



U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF INSPECTOR GENERAL

Catalyst for Improving the Environment

Evaluation Report

ENERGY STAR Program Integrity Can Be Enhanced Through Expanded Product Testing

Report No. 10-P-0040

November 30, 2009



Report Contributors:

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Jerri Dorsey
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Abbreviations

DVD	Digital Versatile Disc
EPA	U.S. Environmental Protection Agency
NIST	National Institute of Standards and Technology
OIG	Office of Inspector General

Cover photos: ENERGY STAR product categories, from left: monitors, DVD products, and printers. (Photos courtesy EPA)



At a Glance

Catalyst for Improving the Environment

Why We Did This Review

We initiated this evaluation to independently test ENERGY STAR products to determine whether their energy-efficient performance complied with the ENERGY STAR program's required specifications.

Background

The U.S. Environmental Protection Agency (EPA) established the ENERGY STAR Labeling Program as an innovative approach to environmental protection. More than 2,400 manufacturers and over 40,000 individual product models across 60 product categories are ENERGY STAR qualified. In 2007, EPA reported that the ENERGY STAR program helped Americans save 180 billion kilowatt-hours, about 5 percent of U.S. electricity demand, and prevented the emission of 40 million metric tons of carbon equivalents of greenhouse gases.

For further information, contact our Office of Congressional, Public Affairs and Management at (202) 566-2391.

To view the full report, click on the following link:
www.epa.gov/oig/reports/2010/20091130-10-P-0040.pdf

ENERGY STAR Program Integrity Can Be Enhanced Through Expanded Product Testing

What We Found

Almost all of the ENERGY STAR products in our test sample met, and in most cases exceeded, the program's performance standards. However, selected non-ENERGY STAR products performed comparably to, and in some cases better than, ENERGY STAR products. That level of product performance affects the ENERGY STAR label's image as a trusted national symbol for environmental protection through superior energy efficiency.

In addition, the performance results of ENERGY STAR and non-ENERGY STAR products call into question the assumptions used to calculate energy savings and greenhouse gas reductions attributed to this program. Without an enhanced testing program, including the testing of non-ENERGY STAR products, EPA cannot be certain ENERGY STAR products are the more energy-efficient and cost-effective choice for consumers.

What We Recommend

We recommend that EPA verify estimated energy savings and greenhouse gas reduction calculations using a market-based performance-testing program that includes testing non-ENERGY STAR products.

We also recommend that EPA revise the ENERGY STAR Website to include the established standard alongside qualifying product performance data and to provide a summary listing of the highest performers.

The Agency disagreed with our conclusions but concurred with both recommendations.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

November 30, 2009

MEMORANDUM

SUBJECT: ENERGY STAR Program Integrity Can Be Enhanced Through
Expanded Product Testing
Report No. 10-P-0040

FROM: Wade T. Najjum
Assistant Inspector General, Office of Program Evaluation

A handwritten signature in black ink, appearing to read "Wade T. Najjum", is written over the typed name.

TO: Gina McCarthy
Assistant Administrator for Air and Radiation

This is our report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). This report contains findings that describe the problems the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG and does not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

The estimated cost of this report – calculated by multiplying the project's staff days by the applicable daily full cost billing rates in effect at the time, including the costs of purchasing ENERGY STAR and non-ENERGY STAR products and having them analyzed by the National Institute of Standards and Technology – is \$489,338.

Action Required

In accordance with EPA Manual 2750, you are required to provide a written response to this report within 90 calendar days. You should include a corrective actions plan for agreed-upon actions, including milestone dates. We have no objections to the further release of this report to the public. This report will be available at <http://www.epa.gov/oig>.

If you or your staff have any questions regarding this report, please contact me at 202-566-0827 or najjum.wade@epa.gov, Jeffrey Harris at 202-566-0831 or harris.jeffrey@epa.gov, or Jill Ferguson at 202-566-2718 or ferguson.jill@epa.gov.

