

# The Implications and Impacts of China Energy Label

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## **Abstract**

China has formally enforced a new energy efficiency information label entitled “CHINA ENERGY LABEL”, in tandem with a serial of integrated energy efficiency actions, to respond the increasing dual pressures in energy security and local environmental pollution due to dramatic increases in energy consumption. Household refrigerators and room air conditionings without this label were forbidden to be sold in Chinese market after March, 1<sup>st</sup>, 2005.

In this paper, framework and key elements of China Energy Label are presented as follows. This mandatory information label will cover appliances and lighting products with huge energy saving potential step by step by central government issuing product lists. Manufactures should report related data and send test reports to authorized agency after self declaration of their product's energy efficiency. Energy efficiency criteria relies on product's Life Cycle Cost and its efficiency distribution in market. The compliance and enforcement regime is complicated because it depends on local government sectors responsible for quality surveillance or/and energy inspection.

This paper highlightes energy saving potential and emission mitigation from the label based on engineering and economic analysis. Some post- evaluations of label's impacts indicated the label played an active role in market transformation. Statistics analysis showed penetration rate of efficient refrigerators was significantly higher than that of air conditioners. Site surveys validated that the label had already seized “eyeball”, influenced purchase decision of consumers, incented retailers to promotion of efficient appliances and fostered awareness of energy efficiency in market.

## **1. Background**

To respond well to the increasing dual pressures in energy security and local environmental pollution, China government pledged to cut 20% of energy consumption Per 10000 RMB GDP with maintaining economic growth by 7.5% per year in the next 5- year from 2006 to 2010. As energy labelling and standards of appliances and equipment has proven to be one of the most promising policy instruments in energy efficiency field, China have tried his best to introduce and adopt a new energy efficiency information label, in tandem with a serial of integrated energy efficiency actions, to achieve the ambitious energy conservation goal.

On August 13, 2003, *The administrative regulation on Energy Efficiency Label*, hereinafter referred to as *the Administration Regulation*, was duly promulgated by the National Development & Reform Commission (NDRC), the State General Administration for Quality Supervision and the Inspection and Quarantine (AQSIQ). representing successful establishment of a energy label entitled “CHINA ENERGY LABEL” in China. On March 1, 2005, the refrigerators and air conditioners were covered by the label as a first batch of product.

## 2. Legislation and Administration Frame of China Energy label

### 2.1 Legislations and regulations

#### 2.1.1 Supreme laws

Supreme laws for the Administration Regulation consist of *Energy Conservation Law of the PRC*, *Product Quality Law of the PRC*, *Legislation on Certification & Accreditation of PRC*. *Energy Conservation Law* furnishes a legal foundation for China energy label system. Pursuant to provisions in Article 26 in the Law, the enterprise manufacturing energy-consuming products must affix the product with a label, indicating the energy technical index. *Product Quality Law* principally regulates the product label and administrative organs. Article 27 in the Law regulates that product specifications, grades, ingredients and contents shall be in Chinese and be consistent with product performance and utilization requirements. *Legislation on Certification & Accreditation* furnishes professional and technical supports for implementation of China energy label system by regulating the qualification and competence of the test laboratories.

#### 2.1.2 Administration regulation

*the administration regulation* formally set up China Energy label in China. The regulation, which contained 27 articles and 5 chapters including general, implementation of Energy-Efficiency Label, supervision and administration, penalties and supplementary Provisions, offered basic element of the label system.

