Energy-Efficient Product Labeling: Market Impacts on Buyers and Sellers

Jeffrey P. Harris and Nancy Casey-McCabe, Lawrence Berkeley National Laboratory, Energy & Environment Division

With the decline in funding for both government- and utility-sponsored energy efficiency programs, policy-makers and efficiency advocates are shifting attention to those strategies that most effectively leverage routine market transactions, such as product purchasing. Product labeling for energy efficiency is one such strategy. Its primary aim is to inform and influence purchase decisions by individual consumers as well as large institutional buyers. A second, equally important objective of energy labeling is to spur manufacturers and suppliers to compete in offering more energy-efficient products. This paper reviews current practice in energy efficiency labeling by government and independent organizations, both in the United States and other countries. Topics discussed include program and policy issues, lessons learned, the relation of labeling to other market-oriented programs, product rating for broader environmental attributes vs. energy only, and questions that require further research on individual and market behavior.

INTRODUCTION

Programs that rate, label, and/or certify efficient products are included among a broad range of market-oriented strategies to promote energy efficiency. These programs aim to strengthen market mechanisms by making information on a product's energy (or environmental) attributes more available and more highly visible—and, in turn, making it easier for manufacturers to market energy efficiency as a feature. There are a growing number of product rating and labeling programs, sponsored by national and provincial governments, industry associations, and third-parties such as environmental groups, consumer advocates, and utilities. One recent study of energy efficiency labeling identified 12 countries with such programs (Duffy 1996); another report on broader-based environmental labeling identified programs in 21 countries (Abt 1994). These programs have the potential for substantial market impact and for indirectly stimulating new technology, but their actual effects remain largely unexamined. Nor have product labeling programs, with only a few exceptions, been fully integrated with other energy efficiency programs and policies.

In the United States and other countries, there is a widespread belief that product-level information on energy efficiency and environmental attributes is lacking, confusing, or unreliable. As a result, consumers are often unaware of the long-term cost savings and environmental benefits associated with buying a more efficient product. Thus, labeling programs can provide consumers with specific information about which products are more energy-efficient or ''environmentally preferable.'' Some programs aim to influence the market more directly, by shifting purchases towards those products that meet a defined performance threshold. This, in turn, can stimulate manufacturers to re-align their product offerings: cutting back production of their least efficient models and perhaps introducing new, even more efficient units to maintain some product differentiation.

PROGRAM CHARACTERISTICS

While labeling programs have much in common, they can be classified according to these three dimensions:

- Endorsement vs. comparison labels: Endorsement labels offer a ''seal of approval'' for a limited number of products that meet performance criteria. Comparison labels are applied broadly to all products of a given type, providing numerical scores, rankings, or other comparative information but leaving it to the buyer to make an informed choice.

- Sponsorship and funding source: Programs can be instituted by public, private, or non-profit organizations. Funding support falls into two general categories: (1) fees collected from manufacturers to have their product certified and labeled; and (2) program-level funding (generally from the government) which is independent of product manufacturers or other industry sources.

- Energy-only vs. other environmental criteria: Some labeling programs address only a product's energy use or efficiency; others incorporate a broader set of environmental criteria, including energy use and sometimes ''life-cycle'' embodied energy.

These three main program categories are discussed in the following sections; features of selected programs are sum-

marized in Table 1. This paper focuses on selected attributes of a few energy labeling programs, and some broader policy issues raised by labeling. Other programs and issues are examined in more detail in the literature (in particular, see Abt 1994 for determinants of program effectiveness, and Casey-McCabe and Harris 1995 for a more detailed summary of energy labeling programs). A number of international environmental labeling programs are beyond the scope of this paper (U.S. EPA 1993). Other labeling programs are still in the formative stage, such as the U.S. Department of Energy's (DOE) pilot labeling program for appliances (U.S. DOE 1995), which plans to use the same name and logo as the Environmental Protection Agency's (EPA) Energy STAR™ label for other products.

ENDORSEMENT vs. COMPARISON LABELING

Some labels include elements of both ''endorsement'' and ''comparison,'' and consumers may even confuse the two—i.e., interpret a comparison label such as the U.S. Energy Guide as an implicit endorsement of energy efficiency. The choice between a comparison and endorsement approach reflects the underlying philosophy of the sponsor about whether it is best merely to inform consumer choices, or try to actively influence them.

Endorsement labels

''Endorsement'' labeling programs help consumers distinguish among similar products by providing the buyer with a single ''seal of approval'' for those products that meet or exceed some established criteria. Labeling programs with a broader environmental focus may set specific requirements related to the production, use, and disposal of the product throughout its life cycle. Examples include minimum percentage of post-consumer recycled material, maximum toxic content, and emission of volatile organic compounds.

For energy-consuming products, labeling criteria often target a given percentage of the most efficient products on the market. For example, Green Seal criteria try to include models whose energy efficiency is in roughly the top 15 to 20% of models on the market (Hauck, personal communication, 1994). Power Smart's energy efficiency criteria are targeted at about the top 20%. The Power Smart thresholds are not rigid, but may vary from one product to another. Power Smart's general philosophy is to move the market as a whole towards energy efficiency, rather than adhering strictly to a single level of efficiency (Abraham, personal communication, 1994). Thus, they are less concerned that the labeling criteria be comparable among all products than with generally trying to ''push consumers and pull manufacturers'' by making it easier to identify the more efficient products (Lee, personal communication, 1994).

Rather than distinguishing between more efficient and less efficient products in a given category, some endorsement labels try to encourage the purchase of a particular class of products (such as compact fluorescent lamps) that are inherently more efficient than the alternatives (incandescent lamps) or are intrinsically energy-saving (e.g., thermal insulation).

By their nature, endorsement labeling programs are voluntary rather than mandatory. Once guidelines are established for a particular product or service, interested manufacturers, service providers, and others can voluntarily apply for the label. Examples include the U.S. Environmental Protection Agency (EPA) Energy STAR program[1], Green Seal's product certification, and the Canadian government's Environmental Choice (''EcoLogo'') Program. Products must be voluntarily submitted for labeling (often with an associated fee) and certified as meeting the labeling organization's criteria. Companies can then display the label on their certified products and use the logo for marketing.