Table of Contents

Chapters

1	Introduction	1
	Purpose	1
	Background	1
	Scope and Methodology	2
2	Enhanced ENERGY STAR Testing Needed to Ensure Program Integrity	4
	Product Specification Process.....	4
	Both ENERGY STAR and non-ENERGY STAR Products Met Specifications.....	5
	ENERGY STAR Product Performance Varied but Similar to Non-ENERGY STAR Products.....	5
	ENERGY STAR Benefit Claims May Not Be Valid.....	9
	Impact on Consumer Cost Savings.....	9
	Conclusions.....	10
	Recommendations	10
	Agency Comments and OIG Evaluation	10
	Status of Recommendations and Potential Monetary Benefits.....	12

Appendices

A	Agency Comments on Draft Report	13
B	Distribution	15

Chapter 1

Introduction

Purpose

The purpose of this review was to test U.S. Environmental Protection Agency (EPA) ENERGY STAR-qualified products for compliance with required specifications. This independent testing was a check on the validity and reliability of manufacturers' self-certification testing conducted by EPA's ENERGY STAR partners. As the testing evolved and we received initial results showing that a number of the ENERGY STAR products tested exceeded the standard, we decided to expand our scope and test non-ENERGY STAR products. Thus, our initial purpose was expanded to also determine how non-ENERGY STAR products performed in comparison with ENERGY STAR products.

Background

In 1992, EPA's Office of Air and Radiation established the ENERGY STAR Product Labeling program (ENERGY STAR program) as an innovative approach to environmental protection. In 1996, EPA partnered with the U.S. Department of Energy to promote the ENERGY STAR label and broaden the range of products covered. In the ENERGY STAR 2008 overview of achievements, EPA stated that the ENERGY STAR label is recognized by more than 75 percent of the American public. According to EPA, the ENERGY STAR label is the trusted national symbol for environmental protection through superior energy efficiency. EPA also reports that ENERGY STAR has helped individuals save on their energy bills by clearly identifying energy-efficient products with superior performance in the marketplace.

ENERGY STAR is the most significant of EPA's greenhouse gas avoidance programs. In 2006 and 2007, the program accounted for over 50 percent of EPA's contribution. EPA reported that in 2007, the ENERGY STAR program helped Americans save 180 billion kilowatt-hours, about 5 percent of U.S. electricity demand, and prevented the emission of 40 million metric tons of carbon equivalents of greenhouse gases.

The ENERGY STAR program is advertised as a credible, objective source of information for Americans wanting to make well-informed decisions on how to improve the energy efficiency of their homes and businesses. More than 2,400 manufacturers and over 40,000 individual product models across 60 product categories are ENERGY STAR qualified. EPA does not bestow membership into the ENERGY STAR program without a request from the manufacturer. Membership is voluntary. Manufacturers are responsible for certifying product

performance and compliance with ENERGY STAR specifications when they apply to use the label.

In EPA Office of Inspector General (OIG) Report No. 2007-P-00028, *ENERGY STAR Program Can Strengthen Controls Protecting the Integrity of the Label*, issued August 1, 2007, we identified the need to improve EPA's product testing verification. Specifically, we found the following:

- Verification testing was conducted on a minimal basis.
- Test selection methods were inconsistently applied.
- Only a limited amount of the program budget was used for verification testing.
- The quality assurance plan needed improvement.

Our report found that testing of ENERGY STAR products did not begin until 2002, 10 years after the program began. When verification testing began, it was only a small component of EPA's activities. In 2006, the cost of testing represented less than 0.5 percent of the total ENERGY STAR budget. In its first 5 years of verification testing, EPA averaged only two sets of product verification tests per year. When our 2007 report was issued, 44,000 qualified product models existed within the qualified ENERGY STAR product categories. At the end of 2006, EPA had only conducted verification testing on 160 product models in 9 product categories.

Scope and Methodology

Between December 2008 and February 2009, we selected 20 different ENERGY STAR-qualified products for testing from each of 3 product categories. Products were selected and purchased online from the list of qualified products on the ENERGY STAR Website¹ and based on availability at major retailers. Products selected were chosen to represent those that would be available for purchase by the general public. Two identical models of each product category were purchased for a total of 40 ENERGY STAR-qualified products per category, 120 products in all.

¹ <http://www.energystar.gov>

The product categories selected and the specification dates were as follows:

<u>Products</u>	<u>Specification Date</u> ²
Digital Versatile Disc (DVD) products ³	January 1, 2003
Computer monitors	January 1, 2006
Printers ⁴	April 1, 2007

In addition to the ENERGY STAR products, we also tested the performance of some non-ENERGY STAR products. We purchased 10 non-ENERGY STAR products (2 each of 5 models) from each of the above categories for a total of 30 non-ENERGY STAR products. These products underwent the same testing as our sample of ENERGY STAR products, and the results were compared with ENERGY STAR specifications.

