



U.S. ENVIRONMENTAL PROTECTION AGENCY  
OFFICE OF INSPECTOR GENERAL

*Catalyst for Improving the Environment*

## Evaluation Report

# Improvements Needed to Validate Reported ENERGY STAR Benefits

Report No. 09-P-0061

December 17, 2008



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**Abbreviations**

CCAP	Climate Change Action Plan
CFLs	Compact Fluorescent Lights
DOE	Department of Energy
DSM	demand-side management
EPA	U.S. Environmental Protection Agency
kWh	kilowatt hours
MMTCE	million metric tons of carbon equivalent
OIG	Office of Inspector General
PBC	public benefits charge

**Cover art:** The illustrations depict the four primary components of EPA's ENERGY STAR program, from left: products, commercial, industrial, and residential (from EPA).



# At a Glance

*Catalyst for Improving the Environment*

## Why We Did This Review

We initiated this review to examine the validity and accuracy of the reported energy savings for the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR program. This was part of our agenda to assess new approaches to environmental protection. We specifically sought to determine whether the savings reported were valid and fully supportable.

## Background

ENERGY STAR is a voluntary program designed to help businesses and individuals enhance their energy efficiency. In 2006, the ENERGY STAR program reported avoiding a total of 37.6 million metric tons of carbon equivalent. It further reported that ENERGY STAR helped prevent greenhouse gas emissions equivalent to those from 25 million vehicles while savings Americans \$14 billion on their energy bills.

**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/2009/20081217-09-P-0061.pdf](http://www.epa.gov/oig/reports/2009/20081217-09-P-0061.pdf)

## Improvements Needed to Validate Reported ENERGY STAR Benefits

### What We Found

Reported ENERGY STAR benefits represented one-half of EPA's total greenhouse gas emissions avoided in 2006. ENERGY STAR benefits are a major component of efforts reducing such emissions. The accuracy of the program's reported energy savings is important in monitoring the United States' efforts to reduce greenhouse gas emissions.

We found the ENERGY STAR program's reported savings claims were inaccurate and the reported annual savings unreliable. We identified several deficiencies with the shipment data and the process used in calculating benefits. Deficiencies included the lack of a quality review of the data collected; reliance on estimates, forecasting, and unverified third party reporting; and the potential inclusion of exported items. Also, EPA included savings for one Department of Energy (DOE) product that DOE also claimed.

Additionally, sales of formerly qualified products are used to determine ENERGY STAR's market transformation benefits, but we found that this benefit was computed inconsistently. Also, the methodology used to compute the ENERGY STAR commercial sector benefits uses unverified assumptions.

### What We Recommend

We recommended that EPA:

- Establish and implement improved quality controls.
- Develop and consistently apply a data-driven methodology to compute market transformation effects.
- Validate the model for calculating the benefits of the ENERGY STAR commercial sector to ensure it accurately reflects the sector's impacts.

EPA disagreed with many of our conclusions, but stated it had implemented some of the recommendations. However, some of EPA's planned actions do not meet the intent of our recommendations, and we consider these recommendations open and unresolved.



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

OFFICE OF  
INSPECTOR GENERAL

December 17, 2008

**MEMORANDUM**

**SUBJECT:** Improvements Needed to Validate Reported ENERGY STAR Benefits  
Report No. 09-P-0061

**FROM:** Wade T. Najjum  
Assistant Inspector General for Program Evaluation

A handwritten signature in black ink that reads "Wade T. Najjum".

**TO:** Robert J. Meyers  
Principal Deputy Assistant Administrator  
Office of Air and Radiation

This is our report on the ENERGY STAR benefits 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 – is \$538,867.

**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 has any questions regarding this report, please contact me at 202-566-0827; or Jeffrey Harris, Director of Cross Media, at 202-566-0831 or [harris.jeffrey@epa.gov](mailto:harris.jeffrey@epa.gov).

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# Chapter 1

## Introduction

### Purpose

We initiated this review to examine the validity and accuracy of the reported energy savings for the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR program. This was part of our agenda to assess new approaches to environmental protection. We specifically sought to determine whether the savings reported in 2006 were valid and fully supportable.

