

ENERGY STAR® Products Program

Strategic Vision and Guiding Principles

Strategic Vision

The ENERGY STAR product labeling program reduces greenhouse gas emissions by removing barriers in the market that deter consumers and businesses from easily identifying the financial and environmental benefits of purchasing the most energy efficient product model that otherwise meets their needs. Historically, these barriers have included confusion about what constitutes an energy efficient product, difficulty identifying which products are highly efficient and a lack of appreciation of the value efficient products offer. In particular, the program seeks to reduce greenhouse gas emissions using the following approach:

- Establishing a common, objective basis for defining what constitutes high efficiency for a particular product type
- Providing the market with an easy way (i.e. the ENERGY STAR label) to identify products that qualify
- Helping build and sustain demand for highly efficient products through education and outreach and by ensuring that the products deliver on consumer expectations

Program Design

The ENERGY STAR product labeling program overlays the consumer perspective as part of an ongoing process to identify and promote products that reduce greenhouse gas emissions by meeting the highest energy conservation standards. These standards (aka performance specifications) are established to recognize products that are cost-effective from the purchaser stand-point; offer at least equivalent functionality and features as standard products; and are proven and broadly available.

Independent product certification, by parties recognized by EPA, ensures that ENERGY STAR labeled products deliver promised energy and greenhouse gas savings. As the market responds to consumer demand for ENERGY STAR qualified products in a particular category, sales of highly efficient products increase, locking in more and more energy savings and environmental benefit over the life of those units. In the process, because of technological advances and/or reduced production costs, opportunities present themselves to raise the bar over time in terms of what constitutes a highly efficient product in a given category.

The Environmental Protection Agency (EPA) uses 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 other programs in EPA, industry and other stakeholders.

The Department of Energy (DOE) leads the development of product testing procedures and metrics, performs verification testing and provides technical support in the development of ENERGY STAR product specifications.

Guiding Principles for Establishing New or Revised ENERGY STAR Specifications

In establishing or revising an ENERGY STAR product performance specification, EPA employs a set of six key principles. It is important to note that these principles are not applied as a strict checklist per se. The ultimate viability and environmental impact of an ENERGY STAR specification in the marketplace depends upon many factors. The principles are used as guidance during an iterative process to achieve the desired balance among the principles, using the best available market information. The success of a specification can be more reasonably assured through the application of these principles.

Experience has shown that it is typically possible to achieve the necessary balance among principles by selecting efficiency levels reflective of the top 25% of models available on the market when the specification goes into effect.

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

Product categories covered by ENERGY STAR can contribute significant greenhouse gas and 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 limited annual unit sales (e.g. commercial kitchen equipment) or, where there are relatively small energy savings on a unit basis, but very large annual unit sales (e.g. laptops). To determine greenhouse gas and energy savings potential, EPA analyzes 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, idle, 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
- Any confounding issues that could interfere with the product-level savings being realized

In general ENERGY STAR specifications are created only for 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 the ability to realize the product's energy efficiency. This is essential to ensuring ENERGY STAR qualified products deliver promised savings and to maintaining trust in the label. As a result, the Agency is very cautious about labeling products that are components of larger building or industrial systems. In limited circumstances, EPA has coupled a product label (e.g. for central air conditioners) with additional market intervention intended to address installation or use issues (e.g. ENERGY STAR Quality Installation).

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

EPA seeks to maintain the ENERGY STAR label as an attractive purchasing tool for a broad array of consumers by delivering on the concept that energy efficiency does not need to take away from product

performance. 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 Agency would expect few consumers to choose more efficient products if it required sacrificing performance, features or functionality. As such, the Agency examines factors such as size, speed and delivered output (e.g. lumens for lighting) and establishes performance-based efficiency requirements, where appropriate, to avoid trade-offs that compromise consumer satisfaction. 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. In some instances, conservative energy allowances are specified to accommodate particular features without compromising overall energy savings. In other cases, EPA has determined that it is preferable to develop multiple specifications, by dividing up a product category that has a wide range of features and functionalities that result in great variation in energy use. This approach allows consumers to find an efficient model in a product size, speed, or other sub-category without unnecessarily limiting choice. For example, the ENERGY STAR specification for imaging equipment provides different energy performance requirements for copiers, printers, and multi-function devices based on their basic type, e.g., standard versus large format, and color versus monochrome. EPA also recognizes that having numerous sub categories within a specification can work against providing clear information to consumers. As such, the Agency works to avoid subdividing categories beyond what is necessary to account for intended functional variation. As applicable, ENERGY STAR specifications treat different fuel types separately, so that consumers may find the right products for the fuel type in their home, as most make product replacements without switching fuel types.