We performed our evaluation between April 2008 and September 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the review to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our review objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our objectives.

We entered into an Interagency Agreement with the National Institute of Standards and Technology (NIST) to perform the testing of all the products in our sample. NIST tested these products for compliance with ENERGY STAR program specifications between December 2008 and June 2009.

² Most recent efficiency standard date listed in the product specification requirements that were used for testing purposes.

³ DVD products included in our testing were CD players/changers, stereo amplifiers/pre-amplifiers, and stereo receivers.

⁴ Forty ENERGY STAR printers were tested; 24 were ink jet and 16 were laser printers.

Chapter 2

Enhanced ENERGY STAR Testing Needed to Ensure Program Integrity

Although almost all of the ENERGY STAR products in our test sample met, and in most cases exceeded, the program's performance standards, many of the non-ENERGY STAR products tested comparably to, and in some cases better than, the ENERGY STAR products. Comparable performance affects the image of the ENERGY STAR label as a trusted national symbol for environmental protection through superior energy efficiency. In addition, the results call into question the assumptions used to calculate energy savings and greenhouse gas reductions attributed to this program. Based on our testing of non-ENERGY STAR products, EPA cannot be certain ENERGY STAR products are the more energy-efficient and cost-effective choice for consumers.

Product Specification Process

EPA follows six key principles when establishing consumer product energy-efficiency specifications:

1. Significant energy savings can be realized on a national basis.
2. Product performance can be maintained or enhanced with increased energy efficiency.
3. Purchasers will recover their investment in increased energy efficiency within a reasonable time.
4. Energy efficiency can be achieved with several technology options, at least one of which is nonproprietary.
5. Product energy consumption and performance can be measured and verified with testing.
6. Labeling would effectively differentiate products and be visible for purchasers. Typically, the specification is set to recognize the products that rank in the top 25 percent in terms of energy efficiency.

Both ENERGY STAR and non-ENERGY STAR Products Met Specifications

We tested 120 ENERGY STAR-qualified products and 118, or 98 percent, met, and in most cases exceeded, program requirements for compliance. During our product testing, we did not find any evidence that the self-certification process EPA uses allows for products that do not meet the specifications to enter the program. The only products that failed to meet specifications were two printers of the same model. Both failed to meet the “Time to Sleep Mode” requirement.⁵ The categories tested and positive compliance rates are presented in Table 2-1.

Table 2-1: ENERGY STAR-qualified Product Compliance Rates

Product Category	Compliance Rate
DVD products	100%
Computer monitors	100%
Printers	95%

Source: NIST.

Non-ENERGY STAR Product Results

We tested 30 non-ENERGY STAR products comparing performance to program requirements. A majority of these products were also in compliance with ENERGY STAR requirements, as shown in Table 2-2 below.

Table 2-2: Non-ENERGY STAR Product Compliance Rates

Product Category	Compliance Rate
DVD products	60%
Computer monitors	80%
Printers	40%

Source: NIST.

ENERGY STAR Product Performance Varied but Similar to Non-ENERGY STAR Products

Although we expected the ENERGY STAR designation to be a challenge for products (qualified or nonqualified) to meet, we found the majority of products tested, including non-ENERGY STAR products, met the ENERGY STAR efficiency standard, with some exceeding the standard by a wide margin. We also found that not all ENERGY STAR products performed comparably within the same product categories; some models were up to several times more efficient than others. Almost all of the models in our sample, including the non-ENERGY STAR products, would still qualify under more stringent energy efficiency standards.

⁵ The “Time to Sleep Mode” requirement is only one of three tests needed to be ENERGY STAR qualified. Further, as of July 2009, this model was no longer listed as an ENERGY STAR-qualified product.