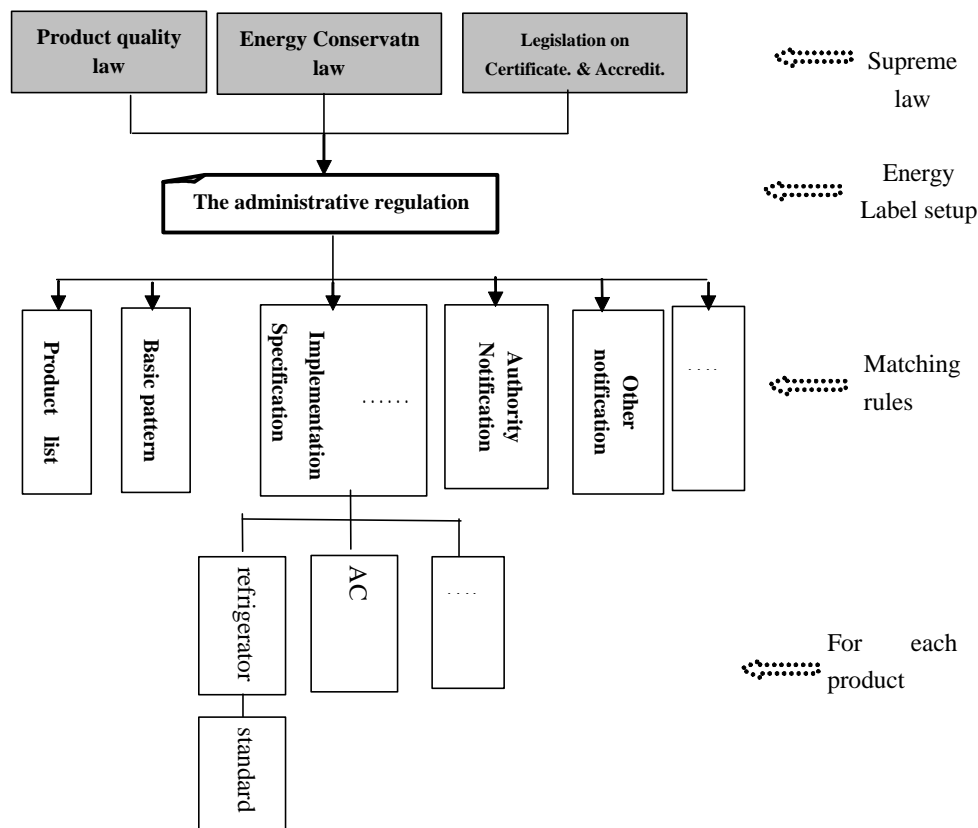
Article 2 clarifies the label is not a continued label but a categorical label. Article 3 defines that the candidate products for the label is energy using products that widely used and have greater energy-saving potential, and explains that the product lists will be issued by government authorities step by step. Article 4 endows the label with mandatory attribute for the listed product. Article 5 enforces the manufactures or imports covered by product list to register their product's energy efficiency in the authorized registrar, Article 12 and 13 give the general procedure of the register, and Article 14 points out the register is free. Article 6, 7 and 22 identify administrative and surveillance frame of the label. Article 8 give basic information item in the label. Article 9 assign the self-declaration model for label's implementation. Other article regulate the obligations of stakeholders and penalties.

#### 2.1.3 Implementation specifications and other documents

Under the umbrella of the administration regulation, NDRC, AQSIQ and CNCA (Certification and Accreditation Administration of PRC) should jointly issue implementation specifications for each listed product to offer detail requirements for implementation. The implementation specification clarifies the detail design and contents of the label for each product, technique criteria for classification of energy efficiency, document list and format for register. Of course, the energy efficiency standard shall also be harmoniously incorporated in relevant regulations and rules for the energy label.

2004, Nov, the first batch of product list, the basic pattern of China Energy Label, two implementation specifications for refrigerators and room air conditioners were publicized. 2005, Jan, NDRC and AQSIQ authorized China National Institute of Standardization (CNIS) to undertake the register, bulletin of the label. NDRC and AQSIQ also issued relevant Notifications twice to future identify and strength the surveillance tasks.

Legislation frame on the energy label, refer to Diagram 1



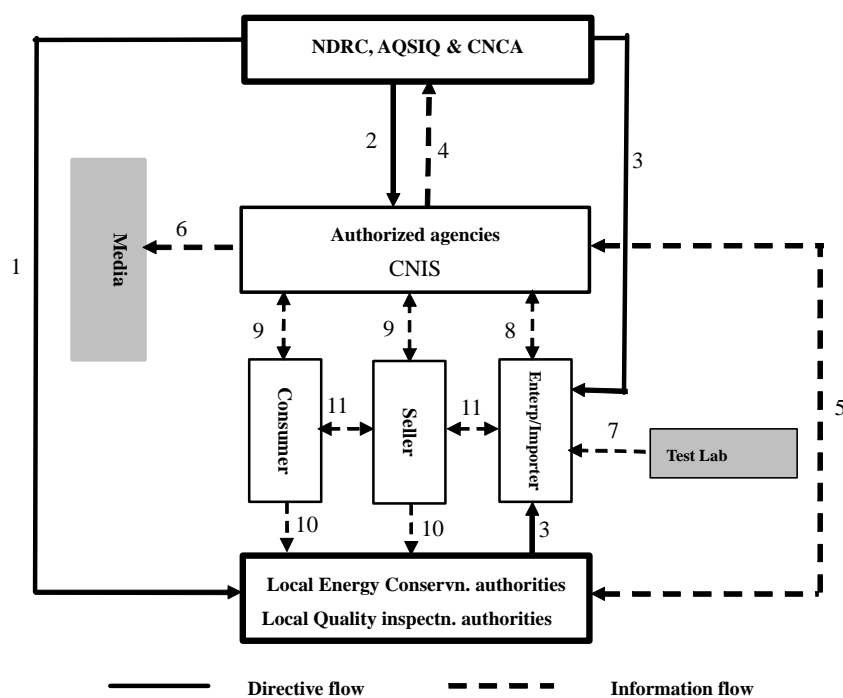
**Figure 1: Legislation frame on the energy label**