### Background

In 1990, Section 103(g) of the Clean Air Act directed the EPA Administrator to “conduct a basic engineering research and technology program to develop, evaluate, and demonstrate non regulatory strategies and technologies for air pollution prevention.” In 1992, EPA's Office of Air and Radiation established the ENERGY STAR Product Labeling Program (the ENERGY STAR program) as an innovative approach to environmental protection. Congress formally authorized the ENERGY STAR program in the Energy Policy Act of 2005.<sup>1</sup>

ENERGY STAR is a voluntary program designed to help businesses and individuals protect the environment through superior energy efficiency. The ENERGY STAR program was designed to overcome selected market barriers. The program was first introduced to recognize and promote energy-efficient computers. It has since grown to cover many additional consumer products and services. In 1996, EPA partnered with the Department of Energy (DOE) to promote the ENERGY STAR label and broaden the range of products covered.<sup>2</sup>

The ENERGY STAR program is one part of a larger U.S. government-wide agenda to address climate change. In 2002, the President announced a goal of reducing America's greenhouse gas intensity 18 percent by 2012. EPA's programs are expected to contribute over 70 percent of the emissions reductions needed to meet the President's greenhouse gas intensity goal. ENERGY STAR is the most significant of the EPA's greenhouse gas avoidance programs. In 2006, the program accounted for over 50 percent of EPA's contribution. The success of ENERGY STAR is therefore central to whether the United States will meet the President's goal for reducing greenhouse gas intensity.

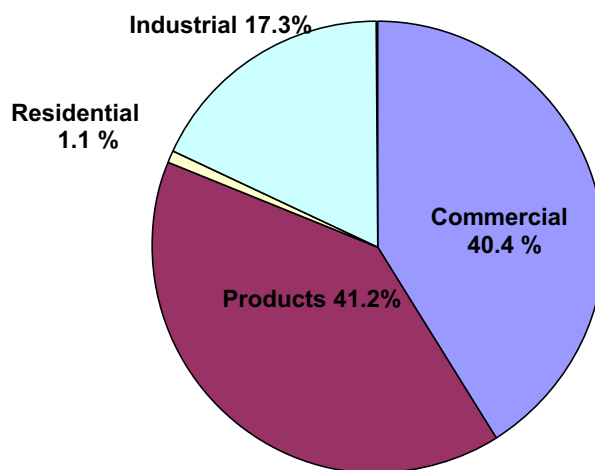
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<sup>1</sup> Public Law 109-58-Aug. 8, 2005; Subtitle C-Energy Efficient Products, Sec. 131. ENERGY STAR program.

<sup>2</sup> A Memorandum of Cooperation was signed jointly on May 29, 1996.

The ENERGY STAR program reported avoiding a total of 37.6 million metric tons of carbon equivalent (MMTCE) in 2006. According to the EPA, the program helped prevent greenhouse gas emissions equivalent to those from 25 million vehicles while saving Americans \$14 billion on their energy bills. ENERGY STAR has four program sectors: products, commercial, industrial, and residential. The 2006 reported carbon emissions avoided by program sector are illustrated in Figure 1-1; the paragraphs that follow describe the four sectors.

**Figure 1-1: Carbon Emissions Avoided by Sector for 2006**



Source: OIG Analysis of ENERGY STAR 2006 Annual Report

## Products

According to ENERGY STAR staff the product sector is designed to promote energy-efficient products for purchase by consumers. This sector is the original component of EPA's ENERGY STAR program and is still the most recognizable part of the program.<sup>3</sup> EPA reports that approximately 1,700 manufacturers are using the ENERGY STAR label on over 40,000 product models across more than 50 product categories. Annually, consumers are reportedly purchasing approximately 300 million ENERGY STAR-qualified products and have invested in over 2 billion products since 1992. ENERGY STAR reported within its 2006 annual report that the product sector was responsible for 15.5 MMTCE emissions avoided.

<sup>3</sup> A logic model illustrating how the ENERGY STAR program is designed to promote energy efficiency among consumer products is depicted in Appendix A.