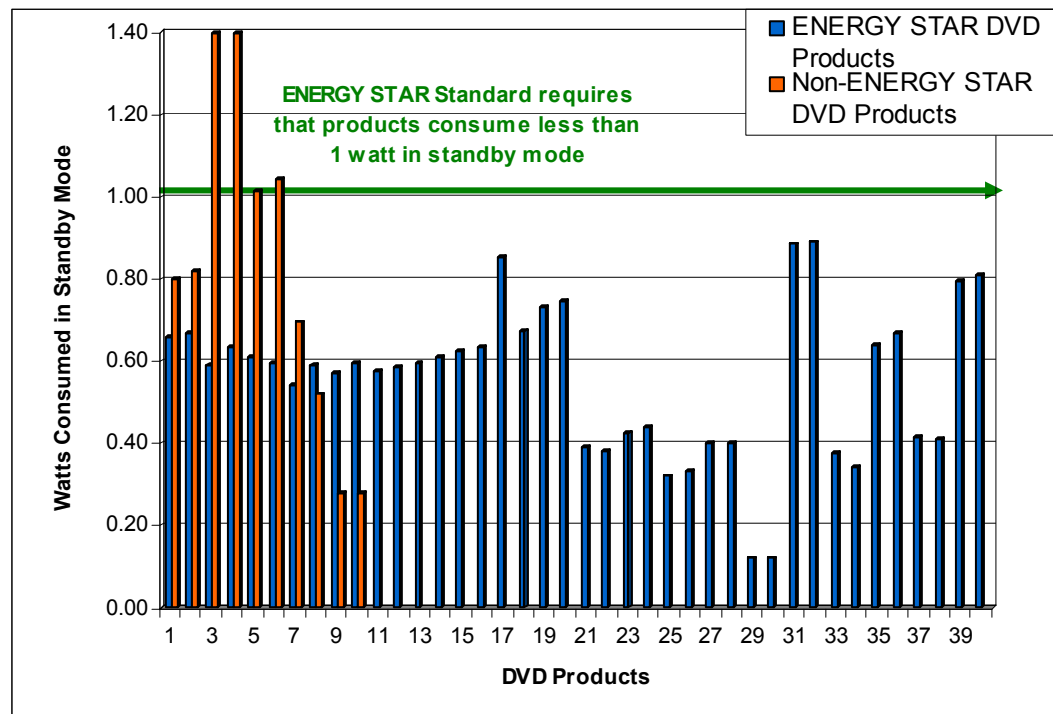
Manufacturer-supplied performance data for each ENERGY STAR-qualified product is available on EPA’s Website. However, these data are not readily usable for performance comparison by consumers because the ENERGY STAR-qualifying standard is not included.

DVD Testing Results

DVD products must consume less than 1 watt of electricity in standby mode to qualify for the ENERGY STAR label. In our sample, we found the average consumption by the ENERGY STAR-qualified products was 0.56 watt, slightly more than half the allowable amount. The performance of these qualified products ranged from a low of 0.12 watt to a high of 0.89 watt. Six of the 10 non-ENERGY STAR products we tested also met the standard. Two of the 10 non-ENERGY STAR products performed better than 38 of the 40 (95 percent) ENERGY STAR products we tested.

Specific details on the DVD products tested are presented in Figure 2-1 and described below. All items below the green bar met ENERGY STAR requirements.

