

The EnergyGuide Label: Evaluation and Recommendations for an Improved Design

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ABSTRACT

Since 1980, major home appliances and heating and cooling equipment have been required to display the EnergyGuide label. The label is intended to help consumers make cost-effective appliance purchasing decisions by providing comparative information about product energy use. An effective EnergyGuide has the potential to promote energy-efficient appliance purchases, thereby reducing overall energy consumption and saving consumers money.

Findings of a comprehensive, two-year evaluation of the EnergyGuide demonstrate that the current label design is confusing to consumers and has little, if any, role in appliance purchasing decisions. Testing of alternative label designs identified several label designs preferred by consumers. In particular, a categorical, stars-based label out-performs the current label. It grabs consumer attention, is easily understood, and correctly communicates appliance energy consumption. It is credible and motivates consumers to read the label and consider energy use when purchasing an appliance. Our findings are based on multi-method primary research, including a consumer intercept survey; consumer focus groups; a simulated shopping experiment; and semi-structured interviews with consumers, retailers, manufacturers, and contractors. This research, along with international experience, demonstrates that categorical labels better meet consumer needs and the objectives of the EnergyGuide labeling program. In 2002, the research sponsors will petition the Federal Trade Commission (FTC) to adopt an improved EnergyGuide design based on findings.

This paper builds on earlier work (Egan, Payne, and Thorne 2000) by presenting overall and summary findings (whereas earlier work provided only interim results) and going into detail about individual research tasks previously not reported.

Introduction

The U.S. EnergyGuide labeling program was launched in 1980 under the direction of the FTC. The legislation establishing the label set two goals for the program: (1) to improve energy efficiency and (2) to assist consumers in making purchase decisions. In fact, the ability or inability of a comparative label to assist consumers is listed as a primary criterion for deciding which products to label. Over its first twenty years, no systematic evaluation of the program or the efficacy of the current label design was undertaken. However, small-scale studies and anecdotal evidence suggested significant comprehension problems with the label and a low level of reported use (duPont 1998). At the same time, alternative labeling approaches were developed and implemented in a number of other countries with impressive

results in terms of consumer awareness, market impacts, and energy savings.¹ In particular, an international trend toward the use of categorical labels has emerged.² The current U.S. label is shown in Figure 1.

In this context, a consortium of sponsors developed a research project to evaluate the efficacy of the EnergyGuide label and determine the best label format and graphical element to meet the goals of the labeling program.

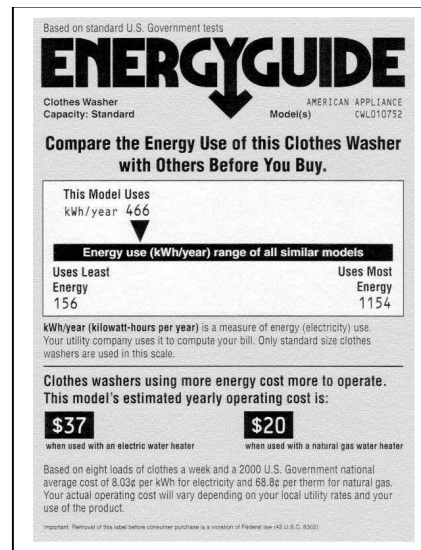
Methodology

In 1999, ACEEE launched its appliance labeling project with the goal of developing an EnergyGuide label that is easy to understand, provides motivating and comprehensible information on appliance efficiency, and positively impacts the energy efficiency of consumer appliance purchase decisions.

The project covered white goods, heating and cooling equipment, and water heaters, but emphasized products sold through retail outlets where consumers see the label as part of their shopping experience. Research was conducted with both consumers (through focus groups, semi-structured interviews, a consumer survey, and a simulated shopping experiment) and supply-side market actors (i.e., manufacturers, heating and cooling contractors, and retail sales staff). In research with consumers and retail sales staff, the project tested seven graphical designs, which were modified at each stage to incorporate our findings. With manufacturers and contractors, labels were not presented during interviewing. Instead, the interviews focused on opinions of and experience with the EnergyGuide program as it is currently implemented. Table 1 summarizes, in sequence, the research tasks involving consumers, the primary focus of the project.

The primary research was conducted in two phases. First, qualitative research methods were used to gather in-depth feedback on the current label and alternate label executions. Focus groups and consumer interviews were used to explore label preferences, solicit opinions on specific informational elements, test label comprehension and interpretation, and select optimal designs for testing in survey research. The methodology and results of the first and second consumer focus groups, consumer interviews, and interviews with supply-side actors are covered in detail in Egan, Payne, and Thorne (2000) and Thorne and Egan (2002). The survey phase of the research project was intended to quantitatively verify the results of the qualitative research and to investigate how alternate label designs performed in a real-world shopping environment.

Figure 1. U.S. Energy Guide



¹ Evaluations of the European Union label (Boardman et al. 1997; Waide 1997), Australian label (Harrington 1999; Wilkenfeld 1997), and Thai label (du Pont 1998; Sulyma et al. 2000) show impressive results.

² Appliance labels typically fall into one of two categories regarding their approach to information organization—categorical or continuous. A categorical label divides the range of comparative models into distinct groups or segments, while a continuous label marks the low and high end of the range of comparative models without explicitly grouping anything in between.

Table 1. Summary of Consumer Research Tasks

Research Task	Objectives	Sample
Consumer focus groups —round one	Examine consumer perceptions of current EnergyGuide and responses to alternative label designs in order to uncover trends and general directions for additional qualitative and quantitative analysis.	Six consumer focus groups were conducted in Baltimore and Washington, DC. A total of 57 consumers participated.
Consumer interviews	Evaluate the current EnergyGuide in depth and side-by-side with alternative labeling approaches to draw out comprehension and information-processing issues and examine reported label preferences.	54 semi-structured customer intercept interviews were completed at retail stores in Boston, Denver, and Dallas.
Consumer focus groups —round two	Identify final designs for quantitative testing from range of labels modified based on earlier research and to test additional informational and visual elements.	Six consumer focus groups were conducted in Chicago and Ft. Lauderdale. A total of 55 consumers participated.
Consumer focus groups —round three	Evaluate additional continuous and categorical rating concepts, determine preferred level of content, and explore interaction of categorical rating systems with the ENERGY STAR [®] label. Provide final input for labels to be tested in quantitative research.	Four consumer focus groups were conducted in Charlotte, NC and Syracuse, NY. A total of 37 consumers participated.
Consumer survey	Empirically determine which of lead label concepts has highest rate of comprehension and motivating ability.	500 mall intercept surveys were completed in Atlanta, Milwaukee, New York, Phoenix, and San Francisco.
Simulated shopping Experiment	Test impact of optimized categorical and continuous label designs on simulated consumer purchase decisions and perceptions of product quality and value.	204 homeowners (including 49 couples) “shopped” for clothes washers and water heaters in Tampa.

Note: Shaded rows correspond to earlier research tasks reported on in detail in Egan, Payne, and Thorne (2000) and Thorne and Egan (2002).

This paper focuses on the final qualitative research task (i.e., the third round of focus groups) and the survey research phase (i.e., consumer survey and simulated shopping experiment), discusses new findings from these tasks, and summarizes the overall findings and recommendations from the entire appliance labeling project.

Qualitative Research

After completion of the first and second round of focus groups and consumer interviews, a third set of four focus groups was conducted to provide input on additional label designs and aid in the selection of label designs to be tested during the following survey research phase. Building on the findings from the earlier focus groups and consumer interviews, the final round of focus groups was intended to evaluate additional continuous and categorical rating concepts and better determine the preferred level of content for the EnergyGuide label. In addition, the groups explored consumer preferences for placement of the ENERGY STAR label on the EnergyGuide in response to an FTC ruling allowing manufacturers to display the ENERGY STAR on the EnergyGuide of qualifying products. The groups also investigated the interaction between various categorical rating systems and the ENERGY STAR label. Specifically, the groups sought to determine whether consumers would

find categorical labels confusing when combined with the ENERGY STAR label since it is effectively a two category (compliant versus non-compliant) label.

As in the earlier tasks, the label executions were modified to address issues and suggestions raised in previous research tasks and the least promising label executions were dropped in response to negative responses in the second round of focus groups. In addition, new variations on the label were included to test additional graphical rating concepts. Three categorical-style labels were tested, including stars, check marks, and letters (presented horizontally since earlier research had shown the vertical presentation was problematic for consumer comprehension). Four continuous-style labels were tested as well, including the current (or line graph) label, the bar with scale graph, the gradation graph, and the slope graph. The current label was tested with the level of explanatory text that is currently found on the actual label. All other designs were tested with a medium-high level of text preferred by consumers based on input from the earlier focus groups. Versions of the current, stars, and check marks labels were tested with the ENERGY STAR. Unlike the earlier tasks, the current label was not identified to participants as the EnergyGuide design in current use; it was referred to as the line graph label. Figures 2 and 3 show the labels tested. Table 2 summarizes the findings from the focus groups.

Figure 2. Categorical Labels Used in Third Focus Groups

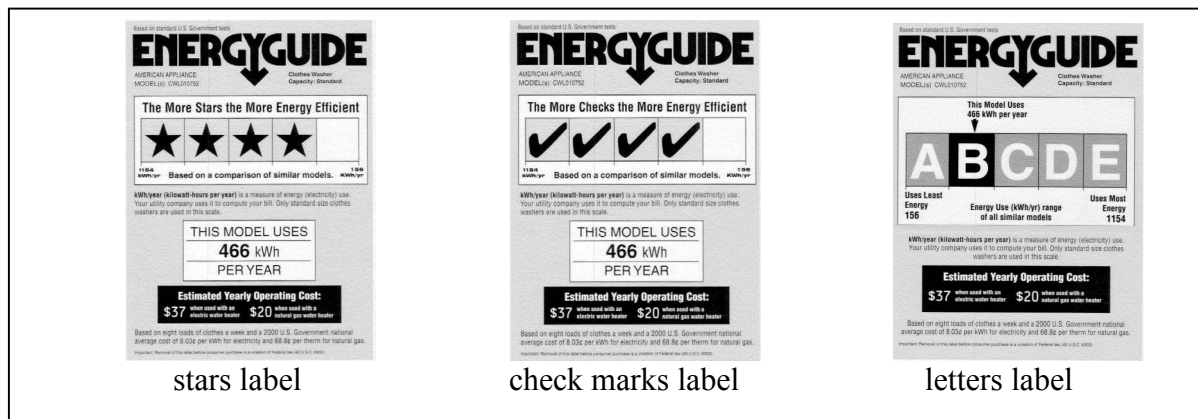


Figure 3. Alternate Continuous Labels Used in Third Focus Groups

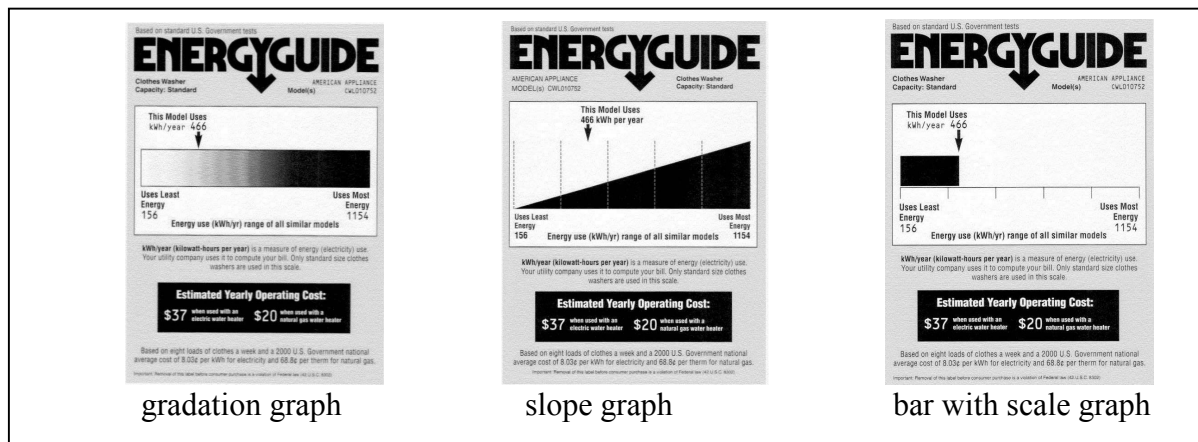


Table 2. Findings of Consumer Focus Groups—Round Three

Label Element	Findings
Categorical labels	<ul style="list-style-type: none"> • Categorical concepts preferred over continuous graphing concepts • Stars preferred over all other designs; considered most attention-grabbing and effective at increasing consumer awareness of energy efficiency • Check marks visually unappealing and ineffective in communicating importance of energy efficiency or influencing purchasing decisions, but a second choice to stars • Letters less appealing than stars or check marks and most difficult to use in retail environment • Stars might infer a rating of quality and performance beyond energy efficiency for a minority of respondents
Continuous labels	<ul style="list-style-type: none"> • Bar with scale graph favored by virtually all respondents over other continuous graphs • Bar with scale graph considered more user-friendly than current line graph due to use of arrow to signify model’s energy use on scale and inclusion of tick marks along the scale • Bar with scale graph preferred because more visually appealing and easier to understand than the current line graph, but no more attention-grabbing or effective in encouraging energy-efficient purchases • Gradation and slope graphs dismissed as unattractive and confusing • Current line graph found difficult to interpret; many respondents unable to use it to make comparisons of energy use among models
Level of explanatory text	<ul style="list-style-type: none"> • High level of text on current label contributed to its lack of visual appeal • High level of text discouraged many participants from reading the label • High-medium level of text preferred as appropriate level of information needed in appliance purchasing
Interaction with ENERGY STAR	<ul style="list-style-type: none"> • Correct interpretation of ENERGY STAR as “seal of approval” despite overall lack of awareness • Negative reaction to ENERGY STAR placement within the box containing the graph on current line graph label (as required by current FTC rules)—this placement is confusing and unappealing and makes label more difficult to read and interpret • Placement of ENERGY STAR in bottom right corner vastly preferred • ENERGY STAR and categorical rating schemes (stars, check marks, or letters) complementary and work well together

In summary, the stars label was the preferred categorical label and the preferred label overall while the bar graph outperformed the other continuous-style labels. The stars label was visually appealing, attention-grabbing, and easy to comprehend quickly and from a distance. In addition, the stars label effectively demonstrated the concept of comparison of energy efficiency among models. The bar with scale was more user-friendly than other graphing concepts and improved comprehension relative to the other graphs. Respondents preferred a medium-high level of text, which they found to provide the appropriate level of information without cluttering the label and discouraging its use. The ENERGY STAR was understood to be an endorsement label and considered a complement to the EnergyGuide rating system. Respondents reacted negatively to the current placement of the ENERGY STAR within the box containing the line graph; placement of the ENERGY STAR in the bottom right corner of the EnergyGuide was vastly preferred and many respondents indicated it would be more effective in this location.

Survey Research

Through the qualitative research phase of the project, the alternative label designs were refined and the least promising designs eliminated. Two additional research tasks were developed to test the findings of the qualitative research among a larger sample of consumers.

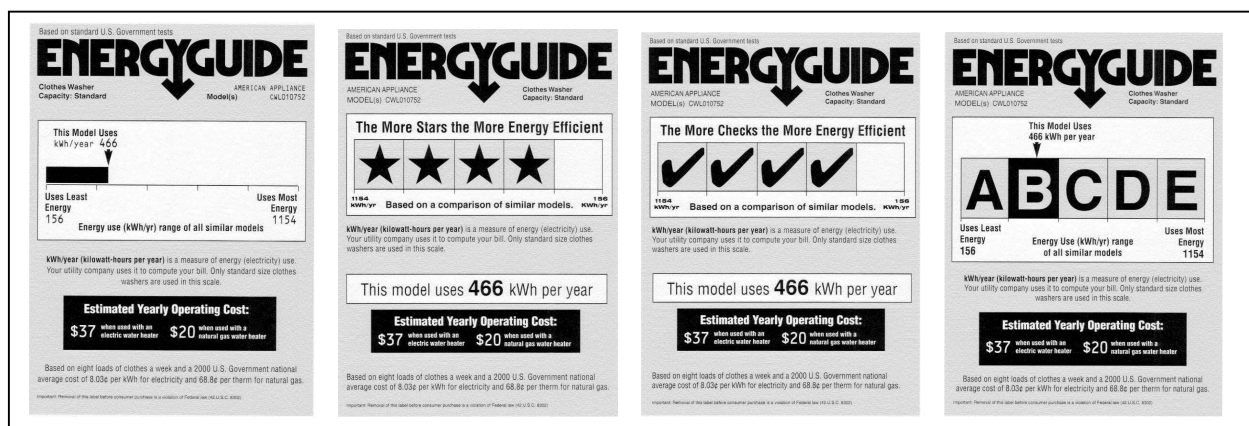
Consumer Survey

A total of 500 surveys were completed with homeowners through mall intercept interviews in five cities to determine which among the lead label concepts has the highest rate of comprehension and motivating ability. Based on the results of the third round of focus groups, discussed above, five label designs were tested, including three categorical designs (letters, stars and checks) and two continuous designs (the current label and the modified bar with scale). Figure 4 shows the four alternate label executions evaluated. Half of the respondents saw and evaluated the five labels with the ENERGY STAR in the bottom right corner of the label (not shown here) and half saw and evaluated the five labels without it.³ The order in which the labels were shown was systematically varied across respondents.

First, respondents were shown a single label design (each representing the same model and energy performance) and asked to rate the label on a scale of 1 to 10, where 1 is not at all and 10 is extremely, in terms of:

- attention-grabbing ability;
- ease of understanding;
- amount of information;
- credibility or believability; and
- ability to encourage consideration of energy use in purchase.

Figure 4. Alternate Labels Tested in Consumer Survey



³ If the consumer was evaluating labels with the ENERGY STAR, the ENERGY STAR would only appear on labels for qualifying appliances in the set of three labels.

To test comprehension of the label, respondents were asked to identify the level of energy efficiency depicted for each label. In the second test of comprehension, respondents were presented with three versions of the same label execution—each with a different kilowatt-hour level—and asked to identify which model they would be most likely and least likely to recommend to a friend, assuming each model had similar features and operating costs were important. Finally, respondents were shown all five labels, left to right, in the same order that they originally saw the labels. Respondents were asked which of the labels:

- they would be most and least likely to read;
- best communicates the energy efficiency of the appliance and which is second best;
- would be most and least likely to motivate them to consider energy use in their purchase and why; and
- is currently in use, if any.

Table 3 summarizes the key results of the consumer survey, which concur with the earlier focus group results.

Table 3. Key Findings of the Consumer Survey

Test	Results
Comprehension: ability to correctly identify efficiency level when each label presented one at a time	<ul style="list-style-type: none"> • Stars and checks labels had the highest rates of correctly communicating the energy efficiency level of the appliance • Current line graph and letters labels had the lowest rates of correctly communicating the energy efficiency level • Results are statistically significant at 95% confidence level • Presence or absence of ENERGY STAR does not impact ability to correctly identify efficiency level of appliance
Comprehension: ability to correctly identify most and least efficient appliance from set of three labels	<ul style="list-style-type: none"> • More than 75% of respondents correctly identified most and least efficient model • Respondents more able to correctly identify most efficient model using the checks label than the letters label • Respondents more likely to give no correct answers with bar with scale label than stars label • ANOVA shows that while differences are minor, they are more than would be expected by chance • ENERGY STAR improves comprehension as measured by this test—respondents are significantly more likely to identify the most efficient model when the ENERGY STAR appears on it, regardless of label execution
Perception: ability to motivate consideration of energy in purchase	<ul style="list-style-type: none"> • Stars and checks rated significantly better than all other labels • Bar with scale label rated better than current line graph label
Perception: most and least motivating labels	<ul style="list-style-type: none"> • Stars (45% most motivating, 2% least motivating) • Checks (20% most, 6% least) • Bar with scale (14% most, 23% least) • Letters (12% most, 23% least) • Current line graph (4% most, 43% least)
Perception: ease of understanding the label	<ul style="list-style-type: none"> • Stars and checks labels easier to understand than all other labels • Letters and bar with scale labels easier to understand than current line graph label • Ratings for stars and checks labels significantly higher, thus stars and checks were rated as most easily understood • More respondents rate each label execution easy to understand when it has ENERGY STAR (55%) than when it does not (49%)

In summary, the survey results suggest that the best label design for U.S. consumers in terms of ease of understanding and motivating ability is based upon stars. Checks are a close second but appear to have less motivating capacity than stars. The bar with scale was an improvement over the current label but not as easily understood or motivating as either stars or checks. It is also interesting to note that most respondents were unable to correctly identify the current label from the group of labels shown.

Simulated Shopping Experience

A total of 204 homeowners, including 49 married couples, were recruited to “shop” for clothes washers and water heaters in a simulated retail environment. Appliances were displayed on a mock shopping floor along with prices, feature cards, and manufacturer point-of-purchase materials. Participants were asked to select the model of each appliance that they would most likely purchase and answer a series of questions about their choices. Based on the results of the consumer survey, the stars and bar with scale label were tested as the most preferred categorical and continuous labels, respectively. Each participant saw the stars label on one appliance type and the bar with scale label on the other; the order in which each label design was seen and evaluated was varied across respondents.⁴ Respondents were not notified that energy use and the EnergyGuide label were the subjects of the study. Figures 5 and 6 are samples of the labels displayed in this simulated shopping environment.

Figure 5. Stars Label

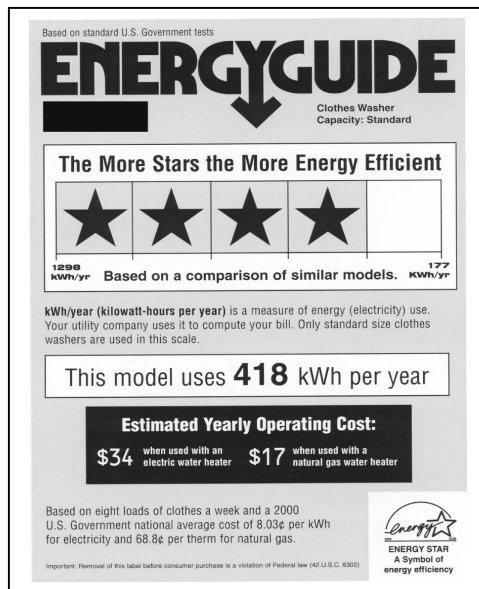
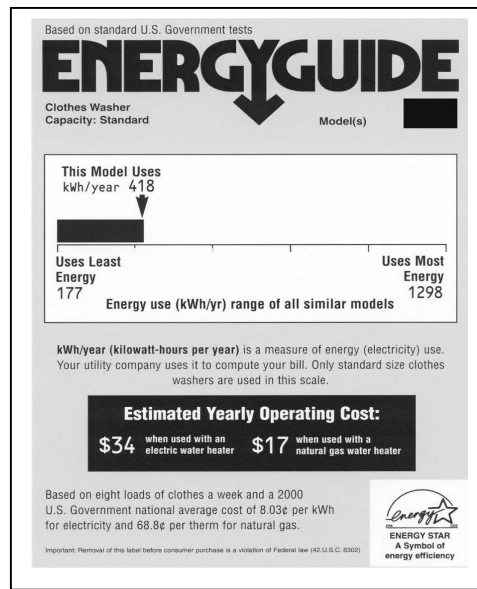


Figure 6. Bar with Scale Label



The shopping experiment was developed in response to concerns that categorical rating systems, particularly the stars-based rating, might mislead consumers by implying product quality in addition to energy efficiency. Thus, the main purpose of the study was to test the impact of each label design on consumer purchase decisions and perceptions of

⁴ Since earlier studies strongly supported the need for improvements to the current EnergyGuide label, and the stars label and the bar with scale label emerged from earlier tasks as the optimal categorical and continuous style designs, respectively, these labels were selected for this final test.

product quality and value.⁵ In addition, the study represents the only research task where participants did not focus on the energy labels being tested. By simulating a real-world shopping environment, the study allowed investigation of label comprehension and the role of energy efficiency in appliance purchasing decisions in the retail environment. Earlier exploration of these issues was limited by the research setting in which the focus groups, interviews, and surveys were conducted.

Once on the mock shopping floor, respondents were asked to look at the appliances on display and select the model they would most likely purchase. Overall, there were no systematic differences in the products most likely to be purchased based on the label displayed. However, the most efficient washing machine was more likely to be selected when accompanied by the stars label than the bar label. When asked the reasons for their purchase preferences, respondents most frequently cited energy efficiency as the reason for their water heater selection. For clothes washers, energy efficiency was the fourth most frequently cited reason after features, price, and capacity.

After reporting their purchase preferences, respondents were asked a series of questions about their perceptions of the quality and value of the appliances on the shopping floor. In general, respondents' perceptions of the quality of the appliance models in the study did not differ in any systematic way by label type. However, there were a few individual differences. For example, the second most efficient water heater was perceived to be of higher quality by respondents who saw the bar label on water heaters than by those who saw the stars label. Respondents who saw clothes washers with the stars label perceived the fourth most efficient washer—the least efficient ENERGY STAR model—to be of higher quality than those who saw the bar label. The least efficient clothes washer was rated at below average quality more often when displayed with the stars label than the bar label.

Perceptions of appliance value also revealed little variation by the label displayed. Respondents were more likely to consider the least efficient clothes washer, as well as the least efficient of the ENERGY STAR models, as a below average value when the models were displayed with the stars label than the bar label. On the other hand, a relatively inefficient clothes washer model was considered to offer higher than average value by a significantly higher portion of respondents who saw the model with the bar label. These findings seem to suggest that the stars label helped respondents distinguish poor values among the less efficient models. There were no significant differences in value perceptions by label for the water heaters.

Energy efficiency was an important determinant of appliance quality and value regardless of the label displayed. On an unaided basis, respondents most frequently named energy efficiency as an attribute differentiating between above and below average quality water heaters. Energy efficiency was the second most frequently named attribute of quality, after features, for clothes washers. When considering appliance value, energy efficiency was the most frequently named determinant of above and below average value for both clothes washers and water heaters. The importance of energy efficiency in participants' perceptions of appliance quality and value was the same for each label. Before entering the simulated shopping environment, respondents were asked to rate the importance of a number of appliance features when making appliance purchases. Respondents placed a higher

⁵ The survey instrument did not define *quality* or *value*—shoppers assigned their own meanings to terms which we treated as independent variables in our analysis.

importance on energy efficiency when determining appliance quality and value in the shopping environment than they did in their responses to these questions.

In summary, the differences among the appliances most likely to be purchased based on the label design were modest. There is some evidence that respondents were more likely to purchase an efficient model when they saw the stars label than when the bar label was displayed. Label design had no systematic impact on respondent perceptions of appliance quality. However, the stars label did communicate less value for the inefficient models with higher operating costs.

New Research Findings

Overall, the third set of focus groups, consumer survey, and shopping experiment verified the findings of the earlier research tasks. Specifically, the current EnergyGuide design—tested in the focus groups and consumer survey—was considered visually unappealing and difficult to understand by many respondents. Alternate designs incorporating a number of improvements to the current label were well-received by study respondents. In particular, the stars-based categorical label continued to garner positive responses and emerged as the most promising label design. Furthermore, the survey results demonstrated that stars and checks labels had the highest rates of comprehension and were easiest to use. The bar with scale continuous label also represents a marked improvement over the current label, although it was not as visually appealing, easy to use, or motivating as the stars label. Finally, when tested in a simulated shopping environment, neither the stars label nor the bar with scale communicated misleading information about product quality beyond energy efficiency.

The third round of focus groups and the consumer survey also explored the interaction of the ENERGY STAR endorsement label with the EnergyGuide label and proposed categorical rating schemes, an issue that was not addressed in the earlier research tasks. Results show that consumers recognize the ENERGY STAR as an endorsement label that is separate from the comparative function of the categorical rating scheme used on the EnergyGuide.

Discussion and Recommendations

Findings of our two-year evaluation reveal the limited impact that the current EnergyGuide label has on the product choices made by U.S. consumers. Although consumers are familiar with the “yellow energy label,” use of the label appears to be low. In fact, most consumers were unable to correctly identify the current label from a group of different label designs, despite the fact that most had recently purchased an appliance or were currently shopping for one.⁶ Findings provide strong evidence that the EnergyGuide can be redesigned to improve consumer comprehension, encourage wider use of the label, and motivate consumers to consider energy use when purchasing a labeled appliance. Table 4 summarizes overall research findings—including the results of earlier research tasks—according to label element.

⁶ For focus groups, we recruited participants who had purchased an appliance within the past 12 months or were currently shopping for one. Interviews were conducted in retail stores with consumers we observed shopping for appliances. Among survey respondents, 80% had purchased a major appliance within the past 2 years.

Table 4. Summary of Key Research Findings

Label Element	Key Findings
Color	<ul style="list-style-type: none"> • Keep yellow background • Keep EnergyGuide logo with current font
Graphical comparison: continuous or categorical?	<ul style="list-style-type: none"> • Categorical preferred with stars easiest and most motivating • Continuous can be improved—bar with scale marks the most significant improvement over existing bar
Categorical labels: different rating schemes	<ul style="list-style-type: none"> • Stars outperform checks and letters as recognized rating—stars are intuitive and most motivating • Checks and letters have confusing meanings or are visually unappealing; stars more familiar, clear, and attention-grabbing
Informational elements	<ul style="list-style-type: none"> • Consumers find operating cost most important but want energy use too
Level of text	<ul style="list-style-type: none"> • Current label too wordy and intimidating but most information is desired • Medium-high verbiage provides appropriate level
Interaction with endorsement label	<ul style="list-style-type: none"> • ENERGY STAR label with graphical element, as currently recommended, is confusing and visually unappealing • Preferred ENERGY STAR placement in bottom right-hand corner of label • ENERGY STAR label is complementary and mutually reinforcing to categorical, as well as continuous, rating schemes

Overall, most consumers preferred a categorical rating system to a continuous-scale graphical design. Categorical ratings are easy to use and quick to decipher. Among the categorical rating systems tested, a clear preference for a stars-based rating emerged. Letters and check marks often had confusing meanings to consumers, whereas stars are familiar and intuitive. The stars rating also proved easiest to understand and most motivating. Furthermore, consumers found the stars rating system complementary with the ENERGY STAR label and certification. Figure 5 shows the optimized stars label.

Of the continuous label designs tested, a bar graph with scale marks, as shown in Figure 6, appears most promising. This label was preferred to the current label design but failed to test as well as the stars label for its visual appeal, attention-grabbing ability, ease of understanding and use, and motivating ability. Both of the optimized labels provide the necessary information elements and preferred level of text with each informational element clearly grouped together and blocked off using the same text style and color. Similarly, the ENERGY STAR is set off from the label graphic in accordance with consumer preferences. Importantly, neither of these labels was found to mislead consumers by implying quality or other characteristics beyond energy consumption.

Next Steps

As the discussion above demonstrates, there is strong evidence that improvements to the current EnergyGuide label are possible. In particular, a categorical system based upon stars is most promising. Any change to the EnergyGuide label would have to offer savings substantial enough to outweigh the impacts on the supply-side actors responsible for implementing the program. Estimated potential energy savings are on the order of 0.25 quads once the current appliance stock has turned over.⁷ The optimized stars label shown in Figure

⁷ A rough “order of magnitude” estimate of potential energy savings provides an indication of the importance of appliance labels. According to the Residential Energy Consumption Survey (EIA 2000), products covered by the FTC labeling program consumed approximately 13 quads of primary energy in 1997. If we estimate (based on the limited research conducted) that a revised label affects purchase decisions by 20% of consumers, and that

5 appears to meet these requirements. Based on our research findings, the stars label builds on the familiar yellow EnergyGuide format, incorporating the well-recognized stars-based rating system, enhanced presentation of key informational elements, preferred ENERGY STAR placement, and an optimized level of explanatory text.

As this paper is being written, a petition is being drafted requesting that the FTC incorporate the project findings into a redesign of the EnergyGuide label. The petition will recommend adoption of a stars-based categorical label as the best design for informing U.S. consumers and motivating their consideration of energy efficiency when purchasing appliances. A less preferred option for FTC consideration is to retain a continuous-style label that is redesigned to enhance its visual appeal, message communication, and information organization.

Whatever the outcome of the petition process, an education campaign should be developed and implemented to improve consumer awareness of the label and the information it provides and to assist consumers in using the label when making appliance purchases.

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each affected consumer saves 10%, then nationwide energy savings would amount to roughly 0.26 quads annually, once the existing appliance stock has turned over.

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