## 2.2 administration system and responsibilities of concerned parties

The energy label management involves in many concerned parties, including administrative agencies, manufacturers/importers, sellers/retailers, consumers, inspection agencies, etc. For the organizational management structure, see Diagram 2.

### 2.2.1 Government agencies involved in Management and supervision

The energy label management agencies consist of two levels: Level 1: NDRC, AQSIQ and CNCA. The three authorities respectively take own responsibilities under the State Council to establish and implement the system. Specifically, their responsibilities include setup and announcement of the product catalogue, development and issuance of the implementation rules and label pattern/specifications, designation of authorized agency, organizing supervision and inspection of the energy label, etc. Among which, NDRC, as the macroeconomic control & energy conservation authority, shall take the lead role in managing the system. Whereas, Level 2 management authorities mean local authorities for supervision and management of the system, including energy conservation department, quality inspection department, as well as Entry-exit Inspection & Quarantine at provincial, municipal and town levels. Level 2 authorities are mainly responsible for supervision and performance of the system on the production and market, and investigate any relevant illegal activities.



1.Organization; 2.Authorization; 3.Supervision/inspection; 4.Suggestion; 5.Information-sharing; 6. announcement; 7.test; 8.Register; 9.Inquiry; 10.Complaint; 11.Information feedback

**Figure 2 : The organizational management structure for the energy label**

### 2.2.2 Authorized agency

The authorized agency is of particular importance for the organization and implementation of the energy label. The agency, authorized by NDRC and AQSIQ, shall be responsible for the following works:

- Acceptance and inspection of the energy label registrations;
- Announcement of the energy label Information;
- Establishment and execution of energy label information registration, announcing and inquiring system;
- Publicities and trainings of the energy label I;
- Receipt of relevant complaint and supply of treatment measures
- Arbitration for disputes on relevant energy information
- Other works required for supervision & management of the energy label.

### 2.2.3 Manufacturer/importer

The manufacturer/importer, who plays the most important role in the implementation of the energy label, takes the following responsibilities:

- to test product energy efficiency pursuant relevant standards;
- to identify label information based on relevant standard and test report;
- to print the label and ensure correct labels affixed to the product in the Catalogue.;
- to submit acceptable registration documentations to the authorized agency and ensure trueness and completeness of the registration documentations;
- to accept social and governmental supervision and inspection.

#### 2.2.4 Seller

The seller shall set and implement the purchase inspection and checking system to ensure the sold products within the Catalogue are affixed with correct label.

#### 2.2.5 Test lab

Test lab shall be responsible for testing energy efficiency of relevant products and arbitrating relevant disputes, whose responsibilities and liabilities are as follows:

- To ensure just and fair test results;
- To exercise the strict sampling procedures, inspections & tests in a just and fair way;
- To be liable for protection of the business secrets they are familiar with.

#### 2.2.6 Consumer

The consumer is not only the target audience of the label, but an important force to supervise the label by complaining the incorrect label to relevant agencies.

### 3. Key elements of China Energy label system

#### 3.1 Nature of the implementation

China Energy Label shall be compulsory for the listed products. Due to different actual conditions of the products and resource requirements, China, by means of issuing the product list (catalogue), gradually executes the energy label system for the products that are extensively used and have large potential in energy saving. Any product listed in the catalogue must be affixed with unified energy label pursuant to relevant provisions; otherwise, it would be forbidden to sell or import such products.

#### 3.2 Mode of certification

China Energy Label employs the pattern of “manufactures self-declaration + Energy data registration + post-Market supervision”.

