Energy-Efficient Appliance Labeling in China: Lessons for Successful Labeling Programs in Varied Markets

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ABSTRACT

Appliance ownership and production has increased dramatically in China in the past two decades. From extremely low levels in 1980, China's appliance industry has become one of the largest in the world, with sales topping U.S. $14.4 billion in 2000. In 1981, less than 1 percent of urban Chinese households owned a refrigerator; by 1998, that number had increased to over 75 percent. This dramatic increase in sales and ownership leads to an excellent opportunity to impact energy consumption in China by affecting the energy efficiency of appliances being bought and sold.

In general, Chinese consumers value energy efficiency and are knowledgeable about the operating costs of major appliances. However, the Chinese marketplace does not provide information that consumers trust about the energy consumption of specific products. Thus, several interdependent organizations have emerged in China to provide information and market supports for energy efficiency.

This paper describes the appliance market in China and the evolution of its standards and labeling programs and the agencies that implement them. It discusses the authors' work with these organizations in developing energy efficiency criteria and supporting an energy efficiency endorsement labeling program in China. It describes how the authors have used their experience with ENERGY STAR® and other programs in the U.S. to work with China to develop a successful program specific to Chinese conditions, with a particular emphasis on refrigerators. It then gives the author's market assessment of the Chinese refrigerator market and recommendations for a successful labeling program and transferable lessons for developing energy efficiency labeling programs in varied markets.

This paper is based on the authors' market research, their support in setting energy efficiency criteria in China, interviews with Chinese manufacturers, retailers, and sales staff, and the development and implementation of labeling strategies and promotion in China.

The Appliance Market in China

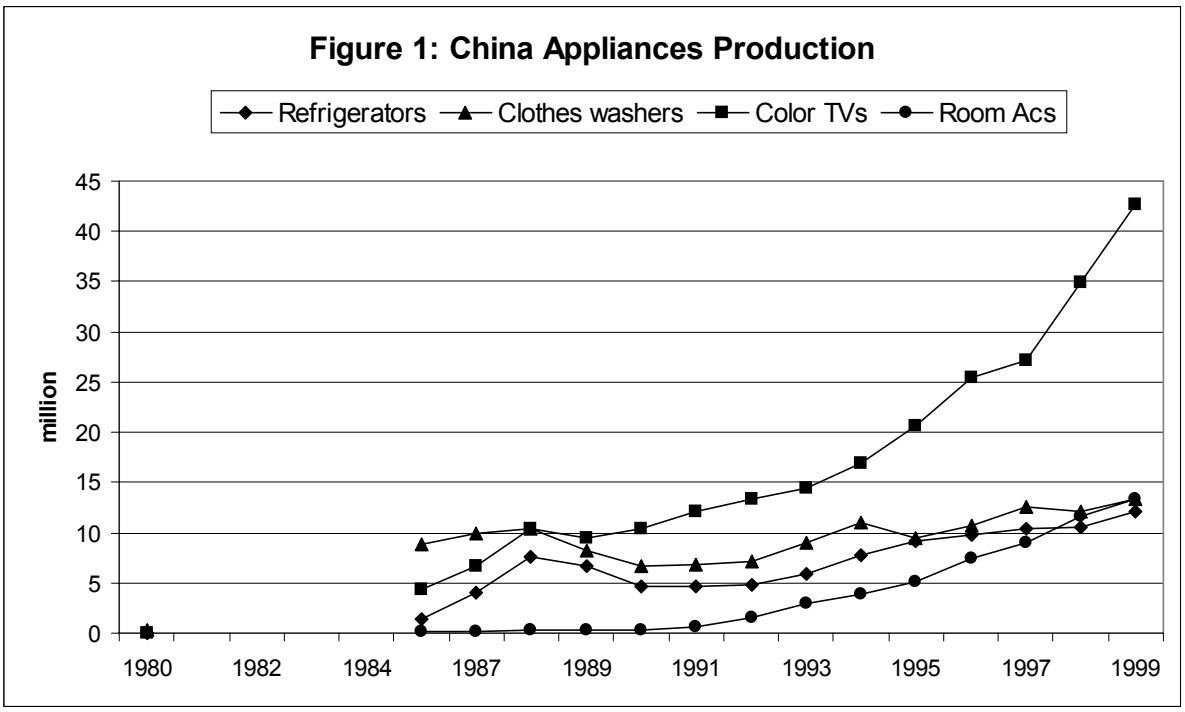
The growth of the Chinese appliance industry over the last twenty years has been monumental. From a very low production base in the early 1980's, China's appliance industry has become one of the largest in the world, with sales topping U.S. $14.4 billion in 2000 (*Appliance* 2001).