Figure 2-1: DVD Product Performance

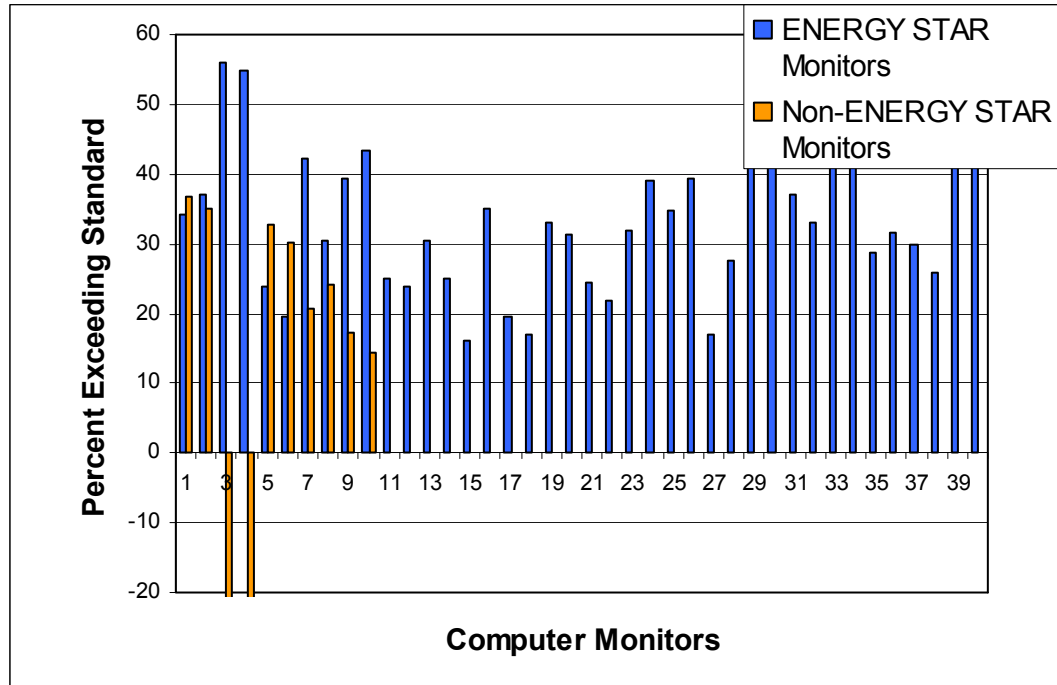


Source: OIG analysis.

Computer Monitor Testing Results

ENERGY STAR performance standards for monitors vary based on product resolution and pixel configurations. Figure 2-2 illustrates the deviation in performance (positive or negative) relative to the applicable standards. The zero line on the chart below shows the value needed to meet the ENERGY STAR specification for this product.

Figure 2-2: Computer Monitor Performance



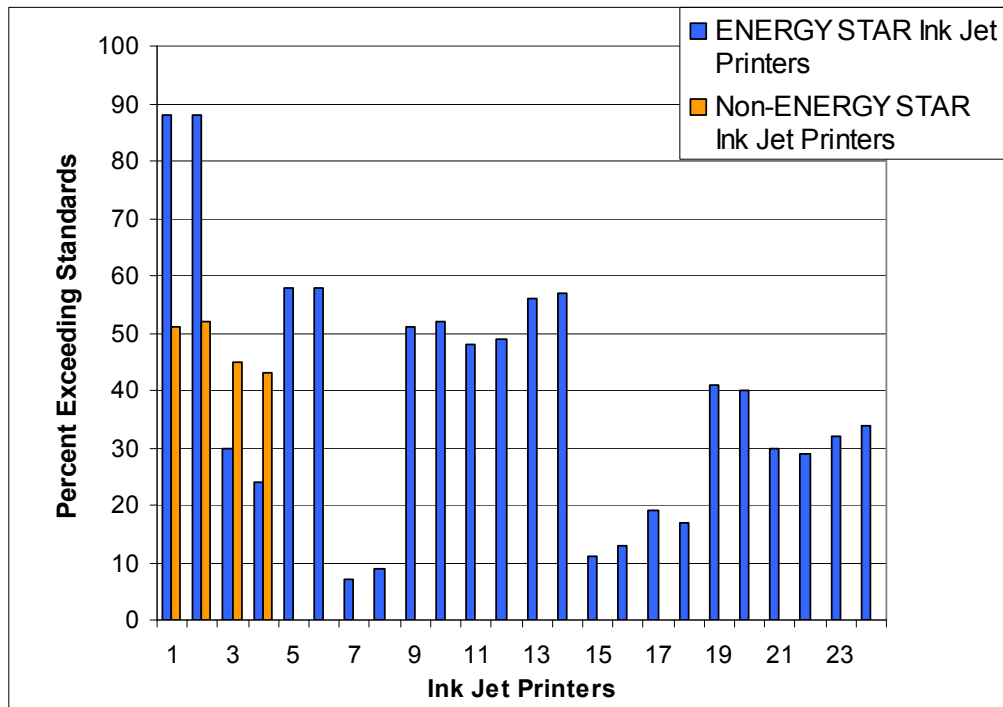
Source: OIG analysis.

The testing results showed that ENERGY STAR monitors surpassed the ENERGY STAR standards by 16 to 55 percent. Eight of the non-ENERGY STAR monitors performed similarly to the qualified products, performing 14 to 37 percent more efficiently than the standards. One non-ENERGY STAR monitor performed more efficiently than half of the qualified products.

