The ENERGY STAR® Label: A Summary of Product Labeling Objectives and Guiding Principles

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This summary document provides an overview of the key principles that guide the US Environmental Protection Agency (EPA) and the US Department of Energy (DOE) when first determining which product categories will be covered by the ENERGY STAR label and then developing and revising the corresponding performance specifications. It begins with a brief introduction followed by a discussion of program objectives and six guiding principles.

Introduction

Introduced by the EPA in 1992 for energy-efficient computers, the ENERGY STAR program has grown to encompass more than 35 product categories in addition to new homes and commercial buildings. For each product category, a unique specification describes the energy performance requirements that a product must meet to qualify for the label. Product manufacturers may use the label to identify those models that meet the energy performance requirements.

Objectives

The ENERGY STAR label was established to achieve the following two objectives:

- To prevent air pollution, including emissions of greenhouse gases, caused by the inefficient use of energy.
- To make it easy for businesses and consumers to identify and purchase products, homes, and buildings with enhanced efficiency that offer savings on utility bills while maintaining, if not enhancing, performance, features, and comfort.

The EPA and DOE use a systematic framework (1) to assess the feasibility for applying the label to a product category; (2) to develop performance specifications that must be met in order to earn the label; and (3) to reassess performance specifications as market conditions change. This process relies on rigorous market, engineering, and pollution savings analyses as well as input from industry and other stakeholders. To ensure that the ENERGY STAR label remains an effective consumer tool, EPA and DOE strive to ensure that the resulting performance-based

specifications identify energy-efficient products whose use results in reasonable financial return without sacrificing product performance or features.

Guiding Principles

To determine the feasibility for any new ENERGY STAR product category and the corresponding performance-based specifications, EPA and DOE follow a set of six key principles. It is important to note that these principles are not applied as a strict checklist per se. However, they are used as guidance during an iterative process to achieve the desired balance among the principles. The ultimate viability of an ENERGY STAR specification in the marketplace depends upon many factors. However, the success of a specification can be more reasonably assured through the application of these principles.

1. Significant energy savings can be realized on a national basis.

EPA and DOE seek to identify product categories that can contribute significant energy savings nationwide. An ENERGY STAR specification can achieve sizable energy savings from a product category where there are significant savings on a unit basis and relatively small annual unit sales or, where there are relatively small energy savings on a unit basis, but very large annual unit sales (see Examples 1 and 2). To determine energy savings potential, EPA and DOE collect and analyze a variety of factors, including, but not limited to the following:

- Number of products sold nationwide and widespread availability
- Market growth rates
- Amount of energy used by product in various power modes as appropriate (e.g., active, sleep, and standby/off power modes)
- The product's typical usage pattern (i.e., amount of time spent in each of the various modes of operation)
- Amount of energy that may be saved through the application of different technologies, operating procedures, or design practices
- Product lifetimes

- Applicable standards and legislation that may affect a product's energy consumption and availability
- Extent to which potential energy savings may be impacted by installation practices or system interactions

It is EPA and DOE's goal to create ENERGY STAR specifications for only those product categories where it is clear that the energy savings potential of a product will translate into tangible energy savings when the product is placed in a home or building. That is, installation or system integration issues have little or no impact on a consumer's ability to realize the product's energy efficiency. This is essential to building and maintaining consumer confidence in the ENERGY STAR label. As a result, the Agencies are very cautious about labeling products that are components of larger building or industrial systems (see Example 3).

EXAMPLE 1: An ENERGY STAR qualified air-source heat pump saves a substantial amount of energy – close to 2,300 kWh per year compared to a conventional new model. In 2002 year, ENERGY STAR qualified units save enough energy to light 160,000 homes for an entire year. This is a significant energy savings, considering the fact that fewer than 1.4 million air source heat pumps are sold annually.

EXAMPLE 2: Among the many reasons TVs were identified as an attractive product for a national program, one of the most important was their large annual unit sales. The per unit energy saved in off/standby mode by a typical ENERGY STAR qualified television does not appear significant when compared to a non-qualified model. On average, up to 4 watts are saved. However, millions of TVs are sold nationwide each year and installed in homes where they spend the majority of the day in off/standby mode. Thus, if models that have earned the ENERGY STAR replaced half of all household TVs, this change would eliminate the air pollution produced by one entire power plant.

Starting in 2005, in order for TVs to qualify for ENERGY STAR, a model must use one watt or less in off/standby mode. Once this specification is in place, it is unlikely that the specification would be further reduced during future revisions. The amount of energy savings possible from further reducing the wattage requirements may not be significant enough to warrant the change, unless there is a major technology advancement or a technologically feasible way to address the energy consumption of TVs in other power modes.

EXAMPLE 3: Due to interest from various stakeholders, EPA evaluated the feasibility of an ENERGY STAR specification for integral electric motors. After extensive research and discussion, EPA concluded that systems integration issues made it not possible at this time to guarantee that the installation of an energy-efficient motor would also yield an energy-efficient system.

2) Product performance can be maintained or enhanced with increased energy efficiency.