In 1980, the total output of household refrigerators in China was less than 50,000 units per year. Annual production of television sets, clothes washers, and air conditioners was approximately 2.5 million, 250,000, and 13,000 units, respectively. Very few households had modern electric appliances, with the exception of radio receivers.

The next decade witnessed enormous growth in China's economy characterized by increasing personal incomes and a rapidly expanding domestic appliance industry. Many international and Chinese manufacturers set up production facilities in the 1980s and production increased rapidly to meet the needs of the large Chinese market.

By 1989, the production of television sets had exceeded 27 million units, and production of clothes washers and refrigerators had reached 8.3 and 6.7 million units respectively. Production of room air conditioners remained below 1 million units.

In the 1990s, the Chinese appliance industry went through another transformation: as appliance sales and ownership in urban centers soared, the market became extremely competitive, and industry consolidation accelerated. By 1999, the output of refrigerators, room air-conditioners, and clothes washers in China had each reached approximately 13 million units, and the output of color television sets had topped 40 million units, making China the largest appliance producer in the world.

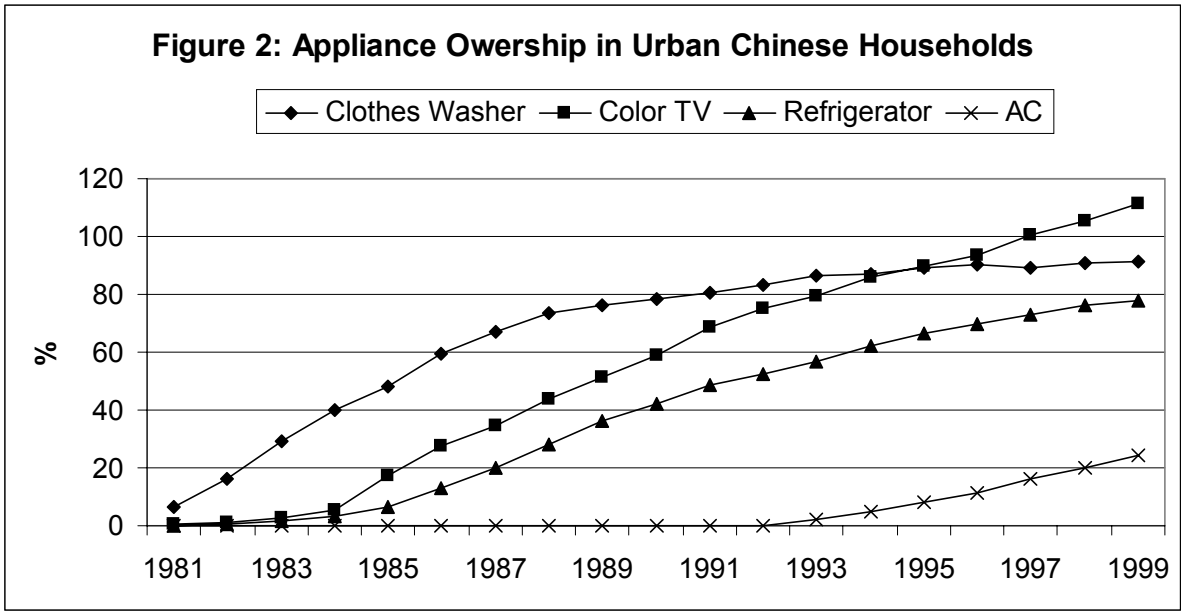


Source: China Statistical Yearbook 2000

In urban China, appliance saturation has reached a very high level. By 1999, ownership of color TVs in urban Chinese households has risen to 112 percent (i.e., homes having on average more than one television set). Saturation has reached 91 percent for clothes washers, 78 percent for refrigerators, and 24 percent for room air-conditioners, respectively.