While energy efficiency remains the basis upon which top performers are selected, EPA has a longstanding practice of including criteria related to other aspects of product performance in ENERGY STAR specifications to ensure that overall product performance is maintained relative to a non-qualifying product. To the extent these types of requirements are included, the Agency leverages existing standards and looks to achieve a minimally acceptable level of performance (i.e. not one that is overly stringent/difficult to achieve). By including additional criteria, the ENERGY STAR program seeks to avoid associating the label with poor quality or otherwise undesirable product models, thereby preserving the influence of the label in the market. For example, ENERGY STAR specifications have addressed product performance by including requirements related to start time, brightness, noise, ease of use, lifetime and warranty. They have also accommodated the general concern consumers have regarding resource, health and cost impacts associated with water, toxics and waste minimization, as well as the interest consumers have in standardized product information and communication capabilities. These types of requirements are incorporated, not as a general principle, but on a case-by-case basis where relevant (e.g. water requirements for water using products) and as advances within a category make them feasible (e.g. design for recyclability in consumer electronics). Examples include requirements related to water use, toxics limits, safety and data reporting. Similarly, in circumstances where the energy use associated with especially large models within a product category exceeds what might credibly be labeled as energy saving and good for the environment, EPA may limit the scope of the relevant ENERGY STAR specification or subject the largest models to requirements more in line with the performance of standard-sized models.

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, EPA examines:

- 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; and the
- Price of energy

In applying this principle, EPA recognizes that product prices can vary dramatically and are a function of a range of different product features and consumer circumstances. The test is not for every model that carries the label to be cost effective or even for those in a single category to be cost effective on average. Instead, this assessment tends to be made based on individual price comparisons between models that are similar except in terms of energy performance. To the extent energy efficiency is sometimes bundled with other high-end product features, it is sometimes difficult to isolate the cost of the energy savings technology.

EPA may also consider the prevalence of rebates or other incentives for the purchase of energy-efficient products in evaluating cost effectiveness.

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, generally within the life of the products generally between 2 and 5 years.

4. Energy-efficiency can be achieved through one or more technologies such that qualifying products are broadly available and offered by more than one manufacturer.

ENERGY STAR is an effective marketing tool that conveys a business advantage to manufacturers that use it. As such, EPA is careful not to favor one manufacturer over all others by designating a proprietary technology or unique design approach when establishing or revising 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

If a specification cannot be established in this manner, for example, there is only one manufacturer of a type of product, or one manufacturer has a patent on the only technology that will make a product more efficient, the Agency will not proceed with an ENERGY STAR specification for this product category.

Further, where a product category consists of multiple technologies, ENERGY STAR specifications generally take a technology neutral approach to helping consumers identify the most efficient products within the category. For example, the ENERGY STAR specification for monitors applies one performance level regardless of whether the technology is CRT or LCD. In situations where technology is a dominant factor in consumer choice, such as gas furnaces versus oil furnaces (because of the fuel type), ENERGY

STAR specifications can be divided into sub-categories with different performance requirements, as appropriate.

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

Product testing has two roles: 1) to yield accurate and repeatable energy consumption values for potentially qualifying products, and 2) to verify that labeled products are performing at the appropriate levels and delivering on ENERGY STAR's promise to consumers. EPA generally relies on test procedures developed and maintained by the U.S. Department of Energy (DOE) for the ENERGY STAR program. When assessing the viability of a product category to be covered by ENERGY STAR, and when developing and revising performance-based specifications, energy performance metrics (e.g., CFM/W, cubic feet per meter per watt; AFUE, Annual Fuel Utilization Efficiency) are chosen to match those of products covered by DOE's regulatory program and for which DOE already has developed a test procedure or can leverage and verify an industry accepted test procedure in use by manufacturers. Examples of sources for potential product test procedures and knowledge include but are not limited to: American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE), American Society of Testing and Materials (ASTM), International Electrotechnical Commission (IEC), and individual trade organizations.