The pattern of enterprise self-declaration is embodied in the following aspects:

- The enterprise by himself or entrusts the test agency certified by state to identify the product energy efficiency;
- The enterprise determine the label information in accordance with the test results and relevant standards;
- The enterprise prints the labels by himself in conformity with relevant requirements;
- The enterprise affixes the labels by himself;
- The enterprise shall be responsible for the accuracy of the label information and accept the supervision and inspection.

#### 3.3 Implementation procedures

The energy label shall be implemented in the following procedures: test of the energy index & identification of the energy information, printing & utilization of the label, registration, re-examination and announcement of the energy label, supervision of the energy labels, etc. For implementation procedures for the energy label, refer to Diagram 3.

#### 3.4 Supervision mechanism

##### 3.4.1 Supervision organs

supervision parties cover the administrative sectors and other stakeholders. The administrative sectors including energy conservation administration departments, quality supervision and inspection department, as well as Entry-exit Inspection & Quarantine at center provincial, municipal and town

levels. The other stakeholders come from the market actors, such as manufacturer, media, retailer, consumer, media etc.

#### *3.4.2 Contents of the supervision management*

Contents of the supervision management are as follows:

- Whether products within the Catalogue are affixed with the energy label or not\ or whether the product operating manual is marked with energy grade or not?;
- Whether the labeling information is correct or not?
- Whether the label is registered or register was updated or not?
- Whether the label pattern is in conformity with regulations or not?.

In order to ensure fair supervision and accurate test results, AQSIQ, NDRC and their provincial counterparts will take responsibilities to check accuracy of information involve the energy performance parameters in the label, including energy efficiency grade, energy consumption, etc.; in addition, the third party of national certified test bodies accredited by CNCA will undertake relevant test arbitration. For disputation in energy performance. To facility help to inspect accuracy of the energy information and organize arbitrate inspection, the authorized agency will frequently report the label utilization to AQSIQ and NDRC based on complaints and information from registration database.

Local energy conservation management department and quality supervision & inspection department shall be responsible for supervision on the utilization conditions of the energy labels under own jurisdiction. Such conditions include: if the listed products are affixed with the unified labels; if the label pattern satisfy relevant requirements; if the used label is registered, if the labeling information is true (among which, such indexes as energy efficiency grade and energy consumption, etc. shall be supervised and inspected by AQSIQ, NDRC, provincial energy management department, provincial quality inspection department, etc;)

#### *3.4.3 Supervision method*

The energy label employs manufacturer's self-declaration model, which requires a high-degree self-discipline from the enterprise and strict inspection from the government. Therefore, diversified supervisions shall be adopted, including administrative supervision, social supervision, etc. The following supervision methods may be adopted:

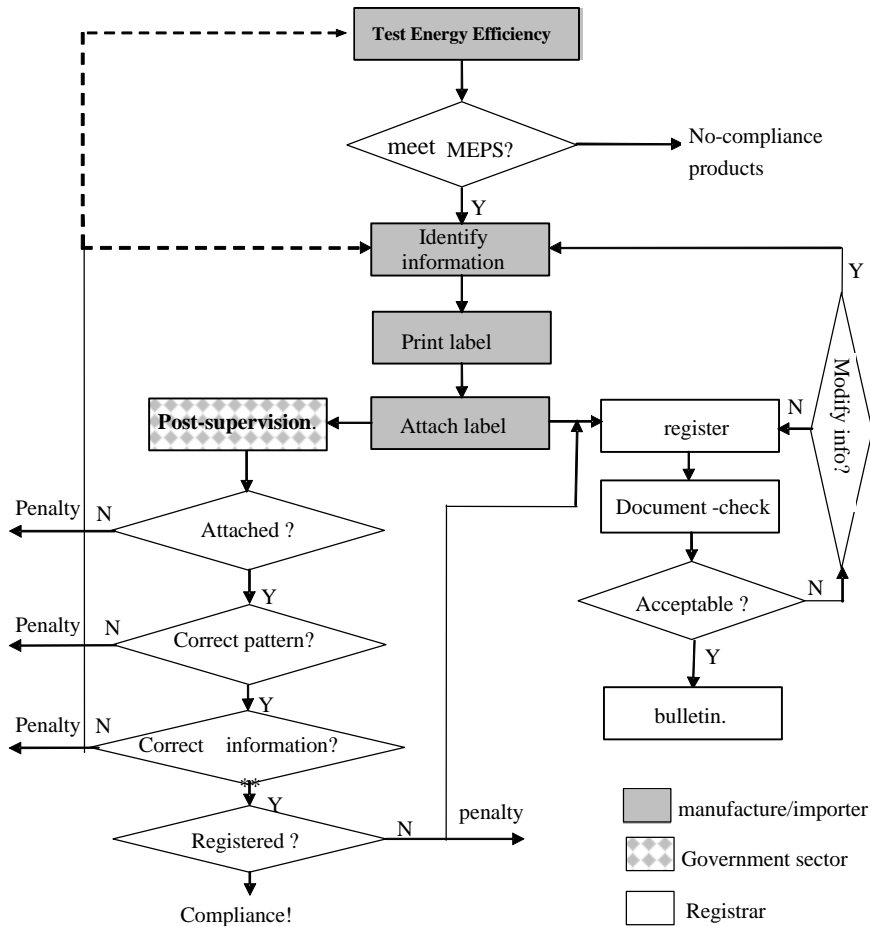
- Random inspection by state authorities
- Routine random inspection by supervision authority
- Mutual tests between manufacturers
- Inspection by the retailers
- Complaints from the consumers
- Report and check by the media