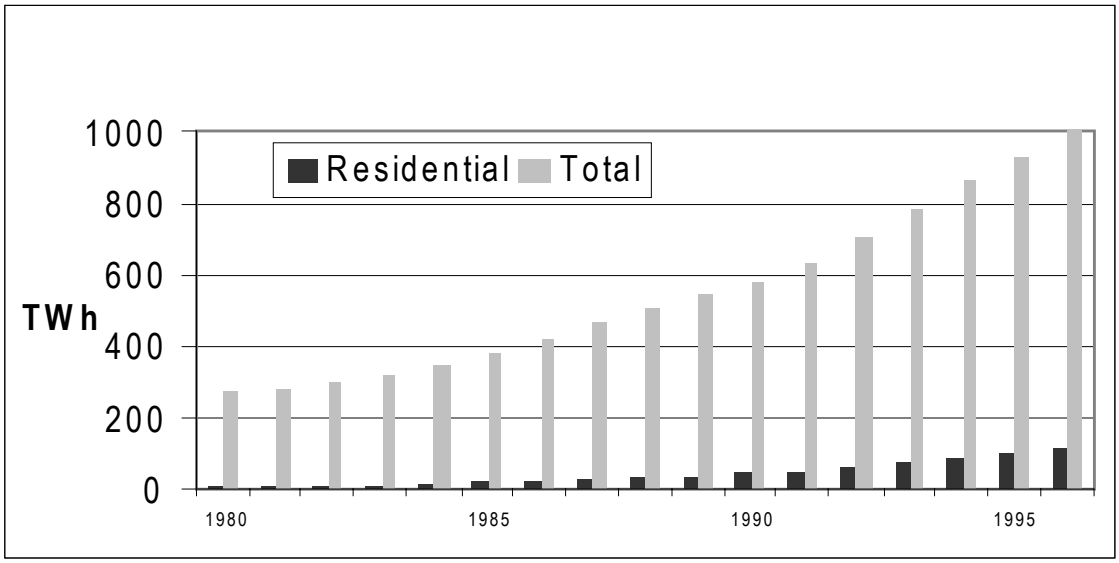
Such a rapid rise in appliance ownership has contributed significantly to the growth of China's electricity use. Between 1980 and 1996, Chinese electricity consumption grew from 276 TWh to 1000 TWh, with an average annual growth rate of 8 percent, while residential electricity use grew from 10 to 113 TWh, averaging 15 percent growth per year (nearly twice as fast as overall electricity consumption). To meet such rapidly increasing demand, China has added 15 GW of new generation capacity every year since 1980. Most of

these new power plants are powered by coal, with high impact on the environment (State Statistical Bureau 2001).



Source: China Statistical Yearbook 2000

Figure 3. Electricity Consumption in China



Standards and Labeling Programs in China

The rapid growth in appliance ownership and residential electricity consumption points to a significant opportunity to save energy by improving the energy efficiency of household appliances. There are large efficiency gaps between appliances in China and

other more developed countries and large variations in energy efficiency among appliance products within China.

In the late 1980s, China recognized that the growth of the appliance market increased the importance of setting minimum efficiency standards. In 1989, China introduced its first set of appliance efficiency standards. In 1997, China passed the Energy Conservation Law, putting end-use energy efficiency and standards and labeling programs at the center of China's new energy conservation strategy. Since then, China has developed comprehensive standards and labeling programs, including minimum energy efficiency standards (MEES), a voluntary energy efficiency endorsement label, and a forthcoming mandatory energy efficiency information label.

Standards and Labeling Institutions in China

Several interdependent agencies and organizations support China's energy efficiency standards and labeling programs, and all have important responsibilities for different aspects of China's overall energy strategy.