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 sets and revises specifications so they reflect the performance of products meeting the highest conservation standards. By recognizing the top performers, EPA distinguishes 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 and would not be established.

In limited cases, the ENERGY STAR specification when it is initially set does not reflect the performance of products currently on the market. Different from the typical specification setting process, this situation arises when research and analysis indicate that manufacturers could implement relatively simple design changes to modify product models to enhance their energy-efficiency. For example, the addition of insulation and timers on water coolers were considered very feasible and low cost and likely the only prerequisites needed to meet the ENERGY STAR specifications. With these design changes, a sufficient selection of models will qualify and the ENERGY STAR label will identify the more efficient products on the market.

Guiding Principles for When to Revise ENERGY STAR Specifications

Since the first ENERGY STAR specification went into effect in 1992 for desktop computers and monitors, more than 150 revisions have been effective across more than 60 product categories. The circumstances prompting a revision have varied but include

- Significant increase in market penetration of ENERGY STAR qualified models
- Change in the Federal minimum efficiency standards
- Technological advancements
- Product availability limitations
- Issues with consumers realizing expected energy savings
- Performance or quality issues
- Issues with test procedures

As part of ongoing program management activities, EPA monitors the extent to which these factors apply to each product category and prioritizes specifications for potential revision accordingly. Specifications for rapidly evolving products tend to be revised every two years. Specifications for more slowly advancing products are reviewed every three years or when market share reaches 35%. In product reviews, EPA considers issues such as availability of a viable test procedure, product differentiation, potential for additional energy savings, or cost effectiveness potential of revised requirements. How market share and other factors lead to a decision to revise an ENERGY STAR specification are discussed in greater detail below.

Significant Increase in Market Penetration of ENERGY STAR Qualified Models

In general, an increase in qualified product market share after an ENERGY STAR specification goes into effect is an important indicator of program success. High market shares alone are not sufficient to warrant a specification revision as high market shares do not by themselves diminish the value of the program. No matter what the market share of ENERGY STAR qualified products, a consumer who purchases a labeled product gets a product that will contribute to a cleaner environment and save them money without sacrifice in performance.

At the same time, when ENERGY STAR qualified models represent a high percentage of the market for a given product category, it suggests there may be an opportunity for additional savings and further refinement in the specification. As a general rule, product specifications will be reviewed for possible revision at least once every three years or when the market share of qualified products reaches about 35%. For products that evolve rapidly in the market, such as displays, ENERGY STAR specifications are reviewed every 2 years.

EXAMPLE 1: In 2010, EPA analysis confirmed that the market share of ENERGY STAR qualified refrigerators had reached approximately 35% the preceding year. Anticipating further increases from there, EPA prioritized the ENERGY STAR refrigerator specification for review in 2011.

However, even a market penetration of 50% or greater does not guarantee that a specification will be revised, or that the revision will occur immediately, as other factors are taken into consideration (see Example 2).

EXAMPLE 2: Although the market share of ENERGY STAR qualified televisions under version 2.0 of the specification exceeded 90% for some time, the specification was not immediately revised because of the

challenges associated with addressing the next opportunity for significant energy savings, “On Mode power.” Significant time and coordination were required to establish a measurement approach and to overcome the challenge associated with establishing an “On Mode” requirement that allowed fair comparison of different technologies and did not compromise functionality. It was not until these issues were addressed that a specification change, consistent with ENERGY STAR Guiding Principles, could be justified. The ENERGY STAR Television specification folded in On Mode requirements as soon as a test method was finalized.

Change in Federal Minimum Efficiency Standards

Periodically, DOE or Congress sets or revises minimum energy efficiency standards for products covered by an ENERGY STAR specification. In the event that the revised standard meets or exceeds the ENERGY STAR requirements, the Government must determine if the ENERGY STAR specification can be made more stringent while still meeting the ENERGY STAR Guiding Principles so that the label can continue to have value in the market (see Examples 3 and 4).