Green Seal requires performance verification by an approved third-party laboratory, and conducts site visits. In evaluating a product's ''life-cycle environmental burdens,'' Scientific Certification Systems (SCS) reviews laboratory data, visits manufacturing plants, and arranges for independent testing. For the European Union (EU) Ecolabel, interested manufacturers must submit independent test data in support of their application. The Canadian Environmental Choice Program (ECP) requires an independent agency to verify and test products for compliance; ECP believes this independent process makes their EcoLogo more credible to consumers. However, the EPA Energy STAR program uses self-certification, allowing each manufacturer to test and report on their own products and relying on competitive market pressures to help expose and correct any serious violations.

Comparison labels

In contrast to an endorsement label, comparison labels are often mandatory and generally apply to all models within a given category. (An exception is the SCS ''Environmental Report Card,'' a comparison label which is both voluntary and limited to manufacturers who pay a fee for the certification and label). The idea is to provide consumers with information on a product's relative energy use, operating cost, or efficiency, information that is easy for the buyer to understand and to consider—along with price, convenience, reliability, and other features—when choosing among models. Comparison labels often use a standardized numerical scale (or in some cases, symbols such as multiple stars or bars of varying length) to report on each model's energy perfor-

Table 1. *Characteristics of Selected Labeling Programs*

Program	Dates	Scope	Products	Sponsor	Notes
I. Endorsement					
Energy STAR (U.S.)	1992	energy	HVAC, lighting, office equip, misc.	gov't	pref. criteria negotiated with mfrs; enlist buyer groups; product listing
E-2000 (Switz.)	1994	energy	office equip.	gov't	labels support effic. target values agreed w/indus.
PowerSmart (Can.)	1989	energy	appliances, HVAC, lighting, motors, office equip., misc.	utility consort.	enlist buyer groups
Green Seal (U.S.)	1990	envir.	office eq., lighting, HVAC, appliances	3rd party	Market services to buyer groups, emphasize verified performance; industry fees
Env. Choice (Can.)	1988	envir.	appliances, bldg equip., plumbing	gov't	indus. fees; consumer educ. + marketing
Blue Angel (Ger.)	1977	envir.	75+ product types.	gov't	indus. fees; life-cycle assessment
EcoLabel (EU)	1992	envir.	appliances, other	gov't(s)	1 EU country takes lead to draft criteria; indus. fees
II. Comparison					
Energy Guide (US)	1975	energy	appliances, HVAC	gov't	req'd for all products sold in U.S.
EnerGuide (Can.)	1978	energy	appliances, other?	gov't	req'd for all products sold in Canada, product listings, consumer info, sales training
Energy Label (EU)		energy		gov't(s)	
NFRC (U.S.)	1992	energy	windows, skylights	ind/govt	Indus-sponsored energy testing/rating methods
Scientif. Cert. (US)		envir.	consumer products	3rd party	indus. fees; claims verif., ''environ. report card''

mance using a metric such as annual energy use, energy operating cost, efficiency index, or thermal U-value. The label may also include a scale, to help the buyer compare that model's energy performance to the range of other products on the market.

Absent such product labels, energy usage information is virtually unavailable for most consumer products (although some commercial equipment, such as motors, boilers, and lighting products, may include industry-accepted efficiency ratings along with other technical specifications). A few comparison labels cover multiple environmental attributes, as well as energy use. An example is the SCS ''Environmental Report Card,'' which includes one or more numerical scores on resource depletion, energy use, air and water pollution, and solid waste—all calibrated to the product's ''full life-cycle.''

The philosophy behind comparison labeling is that if consumers have easy access to reliable energy performance comparisons, they will make better informed decisions and—on the whole—select more energy-efficient products. The European Union's energy labeling is designed to provide consumers with better opportunities to select energy-efficient appliances by making it ''easy for consumers to compare the energy consumption of different appliances'' (DTI Energy 1993). Another example is the National Fenestration Rating Council (NFRC). The Council promotes the use of a uniform methodology for rating energy performance of windows and other glazed products, but does not endorse any

specific products nor set minimum standards for a window rating. NFRC ratings and product labels are beginning to be incorporated into state building codes to allow more accurate ''credit'' for windows with better thermal and optical performance.

Many of the endorsement labels are of relatively recent origin and have not yet faced the question of updating to keep up with changing technologies and markets. This is especially a problem for innovative new products that may not fit the established test methods and criteria. Updating is also essential in cases as EPA's Energy STAR label for office equipment, where the program has been so successful that the majority of new office equipment now meets the criteria set less than 4 years ago. One program, the Swiss E-2000 label, is designed to be updated annually, with a unique label design adopted for one year only and criteria set to include the 25% most efficient products sold in the previous 12 months (Aebischer 1994).

It is an open issue which approach, comparison or endorsement labels, may be most effective for a given product and market. Most likely, the answer will vary—both among countries and across products and submarkets within a single country. And, new ideas remain to be tested. For example, one proposal being discussed by DOE and the Federal Trade Commission is to combine a comparison and endorsement label by printing a special ''green'' version of the U.S. Energy Guide (comparison) label for those products that are, for example, among the 15–25% most energy-efficient in their class. Another idea is to expand the Energy STAR (endorsement) label for office equipment to Europe, and print it on the EU comparison label for those products that qualify.

SPONSORSHIP, FUNDING AND SCOPE

In addition to the type of label, programs can be categorized in terms of sponsorship, source of funding, and whether their coverage is limited to energy or also includes other environmental attributes.

Sponsoring organization

Labeling programs are run by a variety of organizations, including national and local governments, industry associations, and ''third-party'' groups such as utilities or nonprofit consumer or environmental groups (see Table 1). Clearly, the motivation for initiating a labeling program is intimately linked with the type of sponsoring organization. Government programs, such as the Canadian EnerGuide, the U.S. Energy Guide, EPA Energy STAR, Swiss E-2000, or European Union energy label often use labeling as a means to further a national policy objective, in conjunction with—or as an alternative to—other efforts such as mandatory standards for product efficiency. Utilities may use labeling as part of their demand-side management programs (e.g., Power Smart, BPA's Blue Ribbon award). Environmental and consumer advocacy groups such as Green Seal or SCS have their own special concerns for pollution prevention, recycling, reduced use of toxics, etc.

Government-sponsored labeling may be either mandatory or voluntary. Mandatory programs include the U.S. Energy Guide, Canadian EnerGuide, and European Union energy labels. Note that these programs require comparison labels for all models within specified product categories. The stated purpose of the Energy Guide program is the ''effective communication of energy usage of labeled products.'' (FTC 1994b) Besides helping consumers select energy-efficient appliances, the European Union's energy labeling scheme also aims at encouraging manufacturers to produce more efficient appliances. Voluntary government programs include EPA's Energy STAR, and the Canadian Environmental Choice, German Blue Angel, and European Union ecolabeling programs.

The Swiss program combines a voluntary comparison label (E-2000) with a quasi-mandatory program of ''target values'' for efficiency improvement over a 5–7 year period. These targets are based on government negotiations with industry. While the Swiss program relies heavily on voluntary industry compliance, if the target values are not met by agreed-upon dates, the federal government may set mandatory standards (Aebischer 1994).

Along with questions about the relative effectiveness of endorsement and comparison labels, opinions differ as to which sources of information (label sponsors) are considered most credible to consumers. Focus group research by the EPA for their Energy STAR program suggested that government is often seen as the most credible source of energy or environmental product information—but utilities and nongovernmental organizations also report that consumers view their groups favorably as independent sources of information. The government-sponsored Environmental Choice program in Canada describes its product labeling as ''an independent, impartial environmental certification.'' On the other hand, although they receive revenue from manufacturers for their third-party product certification, the non-profit group Green Seal believes that their independence from both government and industry provides increased credibility with buyers.

Fee-based vs. program-funded

A program's funding is often linked to the type of sponsor and the type of label (endorsement or comparison). For example, some government and most third-party endorse-

ment labels are fee-based, receiving at least some of their revenue from fees paid by manufacturers who want their products labeled. Depending on the program, manufacturers may be charged a single fee for the label application or separately for product testing, verification, evaluation, and licensing of the logo. However, payment of an evaluation fee is no guarantee that the labeling organization will grant certification. Most ''program-funded'' labels, supported by a single sponsor or a consortium, are financed by government agencies. Public financing is also most common for comparison labeling programs, such as Energy Guide, EnerGuide, and the European Union energy label. Some programs, such as Canada's Environmental Choice program, are trying to make a transition from government sponsorship to industry fees (Leah, personal communication, 1994).

Energy-only vs. environmental labels

The scope of a labeling program depends on the sponsor's goals and areas of expertise. Some programs address only the direct energy consumption of a product. Other environmental (ecolabeling) programs attempt a ''cradle-to-grave'' look at the entire life-cycle of a product, including the pollution and resource use involved in its production, distribution, use, and disposal. The first such ecolabeling program, established in 1977, was the government-sponsored Blue Angel program in Germany. Energy use may be one factor among many considered, depending on the product. The Blue Angel program, still considered a model for other labeling programs, relies on a broad network of experts, reviewers, and decision-makers, and elaborate procedures for setting standards and certifying products. After a slower start-up the Blue Angel label caught on rapidly, currently awarding certification to 3500 products (mostly German-made) in 75 categories. Its logo is now recognized by a reported 80% of German households (Abt 1994).

In contrast to the Blue Angel, which is a product endorsement label, SCS issues a comparison-type ''environmental report card,'' which often includes product energy use along with other environmental attributes (see Figure 1, below). With its comprehensive ecolabeling approach, SCS tries to help consumers gain a greater understanding of the overall environmental impacts of a product and be ''better able to make informed choices'' (Chaffee, personal communication, 1994). The view at SCS is that an endorsement label is not the best approach for a rapidly changing market, where a certified product may not remain for long among the best available choices. In addition, a ''seal of approval'' based on fixed criteria for each of several environmental attributes may mask significant trade-offs. For example, a given product may not meet all the criteria set by the labeling organization, but may perform exceptionally well on a few of these dimensions and thus impose fewer environmental burdens, overall. SCS believes in letting an informed consumer make these trade-offs. Of course, the contrary view is that few if any consumers—or even large institutional buyers—will take the time or have the background to make the complex judgments needed to consider all these aspects of environmental performance when choosing a product. Another difficulty with the SCS approach—shared by other comparison labels—is the possibility that consumers will interpret the comparison as an endorsement, assuming that *any* product labeled with the Environmental Report Card (for example) is automatically efficient or environmentally preferable.

Many ecolabel programs focus selectively on what they judge to be the most serious environmental impacts, or on the greatest opportunities for improvement. In some cases, a single attribute may be used as a proxy for overall environmental burden (Abt 1994). Green Seal, for example, focuses its (endorsement label) criteria on those aspects of the product life-cycle with the greatest environmental impact (Weissman, personal communication, 1994). Energy efficiency is often a key attribute, but other attributes (such as refrigerant type) may also carry significant weight. For the EU ecolabeling program, for example, a study by the United Kingdom assessed cradle-to-grave impacts for clothes washers and dishwashers, and determined that the largest contribution to the environmental impact is made by direct and indirect (hot water) energy use. As a result, these criteria are emphasized in the ecolabel requirements (UK Ecolabeling Board 1993).

Energy-only labels are generally simpler, more directly tied to financial benefits to the consumer, and less subject to the judgment of the labeling organization. In addition, the multiple criteria involved in an ecolabel may deter some manufacturers from even trying to meet the requirements. Conversely, one limitation of energy-only labels is that they may ignore important environmental considerations—including some that correlate, directly or inversely, with energy efficiency. For example, a very efficient compact fluorescent lamp may also have a higher of mercury.

MARKET IMPACTS: BUYERS AND SELLERS

Market surveys show that a significant fraction of consumers want to ''vote with their wallet'' and make environmentally conscious purchases. A U.S. national survey in 1993 found that more than half of consumers reported considering environmental benefits when purchasing at least some products (Abt 1994). While buyers may also be interested in saving money with energy-efficient products, they often fail to recognize the extent of energy cost savings, which can produce very short paybacks for many products. Labeling programs can help provide the information needed to make these benefits better understood and thus more influential in buyer decisions—and in turn affect production and marketing deci-

sions by sellers. But many questions remain. For example, to what lengths will consumers go to purchase a more efficient (''greener'') product? What other features are they willing to give up (if anything)? Are they willing to pay more in initial cost, even with a quick payback? And, as noted earlier, what information sources do they view as credible? These and many other questions must be answered in either designing or assessing the impact of a labeling program.

Many product labeling programs were established fairly recently. Few evaluations of market impact have been undertaken by labeling groups themselves, and only a handful of studies have been performed by independent organizations. Better information is needed on the effects of labeling on consumer behavior, market shares of labeled products, and manufacturer response. In addition, there is a need for continued market testing to determine what type of information and label format make the most sense to consumers.

Impact on Consumers

One fundamental questions for program design and evaluation is whether endorsement or comparison labels are more effective in influencing consumer behavior. This question hinges on the factors that motivate consumers, their knowledge of the issues, as well as their willingness to try different products or brand names. The answers may vary, not only from one country or culture to another, but across submarkets in the same country and even among individual consumers.

The Green Seal program is relatively new and only a few products carry a Certification Mark, so no market impact data are available on consumer recognition of the label, or whether purchasing decisions have been affected. However, an attitude survey by Green Seal showed that 4 of 5 consumers said they would be more likely to purchase a product certified by Green Seal, when choosing among products of equal quality and price.

While Power Smart has not obtained independent market data on the impact of its endorsement label, there is some anecdotal evidence. One utility in British Columbia reported 95% customer awareness of the Power Smart programs in general (which include product labeling), and noted that sales of energy-efficient refrigerators and motors (both of which are labeled) have risen dramatically in 2–3 years, from 15% to 90% of the market for refrigerators and from 10% to over 70% for motors. However, it is important to note that this same period also saw extensive use of utility rebates and related marketing by Power Smart and its member utilities, so it is difficult to determine the incremental contribution of the labels themselves.

In the 1980s, a consultant study for the Bonneville Power Administration examined the extent to which labeling, education, and promotion could affect market shares of new, energy-efficient refrigerators and freezers. While the study may have been undertaken too early in the implementation of this new program to get an accurate assessment of its impact, a survey of participating retailers estimated that about 22% of customers had been ''influenced'' in their purchase by the Blue Ribbon campaign (BPA 1988).

The effects of the U.S. Energy Guide labels remains poorly understood; there are mixed views about how effective they are in helping consumers identify the most energy-efficient models. For example, one report concluded that the Energy Guide labels are ''not convenient . . . for consumers'' and therefore ''not particularly effective in specific purchase decisions'' (BPA 1988). However, another study found that over one-third of clothes washers buyers and about one-half of refrigerator buyers who were aware of the Energy Guide labels claimed that this information affected their purchasing decision (Dyer 1986). More recently, an in-store survey of appliance buyers conducted for DOE showed that 90% of buyers had noticed the Energy Guide label, and three-fourths of these described the label as ''somewhat'' or ''very'' helpful in their comparison shopping (U.S. DOE 1995). However, these same buyers reported that the label format was confusing and should more clearly emphasize one or two pieces of information, such as energy costs. Despite, this, recent format changes by the Federal Trade Commission go in the opposite direction, emphasizing electricity use in kWh or efficiency indices such as Annual Fuel Utilization Efficiency (AFUE) and Energy Efficiency Ratio (EER), rather than annual or lifetime energy operating costs (FTC 1994a).

In a six-month pilot project in early 1994, Denmark introduced the EU energy label for refrigerators and freezers. The program included a range of promotional and outreach activities, including training of salespeople, promotional literature, and sales aids (DTI Energy 1994, Karbo 1995). This pilot test was complicated by the fact that, prior to introducing the EU label, Denmark had its own system for energy labeling of some appliances, which continued in parallel with the EU labeling test.

An evaluation of the Danish pilot program showed that the energy labels and accompanying media campaign were noticed by buyers and appeared to influence their choice of refrigerators and freezers. In a national survey, over 50% of the respondents (most of whom were not in the market for an appliance) were aware of the media campaign, but only half of these could recall specific elements of the energy labeling program (Karbo 1995). Customer reaction was generally positive: most customers (85%) noticed the energy label, and most (70%) found it easy to understand. In addition, the energy labels seemed to increase consumer interest in the energy consumption of the products. Almost all of

the sales staff interviewed believed that the labels ''got the customers to change their standpoint towards less energy-consuming appliances.'' The participating retail chain reported increased turnover of the energy-efficient products, as well as a shift in models offered for sale towards the more efficient ones, which the sales personnel attributed to the energy labeling and associated ad campaign (DTI Energy 1994, Karbo 1995).

Impacts on manufacturers and retailers

In addition to helping consumers identify efficient (or environmentally preferable) products, a labeling program may also be designed to influence the behavior of manufacturers and suppliers by helping—or in some cases forcing—them to compete on the basis of energy efficiency or other environmental attributes. A related aim is to help speed the development and introduction of new, more efficient (or ''green'') technologies, as labels, standard, or other changes in the market narrow the range of energy performance.

If these are longer term goals, what is the near-term response of manufacturers, especially to the voluntary labeling programs? Program sponsors report that some manufacturers are eager to participate while others seem to view the labeling program as an unwanted market intrusion. The NFRC experienced a generally positive response by manufacturers to its labeling and rating program, developed by an industry-sponsored organization with both financial and technical start-up support from the U.S. DOE. At least 122 manufacturers have submitted over 25,000 window products for NFRC rating, and several have reportedly introduced new, more efficient product lines to take advantage of the rating system.

To date, NFRC has no direct market data on buyer recognition of the label or sales of certified products. However, from informal industry contacts they believe that sales of efficient, NFRC-certified window products have gained significantly as a result of building energy codes and utility programs that rely on the NFRC labeling, as well as general interest by designers and builders (Mathis, personal communication, 1994). The NFRC directory itself provides one indicator of this shift in the market. The mean U-value for products listed in NFRC's first directory (November 1993) was 0.55 [Btu/hr-ft^2-°F]; the average value listed less than one year later (August 1994) was 0.40, while the number of product listings also grew dramatically. An NFRC staff member indicated that manufacturers now feel the need to improve their products' energy performance in order to avoid being listed in the directory as ''poor performers.''

In the case of the EPA Energy STAR program, a striking early success has been the high rate of voluntary participation by manufacturers, especially for personal computers (PCs) and printers. As of late 1994, personal computers that meet the Energy STAR requirements accounted for at least 50% of the business market and a somewhat lower fraction of sales to the home PC market. Over 80% of computer printers now on the market comply with Energy STAR requirements, and compliant monitors are widely available in all screen sizes. In this case, the labeling program received a significant boost in 1993, when Federal agencies were required to purchase Energy STAR qualifying office equipment. Since the Federal government is the largest single customer for office equipment, not only in the United States but worldwide, this Federal purchasing requirement was a major factor contributing to manufacturer participation in the EPA program.

Green Seal has found that, in addition to large national companies, some smaller manufacturers (especially those with limited advertising budgets) are eager to have their products certified and labeled. These firms believe the Seal gives them a marketing edge, especially among those consumer segments committed to ''buying green.'' However, some manufacturers also fear that as more products become certified by Green Seal, this same competitive edge may disappear. Thus, it is possible that too much success (i.e., high participation rates) might erode the value of an endorsement label. Another example came up in the BPA ''Blue Ribbon'' appliance program. Some retailers were reportedly hesitant to participate, out of concern that they might lose sales if a customer requested a labeled model that was listed in the BPA brochure but not carried by their store.

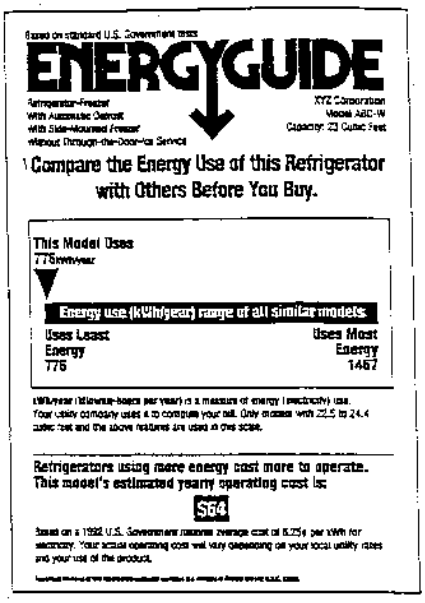
Label format

The amount and type of information presented on a product label, as well as the mode of presentation (relative emphasis on numbers, text, graphics) vary widely among programs. Some label designs are based on focus groups or other consumer testing (U.S. DOE 1995); others evidently are not. The resultant variations in energy labels, illustrated in Figure 1, could provide the basis for a very useful ''natural experiment,'' if the necessary data were available to compare consumer understanding and reactions to various approaches.

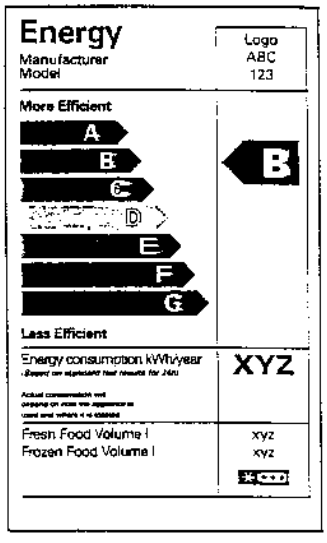
Endorsement programs generally use their logo as the label, and may offer a brief explanation as to why the product has been certified (e.g., 20 percent recycled content, non-toxic, or energy-efficient). In the United States, Federal Trade Commission rules also require some explanation of what the logo means. Comparison labels generally provide more product-specific information on the labels, as shown in Figure 1.

For the U.S. Energy Guide, a Federal rule sets requirements for labeling many types of appliances, while other products, such as plumbing and lighting, must provide certain informa-

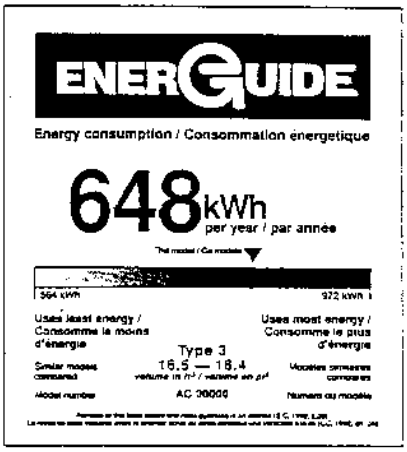
Figure 1. *Examples of comparison-label formats show varying degrees of complexity; all may pose a challenge to the casual user. Of the labels shown here, the multi-criteria ''Environmental Report Card'' provides the most information at the cost of greater complexity. Source: Pylvänäinen 1995 and U.S. EPA 1993.*



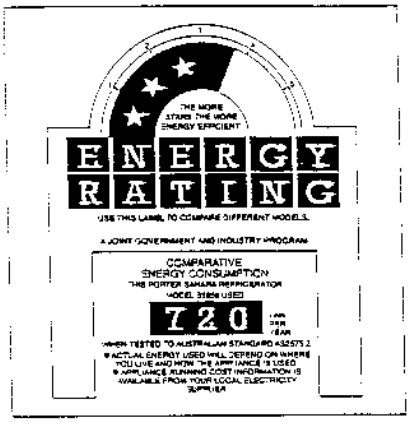
US Energy Guide



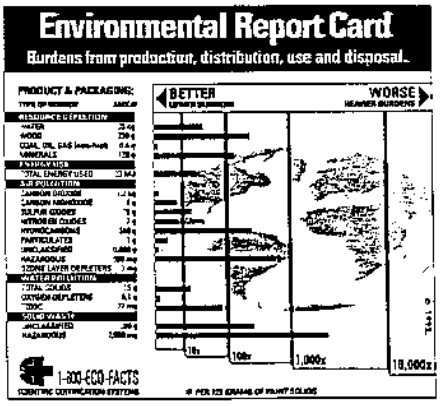
European Union energy label



Canada EnerGuide



Australian Energy Label



SCS Environmental Report Card

tion either on the product or the packaging. Until recently, a linear scale showed how a given product compared with minimum and maximum values for either yearly operating cost or the efficiency rating of other models of a similar size and type. The numerical rating (or annual dollar cost) was shown in large type. However, as noted previously, major changes to the Energy Guide label took effect in December 1994. The Federal Trade Commission now requires that labels for home appliances show annual energy usage (kilowatt-hours), rather than operating cost (FTC 1994a). Although operating cost is still be displayed on the label, this is secondary to the kWh value, as indicated in Figure 1. The FTC's intent is to make the labels ''easier to read and more useful to consumers in comparing the energy efficiencies of the appliances'' (FTC 1994b). The labels may be less likely to mislead some buyers, those with above- or below-average energy costs, and some observers believe that compliance may simpler for manufacturers (E-Source 1994). But these gains may have come at the expense of replacing a highly visible, easily understood, and perhaps more salient number, dollar operating cost, with a ''technical'' term such as kilowatt-hours or energy factor—which may communicate little or nothing to most consumers.

Canada's mandatory EnerGuide label, also shown in Figure 1, is similar to the U.S. label in several ways. The EnerGuide label also emphasizes energy usage rather than annual energy cost, and was revised in 1992 to include a scale of energy performance (Energy, Mines and Resources Canada 1993). The rectangular label now includes annual energy consumption (kWh) rather than the monthly value used on previous labels.

In 1994, a European Union directive called for labeling of refrigerators and freezers, as the first products to use the new EU energy label (EC 1994). Labels placed on these appliances (see Figure 1) will contain the manufacturer, make, and model of the refrigerator or freezer. A graphical representation shows ranges of energy efficiency, from a green arrow labeled ''A'' (more efficient) to a red arrow labeled ''G'' (less efficient). There is a separate black arrow to indicate how that specific model ranks on the efficiency scale. Energy consumption is shown in kilowatt-hours per year; other product information includes fresh-food and freezer volumes and one or more stars to indicate the freezer temperature. If an appliance qualifies for an EU Ecolabel, this symbol can also be placed on the energy label.

The Australian energy rating, illustrated in Figure 1, is a variation on this same theme, using multiple stars rather than a bar or arrow to indicate relative energy performance. Note that, in the Australian system, more stars (and a longer arc) means a ''better'' (more efficient) appliance, while for the European label, a shorter arrow is ''better.''

The SCS ''Environmental Report Card,'' also shown in Figure 1, is perhaps the most complex comparison label now in use. It provides consumers with detailed, quantitative information about a product's life-cycle environmental burden, including production, transport, packaging, use, and disposal. The SCS Report Card has been compared to a food nutritional label found on food (Abt 1994). It quantifies 18 product characteristics in the form of both numerical values and a bar graph with a logarithmic scale (longer bars in this case are ''bad,'' signifying increased environmental burden). The SCS Report Card has been criticized as too complex for the average consumer to use, but the sponsoring organization strongly disagrees. According to one SCS spokesperson, there are ''no data or studies to prove or even show that consumers cannot understand and use this information successfully'' (Chaffee, personal communication, 1995). However, it is difficult to believe that the logarithmic scale is understood by any consumers except a relatively small number who are mathematically literate.

Importance of outreach and promotion

Both program experience and the limited number of evaluations of labeling programs suggest that carefully planned, sustained programs to inform both sales people and their customers about the label are an essential component of a successful program (Abt 1994, BPA 1988, DTI Energy 1994, Karbo 1995). Unfortunately, such awareness and sales training elements have often been of secondary importance or absent from labeling programs altogether. A notable exception was Denmark's six-month pilot project in early 1994, to introduce the EU energy labeling of refrigerators and freezers through a single chain of white goods stores. Appliances on display were tagged with energy labels corresponding to the official EU label, and the salespeople were given technical materials and training. The store featured the energy labels as a part of their advertising and marketing activities. Promotional literature and sales aids provided to the salespeople included an easy-to-understand brochure explaining each part of the EU energy label and an overview of the EU program. It also emphasizes how consumers can benefit the environment by buying a ''green'' appliance that reduces the need to build new power plants and burn fossil fuels. As noted above, both customers and sales staff responded positively to the labeling campaign—but it was generally acknowledged that this would not have happened in the absence of the media campaign to increase customer awareness of the new labels, combined with the sales training efforts.

A similar retail campaign was initiated by the Bonneville Power Administration. The BPA ''Blue Clue'' program labeled the most efficient refrigerator models on display in cooperating retail outlets, and also listed qualifying models in a brochure. In addition to the stickers placed on qualifying

models, BPA provided retailers with free copies of the brochures, posters and other promotional material, along with free newspaper and television advertisements throughout the region and a toll-free number for consumers to ask questions and order brochures. Again, active promotion of the label to prospective buyers was a key element of the program.

The EPA Energy STAR program also illustrates the importance of buyer outreach. The EPA program for office equipment initially tried to maximize voluntary participation by manufacturers—with considerable success in the area of office equipment, as noted above. However, a recent survey by an industry association indicated very low buyer awareness of the program, so EPA is launching a national advertising campaigns to increase program awareness by large governmental and institutional purchasers, as well as small businesses, individual consumers, and retailers. The campaign, targeted to selected demographic groups in 34 cities, will reinforce the full range of Energy STAR labels and associated voluntary pollution-prevention programs. EPA also maintains a data base of Energy-STAR complying products; this information is available to any consumer on request, through a fax hotline and at a new EPA site on the World Wide Web.

To promote recognition of its label, Green Seal has begun several public awareness campaigns, focusing on larger institutional buyers. Beginning in 1994, large purchasers such as governments, universities, and corporations can become Green Seal Environmental Partners by paying a small fee and committing to ''green'' procurement policies. In turn, participants can use the Environmental Partners logo and receive customized buying guides on topics of special interest to their business. Included in these guides are recommendations for specific product brands that Green Seal has determined to be environmentally preferable. Since Green Seal has a limited advertising budget, they have targeted free media such as magazine articles and public service announcements in national publications such as *Time* and *Fortune*.

Canada's Environmental Choice Program is also taking steps to intensify its outreach efforts, in response to earlier difficulties in reaching both consumers and manufacturers. Environmental Choice uses a three-pronged marketing approach, to increase general public awareness, work with retailers, and focus on youth education (Leah, personal communication, 1994).

The Federal Trade Commission, to help consumers understand the new Energy Guide format, is planning a consumer and industry education effort that will likely target the retail sector. (Mills, personal communication, 1995). This appears to be the first outreach program since the label's inception in the early 1980s. However, FTC still has no plans to make available a list or directory of labeled products, as other (comparison or endorsement) labeling organizations often do. For example, even the EPA auto mileage guide label is also used as a basis for government or private, non-profit organizations to publish lists of vehicles according to their fuel economy.

Product listings are also published as an adjunct to comparison labels issued by the National Fenestration Rating Council, Energy STAR, the Canadian EnerGuide, and the national appliance labeling programs in Australia and Denmark. For example, an annual EnerGuide Directory lists all the models for sale in Canada within each product category. These products are ranked in order, from most to least efficient (Energy, Mines, and Resources Canada 1993). Each entry includes the manufacturer, brand name, model number, and values for monthly and yearly energy use. An introductory section shows how to estimate the energy operating cost of an appliance over its lifetime, and encourages consumers to compare products based on life-cycle costs, not just purchase price.

CONCLUSION

This paper has described some of the existing programs in the United States and other countries for labeling the energy performance, and in some cases other environmental attributes, of commonly purchased appliances, equipment, and other energy-related products. Having examined several of the issues associated with program design and implementation, we conclude that a great deal remains to be learned from well-structured market research, and careful quantitative evaluations of today's labeling programs. Future analyses should consider what form and type of product labeling can have the most influence on both buyers and sellers, what types of outreach and consumer education work best, and the use of training and sales incentives to assure that sales personnel will help market efficiency as a valued feature.

Perhaps most important is the design of effective links between product efficiency labels and incentives, promotional campaigns, government and institutional purchasing, and efficiency standards or target values. Product labeling can provide the market information that is an essential foundation for all these other forms of ''market conditioning,'' both to shift purchasing practices toward today's most efficient products and, in turn, to stimulate the introduction of new technologies offering even greater energy savings.

A question of special interest is how much, and under what circumstances, product labels and listings can encourage manufacturers and retailers in a ''race to the top''—i.e., to begin competing on the basis of energy efficiency by introducing more efficient products and removing their least

efficient models from the market. Other important policy questions involve the structure of existing programs and the threatened proliferation of labels offered by third-parties, government, and in some cases by individual manufacturers themselves. At what point does a multiplicity of competing, even conflicting, labels begin to overwhelm the ordinary consumer, or to erode interest by manufacturers in participating in any single program? Too many ''signals'' to the consumer can quickly turn into noise, making it difficult to consumer determine which claims are valid, whether any of the labeling criteria are meaningful, and (for endorsement labels) whether product coverage is suitably inclusive.

Does the growing popularity of product energy labeling point to an emerging consensus on the value of this approach—or only that labeling offers a more affordable and politically acceptable alternative, in a time of shrinking government budgets, eroding utility interest in demand-side management, and resistance to mandatory efficiency standards? And finally, in a global economy increasingly characterized by cross-national production and marketing, how important and how feasible is it to have a single, ''harmonized'' set of performance criteria for energy (and environmental) labels?

ACKNOWLEDGMENTS

This work was supported in part by the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy under Contract No. DE-AC03-76SF00098, and by the U.S. Environmental Protection Agency, Climate Change Division. Our information sources included brochures and other program literature, as well as personal interviews with the following individuals, whose help and advice the authors gratefully acknowledge:

Arthur Weissman, My Ton, and David Hauck of Green Seal; Tim Leah, Janet Stavinga, Valerie Douglass, and John Forman of the Environmental Choice Program, Environment Canada; Areef Abraham, Bob Symon, Brenda Lee, Moira Ann Handford, and Jack Danforth of Power Smart, Inc.; Francesca Carozza of Portland General Electric; James Mills of the Federal Trade Commission; Chris Mathis of the National Fenestration Rating Council; John Rivera of D&R International; Bruce Cody of Bonneville Power Administration; Chet Chaffee of Scientific Certification Systems; Lene Nielsen and Peter Karbo of the Danish Energy Office; and Erja Pylvänäinen, National Consumer Research Centre, Helsinki, Finland.

ENDNOTES

1. Beginning in 1996, the EPA Energy STAR program will become a joint program with the U.S. Department of Energy, using a common logo. In general, DOE will label residential appliances while EPA will label other building-related equipment and products.

REFERENCES

Abraham, A. (Power Smart, Inc.). 1994. Personal communication to the authors.

Abt Associates. 1994. ''Determinants of Effectiveness for Environmental Certification and Labeling Programs.'' Report to the Pollution Prevention Division, Office of Pollution Prevention and Toxics, U.S. Environmental Protection Agency. Report EPA 742-R-94-001. April.

Aebischer, B. 1994. ''From Energy Star to Target Values.'' *Proceedings* of ''Energy-Efficient Office Technology 1994: An International Seminar.'' Electric Power Research Institute. Palo Alto, Calif.

Anderson, Karen. 1990. ''Appliance Efficiency Programs: Beyond Rebates.'' *Home Energy*. 7 (2).

Bonneville Power Administration. 1988. ''The Evaluation of Phase II of the BPA Appliance Energy Efficiency Promotion Campaign: Promotion of Energy Efficient Refrigerators and Freezers.'' Columbia Information Systems, Portland, Ore.

Casey-McCabe, Nancy and Jeffrey Harris. 1995. ''Energy Labeling: A Comparison of Existing Programs.'' In *The Energy Efficiency Challenge for Europe*, Proceedings of the 1995 Summer Study of the European Council for an Energy-Efficient Economy, Mandelieu, France, 6–9 June.

Chaffee, C. (Scientific Certification Systems, Inc.). 1994 and 1995. Personal communications to the authors.

Code of Federal Regulations (CFR). 1994. 16 CFR Part 305, Federal Trade Commission, Washington, DC.

De Hart, A.J. 1993. ''Labelling Appliances for Energy Efficiency in Canada.'' CADDET Newsletter, No. 3. Issued for the International Energy Agency/OECD by Novem. Sittard, the Netherlands.

DTI Energy. 1994. ''Final Report: Pilot Project for Introduction and Use of the EU Energy Labelling of White Goods in Retail Trade.'' Danish Technological Institute. Copenhagen, Denmark.

DTI Energy. 1993. ''EU Energy Labelling: Refrigerators and Freezers.'' Danish Energy Agency. Copenhagen, Denmark.

Duffy, John. 1996. ''Energy Labeling, Standards, and Building Codes: A Global Survey and Assessment for Selected

Developing Countries.'' International Institute for Energy Conservation. Washington, DC.

Dyer, Robert F. 1986. ''A Longitudinal Analysis of the Impact of the Appliance Energy Labeling Program—Final Report.'' Office of Impact Evaluation, Federal Trade Commission, Washington, DC.

Dyer, Robert F. and Thomas J. Maronick. 1988. ''An Evaluation of Consumer Awareness and Use of Energy Labels in the Purchase of Major Appliances: A Longitudinal Analysis.'' *Journal of Public Policy and Management*. 7:83–97.

E-Source, Inc. 1994. ''Residential Appliances Technology Atlas.'' Boulder, Colo.

Energy, Mines and Resources Canada. 1993. EnerGuide 1993: Energy Consumption Ratings of Major Household Appliances, M27-103/1993, Ottawa, Ontario.

''Energy Ideas.'' 1996. Quarterly Newsletter of the Center for Study of Responsive Law's Government Purchasing Project. [Entire issue is devoted to product labeling.] 4 (1): Winter 1996. Washington DC.

Hauck, D. (Green Seal, Inc.). 1994. Personal communication to the authors.

Johnson, Brian J. and Catherine R. Zoi. 1992. ''EPA Energy Star Computers: The Next Generation of Office Equipment.'' *Proceedings* of the 1992 ACEEE Summer Study on Energy Efficiency in Buildings. Asilomar, Calif. August. 6:107–114.

Karbo, Peter. 1995. ''Introduction of EU Energy Labelling in Denmark.'' Case study project report for the Danish Energy Agency (unpublished). Copenhagen, Denmark. June 27.

Leah, T. (Environment Canada). 1994. Personal communication to the authors.

Lee, B. (Power Smart, Inc.). 1994. Personal communication to the authors.

Ling, Rich and Harold Wilhite. ''An Ethnographic Examination of the Role of Energy Efficiency in the Sale and Purchase of Large Household Appliances in Scandinavia.'' 1992. *Proceedings* of the 1992 ACEEE Summer Study on Energy Efficiency in Buildings. Asilomar, CA. August. 10:111–123.

Chris Mathis (National Fenestration Rating Council). 1994. Personal communication to the authors.

Mills, J. (Federal Trade Commission). 1995. Personal communication to the authors.

Ministry of Trade and Industry. 1993. ''Energy Labelling of Household Appliances,'' Working Group on Energy Labelling, Energy Department, Helsinki, Finland.

Official Journal of the European Communities (EC). 1994. Commission Directive 94/2/EC, L 45, Vol. 37.

Paulos, Bentham and Andrew Stoeckle. 1994. ''The Right Label.'' *The Environmental Forum*. May–June: 24–29.

Pylvänäinen, Erja. 1995. ''Energy Labelling—Can the Consumers Be Influenced?'' In *Research Program on Consumer Habits and Energy Conservation—Summary Report*. LINKKI—National Consumer Research Center, University of Helsinki. Publication 15/1996: 95–108. Helsinki, Finland.

Pye, Miriam, Steven Nadel, and Loretta Smith. 1994. ''Super-Efficient Product Labeling.'' American Council for an Energy-Efficient Economy. Washington DC. May. [mimeo]

United Kingdom Ecolabelling Board. 1993. ''Ecolabel Criteria Factsheet.'' No. WMD/1.

U.S. Department of Energy (U.S. DOE). 1995. ''Energy Savers Retailer Initiative.'' Test Phrase Program Report. Washington DC. December 15 [draft].

U.S. Environmental Protection Agency (U.S. EPA). 1993. ''Status Report on the Use of Environmental Labels Worldwide.'' EPA 742-R-9-93-001, Office of Pollution Prevention and Toxics, Washington, DC.

U.S. Federal Trade Commission (FTC). 1994a. *Federal Register*, final rule, Vol. 59, No. 126, p. 34015, July 1, Washington, DC.

U.S. Federal Trade Commission (FTC). 1994b. ''FTC News: FTC Updates Energy-Usage Disclosures for Home Appliances.'' Press release, Bureau of Consumer Protection, Washington, DC.

Weissman, A. (Green Seal, Inc.). 1994. Personal communication to the authors.