China's State Economic and Trade Commission (SETC) is responsible for the overall management of China's economy. SETC's Department of Resource Conservation and Comprehensive Utilization is charged with setting national energy conservation policy and implementing China's Energy Conservation Law (ECL). It has been responsible for supervising the development of energy efficiency standards and labeling in China.

China's State General Administration for Quality Supervision, Inspection, and Quarantine (AQSIQ, formerly the State Bureau of Technical Supervision) is the government agency authorized to issue all standards except for those related to environmental safety and selected petroleum products. MEES are only a small part of AQSIQ's total project portfolio.

The China National Institute of Standardization (CNIS) is a research institution under the supervision of AQSIQ. CNIS provides technical support, including data collection and analysis, to AQSIQ in the development of MEES. CNIS is also responsible for the development of China's mandatory energy efficiency information labeling program under the supervision of SETC and AQSIQ.

The China National Technical Committee for Energy Basics and Management Standards is a technical committee under CNIS that is responsible for the coordination of technical research and the review of standards. The committee comprises researchers, academics, and policy-makers, as well as representatives from manufacturing companies.

The China Certification Center for Energy Conservation Products (CECP) is an independent certification agency that was established in 1998 to administrate a voluntary energy efficiency endorsement labeling program. CECP follows policy guidance from SETC and AQSIQ, and is affiliated administratively with CNIS.

In addition, several international institutions have collaborated with Chinese agencies in developing the labeling and standards programs including the U.S. Environmental Protection Agency (U.S. EPA), Lawrence Berkeley National Laboratory (LBNL), the Energy Foundation (EF), and the Collaborative Labeling and Appliance Standards Program (CLASP).

Minimum Energy Efficiency Standards (MEES)

China issued its first set of MEES for 8 types of products in 1989 (refrigerator/freezers, room air conditioners, clothes washers, electric irons, automatic rice cookers, televisions, radio receivers and recorders, and electric fans). Beginning in 1995, SBTS received technical assistance from Lawrence Berkeley National Lab (LBNL) and U.S. EPA on several projects related to setting standards, including training for SBTS on analytical methodologies for performing detailed economic and engineering analyses that support standard development.

Since the passage of the Energy Conservation Law in China in 1997, the pace of standard development has accelerated. Currently, minimum efficiency standards for small and medium motors have been finalized, and standards for linear and compact fluorescent lamps have been drafted and are undergoing a stakeholder review. Work on a standard for clothes washers has started, and the development of standards for central air-conditioners, water heaters, gas appliances, and the revision of the existing refrigerator standards are planned over the next two years.

Voluntary Energy Efficiency Endorsement Labeling

In addition to minimum standards, China realized that there could be additional energy savings from introducing a voluntary energy efficiency endorsement label. CECP was established for this reason in 1998 and soon after developed an endorsement label to be awarded to products that met both quality assurance and energy performance specifications.

The Chinese CECP Efficiency Label. A blue circle with Chinese character elements. The meanings behind its stylized elements include:

- The Great Wall – means "China"
- China's character – means "conservation"
- The first letter of "China"
- The first letter of "energy"
- The color is blue, which signifies a clean sky, environmental protection, and a beautiful future.

CECP first developed criteria for refrigerators. Criteria were set to be approximately 30 percent more efficient than the MEES. In 1999, CECP granted its energy conservation label to 103 models of refrigerators from 9 major manufacturers, capturing the top 25 percent of the market. Manufacturers quickly responded to the label. By the end of 2000, a total of 203 models from 20 manufacturers qualified, encompassing the majority of the market in China. (CNIS, 2000). Currently, CECP is working to increase the standard to a higher efficiency level.

The next product specification was room air conditioners. In 2000, CECP granted its energy conservation label to 67 models of air-conditioners from 10 manufacturers, whose

collective market share is about 70 percent in China. According to CECP estimates, labeled air-conditioners consume 10 percent less electricity on average than non-labeled products.

In addition to refrigerators and air-conditioners, CECP has recently developed certification specifications for 8 other consumer products including fluorescent lamp ballasts, automatic rice cookers, hot water dispensers, electric water heaters, microwave ovens, and small and medium electric motors. Similar technical specifications are under development for linear and compact fluorescent lamps.