#### *3.4.4 Penalty types*

Enforcing legal responsibilities shall be an important way to ensure successive execution of the energy label system. Meanwhile, appropriate penalties shall be given for lawless activities mentioned above.

Possible penalty includes:

- Make a correction within a fixed term;
- Announcement and exposure in public;
- Fine 10,000 RMB for failure in label's pattern and without register.
- Fine of 50,000 RMB for forgery, fraudulence of label's information
- Forbid selling products without the label.
- Other penalty



**Figure 3: The implementation procedures for the energy label**

### 3.5 product list

On 1st March, 2005, the refrigerators and room air conditioners were enforced to implement the label. The detail models of the refrigerator covered are electric motor driven compressive type refrigerators with volume of 500L and below. The model of ACs covered air conditioners using air cooling condenser, closed motor-compressor, with cooling capacity under 14000W, working under climate T1, no covering speed-variable, mobile and multi-connected air-condition(heat-pump) unit. The label will cover cloth washers and unitary air condition in a year, and will possibly stretch into lighting products, water heater, motors and passenger cars based on practical implementing resource and potential of market transformation from each candidate label program.

### 3.6 pattern of the labels

China energy label pattern shall include basic pattern and specific pattern for each product. The basic pattern means general template for all the products' energy label. The basic pattern regulates the label shapes, colors, designs, overall layout, etc. in addition to other energy characteristics. Detailed patterns and specifications are provided in the implementation specification for different products, considering different sizes of energy-consuming products (e.g. refrigerator, air conditioner) and diversified energy consumption indexes (e.g. power consumption/24h for the refrigerator, energy efficiency ratio, refrigerating capacity for the air conditioner). The specific pattern comes from

proportional zooming-in or zooming-out of the basic pattern, and meanwhile adding relevant information in connection with the product energy characteristics.

After a mixture of qualitative and quantitative market research to rank, screen, modify the label design, and several rounds of stakeholder workshop to solicit opinion and reach consensus on the nature of the final design, the basic pattern was determined. See Diagram 4. The label is a colorful one with blue-and-white background, somewhat similar with EU counterpart, but only 5 grades, include following items: manufacture name, product model, efficiency grade, energy consumption or energy efficiency indexes, other indexes deep involved with energy efficiency, and the adopted energy efficiency code.

The label for refrigerator is 62mm long and 98mm wide and their energy indexes are power consumption (kWh/24 hrs), Cubage of each compartment (L), such as those for chilling, freezing, fresh food storage, etc. The label for room air condition is 109mm long and 66mm wide and their energy indexes are energy efficiency ratio, power input (W), cool capacity.



**Diagram 4: The basic pattern and specification of China Energy Label**

### 3.7 Energy efficiency standards

Energy efficiency standards which is mandatory and offer MEPS and(or) grade criteria of energy performance is the technical basic of the label program. National energy efficiency standards classify refrigerators and room air conditioners' energy efficiency to 5 grades. For refrigerators, the standard is GB 12021.2-2003, the maximum allowable values of the energy consumption and energy efficiency grade for household refrigerators. For room air conditioners, energy efficiency standard is GB 12021.3-2004, the minimum allowable values of the energy efficiency and energy efficiency grades for room air conditioners.