EPA and DOE seek to maintain the ENERGY STAR label as an attractive purchasing tool for a broad array of consumers. This is accomplished by ensuring that the label is not only a credible symbol for energy efficiency, but that it is also found on products with the features and performance that consumers demand. The Agencies would expect few consumers to choose more efficient products if it required sacrificing performance, non-energy-related features, or functionality. The Agencies will continue to examine the following factors when determining the feasibility of new ENERGY STAR product categories and performance-based specifications, to ensure that product quality, features, and functionality are not compromised.

- Safety
- Performance
- Warranty
- Size/capacity/fuel source
- Speeds (e.g., print speed)
- Product sub-categories (e.g., component TV unit)
- Other features that consumers consider in making purchasing decisions

For example, when appropriate, EPA and DOE create specifications that address different fuel types, so that consumers may find the right products for the fuel type in their home, as most make product replacements without switching fuel types. Although one fuel type may be inherently more efficient for certain product categories, when considering the cost of switching to that other fuel type, the purchase may no longer be cost-effective to the consumer.

Often the product performance principle is easily followed, given that many energy-efficient product models are also considered to be of the highest quality with a wide range of features that consumers typically desire (see Example 4). In some cases, EPA and DOE have determined that it is preferable to develop multiple specifications, by dividing up a product category that has a wide range of performance functionality, each requiring different amounts of energy. This

approach allows consumers to find an efficient model in a product size, speed, or other sub-

> EXAMPLE 4: ENERGY STAR qualified dehumidifiers provide energy savings as well as other key features such as enhanced moisture removal, quiet operation, reliability, and durability.

category without unnecessarily limiting choice (see Example 5). In other cases, EPA and DOE have included particular performance-based criteria in the ENERGY STAR specification to ensure that overall product performance is maintained relative to non-qualifying product (see Example 6 and 7). In still other cases, EPA and DOE have determined that a product category is inappropriate for the ENERGY STAR label at this time because of performance expectations (see Example 8).

> EXAMPLE 5: The ENERGY STAR specification for printers provides different energy performance requirements for basic printer types, e.g., standard size vs. large format; and colors vs. black and white. This allows consumers to find an efficient model in the specific product segment they require.

> EXAMPLE 6: The ENERGY STAR specification for residential light fixtures includes requirements for lamp start time, lamp life, noise, dimming capability, and safety. This ensures that ENERGY STAR qualified residential light fixtures are high quality as well as compliant with National Fire Protection Association (NFPA) 70, and the National Electrical Code.

> EXAMPLE 7: Compact fluorescent light bulbs (CFLs) had a poor quality history and lacked any product standards. To address common problems of premature failure and poor light quality of CFLs, DOE developed ENERGY STAR specifications for CFLs that include minimum energy efficiency and efficacy levels along with product lifetime, lumen maintenance, photometric qualities, warranty, and third party testing requirements. As a result CFL customers who choose ENERGY STAR qualified units are better assured of a quality purchase.

> EXAMPLE 8: In the case of automobiles, many consumers are very specific about the performance, size, and features of the cars they intend to purchase. It is also very likely that these desired qualities are not found in the most efficient cars. Therefore, at this time, an ENERGY STAR specification has not been pursued, as there is no feasible way to design a specification that would satisfy both energy efficiency and other performance aspects of cars.

3) Purchasers will recover their investment in increased energy efficiency within a reasonable period of time.

Some energy-efficient products may have a price premium while others do not. In both cases, ENERGY STAR's consumer educational materials explain that all products that use energy have *two* price tags: 1) the initial cost of the product at the time of purchase, and 2) the cost of energy to operate that product over its lifetime. In evaluating the cost effectiveness of a specification for ENERGY STAR qualified products, the following factors are examined:

- Product lifetimes
- Additional cost of energy saving technologies for the manufacturer
- Incremental cost of increased efficiency of products (versus the incremental cost of other product enhancements) as passed onto the purchaser
- Price of energy
- Additional testing that may be needed to qualify as ENERGY STAR
- The geographic distribution of sales (e.g., North vs. South)
- Prevalence of rebates or other incentives for the purchase of energy-efficient products

ENERGY STAR specifications are set so that if there is a cost differential at time of purchase, that cost is recovered through utility bill savings over a reasonable period of time for the typical consumer (see Examples 9, 10, and 11).

EXAMPLE 9: An ENERGY STAR qualified torchiere has an average cost differential of about $30 ($85 for ENERGY STAR, $55 for conventional). However, a consumer will recover this cost in less than two years, given the annual savings for a qualified torchiere are approximately $25. These savings include lower electricity costs and lower bulb replacement rates.

EXAMPLE 10: Purchasers of ENERGY STAR qualified commercial solid door refrigerators and freezers can expect to save $140 annually per refrigerator and $100 annually per freezer. These purchasers will recover their increased cost at the time of purchase within 2 years.

EXAMPLE 11: There is no incremental cost between ENERGY STAR qualified DVD players and those that do not qualify for ENERGY STAR. Therefore, this principle need not be evaluated, as there is no increased initial investment to recover.