Most recently, CECP has been closely following international developments in reducing standby power losses. After months of research and negotiations with the industry players, CECP announced standby requirements for color television sets in a meeting with major Chinese manufacturers in January 2002. The CECP television specifications closely follow the U.S. ENERGY STAR specifications, and CECP has declared its intention to harmonize with other international programs on technical requirements where possible.

Energy Information Labels

Starting in 2000, SETC authorized CNIS to undertake a study of the feasibility of establishing an energy efficiency information labeling program with assistance from the Energy Foundation and CLASP. CNIS has developed a draft regulatory framework for the proposed information labeling program, and is considering a pilot project that would apply the proposed information label to refrigerators.

The CECP Refrigerator Labeling Cooperation Project

In 1999, CECP approached U.S. EPA to request a broad program of capacity building and technical cooperation between CECP's energy efficiency labeling program and the ENERGY STAR program. EPA, together with its partners ICF Consulting and Lawrence Berkeley National Lab (LBNL), reviewed CECP's program in development and agreed with CECP on a number of cooperative activities. One of these activities was supporting CECP's first labeled product, energy-efficient refrigerators.

In planning the refrigerator cooperation project, the first element was to better understand CECP's program and its stage of development. One important difference between China and the U.S. is that in China there were no regional energy efficiency organizations (e.g., utilities, energy authorities) promoting energy efficiency as there are in the U.S.. Therefore, CECP's program would need to serve roles comparable to both the national ENERGY STAR program and the regional utilities and energy efficiency organizations in the U.S.. The team therefore brought program strategies and techniques from both levels of implementation in the U.S.

Mission to China to Interview Refrigerator Market Players

The first element in supporting the refrigerator program was to conduct a market review. EPA and others had previously sponsored analysis of the Chinese refrigerator market, and it became evident was that there was a need for an even greater understanding of market players' motivations and greater involvement of market players in program strategy

and implementation. In the United States, the close involvement and cooperation of manufacturers and retailers in ENERGY STAR has been a key to its success.

EPA, ICF Consulting, and LBNL began working with CECP to plan a mission to China to interview refrigerator market players in order to better understand the market opportunities for the label and to establish a foundation for improved cooperation with them. This mission, combined with prior research, became the basis for a full assessment of the Chinese refrigerator market and the plan for the remaining cooperative activities under the project.

The team began planning the mission in early January 2001. Working with CECP, the team identified key industry manufacturers and retailers and the information that would need to be collected. Recognizing that the mission timeframe would allow only half-day interviews with each company, the team developed a pre-mission questionnaire. This questionnaire was used to collect data from participants in advance of the mission, both to save time during the interviews and to allow the opportunity for face-to-face clarification of key issues that surfaced in the questionnaires. The questionnaire included sections for General Management, Advertising, Sales, and Product Development, in order to collect information from all parts of the organization that would have some involvement with the label.

ICF and LBNL staff then conducted a 10-day mission from April 2 – 11, 2001. They interviewed a cross-section of the Chinese refrigerator industry, including the two largest manufacturers in China (Haier and Kelon), two foreign-invested firms with a significant international presence (Rongshida/Maytag, a joint venture in Heifei, and Siemens), and a medium-sized Chinese manufacturer with significant local presence (Hefei Meran, also called "Meiling"). According to manufacturer-reported sales data, these five firms account for approximately 50 percent of sales in the domestic market.

The mission also conducted two meetings with retailers and four site visits to retail stores. The first retailer meeting was coordinated by Haier in Beijing and included three Haier department store sales managers and one Haier outlet store manager. The second retailer meeting was coordinated by Kelon in Guangzhou and included more than ten Kelon salespeople and ten Kelon sales managers, as well as others. The site visits included visits to a department store and an appliance store in Beijing and two department stores in Guangzhou.

The interviews focused on information specific to the label in three major sections: use of the label to date, how the label fit in corporate objectives, and suggestions for making the label more useful.

At first, the team was not certain that the mission would reveal the information requested. While this method of meeting with market players to understand their motivations and challenges had worked well in the U.S., the team was uncertain that the Chinese manufacturers and retailers would be willing to be as open in disclosing their challenges and concerns.

However, the mission greatly exceeded the team's expectations. The manufacturers and retailers were candid in their responses and were very open in their efforts to cooperate to find ways to improve the label. The mission surfaced a large amount of new market data, and specific concerns and challenges of manufacturers and retailers, to help CECP determine the most effective ways to influence the market.

Assessment of the Refrigerator Market

The team developed the following assessment of the refrigerator market in China, based on prior research and its mission in April 2001, to serve as a basis to understand CECP's key program needs.

Refrigerators in China. In China, refrigerators cost 1-2 months of a typical urban household's income (220-liter models vary greatly in price from $210 to $365, and monthly urban household income is about $188) (LBNL and State Statistical Bureau 2000). The household refrigerator's cost as related to income makes it a major purchase for Chinese consumers, leading to the potential for the consumer to become a more careful and informed shopper than in the U.S..

Labeled refrigerators may cost 15-25 percent more than standard ($45 to $75 for 220-liter model). However, this varies greatly. One manufacturer indicated that they charge no difference for the energy-efficient model, and instead take lower profits (ICF and LBNL interviews). This indicated to the team that the label had not yet become a valued product feature.

However, in general, labeled refrigerators are a cost-effective purchase for the Chinese consumers. Electricity costs vary greatly by region. For the average unlabeled refrigerator, annual energy costs may range from $16 to $55 per year (220-liter model, electricity rates ranging from $.037 to $.125 per kWh) (Ogilvy & Mather, 1997). A labeled refrigerator, which is on average about 30 percent more efficient, can save $50 to $160 in energy costs over a 10-year lifespan.

The lifespan of newer refrigerators is 10-15 years. Refrigerators have become much more reliable since the early 1990's, when they might typically have lasted only 3-4 years. This new information was important when reviewing consumer surveys conducted in the 1990's, which indicated that reliability and warranties were top priority for consumers. As most refrigerators become more reliable, warranties may become less of a priority to consumers compared to other refrigerator characteristics.

Manufacturers and Retailers. In China, manufacturers are the most important link in the product sales chain. Most sales staff are employed by manufacturers, receiving about 40-100 percent of their pay from commission. A consumer will see 3-5 times the number of sales staff on the floor as they see in the U.S., and a salesperson will typically show only their manufacturer's brands (ICF and LBNL interviews).

Most advertising is sponsored by manufacturers. Manufacturers indicated advertising budgets of 36-100 million yuan ($4-$12 million) annually (ICF and LBNL interviews). Their emphasis on energy efficiency ranged from almost none of their budget to half of their budget. One manufacturer that emphasized energy efficiency last year indicated that it would change its message this year "to keep the message fresh." Manufacturers indicated they would be willing to work with CECP on promotions.

There has been major consolidation in the refrigerator market in the past decade. From more than 130 producers in the late 1980's, more than 90 percent of production today comes from the top dozen companies or so, including Haier in the North, Kelon in the South, Xinfei, Huari, Meiling, Xiling, Shangling, and Siemens, and two joint ventures: Maytag and Rongshida, and Electrolux and Zhongyi (CHEEA).

These top manufacturers will play an important role in the use and dissemination of the label. CECP has already developed strong relationships with most of the manufacturers, and has received broad-based use of the label on products in a relatively short time period. The team recommended that CECP enhance and extend those relationships to create a long future of cooperation, and developed an account management plan to help CECP develop a formal strategy for maintaining those relationships

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Consumers and the Sales Process. Consumers in China care about energy efficiency. An Ogilvy & Mather survey showed that energy efficiency jumped from 7th priority to 2nd between 1995 and 1997 (Ogilvy & Mather 1997), and Chinese manufacturers and sales staff agreed that energy efficiency is a high priority for consumers. One manufacturer shared its own survey results of consumer priorities. The highest priorities in order were: low noise, energy efficiency, warranty, and different compartments to avoid odors. Manufacturers and retailers both reported that consumers are knowledgeable and care both about first costs and operating costs of refrigerators. One manufacturer felt the younger generation cared less about costs overall.

The salesperson is integral to sale, yet they reported that consumers do not necessarily trust them (and manufacturers and retailers report that sales staff do make false claims). There is a general "show me" culture (i.e., must see it to believe it) that seems to permeate the sales process. For example, sales staff reported that products sometimes must be uncrated and demonstrated before being shipped to consumer.

According to manufacturers, consumers generally spend only 2-3 minutes looking at each refrigerator or with each salesperson, leaving little time for education. Sales staff said their emphasis is often dictated by the knowledge of consumer (salespeople tend to pitch the features the consumer seems to care about).

Since Chinese consumers are already aware of the value of energy efficiency, there is not the same need in China as in the U.S. to educate and persuade consumers to choose energy-efficient products. Instead, the label promotion can focus on establishing credibility and trust that the label signifies an energy-efficient product. Some manufacturers were interested in the ENERGY STAR label and message. However, the team recommended that a China-specific message be developed that would resonate specifically with Chinese consumers.

The team identified four areas that were important to the success of the label. First, the label needed to be perceived as a credible, authoritative, third-party symbol to improve consumer confidence that the product is actually energy-efficient and help overcome the barrier of distrust of the salesperson in choosing energy-efficient products. Second, it became clear that in-store materials published by the CECP could help explain and verify the label's claims. Third, influencing the salesperson could help influence the consumer. Training sales staff, so that they are facile with the energy efficiency pitch, could improve the number of times energy efficiency is used as a distinguishing feature in the sales process. Also, there may be an opportunity for an outside funding agency to offer sales staff extra commissions (sometimes called SPIFFs) to provide incentives for them to sell energy-efficient products. And finally, outside education to increase consumer awareness of the label will influence the salesperson's likelihood of using that as a distinguishing feature, since some claimed that they used the interests of the consumer in deciding which features to promote.

The CECP Energy-Efficient Refrigerator Label

The team discovered that there were many features of the label and the certification process that could be improved. First, manufacturers indicated that the performance levels for achieving the label should be raised. When the label was introduced, 103 refrigerator models from 9 manufacturers were certified, accounting for approximately 25 percent of production and sales. The criteria for the label were set to achieve this level of market penetration, comparable to the U.S. ENERGY STAR market penetration. However, since the refrigerator label's introduction, a much larger share of the market has qualified for the label. Haier indicated that 50 percent of their product was certified. Rongshida stated that 83 percent of its models were energy-efficient. Siemens indicated that in 2001 100 percent of their product line would qualify for the label, and of Kelon's 48 models, 47 qualify. The team recommended that CECP begin to establish a higher performance standard to capture the top 20 percent of the market.

Another concern with the label was that the certification process is lengthy and costly. It takes up to three months for a new model to be certified, and the manufacturer pays CECP approximately $3,000 to complete the certification procedure. Manufacturers did not mention that the costs were excessive, but did feel that the certification time was too long. Manufacturers are very interested in bringing new products to market quickly, for competitive reasons, and the certification procedure adds a significant delay. Some manufacturers indicated that they had not used the label on qualified products because they were anxious to get the product to market. This is a serious concern for the success of the label. The team has suggested that CECP review its certification process to determine if it can be streamlined.

A third concern with the label was that manufacturers and retailers interviewed thought the design of the label should be improved. The primary concerns were that the label did not immediately convey any useful information to the consumer. The elements are stylized and their meanings are not immediately clear. CECP has agreed that it may need to revise the label. Currently, the team is supporting CECP in developing its branding message. Following identification of the message, a new label will be designed and consumer tested.