Over the last few years, Congress has enacted the Energy Policy Act of 2005 (EPAAct) and the Energy Independence and Security Act of 2007 (EISA) establishing minimum efficiency standards for many more products. In some of these cases, Congress specifically cited ENERGY STAR specifications to be the performance level at which the new standards will be set, compelling a determination as to whether the ENERGY STAR specification can be made more stringent (see Example 3). In some instances, EPA has determined, with stakeholder input, that there is not sufficient, cost-effective product differentiation beyond the standards to warrant a strengthening of the ENERGY STAR specification and so these specifications have been suspended (see Example 5).

EXAMPLE 3: In 2007, EISA established new standards for the Energy Factor (EF) of dehumidifiers in various size classes. The new levels for many sizes equaled or exceeded the current ENERGY STAR specification. Therefore, once EISA passed but before it came into effect, EPA began the process to examine the ENERGY STAR specification, consulted with stakeholders, and ultimately revised the specification to levels more stringent than those in EISA in accordance with the ENERGY STAR guiding principles.

EXAMPLE 4: EPAAct 2005 set new minimum efficiency standards for certain types of commercial refrigeration products that were equivalent to the current ENERGY STAR levels. These new standards went into effect in January 2010. EPA initiated a review of the ENERGY STAR commercial refrigeration specification with stakeholders to determine whether and how it can be revised, consistent with ENERGY STAR Guiding Principles. The revised ENERGY STAR specification for commercial refrigeration products took effect in January 2010.

EXAMPLE 5: In EPAAct 2005, Congress set new Federal minimum efficiency standards for traffic signals by stating that “all traffic signals must meet the ENERGY STAR Program Requirements for traffic signals as in effect on the date of enactment of EPAAct 2005.” In light of Congress’s actions, EPA conducted a review of the traffic signal market and the ENERGY STAR specification to determine appropriate next steps. EPA proposed to suspend the ENERGY STAR specification for traffic signals rather than revise it because only minimal additional energy savings would result from a revised specification, and it could not justify the program expense associated with continuing the level for this product category. Similar situations occurred due to EPAAct 2005 for exit signs and distribution transformers.

Technological Advancements

To remain competitive, manufacturers of office products and home electronics in particular, are continuously redesigning their product lines to make them better in terms of performance, price, and features. In many instances, these technological changes come with advances in energy efficiency. As products become more efficient, an opportunity is presented to revise the ENERGY STAR specification and capture additional savings. (see Example 6). Where multiple technologies exist, the ENERGY STAR Program is committed to helping consumers identify the most efficient choice, regardless of technology thereby allowing market demand for efficiency, rather than the government, decide which technologies ultimately succeed.

EXAMPLE 6: In 2004 EPA revised the ENERGY STAR specification for monitors to address Active Mode. At that time, the relatively new LCD technology was beginning to gain market share relative to CRT technology and was quickly becoming cost competitive. Because LCDs are a significantly more energy efficient technology, their growth in popularity meant the performance level associated with top performing monitors in the market was enhanced. Rather than establish separate requirements for LCD vs. CRT monitors, EPA set one performance level based on the full range of performance levels demonstrated by both LCDs and CRTs currently in the market. Doing so made sense as both technologies deliver consumers the same basic functionality. The ENERGY STAR Program thereby took advantage of efficiency improvements associated with a technological advancement to better help consumers identify the most efficient option meeting their needs. EPA has taken this approach with televisions as well, setting the same requirements for all television technologies recognizing that televisions, regardless of technology, deliver the same basic functionality.

Product Availability

On rare occasions, it is brought to EPA or DOE's attention that product availability is severely limited at the ENERGY STAR performance level. In this case, a change to the specification, making it less stringent, may be warranted to ensure adequate selection of ENERGY STAR qualified equipment in the market (see Example 7).