China have absorbed the best practices from experienced economies in developing energy performance standards. The economic-engineering model and statistics analysis was pre-requisite methodology for drafting mandatory standards. Additionally, deep involvement of manufactures, patient negotiation, and market survey largely balance the count-interest between government aggressive goals on energy conservation and manufacturer' worries on rising cost for more efficient product and facilitate consensus on the new rigorous MEPS.

Generally, in those standards, the following criteria on energy efficiency classification was adopted: the grade 1 means international advanced efficiency, the grade 2 reflects the point of lowest Life Cycle Cost of the product, or accounts for top 20% of product distribution in term of energy efficiency, the

grade 3 stands for average efficiency, the grade 5 identifies the batch of lowest efficient but qualified product which will be removed from market in the next round of MEPS revision and grossly share 10% of product in market.

Table 1 indicates the Chinese energy efficiency criteria is more stringent than that of EU. The gap of requirement of refrigerators between EU and China seems narrow. But compared to the grade A+ and A++ of EU, Grade 1 and 2 of China are less ambitious. But appliance's energy efficiency in local market considered, the Chinese energy efficiency criteria less advanced than that of Korean,

**Table 1 the comparison of energy efficiency criteria between EU and China**

EU			CHINA		
Grades	EER for ACs	EER for refrigerators	Grades	EER for ACs *	EER for refrigerators
A++		30			
A+		42			
A	>3.20	55	1	>3.40	55
B	3.00~3.20	75	2	3.20~3.40	65
C	2.80~3.00	90	3	3.0~3.20	80
D	2.60~2.80	100	4	2.80~3.00	90
E	2.40~2.60	110	5	2.60~2.80	100
F	2.20~2.40	125			
G	≤2.20	>125			

Note: \* ACs with cooling capacity less than 4500W.

#### 4 Energy saving potential of the Label

From findings of Project entitled “ Energy saving potential of major types of energy-using products from energy efficiency standards and labeling”, which funded by Energy foundation(US), and technically supported from ACEEE, the huge energy saving and pollutant mitigation will be achieved from successful implementation of energy information label. 14.2Twh of electricity or 5.5 MTce of primary energy in 2010, and 21.6Twh of electricity or 7.8MTce of primary energy in 2020 can be saved from label's program if it covered 8 types product such as refrigerators, room air conditioners, TV, commercial freezers, clothes washers, CFLs, and unitary ACs. In the term of 'summer peak load' reduction, the label will save a total of about 3.8 GW and 5.8GW of power in the year 2010 and 2020, respectively. Cumulative mitigation of C emission will reach 74.6 Mt from 2005 to 2010. the deep research showed that the average benefit-cost ratio of labels in China is about 2.0.

#### 5 Impacts on Market transformation of the label

Though only one-year enforcement of refrigerators and room air conditioners' label, initial post-evaluation showed the label have played an active role in market transformation and yielded substantial benefit.

### 5.1 energy efficiency database

From March 1<sup>st</sup>, 2005 to March 1<sup>st</sup>, 2006, the two products accounted for more than 98% of turnover in Chinese Market were attached with the label and registered. For the product models still manufactured after March 1<sup>st</sup>, 2005, energy efficiency data of about 2293 models of from 98 refrigerator manufacturers and 4568 models from 75 air conditioner manufacturers, which accounted for more than 98% of turnover in Chinese Market, were recorded by the energy efficiency database in the registrar. For the product models not yet manufactured but still sold in market, energy efficiency data of more than 1800 models of refrigerators and more than 3000 models of air conditioners were recorded by the database.

