5. Designing and Implementing a Labeling Program

Guidebook Prescriptions for Designing Labels

1. Develop an overall strategy for labeling, including goals, priorities, relationship to other energy-efficiency programs, and institutional roles and responsibilities.
2. Work closely with stakeholders. Elicit broad support from manufacturers, retailers, and consumer groups during design and implementation of the program.
3. Decide early on product priorities and label type(s).
4. When designating accredited laboratories, specifying energy- and non-energy-performance test protocols, and defining tolerances, consider aligning with international or regional test procedures.
5. Conduct some market research with stakeholders prior to implementing a labeling program. Use this research as the basis for designing an effective label.
6. Use consistent formats for comparison and endorsement labels across all product types. This will make it easier for consumers to understand the label and will increase its overall effectiveness as a policy measure. If launching both endorsement and comparative labels, integrate the two labeling approaches.
7. Identify resources for ongoing program promotion and marketing, policing and enforcement, and updating of test procedures and information about new technologies on the market. Include, if possible, links to programs sponsored by other government or non-governmental organizations that can increase incentives and resources for promotion.
8. Develop an evaluation plan at the beginning of the program. Collect both process and impact data. Use the results to improve the program.

5.1 The Basics of Energy-Efficiency Labeling

This chapter is designed as a primer and resource for regulators, officials, manufacturers, and advocates (i.e., consumer groups) who wish to understand international best practice and options for designing, and implementing labeling programs for energy-consuming appliances, equipment, or lighting products. It has been extensively updated since the first edition of this guidebook and now includes new details on

the types of labels in use internationally and a detailed discussion of the potential for integrating comparison and endorsement energy-labeling programs.

5.1.1 Why Energy Labeling?

Like other energy-efficiency programs, labeling aims to shift markets for energy-using products and appliances toward greater energy efficiency. Energy-labeling programs help consumers understand which products are most efficient and what the benefits of this efficiency are. Labels not only influence consumers to choose more efficient products but also create competition among manufacturers to produce and market the most energy-efficient models, which engages retailers in promoting efficiency.

The energy efficiency of an appliance is usually hidden from the naked eye. Without a credible energy label, a consumer looking at an appliance has no idea whether a product saves energy or is an energy guzzler. Yet energy consumption determines the operating cost of most appliances and is therefore of concern to the consumer and her/his pocketbook. Consumers are sometimes aware of basic details about a product, such as wattage, and act on that information, for example, by buying 18-W compact fluorescent light bulbs instead of 70-W incandescent bulbs. But wattage is no substitute for the information that an energy label provides—lumen output and product life, for example—which is information that is not readily available to consumers unless it is included on a product label.

Energy labeling of appliances, equipment, and lighting products helps improve overall energy efficiency. The first evaluation of the impact of the recent European Union (E.U.) labeling scheme for refrigeration appliances, washing machines, and lamps, for example, showed a measurable shift toward sales of more-efficient appliances. The sales-weighted average energy efficiency of refrigeration appliances improved by 26% between 1992, just before the scheme was adopted, and late 1999. It has been estimated that 16% of the impact resulted from minimum efficiency standards and 10% resulted from labeling (Bertoldi 2000). Manufacturers' association sales data from the European Community of Domestic Equipment Manufacturers (CECED) show a significant increase in sales of A-rated appliances in the E.U. between 1999 and 2000. The data also show significant differences between countries, with A-rated products, in general, having a much larger market share in countries that have a rebate program or other consumer incentives (www.gfkms.com). It is estimated that in 2003 alone, the U.S. ENERGY STAR labeling program resulted in savings of more than 60 billion kilowatt hours (kWh) and 12 million tonnes of carbon equivalent (see insert: *ENERGY STAR is Being Adopted in Countries Around the World*). ENERGY STAR survey data also show marked differences in effectiveness between regions of the U.S. that have strong incentive and promotion programs and those that do not (CEE 2003).

Energy savings are not always the sole focus of an energy-labeling program. Because energy service—comfort, a cold soda, clean and dry clothes, cooked food, or light for reading—is the immediate benefit that consumers receive from energy-using appliances or equipment, some labels provide information about the level of service provided by an appliance. Many performance attributes, such as quality of lighting and service life for lighting products and minimum noise and moisture condensation for cooling products, can be important factors in consumer choice. Labelers can best promote efficient products by linking energy efficiency and high-quality performance.

ENERGY STAR Is Being Adopted in Countries Around the World

ENERGY STAR is a U.S. government/industry endorsement labeling partnership designed to make it easy for businesses and consumers to choose energy-efficiency solutions, thereby saving money and protecting the environment. ENERGY STAR is a joint program of the U.S. Environmental Protection Agency (U.S. EPA) and the U.S. Department of Energy (U.S. DOE). It was initiated in 1992 by U.S. EPA as an outgrowth of the Green Lights Program that encouraged businesses to replace incandescent lighting with fluorescent lighting. Two years after undertaking Green Lights, U.S. EPA converted this effort into the expanded ENERGY STAR program, which initially recognized energy-efficient computers. Since then, the ENERGY STAR endorsement labeling program has grown to identify efficient products in more than 40 categories, including household appliances, home electronics (televisions, audio systems, etc.), computers and other office equipment, residential heating and cooling equipment, and lighting. U.S. EPA collaborates with U.S. DOE, which is responsible for some ENERGY STAR product categories. In total, consumers bought more than 100 million ENERGY STAR-qualified products in 1999. Efficient new homes became eligible for the ENERGY STAR label in 1995. Efficient buildings became eligible for the label in 1999 when U.S. EPA unveiled a new standardized approach for measuring the efficiency (or energy performance) of an entire building. ENERGY STAR also works with industry partners to promote voluntary energy-efficiency improvements in manufacturing facilities.

A recent survey indicates that 56% of Americans recognize the ENERGY STAR label, and American consumers have purchased more than one billion ENERGY STAR-qualified products (CEE 2003). These products have helped reduce greenhouse gas emission by more than 60 million tonnes of carbon equivalent. In 2003 alone, ENERGY STAR helped Americans save $9 billion on their energy bills and 115 billion kWh—enough electricity to power 20 million homes. The associated reductions in greenhouse gas emissions were equivalent to taking 18 million cars off the road (www.energystar.gov).

Beyond the label, U.S. EPA and U.S. DOE offer many tools and materials to help partner organizations' efforts to promote energy efficiency. These include: promotional ENERGY STAR marks, national public service advertising campaigns, promotional and national campaign materials, performance rating systems, sales training materials, educational brochures, and awards in recognition of excellence. More than 1,400 manufacturers, 550 retailers representing 21,000 storefronts, and 330 utilities and state administrators have developed efforts around the ENERGY STAR brand. ENERGY STAR has become a platform through which each of these organizations/partners can demonstrate their environmental commitment while moving the market toward energy efficiency. U.S. EPA and U.S. DOE also partner with national and regional non-profit organizations that help increase consumer awareness and understanding of the benefits of energy efficiency.

The ENERGY STAR label is also used by other energy-efficiency programs. In 2001, an extensive household survey found that ENERGY STAR-qualified products were being promoted by a total of 86 utilities, market-transformation groups, and state administrators, reaching one-half of U.S. households. It also found that awareness of the label and its influence on consumer purchase decisions were substantially higher in regions where these other programs were prevalent (Cadmus 2001).

ENERGY STAR is also now being adopted in countries around the world. International agreements allowing the implementation of ENERGY

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STAR for selected products are currently in place in Canada, the E.U., Japan, Taiwan, Australia, and New Zealand.

Although ENERGY STAR initially targeted individual consumers, U.S. EPA and U.S. DOE also work with government, corporate, and institutional buyers. Information is available at the ENERGY STAR website (www.energystar.gov/index.cfm?c=pt_reps_purch_procu.pt_reps_purch_procu), including sample procurement language, qualifying product information, and savings calculators that help buyers estimate their potential energy and cost savings.

Reference: U.S. EPA 2004a, U.S. EPA 2004b

5.1.2 Types of Energy Labels

Broadly speaking, there are two distinct types of energy labels in use around the world: endorsement labels and comparison labels (Egan 1999, Harris and McCabe 1996). Table 5-1 highlights their essential features.

Endorsement labels

The purpose of endorsement labeling is to indicate clearly to the consumer that the labeled product saves energy compared to others on the market. Endorsement labels are a seal of approval indicating that a product meets certain specified criteria. These labels are generally based on a "yes-no" cutoff (i.e., they indicate that a product uses more or less energy than a specified threshold), and they offer little additional information. Typically, endorsement labels are applied to the top tier (e.g., the top 15 to 25%) of energy-efficient products in a market.

One example of an endorsement label for energy efficiency is the U.S. ENERGY STAR label. During the past 12 years, the ENERGY STAR program has grown to encompass a wide range of products and international partnerships.

There are two types of energy labels.

Table 5-1 Characteristics of Endorsement and Comparative Energy Labels

Type of Energy Label	Description
Endorsement	Indicates that product is among the most energy-efficient models available on the market. Endorsement labels may or may not be directly linked to comparative labels and/or be integrated and shown on comparative labels.
Comparative	Shows the relative energy use of a product compared to other models available on the market. There are three subcategories of comparative labels: *Categorical* labels use a step ranking system to indicate relative energy use compared to other models on the market. *Continuous* labels use a bar graph or scale to show the range of models available on the market. Unlike categorical labels, continuous labels do not have discrete "categories" of efficiency levels. *Information-only* labels give data on a product's technical performance but offer no simple means (e.g., a scale or categories) that allow consumers to compare energy performance among products.

In Canada, the Power Smart endorsement label was developed by a Canadian utility as a means of "branding" the most energy-efficient electrical products. Recently, the Canadian Government has joined in a comprehensive partnership with the U.S. ENERGY STAR program (see insert: *Canada Has Partnered with ENERGY STAR*). Power Smart utility programs generally now refer customers to ENERGY STAR-labeled products for appliances and equipment purchases.

Canada Has Partnered with ENERGY STAR

Natural Resources Canada has been the administrator of the international ENERGY STAR Program in Canada since May 2001 under a broad arrangement between it, U.S. EPA and U.S. DOE. This broad arrangement was considered desirable because of the similarity of the U.S. and Canadian markets, a prior familiarity of Canadians with the ENERGY STAR label and support expressed for endorsement labels during Climate Change consultations in Canada, the absence of any competing endorsement labeling scheme, the comparability of energy consumption testing procedures and minimum efficiency standards in the two countries, availability of the necessary staff and budgetary resources at Natural Resources Canada, and the desire by both countries to further integrate the North American market. Despite these advantages, it took considerable time and effort to ensure consistency and credibility of the joint program.

Currently, Canada promotes ENERGY STAR criteria for seven product categories comprising 45 products. The decision to engage in ENERGY STAR was made for many reasons including:

- Stakeholders showed strong support for ENERGY STAR as part of Canada's Climate Change Plan
- Endorsement labels have inherent appeal and marketability
- ENERGY STAR fits naturally into Canada's comprehensive equipment efficiency program, which already included strong minimum efficiency standards and comparative labeling approaches
- Canada's participation in ENERGY STAR helps integrate the North American market in many product categories.

Since its introduction to Canada, aided awareness of the ENERGY STAR mark by Canadians has risen from 26% to 44%. Energy Star criteria have been incorporated into federal government and some provincial procurement specifications and have formed the basis for federal and utility rebate programs throughout the country and for provincial sales tax rebates for qualifying products in a number of provinces. Canadian equipment suppliers and retailers have embraced ENERGY STAR and use it in all energy efficiency-related promotions. It is fair to say that ENERGY STAR has become pervasive in Canada.

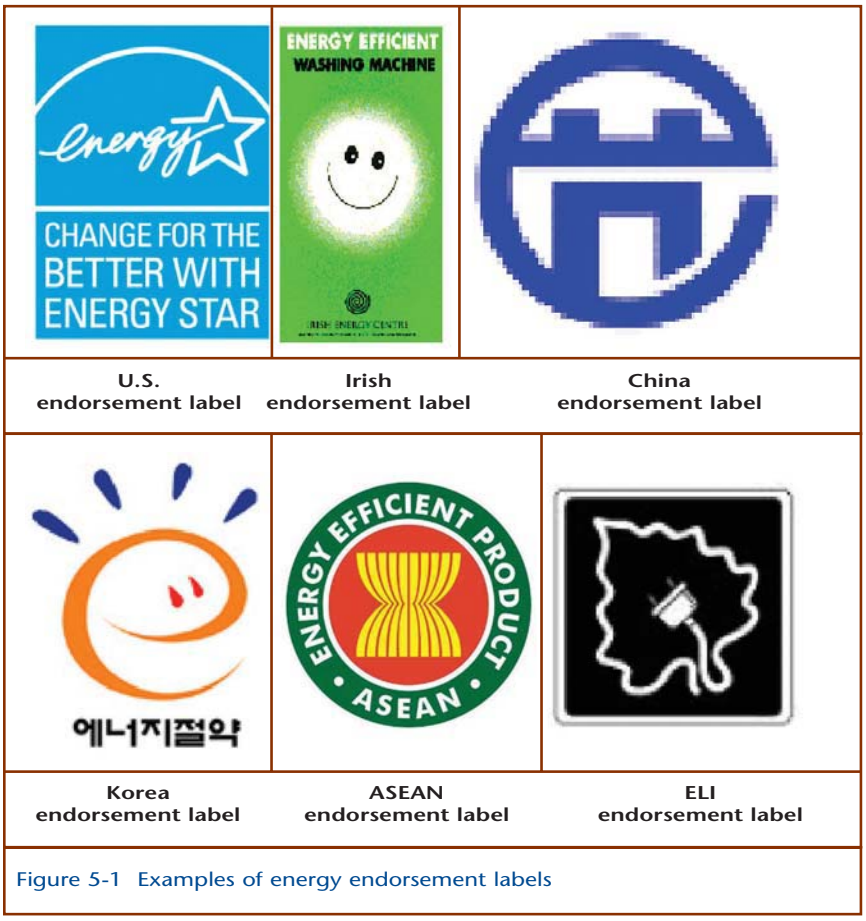
With success come challenges, most of which are shared by ENERGY STAR users throughout the world. Keeping the criteria relevant and focused on high potential areas in a world in which technology changes so rapidly requires constant attention. The obligations that accompany shared ownership of an international program can raise local market and political issues. Maintaining balance between the voluntary high-performance ENERGY STAR program and an aggressive standards regime also requires attention. In addition, attribution of savings and emissions reductions to the program is crucial and remains an ongoing focus of efforts in Canada. Despite these challenges, Energy Star has made and is expected to continue to make an important contribution to the efforts to meet Canada's energy-efficiency and environmental objectives.

Source: Natural Resources Canada 2004

During the past decade, a number of endorsement labels have been developed and implemented in developing countries. The Chinese government initiated an energy-efficiency endorsement labeling program in 1998 and founded the China Certification Center for Energy Conservation Products (CECP) in that same year to manage the program's design and implementation. The program is modeled in some ways after the U.S. ENERGY STAR program, and it has benefited from technical collaboration with the U.S. EPA. As of 2003, 21 product categories had been labeled including household appliances, lighting, motors and office equipment (Liu and Li 2003). A recent analysis of minimum energy-efficiency standards and endorsement-labeling programs in place and under development estimated that together they would reduce projected residential energy use by 9% in 2010 avoiding emissions of more than 11 million tonnes of carbon in China (Lin 2002).

Building on the success of programs to promote efficient lighting in Poland and Mexico, the three-year Efficient Lighting Initiative (ELI) was launched in 2000 to reduce greenhouse gas emissions by increasing the use of energy-efficient lighting technologies in seven countries: Argentina, the Czech Republic, Hungary, Latvia, Peru, the Philippines, and South Africa. ELI was funded by the Global Environment Facility (GEF) and implemented by the International Finance Corporation (IFC). A second generation of ELI is anticipated to involve additional developing countries worldwide. ELI programs in all countries are built around the development of a recognizable ELI consumer logo representing efficient, reliable product performance.

Endorsement labels provide a government stamp of approval.



U.S. endorsement label | Irish endorsement label | China endorsement label

Korea endorsement label | ASEAN endorsement label | ELI endorsement label

Figure 5-1 Examples of energy endorsement labels

Figure 5-1 shows some examples of endorsement labels.

Another type of endorsement label is the "ecolabel." (See Figure 5-2). Ecolabels indicate that a product or process has superior environmental performance or minimal environmental impact. Ecolabeling programs are being implemented by a number of governments and, in some cases, non-governmental organizations (NGOs) in countries around the world. Most ecolabeling programs for appliances and equipment include energy efficiency as one major component in the label rating scheme, but it is not always the primary factor in the rating.

E.U. ecolabel | Singapore's ecolabel

Figure 5-2 Examples of Ecolabels

An ecolabel indicates that a product meets certain environmental criteria.

Comparative Labels

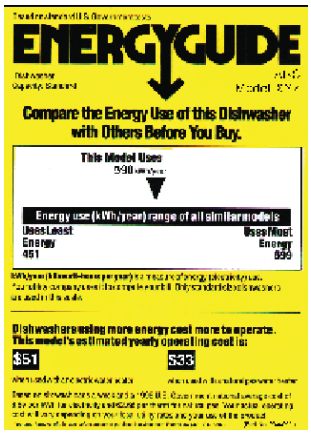
Comparative labels allow consumers to compare energy use among available models in order to make an informed choice. Generally speaking, two forms of comparative labels are in use around the world: one uses a categorical ranking system, and the other uses a continuous scale or bar graph to show relative energy use. A third form, information-only labels, gives information about the labeled product without comparing its energy use to other models. Information-only labels are not often used for promoting energy efficiency.

Categorical Labels use a ranking system that allows consumers to tell how energy efficient a model is compared to other models on the market. Rather than relying on the simple "yes or no" assessment of efficiency relative to the single threshold value that is used for endorsement labeling, categorical labels use multiple classes that progress from least efficient to most efficient or most energy consuming to least energy consuming. Most categorical labels in the world use between five and seven categories for defining the range of performance. A few countries, like Australia, have initiated half-step ranking that effectively doubles the number of qualifying categories. The main emphasis of policy makers should be on establishing clear categories, so a consumer can easily tell, by glancing at a label, how energy efficient a product is relative to others in the market. Categorical labels may or may not give detailed information on the operating characteristics, costs, and energy use of the models.

Continuous-Scale Labels use a bar graph or line to show the range of models available on the market. The scale allows consumers to see where the labeled unit fits into the full range of similar models without sorting performance into specific categories. Continuous labels typically also contain detailed information on the operating characteristics, costs, and energy use of the models.

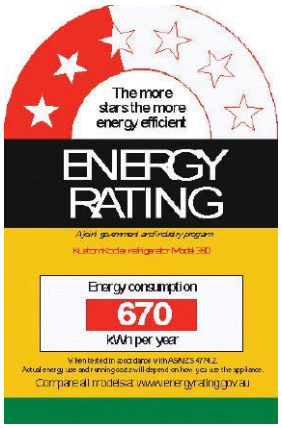
Information-Only Labels such as that used in the Philippines give data on the technical performance of the labeled product but offer no simple way (such as a ranking system) to compare energy performance among products.

Comparison labels use either categories or a continuous scale.

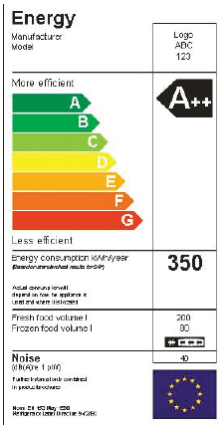


U.S. Label (Continuous)

Thailand's Label (Categorical)

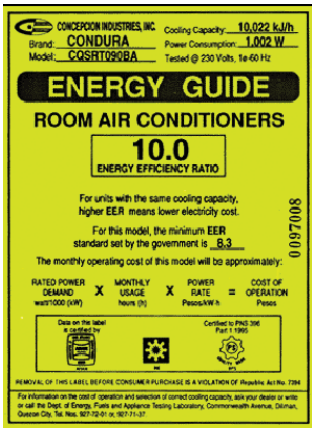


Australia's Label (Categorical)



E.U. Label (Categorical)

Iran Label (Categorical)



Philippines Label (Information)

Figure 5-3 Examples of comparative energy labels

Most Common Label Styles in Use

There are two general formats that are used around the world for categorical labels, and there is one format for continuous labels, as described in the following paragraphs.

Australian-Style Categorical Label (dial). The Australian-style label has a square/rectangular base with a semi-circle or "dial" across the top. The "dial" resembles a speedometer or gauge; the further advanced the gauge indicator is, the better the product. This type of label is used in Australia and Thailand, until recently was used in Korea, and will soon be implemented in India. In Australia, the dial contains stars (up to a maximum of six stars), and in Thailand the dial contains a one-to-five numbering system. The number of stars or the numerical "grade" on the scale depends on the highest pre-set threshold for energy performance that the model is able to meet.

European-Style Categorical Label (bars). The European-style label is a vertical rectangle with a series of letters ranging from "A" (the best) at the top of the label to "G" (the worst) at the bottom.

There is an arrow next to each letter that uses both length and color progression to communicate relative energy efficiency (short and green for "A" and long and red for "G"). All seven graded, colored, and size-varied arrows are visible on every label. The grade of the product is indicated by a black arrow-shaped marker located next to and pointing toward the appropriate bar (e.g., for a "C" grade product, the marker carries the letter "C" and is positioned against the C bar). Because of language requirements of the E.U., the label is in two parts. The right-hand part, which shows the base data common to all products, is not language-specific and is generally affixed to or supplied with an appliance at the point of manufacture; the left-hand part, which gives the explanatory text particular to the model in question, is language specific, and is generally supplied and affixed in the country of sale. This label style is used throughout Western and most of Eastern Europe as well as in Brazil (with a different basis for the A to G category definition than in Western and Eastern Europe). Iran uses a variant of the European-style label that is a mirror image of the European label because Persian script reads right to left, and it uses numerals rather than Roman script letters for ranking: i.e., 1 (best) to 7 (worst). Tunisia uses a European-style label with French on one side of the arrows and Arabic on the other to address the country's bilingual population. South Africa announced plans in 2004 to launch a European-style label.

Canada-U.S. Style Continuous Label (horizontal scale). The rectangular Canada-U.S.-style label shows a linear bar scale indicating the highest and lowest energy use of models in a particular product category [e.g., room air conditioners of similar size in terms of British Thermal Units (Btus)] and shows the position of the specific model on the bar scale. U.S. and Canadian labels are now technically but not 100% visually harmonized; e.g., U.S. labels show annual energy operating costs in small font at the bottom of the label, but Canadian labels do not. The primary use of monetary units (dollars) was abandoned in favor of physical units (KWh or efficiency) because variability in energy prices regionally and from year to year can cause the cost information to be confusing for customers whose rates are not close to the national average. The international trend is strongly toward adoption of categorical energy labels.

5.1.3 How Labels Affect the Market

Energy labels affect stakeholders in four interconnected ways:

- They provide consumers with data on which to base informed choices and encourage selection of the most efficient and suitable product available.
- They encourage manufacturers to improve the energy performance of their models by making energy efficiency transparent to the market place and—at least for endorsement or categorical labels—by providing clear targets or thresholds to aim for in improving energy efficiency.
- They encourage distributors and retailers to stock and display efficient products by offering a selling point for energy-saving models. (Retail salespeople can either advance or impede a labeling program depending on how they treat the relative energy efficiency of models as a part of the sales pitch.)
- They can provide a basis for a wide range of other stakeholders—including other government programs; consumer or environmental groups; electric utilities; and other local, state, or regional organi-

zations—to implement outreach and education, utility demand-side management (DSM), and tax rebates or other programs that provide incentives or otherwise encourage purchase of high-efficiency products.

On the consumer side, energy labels promote the purchase of more efficient models. Energy labels give consumers information that would otherwise be unavailable and that allow consumers to factor operating costs and energy use into decision making. This information (and associated promotion of the labels) results in more efficient purchases.

Once a label is seen as having an actual or potential consumer impact, manufacturers may be motivated to remove their worst models from the market and improve the efficiency of their current models. For example, evaluations have shown that many new products being produced in the E.U. are being designed to just cross the threshold of the higher-efficiency categories, as can be clearly seen in Figure 5-4 (Waide 1998). During the 1990s, the highly competitive and innovative computer and office equipment industries responded to U.S. ENERGY STAR label specifications by building in power management to reduce energy use by up to 50%. By 1999, approximately 80% of new personal computers, 95% of monitors, 99% of printers, and 65% of copiers qualified for the label (Geller 2000).

Distributors and retailers may respond to labels by changing the mix of products they stock and display. Research has indicated that retailers in particular can influence the consumer's final decision in a large percentage of appliance purchases (du Pont 1998). The engagement of retailers and their support for an energy label can be critical to program success. A labeling program needs to account for the fact that retailers and salespeople in many countries get commissions for selling particular brands or models of appliances. To avoid having commissions function as counter-incentives, programs like the ongoing

Within a few years, the E.U. market moved from a random distribution of sales by energy efficiency prior to labeling to a distribution that shows very large peaks at the thresholds of the efficiency classes, demonstrating the clear influence of the label.

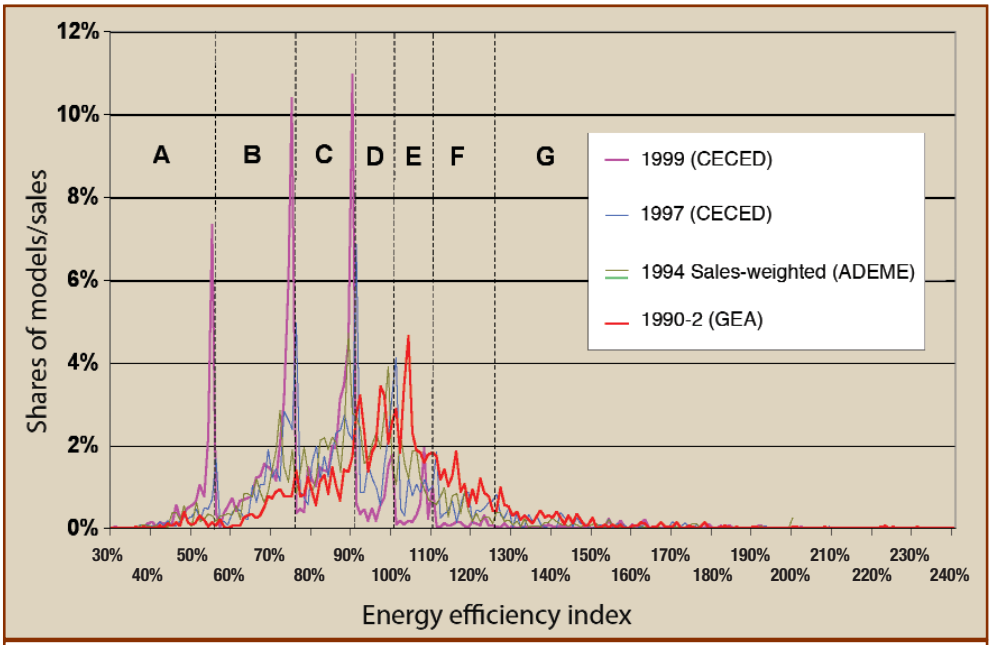


Figure 5-4 Impact of the E.U. refrigerator energy label on sales by efficiency index

China CFC-Free Energy Efficient Refrigerator Project include targeted financial incentives to retailers and salespeople (Phillips 2003).

Experience has shown that the average efficiency of products on the market can be clearly influenced by changes in the incentives offered by manufacturers and distributors as well as by the mix of products that retailers stock and display. Thus, the impact of a label extends beyond energy-aware consumers and affects the average consumer as well.

Programs that promote market response can enhance the impact of energy labels. Consumers will respond if they are made aware of labels, understand the information that labels communicate, and perceive that there are good reasons to make choices based on the labels. Government procurement specifications that require or encourage the purchase of energy-efficient products by government agencies can also dramatically enhance the market for labeled products and can evoke a manufacturer response that affects products provided to the entire market. Other energy-efficiency programs, such as utility incentive programs and building energy codes, can greatly enhance consumer response to labels. Interactions of energy-efficiency labels with a wide range of related programs are discussed in Chapter 10.

5.1.4 Understanding and Involving Program Stakeholders

One of the first steps in designing an energy-labeling program should be to identify relevant stakeholders and form stakeholder decision groups to provide input that will help officials develop the program. It is essential to establish early on a process of stakeholder consultation by convening representatives of all interested parties to gather input on how the program should be designed and marketed. Stakeholder consultation should be linked to a market research effort to design the label and the overall program for launching and promoting the label. Interviews and meetings should be used to formulate and test the mechanics of how the program will operate and to answer the many program design questions that need to be addressed, such as:

- Which agency will manage product testing?
- Will private-sector laboratories be certified for testing?
- Is the proposed label design understandable by and effective with consumers and acceptable to all stakeholders (especially suppliers)?
- Are the proposed label thresholds acceptable to stakeholders?
- Who will issue the labels?
- How will the labels be displayed on the product?
- How will monitoring and enforcement work?
- Who will evaluate the program, and how often?
- How can consumers be convinced that the label is credible?
- How can salespeople be recruited to promote the program?
- Will the labeling program pave the way for minimum efficiency standards?

These questions must be addressed by the lead label-implementing agency (or agencies). This agency is not generally considered a stakeholder but rather leads the consultation process and is responsible for balancing the specific vested interests of the many stakeholders. The agency is often a government body although this need not be the case. Its role in an energy-labeling program includes:

- defining the detailed technical requirements in consultation with stakeholders
- developing and maintaining the legal and/or administrative framework for the program
- registering, policing, and enforcing compliance, if applicable, to ensure that the program remains credible
- providing information to consumers, including ensuring press and TV involvement in the promotion campaign
- evaluating and improving the labeling program

The lead agency often establishes partnerships with key government partners and NGOs, including research institutions [such as the Lawrence Berkeley National Laboratory (LBNL) in the U.S., the China National Institute for Standardization (CNIS), and the Bureau of Indian Standards (BIS)]; utility companies [such as the Electricity Generating Authority of Thailand (EGAT)]; test laboratories; local government agencies; and others whose cooperation is important in establishing program credibility. These program partners must maintain the same independence and neutrality as the lead agency when dealing with the stakeholders.

The lead agency and its partner institutions can obtain input through a combination of individual meetings with key stakeholders and a structured consultation process with stakeholder committees. Eventually, if the stakeholder process is well managed, the private sector will buy into and support the program.

Stakeholder consultation of the type described here was performed in India (Dethman et al. 2000) and China (Waide et al. 2004) and is currently being carried out in Malaysia as part of a Danish-funded effort to design and implement DSM programs, including an energy-labeling program for refrigerators and electric motors (Jensen 2004). This sort of relationship-building and stakeholder mobilization is a time-consuming but critical part of initial program development.

Below, we briefly describe the groups of stakeholders who are typically affected by an energy-labeling program and can be approached to help design and promote the program.

Manufacturers

Manufacturers and importers of products manufactured abroad are key stakeholders. They are the sources of the products to be labeled and are generally responsible for testing products and placing energy labels on products that they sell. Because manufacturers have designed their products and, in most cases, tested them extensively according to local and international test procedures, it is critical that any labeling program include a full and ongoing dialogue between the manufacturers and the implementing agency.

The primary goal of manufacturers is to make products that consumers will want to purchase. Manufacturers have to balance a wide range of elements of product design, including quality, reliability, performance, and price. The introduction of energy labeling makes a product's energy efficiency an important design parameter, at least in cases where the label is effective and influences the decisions of a significant percentage of consumers. Manufacturers of the most-efficient products tend to be supportive of energy labeling; manufacturers that have large sales of low-efficiency products tend to be opposed to or less supportive of energy labeling.

Retailers

Although retailers are often considered to be minor stakeholders in an energy-labeling program, salespeople influence appliance-purchase decisions in a large percentage of cases. One study found that U.S. salespeople have a significant influence in approximately 30–50% of sales of "white goods" (refrigerators, freezers, dishwashers, clothes washers, dryers, and stoves) (du Pont 1998). Salespeople's attitudes can range from highly supportive of the extra cost for energy-efficiency features to neutral or negative regarding energy efficiency.

Retailers can play a very supportive, positive role in energy-labeling programs, especially if they are actively engaged by the implementing agency to assist in marketing the programs and/or if retailer training is provided. Retailer impact can also be negative if increased energy efficiency reduces profit margins or if there is low regard for energy-saving features. In the worst case, retailers may denigrate the credibility of the label or discount its importance if they believe that this will improve their chances of a sale or increase their profit. Many salespeople work on a commission basis, which may provide them with an incentive to sell more costly models with features that may use additional energy rather than promoting energy-efficient models of the same or lower class of refrigerator that may be less expensive.

Consumers

Consumers are a diverse, diffuse group. It takes significant work to obtain reliable information about consumer use and understanding of energy labels and even more effort to determine the changes in consumer purchasing patterns that are likely to result from the presence of energy labels. Nonetheless, consumer involvement is critical in all phases of the program, from market testing of label designs with focus groups to consumer surveys to marketing of the program and dissemination of information. Consumers cannot be expected to change their purchasing patterns if information is inaccurate or unavailable or if the label is unclear and difficult to use.

Consumer and Environmental NGOs

In some countries, NGOs such as consumer and environmental groups take an interest in energy programs. These groups can play the roles of: advocate, acting as a counter-balance to industry in the process of analyzing the market and encouraging the development of higher energy-efficiency thresholds; "watchdog," reviewing the results and progress of a program; promoter, collecting data and providing information to consumers, often through advertisements, brochures, and web sites; and

compliance monitor, carrying out random testing and quality checks to ensure that labels are applied and that the information provided to consumers is adequate.

In many countries, NGOs have their own internal, independent test laboratories and are able to provide well-balanced input to technical discussions. There is growing awareness among some NGOs that energy use is a central element in the environmental problems that many countries face. NGOs can provide important input on a range of issues, including testing, labeling, program marketing, and public awareness (see insert: *Consumers Are Becoming Increasingly Involved in Standards-Setting and Labeling*).

In cases where NGOs are large and sufficiently well funded to actively participate in the process of developing and maintaining energy labels, they can provide valuable input. (Environmental groups in particular are taking an especially keen interest in energy efficiency as concern over climate change spreads.) Increasingly, NGOs are developing the skills to analyze and advocate energy-efficiency policies. In cases where NGOs have relevant expertise, they can play an important role in advocating an aggressive and effective labeling program. In this sense, NGOs can help keep implementation agencies focused on broad goals and program outcomes.

5.1.5 Energy Labeling Is the Tip of the Iceberg

From a consumer's perspective, the label itself is the most important and obvious element of an energy-labeling program. The label design is critical because it must convey information in a way that is easy to understand and assist the consumer with purchase decisions.

Consumers are Becoming Increasingly Involved In Standards-Setting and Labeling

Worldwide, mainstream consumer groups are taking an active role in campaigning on environmental and energy-related issues. At an Asia-wide forum on sustainable energy use and consumer information, the NGO delegates listed appliance labeling as one of their primary policy recommendations. The declaration is excerpted below:

> The Forum gave unanimous support to the establishment of appliance labeling schemes for the widest possible variety of electrical products. While a voluntary system may be adopted initially, it is believed that a compulsory system, based on legislation, is preferable and more effective in the medium to long term. The Forum participants noted the variety of different forms of labels currently in use in different countries, and expressed the strong view that labels should be kept as simple as possible and may include a simple categorical rating scheme (e.g., 1-5 stars, A-G categories). Labels should indicate estimated annual energy use in monetary terms rather than kilowatt-hours. Any categorical system of labeling may need to adjust or recalibrate its rating system periodically so as to distinguish adequately between the efficient and non-efficient products. While consumer organizations need not be directly involved in the implementation of labeling schemes, they should have a role in monitoring compliance by appliance manufacturers.

Source: UNESCAP 1999

However, as Figure 5-5 illustrates, the *energy label that appears on a product is only a small part of an elaborate infrastructure of elements and activities that are the foundation of an energy-labeling program.* Many officials designing energy-labeling programs focus primarily on the design and content of the energy label, but the underlying infrastructure that supports an energy-labeling effort is critical to the program's success. Even though consumers may never be aware of these underlying elements of the program, these elements must be carefully planned, implemented, and maintained to ensure that the program is effective.

The main steps in developing a labeling program are shown in Figure 5-6 and described below.

5.2 Step L-1: Select Products and Decide on the Labeling Approach

In making any design decision for an energy-labeling program, including identifying which products should be labeled and what types of label(s) to apply, it is important to collect and analyze data on the energy-using products sold in the country or region. For a complete discussion of data needs, types of data, and data analysis, see Section 3.4 of Chapter 3.

Once a policy maker has a view of the energy use, market size, and characteristics of the major energy-using products in his/her country, s/he can begin to decide which products should be included in the program and whether to apply comparison labels, endorsement labels, or both.

The energy label is just the tip of the program iceberg.

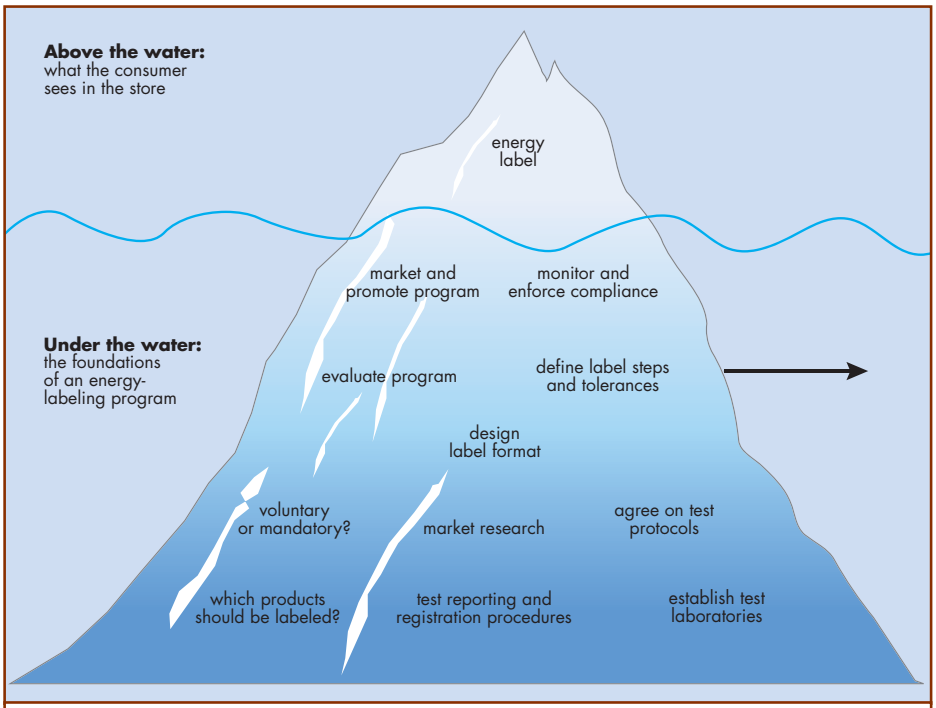


Figure 5-5 The "Iceberg" of energy labeling

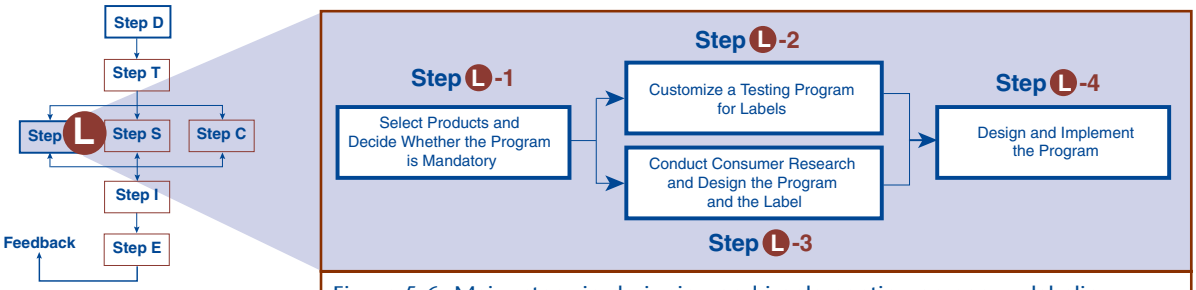


Figure 5-6 Major steps in designing and implementing an energy-labeling program

5.2.1 Selecting Products

As a general rule, energy labeling will realize the greatest energy savings for products:

- that use a significant amount of energy on a national scale
- that are present in most households, offices, or businesses or that are predicted to rapidly increase their saturation
- for which energy-efficient technology exists that is not being used or is under-utilized in most products on the market
- for which the purchaser pays the energy bills (although there are a number of exceptions, such as water heaters, furnaces, and heat pumps, for which labels have effectively impacted markets); and
- for which there is (or could easily be) significant variation in the energy efficiency of different units

If a product does not meet most of these conditions, then energy labeling of that product may have little beneficial effect.

Aside from the magnitude of potential savings, other considerations sometimes enter into the selection of products for endorsement labeling. The U.S. ENERGY STAR program, for example, has defined six key principles known as the ENERGY STAR guidelines to determine the feasibility of addressing new product categories (McWhinney et al. 2004):

1. Significant energy savings can be realized on a national basis.
2. Product performance can be maintained or enhanced with increased energy efficiency.
3. Purchasers will recover their investments in increased energy efficiency within a reasonable time period.
4. Energy efficiency can be achieved with several technology options, at least one of which is nonproprietary.
5. Product energy consumption and performance can be measured and verified with testing.
6. The label would effectively differentiate products and be visible to purchasers.

For some product types, minimum energy-efficiency standards, rather than labeling, may be the best alternative. Many experts believe that this is especially true for products like water heaters and central air conditioners that are generally purchased by a third party (i.e., a purchaser who does not pay the energy bills associated with the product). Nonetheless, for both of these products, some countries have decided that labeling is also useful. For example, water heaters are labeled in Australia, and central air conditioners are labeled in the U.S. For other products, such as refrigerators, energy-efficiency standards and labels can work best together.

There will always be an element of the market that is "energy-label resistant." Many consumers are not interested in energy use and will ignore a label's message. Still, an energy-labeling program can achieve significant energy savings even when a large number of consumers ignore labels so long as there is also a large segment of the population that is influenced by the label.

Questions to consider when deciding on how to approach an energy-labeling initiative include:

- Should one start with an endorsement or a comparative labeling program?
- If comparative, should the label be continuous or categorical?
- If comparative, should the labeling program be mandatory or voluntary?
- How, and to what degree, should endorsement and comparative labels be linked?

5.2.2 Endorsement vs. Comparison Labels

Endorsement labels and comparative labels can be—and often are—used together. Choosing one label type at the inception of a program does not preclude adding the complementary label, if applicable to the product, later. In view of the learning curve for implementing any new program, it may be best to start with a single label type and allow time for its credibility to be established before launching a second labeling program. This section of the guidebook focuses on the strengths, weaknesses, and applicability of endorsement versus comparison labeling. Section 5.2.3 describes how and when it might make sense to combine the two types of labels in a single program or label format.

The appropriate choice of label is not always obvious; the effectiveness of the two basic label approaches for the same product may differ widely in different countries or regions. The type of label that will work best depends on a number of factors: the local culture, consumer knowledge and attitudes, and the program design framework and goals. As noted above, factors such as good program design, consistency over time and products, and effective marketing and promotion may be as important as the choice of initial label type in determining a label's impact on the market. In choosing a label type, consider the following characteristics:

Applicability

Comparison labels, especially categorical ones, are most frequently applied to major appliances (durable goods) that use large amounts of energy, have long lifetimes, and have design cycles of several years or more. These appliances are the largest energy users that are normally purchased directly by

household consumers; for these products, comparative labels can influence consumers and manufacturers and affect the market in ways that endorsement labels cannot. Although both label types are commonly used for durable household appliances such as refrigerators, air conditioners, and clothes washers, endorsement labeling is applicable to a wider range of products, including consumer electronics, lighting, and office equipment. These latter products are difficult to include in comparison labeling programs for several reasons: Many have shorter lifetimes and design cycles, and some, such as consumer electronics and computers, demonstrate relatively narrow ranges of energy consumption among models or bimodal distributions related to specific efficiency features (e.g., the sleep mode on computer monitors). Even if the range of energy consumption among products is relatively narrow, a high and expanding rate of market penetration can mean sizeable energy savings for countries that promote energy-efficient models. Other products, such as motors, central air-conditioners, commercial refrigerators and freezers, and transformers—are not purchased directly by the consumer. For these products, the detailed information provided on a comparative label is often not worth the effort and time to provide it. The simpler, more rapidly implemented, and less costly endorsement label is preferable in many of these situations

Consumer impact

Endorsement labels have a simple message that is easy to understand: is this product energy efficient or not? Because they provide the minimal information directly on the label, they require minimal thinking by the consumer. For consumers who are weighing many other factors when making a purchase and who prefer a simple endorsement from a trusted source, this benefit should not be underestimated. For consumers who have greater interest and are more influenced by detailed and technical information, comparative labeling may be preferred. This is true particularly for relatively expensive and long-lived durable goods. Comparative labels provide more detailed information than endorsement labels, so consumers who wish to invest the time are likely to grasp the label content: how much energy is saved, compared to what, etc. When they are mandatory, comparison labels provide consumers with information about all products in the market. When endorsement labels are used, the vast majority (75–85%) of lower-efficiency models on the market will not qualify for an endorsement label and will therefore remain unlabeled. By contrast, comparison labels can help consumers identify the most efficient products on the market and also avoid the least efficient products. Neither approach will suit all consumers at all times or even any one consumer all the time.

Impact on manufacturers

Comparative labels are more effective than endorsement labels at spurring manufacturers to discontinue low-efficiency models because manufacturers generally like to avoid being seen as having the worst product. Particularly in the case of categorical labels, as mentioned earlier, it has been demonstrated that manufacturers tend to design products that just cross the threshold of the next efficiency level on the label (Figure 5-4). In addition, over time, low-end categories become irrelevant as product efficiencies leap from one label category to the next. Because endorsement labels are voluntary and limited to the high-efficiency end of the market, these labels tend to engage progressive manufacturers in a constructive relationship. Endorsement labeling can be a good mechanism for introducing

industry to standards and labeling programs, particularly in countries where companies are hesitant about or averse to such efforts. The endorsement label program does not directly threaten manufacturers of less-efficient models because it allows them to remain in the market without unwanted attention drawn to these models. Manufacturers who produce or could produce highly efficient products self select by partnering with the program and see it as beneficial in differentiating their superior products. The simplicity of endorsement labeling allows for easy integration with product marketing by manufacturers, retailers, and others.

Complete market coverage

Because of their detailed and often mandatory nature, comparative labeling schemes tend to generate more comprehensive, publicly available data on product efficiencies than endorsement labels do. This is advantageous for policy makers because it facilitates program evaluation and tracking and documenting of energy savings over time, which is crucial for proving program success to sponsors.

Flexibility and response time

Endorsement labels require less time than comparison labels and no regulatory process for implementation and revision. Endorsement labels can stay relevant in markets that shift every few years or less. Also, as manufacturers improve the energy efficiency of their products over time to achieve higher ratings under a categorical label scheme, endorsement label criteria can be more easily adjusted to closely track this upward movement and thus can continue to differentiate the most-efficient products.

Cost of implementation

Because endorsement labels are non-regulatory and simpler than comparison labels, government administrative costs for them are lower. From the perspective of individual manufacturers, the costs of participation are voluntary rather than being required as a part of a regulatory burden. For either type of label, manufacturers and retailers will likely view the outreach and promotion expenditures by government, utilities, NGOs, and other stakeholders as free leverage to their own advertising dollars. The program benefits by leveraging the significant resources that manufacturers routinely devote to their own product advertising.

Cross-program application

Labels can be utilized by other market-transformation programs such as financial incentive programs and government procurement. It is simple to identify the top one or two classes in categorical comparison labels as the required levels for participation in these other programs. With continuous comparison labels, a percent above the minimum could be used, but the label itself offers no convenient benchmark for use by the other programs. With endorsement labels, qualification for the endorsement would be the requirement for participation. The simple message of buying or qualifying only products that meet these predetermined and publicly disclosed thresholds can reduce the financial, staff and transaction costs associated with the supplemental programs. If endorsement labels are used in these programs and are well publicized—see, e.g., the recommendations in Chapter 7—they may also appeal to a targeted mix of consumer preferences (e.g., environmental protection, monetary savings, international credibility) and be quite effective, at least with a segment of the market.

5.2.3 Additional Design Issues for Comparison Labeling

If policy makers decide to implement comparison labeling for specific products, it is also necessary to decide whether the program should be mandatory or voluntary and whether to use a categorical or continuous format.

Mandatory or voluntary

Depending on the product and its range of energy consumption, market readiness, degree of stakeholder support, budget for marketing and outreach, and a host of other factors, either a mandatory or voluntary approach can result in substantial energy savings. The key is that the program be well designed and that policy makers assess the benefit and appropriateness of these two policy approaches at the outset and in the broader context of a country's energy-policy goals.

For a number of reasons, it is sometimes easier to start with a voluntary program. First, it can be easier to reach agreement with stakeholders—particularly manufacturers—on a voluntary program. Second, the voluntary program can provide a good learning experience for both the implementing agency and industry, allowing each to adjust and understand its role and responsibilities. Voluntary labeling programs can also be more flexible and adaptable than mandatory labeling programs because their non-binding and non-regulatory approach generally means less lead time, less stakeholder analysis, and more marketing flexibility.

A phased approach with eventual transition to mandatory labeling for all products after completion of a successful, well-defined voluntary period can also be beneficial. This arrangement is best designed into the program at the outset to clearly set expectations and avoid confusion or misgivings. This transition would typically be applicable only to comparative programs and not endorsement programs, which are best implemented on a voluntary basis.

A major limitation of voluntary comparison labeling programs is that manufacturers typically choose not to place labels on products with low ranking (e.g., 1 or 2 stars). (Agra-Monenco International 1999 and Danish Energy Management 2004) If products with a poor energy rating have no labels, some consumers who might avoid these products if all the information about the products were available could end up buying them. Ultimately, comparison labeling programs work best if consumers can easily distinguish between poor-, average-, higher-, and highest-efficiency products.

Categorical versus Continuous Labels

Research has indicated that categorical labels are generally easier for consumers to understand than continuous labels (du Pont 1998). Categorical labels provide more information about energy use and, if well designed and implemented, can provide an easily identifiable basis for buyers to focus on energy efficiency from one purchase to another, across or within equipment categories (e.g., "That product was an 'A' and this one is a 'C'"). Furthermore, categorical labels can provide a clear basis for other market-transforming programs such as the utility DSM incentives discussed in Chapter 10.

As noted above, categorical labels have a drawback that must be addressed by program designers: every few years, as the labeling program succeeds in encouraging manufacturers to improve the energy efficiency of their products, the models of a particular product will likely cluster in the highest (most energy-efficient) categories. When this happens, the label categories need to be revised. In this case, either the criteria for the categories must be revised, or new categories must be added in a way that consumers will notice. Adjusting category criteria minimizes consumer confusion. Adding categories requires re-educating consumers and may reduce the label's effectiveness.

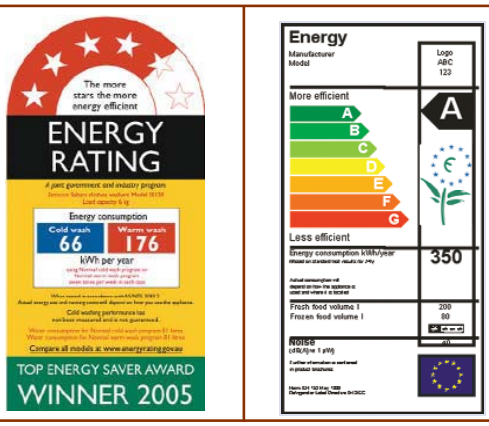
In an analogous manner, the end points of the continuous label scale need to be revised when new products are released that redefine either the least or most energy-efficient product in its class.

5.2.4 How and When to Combine Endorsement and Comparison Labels

As the previous section clearly illustrates, comparative and endorsement labels each have unique advantages. As labeling programs expand and mature, it may make sense to display both labels simultaneously on some products. In several countries, both types of labels have been joined into an overall strategy with the idea that complementary labels for certain products can result in greater energy-efficiency improvements than would result from a single label alone. Two examples of integrated labeling programs currently in place, in Australia and the E.U., are shown in Figure 5-7. In Australia, the integration of the endorsement label into the comparative label was announced in 2004, with implementation starting in 2005 (www.energyrating.gov.au/tesaw-main.html). In Europe, manufacturers have the option of integrating the European Eco-label into the appliance energy label. In practice, however, this is rarely done, and it appears that manufacturers do not see the Eco-label as a competitive advantage for appliances in Europe (Lebot 2004).

To date, multiple labels have been most commonly applied to major home appliances for space heating and cooling, refrigeration, and clothes and dish washing (see Table 5-2). Endorsement labels are commonly used for these products as well as for a wider range of products, including consumer electronics and office equipment that have shorter life and design cycles. Comparison labels, especially of the categorical type, are normally applied to appliances that use large amounts of energy, have expected lifetimes of many years and have design cycles that extend over several years. Thus, these large appliances are the most attractive candidates for integrated labeling

Combining labeling programs entails visual integration or "co-location" of labels on



Australian integrated label | E.U.'s integrated label

Figure 5-7 Two examples of integrated labels

Integrating endorsement labels with comparison labels can enhance the effectiveness of labeling.

Table 5-2 **Products with Multiple Labels in Use or Under Consideration**

Label integration has been applied mainly to major home appliances.

Product Type	European Union[1]	Australia	United States
Refrigerators	✓	✓	✓
Freezers	✓	✓	
Clothes Washers	✓	✓	✓
Dishwashers	✓	✓	✓
Air Conditioners		✓	✓
Space-heating Equipment		✓	✓
Water Heaters		✓	
Lighting Products	✓		✓

[1]In the European Union, appliances can carry both comparison label and an ecolabel (that is broader than an energy endorsement label, but for these products energy consumption is a key component).

Source: IEA 2003, , Marker et al. 2003

products, coordination of marketing and consumer education, and integration of the labeling procedures, including the process and timing of setting performance levels and specifications, revising specifications, and testing and verifying performance. Current experience suggests that visual integration is desirable and important for success, as is coordination of marketing campaigns. Integration of the labeling procedures is a more complex question. Close integration and coordination of processes has the advantages of simplicity and efficiency; however, if integration is too rigid, both labeling programs may suffer. Some flexible coordination of labeling procedures is beneficial and can enhance program efficiency and improve overall market-transformation effectiveness. The mechanics of visual integration and process coordination are discussed further in the following paragraphs.

Visual Integration

Comparison and endorsement labels may be integrated visually either by merging both labels into a single display or by "co-location" of both labels in the same general place on the product. Co-location is consistent with the fundamental marketing principle of making the message and consumer decision process as simple and reinforcing as possible. Placing labels together side by side or in a well-designed, common format can help avoid confusion and make it easy for consumers to understand the information presented. Figure 5-7 shows the E.U. comparison label with an embedded Eco-label and the Australian comparison label combined with the Top Energy Saver Award (TESAW) endorsement label. Market research on label design (discussed in Section 5.3) should consider alternative arrangements of the two labels together as well as alternative designs to determine what options are most meaningful and least confusing for consumers. In a U.S. survey, researchers found that the location of the ENERGY STAR label within the overall layout of the comparison label can determine whether it creates confusion or increases understanding in the minds of consumers. Specifically, the study found that defining a discrete and consistent space for the ENERGY STAR label separate from the comparative and technical information of the U.S. EnergyGuide label was essential because: this practice limited confusion between the information contained in the two indicators individually and it was

obvious that if the ENERGY STAR space was empty, the model did not qualify for the program. Figure 5-8 shows the label integration layout suggested by this study to be most effective. The study also found that when the message was conveyed by both labels within the same visual format, most consumers had a good understanding of it and further found the two to be mutually reinforcing (Thorne and Egan 2002b, Shugoll 1999).

Process Coordination

In deciding whether to combine endorsement and comparative labeling programs, it is important to understand the technical capacities, institutional arrangements, laws, and regulations already in place. For example, what is the best way to coordinate the activities of the lead institution(s) for labeling programs, the roles of other key players, and the objectives of different programs and institutions? For comparison labels, it is important to understand the legal/regulatory basis of the labeling requirement as this may limit flexibility for coordination. For example, the category levels and requirements for a comparison label may be directly linked in a legal/regulatory way to the energy-efficiency standard for a particular product, and this may have major impact on the process and timing of label revisions.

Poor integration risks "buyer confusion," potentially incompatible technical requirements, and unacceptable compliance costs and hassle for industry. It makes it difficult to "manage convergence" of energy and other resource-conservation efforts (e.g., water). Conversely, there is potential to increase the impact of all labeling systems by harmonizing their visual formats and streamlining supplier and administrative costs" (Marker et al. 2003). Good integration has the potential advantage of combining and simplifying each of the separate processes of developing the labels, including the processes of technical analysis and setting of levels, stakeholder consultation, testing and reporting, publication, and dissemination. This simplification can, on the one hand, reduce the burden on manufacturers, improve the efficiency of resource use by the government agencies involved, and result in a well-defined and easily understood program. On the other hand, overly rigid linkage of labels may sacrifice some of the potential benefits of the voluntary endorsement program. As discussed above, voluntary endorsement labeling programs allow for flexibility in setting and revising specifications in response to changing market conditions as well as in including non-energy-performance attributes that consumers may value as much as or more than energy. Voluntary endorsement programs also make it easier than is the case with mandatory labels for regulators to develop a constructive and collaborative relationship with industry and to promote a consistent message across a large number of products. Very tight or rigid linkage to a regulatory, mandatory comparison labeling process will almost certainly change the character of the voluntary program and can risk undermining its effectiveness.

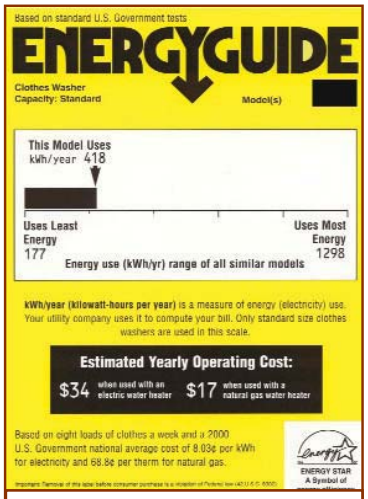


Figure 5-8 Recommended integration of ENERGY STAR logo into U.S. EnergyGuide Label

The placement of an endorsement logo within a comparison label affects its impact.

The objective should be to find the balance between integration and flexibility that works best in a specific situation. In the U.S., E.U., and Australia, officials set and update performance specifications for endorsement labels relatively independently from comparison labels. For continuous comparison labels (like those in the U.S. and Canada), the performance specifications for endorsement and comparison can be established and updated independently even though the two labels are combined visually and are based on the same testing protocols.

If both comparison and endorsement labels are employed, it is essential that energy-performance testing procedures be harmonized; that is, the required test procedure should be the same for both labels as should the minimum energy-performance standards (MEPS), if the latter exist for the particular product. Multiple procedures result in wasted time, extra paperwork, confusion, and unnecessary burden for industry and regulators. There may also be a need for testing of non-energy-performance attributes that may be specific to one label, particularly for endorsement labeling. If one or both labels have been in place for some time, careful consideration should be given to prior investment in and benefits achieved by these programs. An integrated labeling strategy should be designed to retain and build on existing market awareness among consumers. It is critically important to avoid confusing consumers with multiple or conflicting messages.

When the comparison label is categorical, as in Australia and the E.U., a complicated set of questions arises because of the need to match or coordinate the threshold levels for classes on the categorical label with the threshold level for the endorsement label. The difficulty arises from the different objectives of comparative and endorsement labels. The comparative label should be designed so that the label categories cover the range of efficiency levels on the market: some models should get low ratings, some should get middle ratings, and some should get high ratings. However, the endorsement label is designed to show the special status (i.e., "energy efficient") of the top tier of models in the market, usually the top 15–25% of models in terms of energy efficiency. Consumer understanding will be enhanced if the endorsement performance specification is set in relation to one or more of the category thresholds. Initially, for example, the endorsement specification may be set equal to the top (e.g., "A" or "5-star") category of the comparison label. Once in place, however, the two labels may need to be periodically evaluated and updated using independent but coordinated processes.

In Australia, the TESAW endorsement label is voluntary and updated once a year, but the comparative label is mandatory and likely to be updated only every five to 10 years. The TESAW label applies for a 14-month period from November of the prior year through the end of the year specified on the label. Specific performance requirements for a product may or may not change in a given year, but a new criteria document is issued, and manufacturers need to certify their products against the new document each year (AGO 2004). The categories of the comparative label are designed so that, when they are established or updated, there are few, if any models in the top categories. Over time, as the comparison label and other efficiency measures are successful in transforming the market, models will move up until eventually they will be bunched primarily into the top categories on the label. When the algorithm that establishes the values for the thresholds of each category is periodically revised,

the categories shift up, and this moves currently highly rated models down into the lower categories. The Australian Greenhouse Office (AGO) and other stakeholders recognize that there is potential for consumers to become confused at points in the cycle when many models have high comparative ratings, and for the endorsement label to help consumers distinguish which models are actually the most efficient on the market. For this and other reasons, the endorsement label is seen as a valuable complement to the comparative label.

The E.U. documented the benefits of a somewhat similar strategy in which the energy criteria for the E.U. Eco-label were used to foreshadow when a model would qualify for the highest new categories (A+ and above), which had been approved for the comparison label for refrigerators but would not go into effect for several years. This strategy was intended to allow manufacturers of more-efficient models to continue to differentiate their models by qualifying for the Eco-label and at the same time to allow consumers to identify efficient products even though a large fraction of the market had become bunched in the highest energy label category (category "A" at that point in time) (Dolley 2004). However, as mentioned previously, manufacturers have not responded this way to any great extent.

In this process of combining comparative and endorsement labels, it is important to maintain a consistent meaning and message for each label. For endorsement labels in particular, the consumer impact is magnified if the label is consistently applied across a large number of products so that consumers see it frequently and increasingly recognize it and understand its meaning. It is also important that coordinated application of the endorsement and comparison labels is consistent with the broader meaning of the labels. That is, the endorsement label should retain its purpose of identifying the top-efficiency models on the market.

Other details may need to be adjusted when labeling programs are integrated, e.g., how are labels produced and by whom? In Australia, the E.U., and the U.S., manufacturers are provided with formats and images for both labels along with instructions for visual integration, and the labels are produced by the manufacturers. In the E.U., labeling is a two-stage process: manufacturers produce the images, but retailers insert the text in the appropriate language for the country of sale. There are no direct charges associated with the application of either type of label in these three countries.

However, in some developing countries, like China, manufacturers are charged a fee for use of the endorsement label to generate revenue for program operation (Liu and Li 2003). This can create a coordination issue when a new comparison label is introduced for a product that was previously only covered by an endorsement label. If the comparison label is mandatory, policy makers should take care to demonstrate clearly to manufacturers that the paid endorsement label program is not redundant.

Marketing and promotion campaigns should be coordinated to reflect integration of the labels. Enforcement and verification procedures as well as stakeholder consultation processes need to be coordinated in order to minimize duplication, confusion, and the burden of paperwork, without sacrificing the features that establish the separate identities of the two types of labeling programs.

5.2.5 Harmonization Considerations

The points raised in the three previous sections need to be tempered by consideration of the relation of any labeling programs to the markets of a country's trading partners. If products are compared using a category-type rating scale, such as stars, numbers, or letters, it is important to tailor the energy-efficiency algorithms to regional or national markets. Although it may be difficult, if not impossible, to translate an energy-rating system from one country to another, the benefits can be large.

Harmonization of the design and format of an energy label across countries is not necessarily recommended. In fact, given local cultural differences, it is unlikely that an energy label that is effective in one country will have the same impact in a neighboring country. As a general rule, it is important to adapt label design to facilitate communication and maximize consumer understanding. The Korean and Thai categorical labels are an example of the importance of cultural adaptation of labeling content and meaning; although these labels are quite similar in their numeric approach to rating energy consumption, the highest and most energy-efficient rating is a number "1" in Korea but a "5" in Thailand; these differing scales were chosen in response to survey results in the two countries. As previously noted, the European-style label was reversed in Iran to reflect the fact that the Persian language is read from right to left.

Within some trading regions, it may be worthwhile to consider harmonization and/or regional recognition of labels. The most prominent example is the European comparative label, which applies across all 25 European countries. Another type of regional energy label is now being developed for Southeast Asia, by the Association of Southeast Asian Nations (ASEAN). The programmatic details of the ASEAN endorsement label are being worked out. Initially, the label will be used to certify ballasts manufactured or sold in the ASEAN region that meet a threshold efficiency level. Later, the program may be expanded to include other products, such as refrigerators, electric motors, or air conditioners. (See insert: *The ASEAN Energy-Labeling Scheme.*)

5.3 Step L-2: Conduct Market Research to Design the Label(s)

After selecting products to label and the types of labels to use, the next step is to conduct market research on the label design (Step L-2 should proceed simultaneously with Step L-3, which is described in Section 5.4 below). Market research focuses on the following elements of the label: its visual design, the technical specifications that it will represent, non-energy attributes that might be included on it, and any details that will help in outreach/marketing campaigns.

No matter how meager or generous the resources are for market research, it is desirable to solicit views from a range of stakeholders. Appropriate involvement of key stakeholders can dramatically enhance public acceptance of the label, so it is essential early on to identify relevant stakeholders and form stakeholder decision groups. An inclusive process will ensure that some level of agreement about the "best"

label design will be forged. Given that a good deal of money will likely be spent to develop, implement, and evaluate a labeling program, market research is a small investment to help ensure the program's success. It is generally useful for stakeholders to be involved during the market research through a committee or working group, so that they can review interim results and be consulted as the process moves forward.

Consumers are the primary users of the information presented on energy labels, so it is appropriate that labels should be designed to present information to them in as useful and accessible a manner as possible. It is difficult for policy makers to know, without consumer input, what label format and content will be most effective. As noted above, a label design that has been effective in one region and culture may not necessarily be effective in another. Market research is the only way to ensure that a label design is appropriate to a particular country context or target market.

To be effective market-transformation instruments, energy labels should be designed to affect not only consumers but also manufacturers and retailers. Market research with suppliers has a double benefit: it provides feedback on how the label design can influence suppliers, and, at the same time, it allows suppliers, with their firsthand, in-depth experience of marketing and selling the products, to provide input on how to influence consumers.

The ASEAN Energy-Labeling Scheme

The energy ministers of ASEAN have identified the development of an ASEAN regional energy-labeling program as a priority action needed to accelerate the rate of improvement in the energy efficiency of end-use equipment while avoiding the introduction of regional non-tariff trade barriers. The objective of developing an ASEAN regional energy-labeling program was adopted by the Senior Officials Meeting on Energy (SOME) in July 1999, and the ASEAN Energy Efficiency and Conservation Sub-Sector Network (EE&C-SSN) was given the mandate to develop and implement the program.

The ASEAN EE&C-SSN has organized a number of meetings to move the program forward, and they have agreed in principle that the ASEAN regional energy-labeling program will be implemented on a voluntary basis and the label will initially be an endorsement label. Six types of appliances and equipment are to be covered by the program: lighting products, fluorescent lamp ballasts, fans, air conditioners, refrigerators, and electric motors. Of these, fluorescent lamp ballasts were selected as the priority product. The EE&C-SSN is now developing a regional implementation master plan for fluorescent lamp ballasts, which will be a model for eventually expanding the program to cover other products on the list.

Source: AMI (Agra-Monenco International) 1999

The design of a label also needs to take into account the goals and concerns of policy makers who may wish to stress particular design elements to reflect policy goals.

Accordingly, the label design process should be based on market research that draws on input from all key stakeholders: consumers, manufacturers, retailers, and policy makers.

Data can be obtained from either primary sources generated by the project itself or from existing secondary sources, i.e., past market research or research from another country that can be applied to the

current situation. Primary research collects new quantitative or qualitative information. Insights from secondary research can help inform primary research efforts; however, because label preferences may be quite subjective and may change across cultures, it is important to make sure that the secondary research is applicable to the current context.

At least some primary research should be done as part of every label design effort because, by relying solely on secondary data, policy designers run the risk of missing design nuances such as color preference and scale comprehension that are linked to specific cultural values, types of products/features available in the market, and prior energy-conservation messages in the country where the program is being implemented. For example, market research found that Chinese consumers much preferred energy consumption information in the units 'per day' rather than the units 'per year' that are used in Europe. Manufacturers had previously marketed refrigerator energy consumption in terms of kWh per day in China, so this was a familiar unit of measure for Chinese consumers (Waide et al. 2004). We cited other examples earlier in this chapter of differences in label design in Iran, Thailand, and Korea, which were dictated by different local perceptions.

5.3.1 Market Research for Visual Design

Market research on the design of the visual imagery and technical elements that will be included in the label can be either quantitative or qualitative. Quantitative research uses surveys of randomly selected samples of a particular population. Surveys can be done in person, by telephone, over the internet, or by mail. If sample sizes and compositions are representative, the results of quantitative surveys can be projected to the whole population from which the sample is drawn.

Qualitative research can include focus groups and one-on-one interviews. Focus groups are generally useful at the outset of label design efforts to gather broad feedback on the range of labels under consideration. The goal of a focus group is not so much to rank each initial candidate label design but to establish which elements of each label are likely to be successful and why. Focus groups can also be helpful as a last check before selecting the designs that will be tested in quantitative research. Consumer focus group research is a specialized discipline that requires professional expertise. It is common for program managers to hire a professional organization to design and conduct such research. Guidelines for focus group research are found in insert: *Guidelines for Focus Groups* (Egan et al. 2000).

One-on-one interviews are best utilized for testing comprehension and interpretation of the various labels under consideration as well as for identifying the reasons behind preference-related statements. Specifically, interviews illuminate the interpretation of elements in labels, the overall interpretation of each label, and the cause of difficulties in understanding the labels. Interviews reveal interpretive enhancements that can be incorporated in the label graphics (Egan et al. 2000).

Both focus groups and individual interviews shed light on in-depth views of key audiences for labels and are particularly useful for gathering responses to visual information to be used on labels and in marketing. However, because of the limited number of respondents generally involved in qualitative research, these studies should be regarded as exploratory and the results used to generate hypotheses for later

verification using quantitative methods. The non-statistical nature of qualitative research means the results cannot be generalized to the greater population with a known level of statistical precision (Shugoll Research 1999).

Consumer research is best designed to follow an iterative process with the dual and contrasting aims of allowing the maximum number of design concepts to be explored at each stage and progressively narrowing down the sets of viable design concepts by successive exclusion of the least successful concepts. A multi-method design to elicit feedback from consumers, policy makers, manufacturers, and retailers is optimal. For example, Figure 5-9 shows the logic and approach that was used in research to design a comparative energy label for China (Waide et al. 2004).

An example of the benefit of market research using focus groups comes from Mexico. A study of the potential effectiveness of Mexico's comparative label tested the appeal of the existing label and various alternatives and consumers' understanding of the content. The study found that what was most

Guidelines for Focus Groups

- Select only locally based, experienced, native-speaking firms to arrange and moderate groups, in order to avoid reactivity to foreign, outside, or novice group leaders;
- Design a guideline for moderators that is comprehensive to ensure that sessions are conducted consistently (which facilitates comparison) and without leading of the responses (avoidance of bias).
- When possible, use state-of-the-art facilities including a one-way mirror for unobtrusive client observation and audio/video recording equipment for data gathering. The use of a one-way mirror, in combination with simultaneous translation, can permit international experts to watch for consistency in the moderation of the focus groups from one session to another.
- Consider demographics to determine effective socio-economic groupings (e.g., high education/income versus low education/income) and an appropriate geographic spread. If different groups are likely to react to energy labels differently by virtue of demographics alone (e.g., are women likely to have different reactions to energy labeling than men?), focus groups should be conducted separately because homogeneity of respondents is important for the success of focus groups. If separate groups are not possible and subgroup trends are observed, demographic data of interest should be collected for later breakdown.
- Screen participants to ensure that they are members of the target population and to avoid the accidental inclusion of participants with either specific technical knowledge of appliances and/or energy use or experience in market research.

Sources: Egan et al. 2000, Waide et al. 2004

Label design research deserves careful thought.

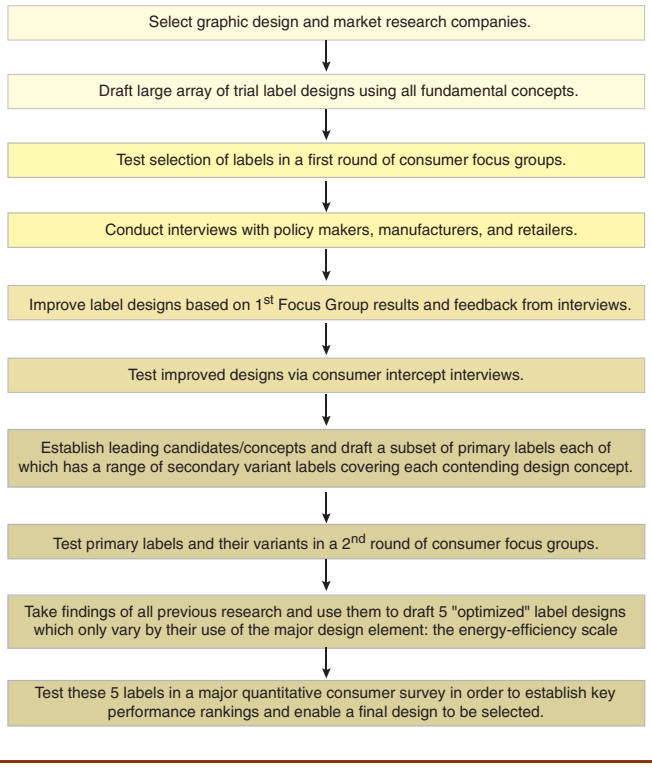


Figure 5-9 Label design research flowchart

appealing was not always best understood, as is shown clearly in Figure 5-10 (www.gdelta.com). Consumer understanding is discussed further in Section 7.5.6.

Another good example of using consumer research to develop an effective label design comes from India (see insert: *Research in India* on page119). Researchers there used a phased approach that included both quantitative and qualitative research methods and involved not only consumers but also other key audiences (IRG 1999). The final label design was based on broad consensus among these various audiences.

Care must be taken to use best-practice research design methods in order to avoid bias in the results. For example, a well-documented problem is known as the "deference effect" in which participants bias their responses to please the interviewer (Bernard 1994). A 1991 Australian study showed that energy efficiency and operating costs ranked second in importance after unit capacity and that running costs and efficiency were reported as the most important attributes in the choice of a dishwasher. However, because the facilitators introduced themselves as energy researchers conducting a study on energy efficiency, these results must be viewed with skepticism; a response bias in favor of energy efficiency may well have been generated by the introduction (SEC Victoria 1991). Well-designed and professional research plans can be structured to avoid these problems.

Once market research is completed and all the issues noted above have been considered, recommendations must be reviewed following a specified process that leads to a final decision on the label format.

5.3.2 Market Research for Technical Specifications

In parallel with visual label-design research, it is important to gather data on the size of the market and the efficiency distribution of models sold as well as the cost and potential technologies for efficiency

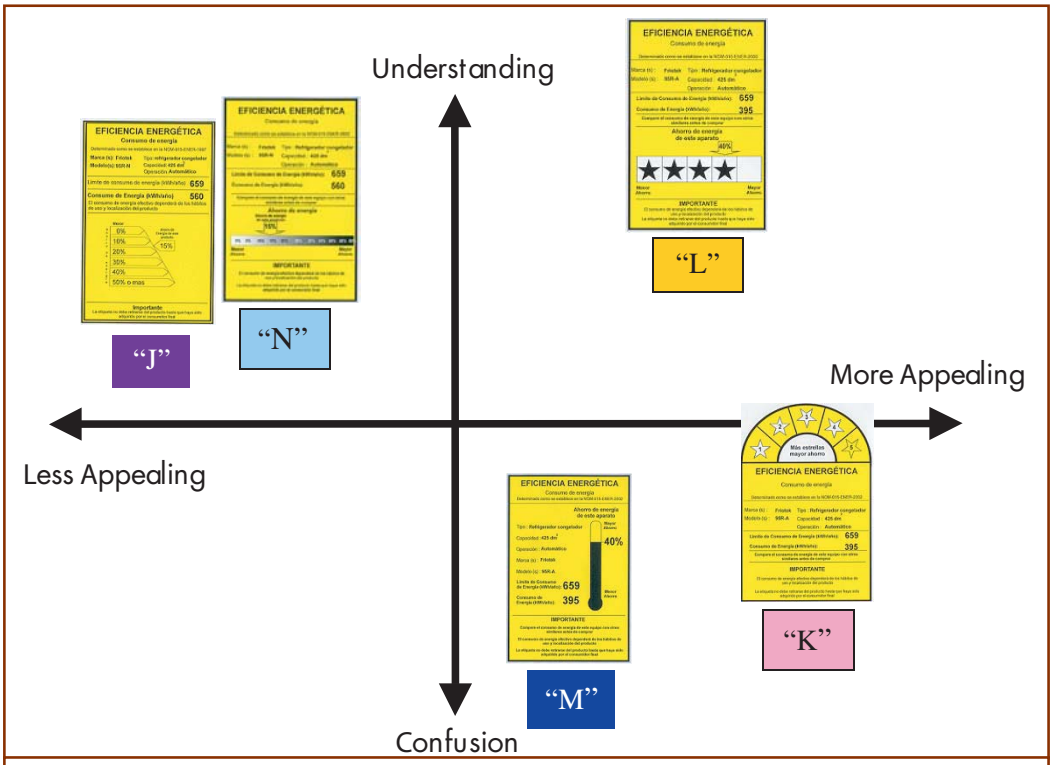


Figure 5-10 Focus group results of five finalist label designs in Mexico

Balancing appeal and consumer understanding can be a challenge.

improvements. These data are necessary to estimate the potential savings from the energy-labeling program.

Market analysis can rely on secondary data available from manufacturers, government statistics, and research firms. If resources are available, the program manager may hire a consultant to carry out new market research and analysis. It is important to have as much data as possible based on results of energy-performance testing in accredited laboratories (see Section 5.4 below). In addition, as noted above, it is advisable to have a process for regular consultation with stakeholders (see Section 5.1.4) and to use this process to assist in collecting market data and reviewing the market analysis, to ensure an accurate overview of market size and efficiency levels. The process of market analysis is described in Section 3.4 of Chapter 3.

Performance Specifications

A process for developing appropriate performance specifications is essential to ensure the effectiveness and credibility of the label over time. Performance levels should be based on the energy saved for each individual product, the cost effectiveness of the levels, and the acceptability to consumers of incremental costs. They should avoid performance levels that can be met by only one or very few manufacturers with proprietary technologies.

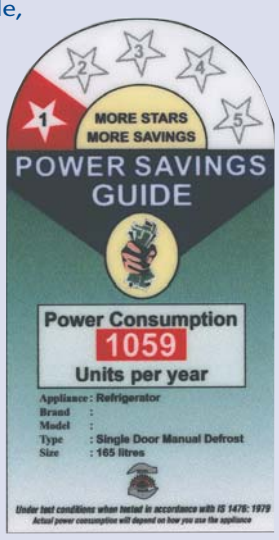
For countries developing their first label for a product, the process of creating workable, effective technical specifications can be considerably simplified by starting with specifications already published

Research In India

To understand India's diverse consumers and develop an appliance efficiency comparison label that would attract, persuade, and communicate clearly to those consumers, the U.S. Agency for International Development/India sponsored a three-phase, two-year consumer research project. Phase I, a baseline survey, set the stage for many decisions that followed, including whether or not label development should proceed. In-home interviews with 1,833 urban consumers in six major cities revealed that:

- Because of their penetration and brand homogeneity, refrigerators would be the best appliance for initial standards and labeling.
- Consumers could be reached through and would respond very positively to a labeling regime.
- The label design should appeal to both men and women because both were involved in buying decisions.
- Consumers did not connect energy efficiency to appliance purchases even though energy issues (e.g., shortages, quality) were of high concern to many consumers.
- For the labeling program to be effective, a strong marketing/information campaign would need to be coupled to it.
- Program planning should address consumers' distrust of appliance salespeople and resulting heavy reliance on manufacturers and word of mouth in appliance purchase decisions.

Phase 2 convened 10 qualitative consumer focus groups to test 17 different label designs constructed from existing successful label formats elsewhere, using design elements meant to appeal to Indian consumers. Consumers reviewed the options and selected the ones they found most understandable, appealing, and persuasive. The groups also "constructed their own favorite label" from the individual label elements. Despite the many label formats and elements, much consensus emerged. Consumers favored and best understood two label types, one using stars as the rating scale and one using a single-bar, sliding scale. Participants also identified many specific likes and dislikes.



Phase 3 consisted of a focus group to factor the opinions of key government and appliance industry experts into the label development process and a quantitative survey of 673 consumers who were placed in a buying context. Consumers rated four "final" labels for their appeal, comprehensibility, and persuasiveness. Although all four labels scored high, some differences in these three areas resulted in the following label being recommended.

Source: IRG 1999

in other countries for the same product. Such specifications should not be adopted wholesale but can often be adapted to fit the distribution of products in the host countries and to accommodate other specific conditions in the particular country. The CLASP website (www.clasponline.org) and the Asia Pacific Economic Cooperation (APEC) Energy Standards Information System (ESIS) website (www.APEC-ESIS.org) offer easy access to a wide range of national programs and specifications, searchable by product.

Specifications for *continuous comparison labels* (like those used in the U.S. and Canada) require the least analysis to establish technical requirements. Key components of the analysis include specifying product size and performance classes (e.g. the size of the refrigerator, and features such as automatic ice making), compiling the energy-performance information for all products of a class, and specifying the end points of the range for each product. The labeling requirements specify the product classes and ranges and the procedure for calculating the performance of each model. The manufacturer is then required to produce the label and indicate where the product falls in this range. (For an example of this type of specification, see the U.S. Federal Trade Commission website instructions for the U.S. Energy Guide label—www.ftc.gov/appliances).

Technical specifications for *categorical comparison labels* involve more complicated analysis and decisions. In addition to analysis similar to that described above for continuous labels, establishing categorical comparison labels requires that product distribution data be analyzed to develop the threshold values for each category. It is also necessary to perform engineering analysis of potential technical improvements in efficiency and costs. The category thresholds are normally expressed either as percentages above or below a weighted average of the market or as actual energy-performance values. The thresholds can define uniform steps or steps of different sizes depending on the product distribution and the overall objectives of the program. In the E.U., for example, categories for cold appliances were established with a fairly even distribution, based on the policy objective of encouraging improvements in efficiency during subsequent years and the requirement that products not yet available in the market should fall into the highest efficiency class if they used the best available technology. The categories were specified as an algorithm with percentages above and below the average value for each model class. When the label was introduced in 1994, there were almost no available models in the best-performance class (A), but a detailed engineering analysis had shown that is was quite possible for manufacturers to produce class-A products (Lebot et al. 2001). The Australian label appliance-rating categories also reflect an ambitious approach; when they are updated, the most efficient products are generally rated at only 3 or 4 stars although the most-efficient category (5 stars) is determined to be achievable based on engineering analysis (See www.energyrating.gov.au).

For *endorsement labels*, a detailed analysis is needed to establish the performance threshold for a high-efficiency portion of the market, commonly the top 10-25 %. The intent is usually to reflect current market conditions and to update the threshold frequently as the market shifts toward greater efficiency over time. The U.S. ENERGY STAR program provides an example of the process of developing performance specifications for endorsement labeling (McWhinney et al. 2004). This multi-step process includes early consultation with manufacturers and engineering analysis to determine the:

- energy-performance distribution of models currently in the market
- technical potential for efficiency improvements
- national energy saving estimates for alternative proposed efficiency levels
- time needed to introduce product design changes
- potential technical barriers
- cost effectiveness of technical improvements

Based on the analysis, draft specifications are developed and additional consultations are held with manufacturers, other stakeholders, and independent technical experts before final specifications are issued. The program staff works in close cooperation with interested industry partners during the collection of the necessary engineering, technical, and market data; during the process of review and comment on the analysis; and in drafting the specifications themselves.

Often, the process of consumer research and consultation with manufacturers, retailers, and other experts identifies *non-energy-performance features* that are more important than energy performance in consumer choices. It may be necessary to include these other performance measures and their test procedures in the technical specification. For example, the color and other qualities of light or the delay in start-up for some fluorescent bulbs may be critical for consumer acceptance of lighting products. Cleanliness, noise, and time per wash may be greater determinants of the desirability of a clothes washer than energy performance. If some manufacturers were to meet energy requirements at the expense of these features, consumers might be dissatisfied, which would undermine the credibility of the entire labeling program. This is especially important for endorsement labeling because the linkage of energy efficiency with high quality is a key message in marketing labeled products (McWhinney et al. 2004).

It is also sometimes necessary to specify these additional performance measures for categorical comparison labels, as in the E.U. label for clothes washers, which includes an A through G rating for washing performance (Lebot et al. 2001). The establishment of a set of categories for other performance attributes is quite complicated and is therefore less extensively applied in comparison labeling than in endorsement labeling.

Production and Placement Specifications

Many well-established labeling programs provide formats and label requirements to manufacturers but rely on manufacturers to print and attach labels before products are shipped to market. The specifications include detailed instructions for the appearance and content of the label as well as its placement on the product. These instructions are available on program websites such as the Australian Greenhouse Office site (www.energyrating.gov.au) and the U.S. ENERGY STAR site (www.energystar.gov/).

In the E.U., the process of producing and affixing labels is complicated by the need to accommodate many languages in the different member countries. As noted earlier, the label is created in two parts, with manufacturers required to produce the portion that contains technical and rating information in numeric and visual form shipped with the product. The balance of the label is provided by retailers in the appropriate language; retailers are also responsible for ensuring that labels are placed on products in the required position.

5.4 Step L-3: Customize a Testing Program for Labels

Because Step L-3, customizing a testing program for labels, and Step L-2, market research (described in the previous section) explore and amplify similar information, they should proceed simultaneously.

A labeling program is unlikely to be effective without an appropriate testing program. Energy-performance testing is discussed in detail in Chapter 4. In this section, we briefly discuss testing issues related specifically to designing and implementing a labeling program.

Initiating a testing program requires access to competent government or private testing laboratories, which should be accredited and/or certified to ensure accuracy of and confidence in the test results. Accreditation is especially necessary when in-country testing laboratories are not available. Such acceptance also eliminates duplicate testing and thus reduces the cost of importing goods. Accreditation of testing laboratories and mutual recognition agreements can be important and are discussed in Chapters 3, 4, and 8.

Once a system for energy-performance testing is in place, the results of initial testing of a sample of products can be used to:

- characterize the range of efficiency of models sold in the market
- estimate the potential savings from the labeling program
- form the basis for developing the label categories
- provide the energy-performance results used to label each product

5.4.1 Design of the Testing Program

Tests must verify all the important information on the label. The test data required for an energy-labeling program should at a minimum include three essential elements:

- **Energy consumption.** The metric of energy consumption will be shown on the comparative energy label or provide the threshold for qualifying a product for an endorsement label. For example, the test might specify energy use per day, per hour, per month, or per cycle.

- **Performance.** A description of other measurements or separate tests that must be performed to establish the product's capacity (e.g., kilowatts of cooling capacity for air conditioners, liters of internal volume for refrigerators) or function/performance (e.g., a washing and drying index for dishwashers). If other non-energy-performance features such as washing performance or quality of light are to be included in the label specifications, testing protocols for these features must be included.
- **Tolerance.** Rules specified by regulators to ensure that values reported by tests are within acceptable error bands and to provide for retesting and resolving any apparent differences in results.

There is a range of approaches to publishing the rules that govern product testing. Some tests and rules may be published by a country's standards-setting agency, as references to standards from an international agency such as the International Standards Organization (ISO) or International Electrotechnical Commission (IEC). Alternatively, lawmakers or regulators in any country may publish all energy-related requirements, from the test procedure to the requirements for energy labeling, in an official government regulation.

In practice, there is a continuum, and the approach differs in every country. Experience suggests that if large volumes of technical requirements are embedded within regulations, these requirements can be difficult to change and keep up to date. A second problem with extensive reliance on regulations is that often the people responsible for writing regulations, usually lawyers, are not experts in energy efficiency, so drafting errors can be common unless the text is carefully verified.

There are also cases in which a number of states, provinces, or countries have separate laws and regulations but implement a common labeling program (e.g., the Australian states, Canadian provinces, and European countries). In cases like these, it is preferable to have technical requirements referenced to a single source (e.g., a national or international standard) rather than replicating copies of the requirements in numerous separate acts or local legislation.

5.4.2 Product Registration and Test Reports

Requirements for the certification of test results for energy labeling vary. Certification often but not always involves some form of registration or filing of test reports. Many countries, including Europe, the U.S. and Australia, allow manufacturers to self-certify their products. Self-certification only works, however, if the regulatory agency can effectively monitor and enforce compliance. The cost of a testing and certification program depends directly on how stringent the process is, but the total costs associated with product testing for an energy-labeling program are relatively small in comparison to the total costs of product manufacture although the costs of testing for products exported to multiple countries with differing test requirements can significantly reduce manufacturers' profit margins.

In some countries (e.g., Australia), manufacturers have to submit test reports for approval of an energy label for a product. These reports are usually submitted as part of the process of product registration. An alternative approach, used by the E.U., is to require manufacturers to retain copies of formal test reports until manufacturing of the model has ceased (or, more commonly, for a period of some years

after manufacturing has ceased). The manufacturer is usually required to produce these test reports only if there is a question regarding the validity of the label claims. Although this approach reduces the government's administrative costs for the program, it makes verifying declared performance difficult. It also makes it difficult to track products on the market and to ensure ongoing monitoring of the compliance and accuracy of the information on labeled products.

In Thailand, registration of test results is done by the DSM Office at EGAT, and all products must be tested at a government-certified laboratory. An advantage to this approach is that the DSM Office now has a complete database of all products labeled since labeling programs began in 1996, and they can easily review the data to analyze trends and track improvements in energy performance over time.

5.5 Step L-4: Implement the Program

Once a labeling program is designed, it is important to have a clear plan for implementing the program, including rules and guidelines, marketing and promotion, compliance and enforcement, and regular revision of technical specifications.

5.5.1 Establish and Announce Regulations and Procedures

At the program outset, it is important to develop an action or implementation plan covering all aspects of the program. The plan does not need to be long, but it should specify the main implementation steps and identify which agencies are primarily responsible for each step. In general, the main steps include:

- consulting with stakeholders to agree on roles
- securing budget and resources for program implementation
- finalizing technical specifications for the program
- announcing technical specifications to stakeholders
- drafting step-by-step guidelines for the program, including timing of implementation
- consulting with stakeholders on draft program guidelines
- finalizing and disseminating program guidelines and implementation schedule
- initiating program implementation

5.5.2 Program Marketing and Promotion

Placement of an energy label on a product is only the first step in attempting to influence consumers' purchase decisions. Research has shown that education and media promotion, e.g., newspaper, magazine, radio or television ads, are valuable aids in making a label effective. A number of related measures within a program increase the effectiveness of an energy label, including:

- retailer support for the program (hostile retailers can neutralize the impact of labels)
- government promotion of the program (e.g., frequent public-service announcements and annual efficiency awards)
- publication of lists of current models on the market (e.g., a brochure and an internet site that are easily accessible)
- point-of-sale information and support

Promotional marketing is most effective when consumers receive numerous, consistent messages regarding energy efficiency, not just as part of the energy-labeling program but also in other, related energy programs that may be running in parallel. Repeated messages reinforce a culture of energy efficiency among consumers and industry and help to create an energy-efficiency ethic within the country.

Often the most important promotion and marketing efforts are carried out by some of the other energy-efficiency programs described in Chapter 10. For example, China's refrigerator labels are being promoted in a larger refrigerator market-transformation project that includes a variety of stakeholder activities and consumer communication. Chapter 7 describes in more detail the techniques for successful label marketing and outreach.

5.5.3 Compliance and Enforcement

For a labeling program to be truly effective, it must be credible to consumers, manufacturers, and other stakeholders. A mechanism is needed to ensure that manufacturers, distributors, and retailers comply. For a mandatory labeling program, it is usually necessary to establish a policing and enforcement scheme to detect instances in which labels are not displayed on products. Violation of the labeling requirement must be penalized to discourage continued noncompliance.

Compliance is important with any type of label—endorsement, or mandatory or voluntary comparison—though the mechanisms and penalties may be quite different. The voluntary U.S. ENERGY STAR program, for example, relies heavily on stakeholders to check compliance and bring problems to the attention of the program managers. It also carries out "check testing," periodically buying a random sample of appliance models from stores and testing them in independent laboratories. The primary penalty for noncompliance is to remove the label from the manufacturer; information about the removal is posted on the ENERGY STAR website. Because the program is voluntary and manufacturers are choosing to participate, they usually try to resolve problems to avoid label withdrawal. The withdrawal of a label has occurred only rarely during the 12-year history of the program.

If an energy-labeling program is to be credible to the public, it is necessary to ensure that claims made on any energy label are reasonable and accurate. This requires verification of claims about capacity, performance, and energy consumption, as applicable, through independent testing. In a competitive market, much of this policing can be undertaken by competing manufacturers. Detailed discussion of policing and enforcement can be found in Chapter 8.

5.6 Program Monitoring, Evaluation, and Revision

Monitoring is an ongoing process of providing timely and regular information about the progress of a labeling program, and *evaluation* assesses the effectiveness of a label, usually at the end of a program. Regular *revision* of technical specifications and label designs is also an important element of a program.

5.6.1 Monitoring vs. Evaluation

Monitoring tracks key data and indicators and acts as an "early warning system" for problems. By contrast, evaluation is not ongoing but is carried out at a discrete point in time, usually at the completion of the project, and usually entails comparison with a baseline that was established at the beginning of the project. For multi-year projects, evaluation may also be performed as a mid-term review. Evaluations take longer than monitoring and go into depth to understand causes and effects (Danish Management A/S et al. 2001).

5.6.2 Monitoring Strategy

From the outset, the program management team should establish a system for tracking and monitoring key program data. The monitoring system should provide results-oriented information and report its findings in a user-friendly and timely manner to the main stakeholders.

It is important for the implementing agency to discuss and agree on a set of program indicators by which the agency measures its progress toward achieving its goals and, ultimately, measures program success. Some tracking indicators for a labeling program for a particular product could include:

- number of label applications and percent increase/decrease from previous period
- number of manufacturers participating in labeling program and percent increase/decrease from previous period
- number of labeled models currently in market as percent of all models sold and percent increase/decrease from previous period
- number of labeled units currently labeled in market as percent of all units sold and percent increase/decrease from previous period
- percent of labeled units in each label category and increase/decrease from previous period
- average efficiency of all labeled models in market and percent increase/decrease from previous period
- percent of check-tested models that pass/fail and increase/decrease from previous period

The best way to make a monitoring system transparent is to make it web-based, with access provided to program staff and consultants as needed. For example, program staff and consultants might have access to raw data on test results, label registrations, market estimates, and check-test results while the public

website might show regular updates of the number of models labeled, average efficiency of models labeled, trends in efficiency levels in the market, etc.

Chapter 9 addresses the basics of program evaluation. The discussion below treats aspects of program monitoring and evaluation that are specific to labels.

5.6.3 Evaluation Approaches

To assess whether an energy label is effective, a policy maker can ask the following basic questions:

- Are consumers and retail sales staff aware of the label, and does it grab their attention in a retail environment?
- Do they understand the label and make correct conclusions about the energy efficiency of models depicted?
- Do they find the label credible and interesting or otherwise have a positive reaction to the label's appearance and technical content?
- Do they state a willingness because of the label to purchase more-energy-efficient appliances than they would have otherwise?
- Do they change their behavior and/or purchase more-energy-efficient appliances?
- Are manufacturers influenced to produce more-efficient products by the labels or by consumer reactions to the labels?

Measuring Awareness, Understanding, and Impact

Label awareness is commonly used as a proxy measure of label effectiveness. However, awareness surveys do not provide useful information about consumer understanding or decision making. In addition, awareness surveys require careful construction. Simple exercises such as showing a label and asking study participants if they have seen such an information tool before have been shown to yield inflated results. Open-ended questions that ask study participants what energy indicators they use or see in a retail context typically yield more conservative results. Such "unaided" questions should precede any "aided" questions that display the target label. This will indicate a range of results, with the unaided measure usually reflecting the likely lowest level of awareness and the aided measure the likely highest level.

Consumer understanding is more difficult to measure than awareness and requires a mixture of research techniques, including in-person interviews and surveys. The important variables to measure are the relative importance of the label (compared to other features of the appliance) in the purchase decision, how well consumers understand the label's central message and its individual elements, the extent to which consumers' conclusions and/or take-away messages reflect the actual product performance, the amount of time required to respond to and understand the label (particularly the likelihood that this amount of time would be committed in an actual rather than experimental buying environment), and the degree to which consumers recall the label's key elements.

Analysts and program managers often fail to measure the most important label impact: whether the label can be linked to consumer decisions to purchase more efficient appliances. This effect can be assessed by surveying consumers to see whether those who are aware of the label rely on it to select efficient products. The effect on purchase decisions can also be assessed broadly by tracing shipment-weighted average efficiencies in the market and attempting to correlate changes over time with the introduction and characteristics of a labeling program.

Most previous evaluations of energy-labeling programs have shown a high level of consumer awareness of labels. Generally, awareness tends to increase during the life of the labeling program, and the vast majority of shoppers are aware of labels after they have visited stores to make purchases.

Evaluations have found that simple, uncluttered label designs with related information grouped and delineated by outlines or shading are the most effective for conveying information about energy efficiency. These evaluations have used focus groups, interviews with consumers and salespeople, and laboratory tests designed to measure consumers' understanding of different label designs. Some studies suggest that categorical comparison labels tend to be more readily understood by consumers than continuous comparison labels (Thorne and Egan 2002b, Egan et al. 2000, and du Pont 1998). However, a recent Canadian impact analysis (Tiedemann et al. 2003) found that the Canadian EnerGuide continuous label was quite effective in influencing consumer choices and improving energy efficiency of products in the market.

Ways of Evaluating Labeling Programs

There are two main types of evaluation of labeling programs: process evaluation and impact evaluation. These are covered in detail in Chapter 9. Below, we summarize the main elements of each type of evaluation.

Process Evaluation

Process evaluations are often qualitative in nature and measure how well a program is functioning. Although process elements are sometimes seen as relatively unimportant by policy makers, these elements are critical to the implementation and success of a program. Process elements include:

- assessing consumer's priorities in purchasing an appliance
- tracking consumer awareness levels
- monitoring correct display or application of the label in retail settings
- valuating administrative efficiency (e.g., registration times etc.)
- checking and verifying manufacturer claims (maintaining program credibility) and label application procedures
- documenting the range and equivalent cost of the supplemental resources that stakeholders outside the implementing agency (e.g., NGOs, industry, retailers) have contributed to the labeling process

Impact Evaluation

Impact evaluations assess the energy and environmental effects of a labeling program. Impact data can also be used to determine cost effectiveness and can assist in stock modeling and end-use (bottom up) forecasting of future trends. Impact elements include:

- influence of the label on purchase decisions,
- tracking of sales-weighted efficiency trends, and
- determining energy and demand savings.

Impacts can be very difficult to determine accurately, especially for a labeling program because labeling programs, unlike standards programs, have no prescribed efficiency improvement. One of the fundamental problems is that, once an energy-labeling program has been in place for a period of time, determining a "base case" against which to compare the program impact becomes increasingly difficult. Furthermore, labeling programs usually exist along with standards programs, and separation of the impacts of the two is extremely costly and difficult. (One approach to the evaluation of some elements of a labeling program can be found in Webber et al. 2000, 2003, and 2004). In general, it is safest to evaluate and report the combined impact of the labels and standards rather than to attempt separate attribution.

5.6.4 Regular Revision of Technical Specifications and Label Design

Test procedures need to be periodically revised to accommodate changes in any related international test procedures and to address new products and technologies that come onto the market and may not be adequately addressed by the published testing method, as described previously in Chapter 3 and in Section 5.4. Likewise, the technical specifications, such as the acceptance threshold for an endorsement label, require the same considerations described in Section 5.3.2.

However, revision of the categories of a categorical comparison label and changes in the label format require special attention because they are readily noticeable to the consumer. Some special considerations for this revision process are described below.

Revising Classes on a Categorical Comparison Label

When a label has been in the market for a few years (or sometimes even less time), the products offered by manufacturers will likely cluster in the higher efficiency levels. When this happens, the cutoff for the classes that define categorical comparison labels needs to be incrementally adjusted ("ratcheted") upward. As mentioned in Section 5.2.2, this can be accomplished by changing the cutoff criteria for the existing categories or by defining new categories. Defining new categories can be controversial because the results will be noticeable to the public and the redefinition affects manufacturers whose model designs and marketing programs may have been tailored to the current label rating scheme. These concerns were especially important when the E.U. label was revised; this revision process offers some useful lessons for a label program manger (see insert: *The A⁺/A⁺⁺ Controversy*).

Updating the Label Format

It is important to periodically evaluate the label design to determine whether it is well understood by consumers and is affecting consumer decision making. Australia, Thailand, Korea, and the U.S. are in various stages of redesigning their appliance energy labels. The experiences of some of these efforts to date suggest that label redesign offers an opportunity for significant improvement in program effectiveness after a label has been in use for several years.

The Australian government is finalizing the first update of its 14-year-old appliance energy-labeling scheme, partly in response to the introduction of mandatory MEPS for certain appliances that will render the current efficiency-rating system obsolete. The Australian scheme was one of the first in which a categorical energy label was revised and the efficiency categories "ratcheted" upward. In addition, regulations have been formulated to promote harmonized implementation of the program, and

The A+/A++ Controversy

In 1999-2000, the European Commission funded a major technical and policy assessment of cold appliances (refrigerators and freezers). Two objectives of the study were to analyze and propose a revision of the existing energy label and potentially propose new MEPS in order to take into account 1) the observed market transformation 2) a new life-cycle cost assessment and 3) other factors, such as industrial impacts. This study concluded that a regrading of the A to G label thresholds was appropriate, the new A class should be 45% more efficient than the existing A class, and the new G class should be between the current C and D levels (reflecting that most products worse than class C are prohibited from sale by the MEPS that came into effect in 1999) (ADEME and PW Consulting 2000).

Despite the recommendations of the study, European suppliers of cold appliances negotiated a different route with the E.U. Energy Labeling Regulatory Committee (ELRC) and the European Commission, proposing the introduction of two more categories (A+ and A++) in addition to the existing ones and a voluntary agreement in place of MEPS for cold appliances. This proposal was accepted but was viewed by many delegations to the ELRC as a temporary solution. The revised European label, which was launched in 2003, maintains the colored A to G format on the left side, and the A+ and A++ ratings are displayed on the white column on the right side of the label (see Figure 5-3). Industry also made a unilateral commitment to phase out class-C or lower efficiency appliances by 2004 and to attain a production-weighted efficiency average of slightly better than the current class A by 2006.

In 2002, European manufacturers also requested the introduction of a new A+ category for clothes washers, but this was ultimately rejected by the ELRC and the European Commission, largely because the A+ approach adopted for refrigerators was seen as a temporary measure in advance of a more holistic revision of the existing labeling scheme.

Australian national test standards (known as "Australian Standards") have been modified to conform to labels and efficiency-standards requirements. These actions are part of a broader set of measures aimed at reducing greenhouse emissions and energy use.

As part of the labeling review, market researchers were commissioned to benchmark consumer understanding and acceptance of the current energy label. The response was clear and strong: the label in its current form was well liked and had a high degree of credibility. It quickly became clear that there was a substantial amount of investment in the current label in terms of consumer understanding and image recognition, so the label redesign transformed into an attempt to improve how the label communicates to consumers. A number of new designs were tested with a series of focus groups. It was found that the basic design was well recognized, but there were areas where information could be more clearly presented. There were also calls for limited amounts of additional information, such as a website to provide further information and the inclusion of water consumption data for products that use water. The new label (see Figure 5-3 on page 95) is similar to the old label in color and appearance, but the design is simplified, and the font sizes and text positions are clearer, to facilitate consumer understanding. There was also a conscious decision to visually separate the star rating at the top of the label (the part most commonly used by consumers) from the more technical data at the bottom of the label (energy, capacity, and so on) to make the label as friendly as possible (Appliance Efficiency 1999, Artcraft Research 1998).

The Thai DSM Office decided to recalibrate its label in 2001 after 85-90% of all single-door refrigerators models clustered in the top ("5") category. The categories were ratcheted up by one level and a "2001" watermark was placed on the label background to differentiate it from the previous label.

The Korean government has redesigned its 12-year-old refrigerator, air-conditioner, and rice-cooker labels (see Figure 5-11). The Korean energy-efficiency labeling program rates each particular model (or type of product) on a five-level scale of efficiency with level 1 representing the highest energy efficiency. Labels must be affixed on all products and must provide information on energy consumption, determined in accordance with test standards. The program also requires that energy consumption information be displayed on any technical material associated with the sale of the products. The labeling is mandatory and helps consumers take energy efficiency into consideration when making purchase decisions.

Old refrigerator label | New refrigerator label

Figure 5-11 Korea label redesign

Korea has redesigned its refrigerator label.

Korea also has mandatory energy-efficiency standards. It recently upgraded its MEPS for refrigerators, air conditioners, and rice cookers because the market no longer showed product discrimination: more than 90% of models qualified as level 1 or 2. The new MEPS level for a refrigerator is now almost the same as old level 2. The Korean government took this opportunity to redesign the label as well. Instead of five levels of performance, the label now features the percentage, on a continuous-scale dial, by which the model is better than the minimum standard.

In the U.S., recent research has shown that the EnergyGuide label (shown in Figure 5-3 on page 95) is not well understood by a majority of consumers. In response, the American Council for an Energy-Efficient Economy (ACEEE) is leading a multi-task, interdisciplinary research effort to document how U.S. consumers perceive and use the current EnergyGuide label and to explore options for improving the label design by building on successful label designs elsewhere in the world. The project focuses on products currently covered by the Federal Trade Commission's EnergyGuide label program, including white goods, water heaters, and, to a lesser degree, heating and cooling equipment. The task force is conducting primary and secondary research along with extensive stakeholder outreach. The goal of this project is to develop an EnergyGuide label that the vast majority of consumers can easily understand, that provides motivating and comprehensible information on appliance efficiency, and that positively impacts the consideration of energy efficiency in consumer appliance purchase decisions. The project includes two major activities: research and communications (Thorne and Egan 2002 a, Egan et al. 2000, BPA 1987, Carswell et al. 1989, and du Pont 1998).

International experience in the field of energy labeling is growing rapidly in all aspects—program design, implementation, evaluation, enforcement, and redesign of labels. This chapter is intended as a beginning guide for officials or advocates considering or starting to implement a program. The websites, authors, agencies, and other resources mentioned in this chapter should provide the most current information to readers as they implement, maintain, and refine their labeling programs. Programs work best if all products are labeled and if consumers can easily distinguish between poor-, average-, higher-, and highest-efficiency products.