Printer Testing Results

As with monitors, printer performance standards vary based on the addition of certain features included with the base product model. Figure 2-3 shows the performance relative to the key standard, the “Sleep Allowed Measure.” Similar to Figure 2-2, the zero line on this chart shows the value needed to meet ENERGY STAR specifications for these standards. While Figure 2-3 only applies to the ink jet printers tested, the test results for laser printers were similar.

Figure 2-3: Ink Jet Printer Performance



Source: OIG analysis.

Testing results showed that ENERGY STAR ink jet printers surpassed the ENERGY STAR standards by a low of almost 7 percent to a high of 88 percent. The laser printers (not shown) exceeded the applicable standards by a low of 2 percent to a high of 81 percent. In addition, the performance of some of the non-ENERGY STAR ink jet and laser printers exceeded the key ENERGY STAR efficiency standards by a considerable margin.

ENERGY STAR Benefit Claims May Not Be Valid

Based on our test results, the energy and greenhouse gas reductions claimed for qualified products may not be valid. EPA uses the formula shown in Figure 2-4 to calculate the annual energy savings benefits and greenhouse gas reductions resulting from the ENERGY STAR program:

Figure 2-4: ENERGY STAR Energy Savings Calculation

$$\frac{\text{Non-ENERGY STAR product energy consumption} - \text{ENERGY STAR product minimum energy consumption}}{\text{ENERGY STAR product sales}} = \text{ENERGY STAR Product's Energy Savings}$$

Source: EPA.

This formula and our test results ultimately affect the accuracy of the computed energy savings attributable to the program. We did not find the ENERGY STAR products in our sample to have performance levels equal to the minimum standard, nor did we find all ENERGY STAR products for a particular category to perform similarly. Both the generalizations inherent in the formula and the final benefits reported are affected by (1) the overlap between ENERGY STAR and non-ENERGY STAR products for energy savings, and (2) the variation in performance within the ENERGY STAR products.

Impact on Consumer Cost Savings

ENERGY STAR products are advertised as offering consumers a means to reduce home and business energy costs, as well as an opportunity to help reduce greenhouse gas emissions. In a 2008 survey of consumers, EPA found 63 percent of households associated the ENERGY STAR label with “efficiency or energy savings.” In addition, of the households that recognized the ENERGY STAR label and purchased a product in a relevant product category within the past 12 months, 73 percent purchased an ENERGY STAR-labeled product.

Our results for the non-ENERGY STAR products tested show that many of these products met and exceeded program requirements. However, within the ENERGY STAR products selected, there were significant performance variations. These variations between qualified products and overlap with nonqualified products may mean that the cost savings advertised to consumers is misleading. Consumers who base their purchase of energy-efficient products on the ENERGY

STAR label do not necessarily realize savings over some non-ENERGY STAR products. Additionally, there can be a significant difference in efficiency among ENERGY STAR-qualified products.

Conclusions

The ENERGY STAR program is widely recognized but misunderstood. The ENERGY STAR label does not necessarily assure consumers superior energy savings over products that are not labeled ENERGY STAR. Despite the performance of all products in a given ENERGY STAR category, only those products produced by manufacturers that choose to join the ENERGY STAR program may advertise their products with the ENERGY STAR label.

If our sample results are representative of the universe of ENERGY STAR products, these results call into question the ability of the program to identify products with superior energy efficiency. Because manufacturer participation in the program is voluntary, the ENERGY STAR designation does not necessarily identify the best performing products in the marketplace. Additionally, a high rate of compliance by non-ENERGY STAR products will affect the EPA's method of computing energy savings. EPA could improve the integrity of the program with enhanced product testing and adjustments to the greenhouse gas benefits calculation.

Recommendations

We recommend that the Assistant Administrator for Air and Radiation:

- 2-1 Verify estimated energy savings and greenhouse gas reduction calculations using a market-based performance testing program that includes testing non-ENERGY STAR products.
- 2-2 Revise the ENERGY STAR Website to include the established standard alongside qualifying product performance data and to provide a summary listing of the highest performers.