## Commercial and Industrial Sectors

The commercial and industrial sectors are designed to promote superior corporate energy management approaches and provide partners guidance on assessing current energy use and developing plans that will lead to energy reductions and overall energy efficiency. Annually, commercial and industrial buildings use approximately \$200 billion worth of electricity and natural gas, which results in nearly half of the U.S. greenhouse gas emissions. ENERGY STAR reported within the 2006 annual report that the commercial and industrial sectors avoided combined total emissions of 21.7 MMTCE.<sup>4</sup> EPA reported that increasing energy prices and greater concern for the environment and global warming have recently increased interest and participation in ENERGY STAR's commercial and industrial program efforts.

## Residential Sector

The residential sector is designed to help make residential homes more energy efficient. This sector is composed of two primary components: home improvements and new homes. ENERGY STAR reported that households can reduce their energy use up to 30 percent and save \$600 annually on utility bills by using qualified products and services. In the 2006 annual report, EPA reported that ENERGY STAR's residential sector avoided total emissions of 0.4 MMTCE.

## Noteworthy Achievements

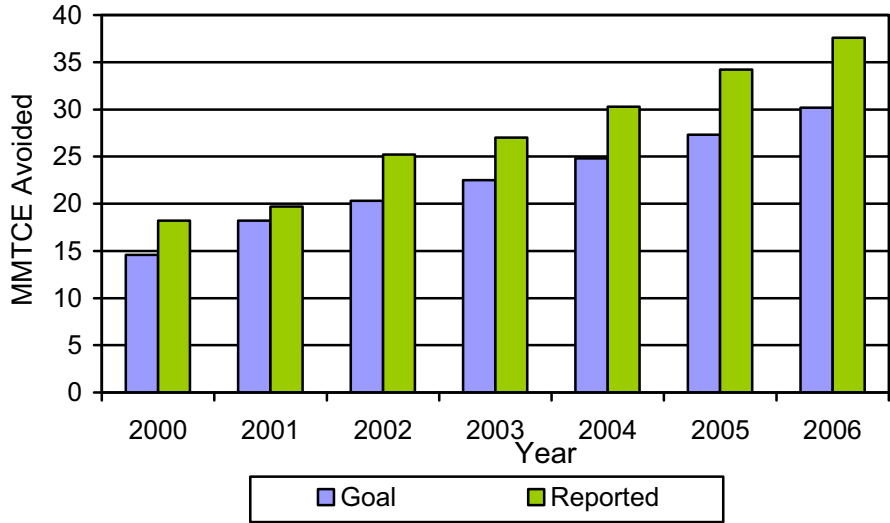
According to ENERGY STAR, the program has grown steadily in terms of the energy efficient solutions it offers, the variety of partners, and the benefits it delivers. EPA has been successful in marketing the ENERGY STAR brand and label. In 2007, EPA reported that 74 percent of households nationwide recognize the ENERGY STAR label and 62 percent associated the label with "energy efficiency or energy savings."

Since 2000, the ENERGY STAR program has consistently outperformed its annual goals, as illustrated in Figure 1-2.

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<sup>4</sup> A logic model illustrating how the ENERGY STAR program is designed to promote energy efficiency among commercial buildings is depicted in Appendix B.

**Figure 1-2: ENERGY STAR Goals Are Surpassed**



Source: ENERGY STAR and Other Climate Protection Partnership Annual Reports, 2000 through 2006

The ENERGY STAR program’s overall reported achievements in 2006 exceeded the program’s goals as illustrated in Table 1-1.

**Table 1-1: ENERGY STAR 2006 Goals and Achievements by Program**

ENERGY STAR Program	2006 Goal (MMTCE Avoided)	2006 Achievements (MMTCE Avoided)
Product Labeling	14.5	15.5
Residential	0.5	0.4
Commercial Buildings	11.5	15.2
Industrial	3.7	6.5
<b>Total</b>	<b>30.2</b>	<b>37.6</b>

Source: Based on data presented in the ENERGY STAR and Other Climate Protection Partnerships 2006 Annual Report

**Scope and Methodology**

We conducted this performance evaluation in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the evaluation to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based upon our objectives. We performed our field work from January through September 2008.

Our review included an examination of applicable laws and regulations as well as Agency guidance. We reviewed those internal controls that were relevant to our objectives. We reviewed ENERGY STAR annual reports, and Agency guidance

documents. We reviewed planning documents, including logic models. We met with Agency staff and contractors. We reviewed the methodologies governing the savings benefit calculations for the commercial and products program sectors.<sup>5</sup> