a growing need for a unified evaluation method and labeling method.

3-3 Regional Differences

China has a wide land area, which encompasses diverse climate zones, income levels, housing styles, and very different lifestyles. Therefore, the energy consumption of the appliances and equipment varies by these conditions largely. The use of AC is determined by the climate, and the use of lighting also depends on the sun light conditions.

In the case of AC, the usage of AC and the time of use vary significantly by climate in northern and southern China. Therefore, a survey will be an important way to find out the use of AC in China and to inform consumers. In China, a survey of energy use of AC was conducted in 1998. Since then, with the economic development and rising income levels, the usage pattern of AC is considered to have changed significantly compared to 1998. According to the survey, the average cooling days in China was 97 days, with the longest of 138 days in Southern China, and shortest of 73 days in east China. In addition, for heating in the winter, 41.4% of the households that have heating use heat pump AC for heating, and the usage is around 66 days in southwestern regions, and 51 days in southern regions.

The current efficiency standard and labeling program for AC does not take these differences into consideration, thus there is a need for improvement to accommodate regional differences.

3-4 Limitation in the Items Covered by Labeling Scheme

Energy efficiency standards and labeling is one of the important measures to promote energy-saving of appliances and equipment. Energy efficiency standards do not only improve product performance, but also help popularize energy-saving products through propagating to customers. At present, in China, there are 33 types of appliances and equipment, but only 22 types

have been labeled. In other words, 11 types, one third of all types of appliances and equipment, are not yet labeled.

3-5 Barrier of Sales Promotion

The lack of measures to encourage sellers to promote energy-saving products works against the spread of energy-saving products, and prevents the realization of full potential of energy efficiency standards and labeling. In recent years, the Chinese Government is strongly promoting the popularization of energy-saving products through providing subsidies, such as the Program of State Subsidy, subsidies for replacing old products for new ones, subsidies for high-efficient lighting products, and so on. Such government subsidies temporarily attained better results. However, the problem of how to promote the diffusion of energy-saving products after subsidies are over still remains.

Along with the implementation of energy efficiency standards and strong market competition, with improving energy efficiency of appliances and equipment, the policies for diffusion of energy-saving products in the market do not keep pace with implementation. Currently, the degree of compliance with energy efficiency standards in China is shown on labels using five degrees, from the first degree to the fifth degree. According to the standards, the seller should be able to pass correct information to customers in an easy-to-understand manner. However, the government does not have policies aimed at sellers that encourage selling energy-saving products. Therefore, sellers are inclined to sell any types of products to attain best company orientated benefits. Under this condition, energy-saving products with high producing costs can not be popularized in the market.

4. Prospects of Energy Efficiency Standard and Labeling System

In view of the formerly discussed issues, we should try to seek solutions to solve them. First, the development, and implementation and update of energy efficiency standards should be arranged rationally and in a timely manner. Generally, the revision of minimum energy efficiency standards is to be adapted to the standards that should be attained 3 to 5 years later. So enterprises shall be able to put products meeting the scheduled standards into market, which is called predetermined standards. The implementation of the standards would be beneficial for enterprises' technological progress. Also, by combining the standards with enterprises' technology, the gap between Minimum Energy Performance Standards (MEPS) and market sales would vanish.

Second, the same commodities group should not set up different energy efficiency standards, and the evaluation methods also should be unified, in order to provide consumers with the correct evaluation, which enables consumers to make well informed decisions. Supposing that ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) are to be integrated into one system in China, it will not only provide more chances for Chinese commodities to gain entry into the international market, but also promote the development of energy efficiency standards in China. For example, as to the evaluation method of energy efficiency of AC, there are several ways, not yet unified in the world. Likewise in China, the

ones for fixed speed AC and variable-speed AC differ in EER (Energy Efficiency Rating) & SEER (Seasonal Energy Efficiency Ratio). Presently, APF (Annual Performance Factor), the evaluation method adopted by Japan, is being considered for development of ISO standard. Correspondingly China also might consider the introduction of APF.

Third, considering the wide land area of China, it is important to adopt the evaluation methods accommodating regional difference. In the case of Japan, regional coefficients for APF are being set in order to enable the calculation of annual electricity consumption according to the region. Consumers can use the regional coefficients in choosing different commodities. In China, the evaluation methods based on regional difference will present actual information of energy efficiency and energy consumption to customers and encourage them to make correct choices.

But strict energy efficiency standards can not ensure the wide diffusion of energy-saving appliances and equipment necessary to achieve energy conservation. The energy efficiency standards and labeling should be used together. It is not only necessary to diffuse energy-saving products in the market through labeling, but also to increase the number of products that require energy-efficiency labeling.

Finally, along with the expansion of labeling and improvement of energy efficiency standards, in order to realize the benefits of these policies in the markets, it would be necessary to introduce policy measures to encourage the energy-saving product best sellers. By placing such best sellers as leaders in diffusing energy-saving products, energy-saving products should be promoted in the market. Therefore, good policies in China are able to improve the cognition of labeling and awareness of energy-saving.

〈Reference〉

1) China National Institute of Standardization, White Book on Energy Efficiency of Energy-using Products in China, China Standards Press, 2010.
2) Li Aixian, Energy Efficiency Trend and Development in China, Journal of Gas Turbine Society of Japan, 25, (1998), pp. 2-7.
3) National Bureau of Statistics of China, China Statistical Yearbook, China Statistics Press, 2010.
4) National Development and Reform Commission : http://www.sdpc.gov.cn/default.htm
5) China National Institute of Standardization, China Household Energy Consumption Survey, 2009.

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