4) **Energy-efficiency can be achieved with several technology options, at least one of which is non-proprietary.**

ENERGY STAR is an effective marketing tool that may convey a business advantage to manufacturers that use it. As such, EPA and DOE are careful not to favor one manufacturer over all others by designating a proprietary technology or unique design approach when developing the performance attributes of an ENERGY STAR product specification. To ensure that specifications are set so that more than one manufacturer can meet them with at least one of their product models, the following factors are considered and evaluated:

- Number of companies that manufacture a product type
- Availability, variety, and cost-competitiveness of energy-saving technologies
- Proprietary or exclusive nature of any technologies in use

EXAMPLE 12: The ENERGY STAR specification for cordless telephones was set at a level such that manufacturers could implement any of several design options to meet the required efficiency. These options included employing: more efficient power supplies; smart charging technology, which prevents battery overcharging; smart circuitry that disengages when the unit is turned off or in its standby mode; and/or low power LED lights on product displays. These options are widely available, cost-effective, and not proprietary in nature.

5) Product energy consumption and performance can be measured and verified with testing.

Product testing has two roles: 1) to yield accurate energy consumption values for products whose manufacturers are hoping to earn the label, and 2) to verify that labeled products are performing at the appropriate levels and delivering on ENERGY STAR's promise to consumers. When assessing the viability of a product category to be covered by ENERGY STAR, and when developing specific performance-based specifications, EPA and DOE make every effort to choose energy performance metrics (e.g., CFM/W, cubic feet per meter per watt; AFUE, Annual

Fuel Utilization Efficiency) for which an industry accepted test procedure exists and is in use by manufacturers. It is critical that the Agencies, in concert with product manufacturers and other stakeholders, work closely to fine-tune the selected test procedure to ensure it accurately and repeatedly measures the energy consumption of a product, regardless of who is conducting the testing. The following are examples of organizations that may be sources for product test procedures and knowledge:

- The United States Federal Government Code of Regulations (CFR)
- American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)
- American Society of Testing and Materials (ASTM)
- American National Standards Institute (ANSI)
- Canadian Standards Association (CSA)
- International Electrotechnical Commission (IEC)
- Individual trade organizations: American Home Appliance Manufacturers (AHAM), Air Conditioning and Refrigeration Institute (ARI), Illuminating Engineering Society of North America (IESNA), Home Ventilating Institute (HVI).

At other times, existing industry test procedures may not be entirely appropriate for use by ENERGY STAR, or may not exist at all. In this case, the Agencies must take the lead, while working closely with manufacturers and other stakeholders, to develop an appropriate test procedure that yields accurate and precise (repeatable) energy consumption values for the units under test (see Example 13).

> EXAMPLE 13: Before a specification for ENERGY STAR qualified ceiling fans was created, an accepted industry test procedure to measure the energy consumption of ceiling fans did not exist. Due to manufacturer and retailer interest in a specification and the potential opportunity for energy savings, EPA worked closely with all stakeholders to create a technically sound test procedure and implementation manual.

6) Labeling would effectively differentiate products and be visible for purchasers.

As previously described, a goal of ENERGY STAR is to provide value to purchasers by enabling them to easily identify energy-efficient products that have earned the ENERGY STAR label. To achieve this goal, EPA and DOE have set specifications that may be met by only the most efficient products. This level typically represents approximately the top quartile of products currently available in the market at the time the specification is initially set. By recognizing the top quartile, EPA and DOE distinguish these products from the others, thereby adding to their intrinsic value.

Observing variations in the energy performance of models in a product category is important for ENERGY STAR to design a specification and to serve in this differentiation role. Moreover, the more extreme the spectrum of energy performance among models, the larger the potential magnitude for energy savings that may result from a product specification. If all product models used approximately equal amounts of energy, then an ENERGY STAR specification would not be pragmatic (see Example 14).

In some cases, very few models may meet the ENERGY STAR specification when it is initially set. Through research and analysis prior to setting the specification, EPA and DOE may conclude that manufacturers could implement relatively simple design changes to modify product models to enhance their energy-efficiency. With these design changes, sufficient numbers of models will qualify and ENERGY STAR will identify the more efficient products on the market (see Example 15).

EXAMPLE 14: An ENERGY STAR specification for stovetops has not been developed given that no significant variation in energy consumption exists among the product models. The basic technology employed by most manufacturers is similar for most conventional stovetop models.

EXAMPLE 15: When the ENERGY STAR specification for water coolers was first developed, very few, if any, models were able to qualify. However, the addition of insulation and timers were considered very feasible, and likely to be the sole prerequisites needed to meet the specification. Over time, several manufacturers have altered their designs to qualify a number of water cooler models.

Once an ENERGY STAR specification is in place for some amount of time, market conditions and the available model mix may change, resulting in a majority of models meeting the specification. Thus, the label would no longer serve as a differentiator. This scenario dictates that EPA and DOE reassess the specification and potentially revise it, so that the label again serves to identify the most efficient models. In effect, the specification development cycle begins again driven by the application of ENERGY STAR's guiding principles, as outlined above.