Agency Comments and OIG Evaluation

The Agency concurred with our recommendations and agreed to implement them. However, the Agency disagreed with the report's conclusions. The Agency did not concur with conclusions drawn based on a select number of non-ENERGY STAR products performing comparably to or better than the ENERGY STAR products. The Agency concluded that the value of the ENERGY STAR label is ultimately in the assurance the label provides consumers that the ENERGY STAR product they purchase will consistently save them energy. We disagree with this conclusion and maintain our concerns about the integrity of the ENERGY STAR

program as well as the associated energy and cost savings reported to consumers. The Agency's complete response is included in Appendix A.

Status of Recommendations and Potential Monetary Benefits

RECOMMENDATIONS						POTENTIAL MONETARY BENEFITS (in \$000s)	
Rec. No.	Page No.	Subject	Status ¹	Action Official	Planned Completion Date	Claimed Amount	Agreed To Amount
2-1	10	Verify estimated energy savings and greenhouse gas reduction calculations using a market-based performance testing program that includes testing non-ENERGY STAR products.	O	Assistant Administrator for Air and Radiation			
2-2	10	Revise the ENERGY STAR Website to include the established standard alongside qualifying product performance data and to provide a summary listing of the highest performers.	O	Assistant Administrator for Air and Radiation			

¹ O = recommendation is open with agreed-to corrective actions pending
 C = recommendation is closed with all agreed-to actions completed
 U = recommendation is undecided with resolution efforts in progress

Appendix A**Agency Comments on Draft Report**

(Received on November 6, 2009)

MEMORANDUM

Subject: Comments on the Draft Evaluation Report: ENERGY STAR
Program Integrity Can Be Enhanced Through Expanded Product Testing

From: Elizabeth Craig
Deputy Assistant Administrator

To: Jeffrey Harris, Director
Cross-Media Issues, Office of Program Evaluation

Thank you for the opportunity to comment on the Draft Evaluation Report: ENERGY STAR Program Integrity Can Be Enhanced Through Expanded Product Testing. We are pleased to see that testing done by the Inspector General's Office indicates that the ENERGY STAR qualified products tested are at least as efficient as advertised and no issues with the manufacturer self-certification process were indicated.

While we appreciate and share your interest in protecting the integrity of the ENERGY STAR Program, we do not concur with the conclusions drawn based on a select number of non-ENERGY STAR qualified products performing comparably to or better than the ENERGY STAR products. The ENERGY STAR label's image as a trusted symbol for environmental protection through superior efficiency is ultimately affected by the performance of products bearing the label, not by non-participating products. In fact, based on the compliance rates the OIG found, the consumer choosing a product with the ENERGY STAR label receives the energy efficiency they expect; choosing a non-ENERGY STAR product would provide the consumer with a range of possible outcomes as the non-ENERGY STAR products may or may not be efficient.

Although we disagree with the report's conclusions, we recognize potential benefit associated with the recommendations it makes and would be pleased to implement them.

OAR Response to IG Recommendations in Draft Report and Status of Implementation

Recommendation 2-1: Verify estimated energy savings and greenhouse gas reduction calculations using a market-based performance-testing program that includes testing non-ENERGY STAR products

OAR Response: As part of the Obama Administration's commitment to enhancing the ENERGY STAR Program (as articulated in a new MOU signed by EPA and DOE on September 30, 2009), we plan to institute new ENERGY STAR qualification testing requirements that will leverage market-based mechanisms to broaden and improve the performance test data available to us for use in verifying estimated energy savings and greenhouse gas reduction calculations. In conjunction with this effort, we will be working with the Department of Energy to expand verification testing of ENERGY STAR qualified products, with the intent being to test both qualified and non-qualified products.

Recommendation 2-2: Revise the ENERGY STAR Website to include the established standard along side qualifying product performance data and to provide a summary listing of the highest performers.

OAR Response: We agree that it may be useful to provide interested consumers a web-based means of comparing and ranking qualifying product performance against established ENERGY STAR standards. We are currently exploring options for effectively addressing this while minimizing added administrative burden.

cc: Brian McLean
Ann Bailey
David LaRouche

Appendix B

Distribution

Office of the Administrator
Assistant Administrator, Office of Air and Radiation
Deputy Assistant Administrator, Office of Air and Radiation
Agency Follow-up Official (the CFO)
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Acting Inspector General