EXAMPLE 7: In 2006, EPA revised the ENERGY STAR specification for oil furnaces from a minimum of 90% AFUE to 83% AFUE. This change was made based on: (1) feedback received from builders in the Northeast U.S. concerning a lack of available ENERGY STAR qualified equipment; and (2) concern expressed by energy efficiency program implementers in the Northeast U.S. that the limited supply of qualified oil furnaces restricted their ability to promote efficient equipment. Unable to locate ENERGY STAR qualified oil furnaces, builders maintained that they were reverting to minimum efficiency equipment (78% AFUE). EPA found that a minimum 83% AFUE level represented approximately 25% of the models currently available in the marketplace and that this level ensured that a number of manufacturers and brands could earn the ENERGY STAR label, thus allowing for more adequate selection, consistent with ENERGY STAR program principles.

Ensuring Consumers Realize Expected Energy Savings

ENERGY STAR holds a promise that when consumers purchase and use an ENERGY STAR qualified product they will save energy as compared with the purchase and use of a standard product model. However, there are instances where aspects such as installation or consumer behavior can significantly impact the extent to which those energy savings are actually realized. As issues arise, revisions to specifications may be warranted to provide additional safeguards (see Example 8). In some instances, where installation issues cannot be fully addressed through the product specification, EPA has

developed complementary field programs such as the ENERGY STAR Quality Installation Program to address sizing and installation issues associated with central air conditioning.

EXAMPLE 8: The ENERGY STAR specification for Programmable Thermostats is intended to save consumers 10-30% on the space heating and cooling portion of their energy bills. With proper use of the thermostat, such savings are easily achievable; however field studies suggested that programmable thermostats were achieving considerably lower savings than their estimated potential. EPA suspended the ENERGY STAR thermostat program while working with stakeholders to develop a usability metric that would help ensure that products in this ENERGY STAR product category could be used in a way that would deliver on their promise of significant savings.

Performance or Quality Concerns

One key feature of the ENERGY STAR label is that it delivers energy savings without sacrifice in performance or quality. When quality or performance issues arise, EPA and DOE recognize the importance of addressing them through enhancements to the relevant ENERGY STAR specification so as to avoid undermining the value of the label in the market. Lighting is a product category with a history of performance issues that have largely been addressed through added technical specifications for ENERGY STAR qualification (see Example 9).

EXAMPLE 9: In 2005, EPA addressed increasing consumer complaints about color variations in the light output of efficient lighting. In consultation with the Lighting Research Center, industry and other stakeholders, the Residential Light Fixture specification (now the Luminaires specification) was revised to include variability limits so that purchasers of ENERGY STAR qualified fixtures could be more confident that the product they purchased delivers the light color specified. Similar color requirements were subsequently incorporated into the ENERGY STAR specification for CFLs.

Concerns with Test Procedures

As technology innovations are introduced into the market, opportunities for improving aspects of commonly used test procedures have arisen (see Example 10). The process to address these opportunities involves evaluating questions and feedback received from stakeholders and lessons learned from product testing. When necessary and consistent with DOE's statutory requirements for covered products, DOE will review the test procedure to determine if it adequately measures the energy consumption of products and generally reflects "real-world" conditions. If the test procedure is revised, the energy performance data set for the product category will be examined to see how it is affected by the changes and an assessment will be made as to whether adjustments to the ENERGY STAR performance levels are warranted.

EXAMPLE 10: In 2003, DOE revised the test procedure for residential dishwashers. The original Federal dishwasher test procedure used clean dishes to perform all energy tests. In the mid-1990s, dishwasher manufacturers began to improve efficiency by using "soil sensor" controls, which detected the cleanliness of the dishes and planned the wash cycle accordingly. Implementation of a soil sensor assumes that the consumers using models with this technology would actually load their dishwasher with soiled dishes, and allows the dishwasher to reduce its energy use when the dishes are not heavily soiled. Consequently, DOE received comments that a clean dish test procedure with soil sensing models could yield unrealistic energy consumption numbers. As a result, soil sensing models are now tested using a mix of a ratio of heavily, moderately, and lightly soiled dishes as specified in the revised test

procedure. Non-soil sensing dishwashers continue to be tested with clean dishes since they do not change energy consumption in response to amount of soiling. Changes to the ENERGY STAR criteria for dishwashers were then made based on the dataset derived from using the new test procedure. DOE is now developing tailored cleanability testing requirements and EPA will consider specification levels for them in future specification revisions once a test method and data become available.