### 5.2 Penetration of efficient products

Diagram 5 shows the energy efficiency distribution of those models which still manufactured after 1<sup>st</sup>, March, 2005. Compared two caky charts, it is very clear that penetration rate of efficient air conditioners was very lower than that of refrigerators. For refrigerators, about 40% of the models belonged to grade 1 and more than 70% of models met energy efficiency requirement ( grade 1 and 2) of China Energy Conservation Product ( CECP, a endorsement label). Reversely, less than 10% of air conditioner model met the endorsement label requirement, and about 70% of model is low efficient(very cheap). The main reasons are possibly as follows: a),GB 12021.2 was issue by May, 2005 and enforced by Nov. 2003, but GB 12021.3 was issue by Aug. 2004 and enforce by Mar. 2005. So, refrigerator enterprises have relatively enough time to adjust strategies of product model and manufacture and promote efficient model than air conditioner company; b), in recent 5 years, the market of air conditioner fluctuated dramatically, violently shifting seller's market to buyer's market. Supply severely exceeding supply caused irrational price war to alleviate manufacturer's storage. Many manufactures desperately cut the air conditioner's cost at the expense of product's performance including energy efficiency. but for refrigerator, the market is more mature. The efficiency approach is one of key market strategy; c), In Market, the awareness of energy efficiency for air conditioners was very lower than that of refrigerators. In general, for air conditioners, the manufacturer and retailer enthused about cost promotion but reluctant declaration of energy efficiency. Most of consumers ignored energy performance but reveled in the manufactures' promotion of very cheap air conditioners. Reversely, the concept of energy consumption per day was rooted into consumers by the refrigerator manufactures and retailers' advertisement and sale promotion. Consumers associated the energy performance with quality and money benefit.

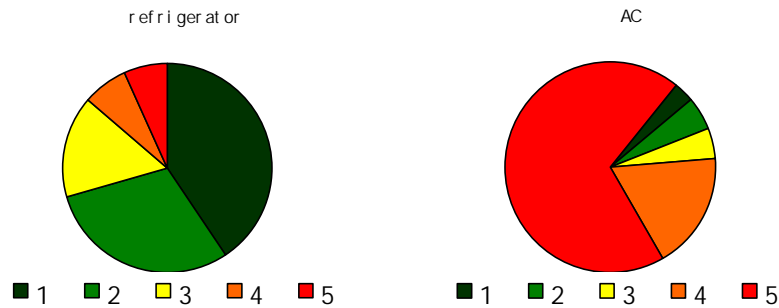
The mode distribution both refrigerators and air conditioners did not belong to Gaussian distribution. The distribution informed that refrigerator' market is efficiency driving, air conditioner is the cost driving.

### 5.3 market transformation

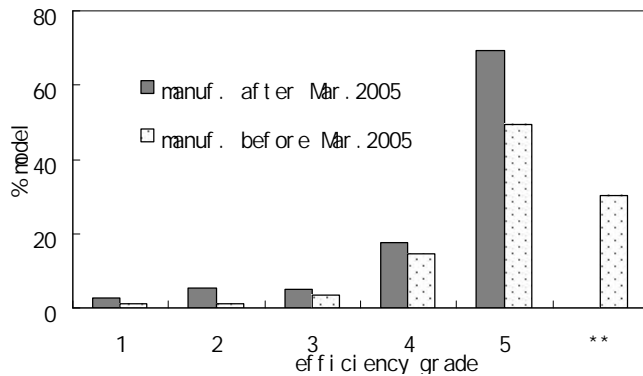
Comparing the distribution of product mode manufactured from 1<sup>st</sup> March, 2005 to 1<sup>st</sup>, March, 2006 with that manufactured before 1<sup>st</sup> march, 2005, we can find both refrigerator and air conditioner's market transformed from a low level of energy efficiency to a higher level.

**Air conditioners** : the diagram 6 shows a moderate increase by 6% in proportion of the efficient modes ( grade 1 and 2) and a significant decrease of the less efficient models( model 5 and below) by 10% in a year. More important, 30%of models which did not reach the MEPS were eliminated.

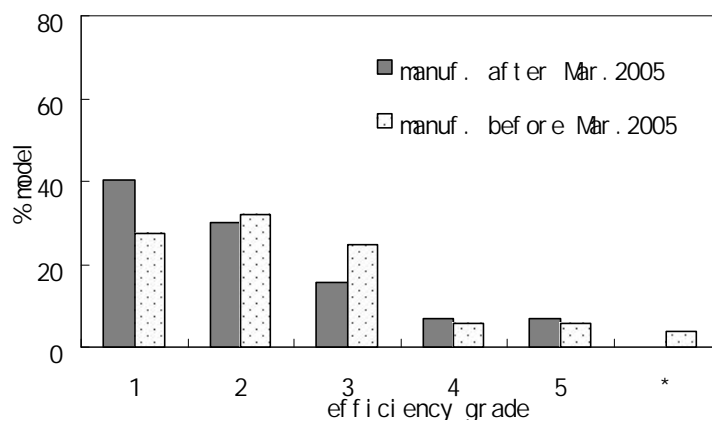
**Refrigerator:** the diagram 7 shows a significant increase by 13% in proportion of the most efficient modes ( grade 1) and a significant decrease of the average efficient models( model 3) by 9% in a year. About 4%of models which did not reach the MEPS were eliminated.



**Figure 5: the energy efficiency distribution of model of refrigerators and air conditioners, respectively.**



**Figure 6: Comparison of the energy efficiency distribution in term of models between room air conditioners manufactured after Mar. 2005 and those manufactured before Mar. 2005**  
Note: \*\* means efficiency below grade 5, namely, not meet MEPS



**Figure 7: Comparison of the energy efficiency distribution in term of models between refrigerators manufactured after Mar. 2005 and those manufactured before Mar. 2005**  
Note: \* means efficiency below grade 5, namely, not meet MEPS

The label pushed the transformation from the following dimensions: a) label facilitated the removal of least efficient products (30% of air conditioners' model were pushed out from the market). Because of implementation and promotion, the local supervision authorities strengthened intensity and frequency of market surveillance and manufacturers well recognized that the listed products with efficiency below grade 5 belongs to unqualified product. So label enhanced the compliance of the MEPS; b), manufacturers were roused to development of products. The drives at least include the NDRC and AQSIQ's periodic official notifications of the manufacturer and model lists of products with grade 1 and 2, which advertised their products and (more important) boasted their brands, and relevant incentives such as the government procurements. The products with label 1 or 2 met the efficiency requirement of the CECP label. If they were granted to use the label after a voluntary third party certification, they had some advantages in competence of bid of government procurement; c), most importantly, more and more consumers were familiar with label and consider the efficiency and operation cost as a key factor in their purchase decision. The label tells a consumer the true cost of an appliance and changes their choice, thus impresses on the manufacturers' strategies of product model. A survey with 600 samples from more than 100 appliance chain shops in six big cities was conducted by CNIS to figure out attitude of consumers and retailers toward the label. The findings show the label has already attracted "eyeballs" from retailers and consumers as a distinct advertisement. 40% of consumers are very interested in the products with grade 1 label and 35% for grade 2, and only less than 10% for label 3, 4, 5, respectively. Most of retailers can correctly understand the label and confess they are willing to show the label to consumers to promote the high pole of products. From this reliable and reasoned energy efficiency data of all models in market and some surveys, a primary assessment indicated about 1.8 billion KWh electricity was saved from the label's implementation for the refrigerators and air conditioners in one year. About 20% of manufacturers were shut down because of their uncompetitive products in efficiency. Of course, a well designed survey and evaluation research needed to further unveil the impacts of the label on market transformation.

## 6. Conclusions

China Energy Label was mandatorily implemented for the listed products in the mode of manufacturer self-declaration + register of energy efficiency + post-surveillance. NDRC, AQSIQ and CNCA are responsible for issuing relevant legislation and specifications to set up the scheme of the label and planning & organizing national supervision within their respective jurisdiction. The local administrative counterparts undertook the market supervision and surveillance to enforce the compliance of the label. CNIS, the authorized register agency, took charge of recording, checking, bulletin of energy efficiency data.

From statistical analyses of recorded data from official register data, the penetration rate of efficient refrigerators was significantly higher than that of air conditioners. The label played an active role in market transformation by strengthening implementation of MEPS and sharpening of penetration of efficient models. An assessment showed about 1.8 billion KWh electricity was saved from the market transformation. Site surveys validated that the label influenced purchase decision of consumers, incited retailers to promotion of efficient appliances and fostered awareness of energy efficiency in market.

## Referecnes

- [1] Stephen Wiel & James McMahon. Energy-Efficiency Labels and Standards: A Guidebook for Appliances, Equipment and Lighting, 2002, CLASP, Washington, D.C., USA.
- [2] Jin Minghong et al. The Design and Market Research of China's Energy Efficiency Information Label. In "Energy Efficiency in Domestic Appliances and Lighting", the proceeding of" the 3rd international conference on energy efficiency in domestic appliance and lighting" , Turin, Italy:2003..
- [3] Liang Xiuying et al (2004). Research o Energy Saving Potential from Standards and Labels for Chinese Major Energy-Using Products . In "Energy Efficiency in Domestic Appliances and Lighting", the proceeding of" the 3rd international conference on energy efficiency in domestic appliance and lighting" , Turin, Italy:2003.
- [4] Jin Minghong & Li Aixian , China Energy Label System. China Energy, 2005(5).