A fourth issue is that there is currently low consumer awareness of the label. Most manufacturers, retailers, and sales staff agreed that consumers generally do not recognize the label or know what it means. Only Siemens said that at least some consumers recognize the label ("but not all"). CECP committed to the manufacturers to develop a pilot promotional project for the label on refrigerators. In the fall of 2001, the team began working with CECP to develop refrigerator point-of-purchase (POP) materials for use by manufacturers. This project has had two problems that are similar to lessons learned in the U.S.. First, when the team announced in November the project to develop POP for the following summer, many manufacturers indicated that they would be unable to participate because they had already allocated their marketing budgets for the year. The second problem was that manufacturers were concerned about how their promotions of the label would affect their overall sales, both in whether promoting labeled products would reduce the sales of their non-qualifying models, and whether promoting the label would also support sales of other manufacturers' labeled products. The team is currently working with CECP to overcome both of these problems.

Support for the CECP Label

The cooperation of EPA, ICF Consulting, and LBNL with CECP has included several elements, many of which are currently in process. The team worked with CECP to develop a business plan to provide a framework for its overall strategy and to set priorities for the short- and long-term that recognized finite staffing and budgets. It provided training in the U.S. for the CECP management team to learn ENERGY STAR methods and regional program strategies. ICF Consulting helped develop a detailed integrated marketing and communications plan that laid out a comprehensive strategy for promotion of the label, and provided training on finalizing and implementing that plan in China. LBNL has begun working to raise the criteria on the refrigerators to keep pace with improvements in efficiency and to find ways to shorten the certification process. ICF Consulting and EPA prepared an account management plan to improve CECP's cooperation with manufacturers. ICF Consulting and EPA are providing extensive support in developing a pilot promotional project for refrigerators that includes baseline consumer research, developing a brand message that resonates with consumers and creating point-of-purchase materials in cooperation with manufacturers.

Several activities are opportunities for later cooperation. The label redesign has been scheduled for after the development of the branding message. Salesperson training has been postponed until more immediate priorities have been accomplished, and a funding source for SPIFFs has not been identified.

Transferable Lessons

There are several lessons from our work with the CECP label that can be useful to labeling programs in the U.S. and around the world.

First, capacity building for a strong energy-efficient labeling program in China is worthwhile. The Chinese appliance market is one of the largest in the world, and the opportunity to impact economic growth, energy consumption, and environmental impacts is important. There are a number of lessons that have been learned in the U.S. in the past decade that are valuable to other countries, and learning lessons in other countries may also continually improve the U.S. programs.

Second, we found that as in the United States, relationships with market players were critical. Manufacturers were very willing to cooperate to find ways to make the label a success. We developed an account management plan for CECP to ensure a strategy for maintaining those relationships. As in the U.S., it is critical to understand manufacturer schedules and constraints in order to get maximum cooperation and support. In China, manufacturers play the major role in the sales process, so the program did not develop an outreach strategy for retailers.

Third, it is critical to maintain the standards and quality around the label. The labeled products should continually be assessed to determine if an increase in the efficiency criteria is required, and to monitor quality features of the product. Refrigerator manufacturers stated that the CECP label had ceased to become a distinguishing feature since so many products qualified.

Fourth, it is very important to work with the consumer attitudes in the host country. We are still completing the message development and testing in China, and we expect that the attitudes and needs among Chinese consumers are so different from consumers in the U.S. that the resulting message will also be different. We have also found both in the U.S. and in

other countries that *messages and symbols that resonate with members of the labeling organization may not be the messages that resonate with buyers*. Therefore, it is very important to have independent consumer testing rather than rely on managers within the labeling organization to make decisions about messages and promotion design.

References

CHEAA. China Household Electric Appliance Association. Statistical releases, various dates.

China National Institute of Standardization. 2000. "China's Energy Efficiency Standards and Labels: Status and Prospect." Paper presented at the *2000 Energy Foundation Policy Advisory Committee Meeting, November, 2000*. Beijing, China.

Li, A., J.H. Cheng. 2001. "Research progress of 2000-2001 China energy efficiency labels and standards and plan for future work." Paper prepared for *2001 Policy Advisory Committee Meeting of China Sustainable Energy Program*. The Energy Foundation.

Ogilvy & Mather Public Relations. 1997. *China Refrigeration Study*. Beijing, China: Ogilvy & Mather.

State Statistical Bureau. 2001. *China Statistical Yearbook 2000.* Beijing, China: State Statistical Bureau.

----------. October 2001. *Appliance.*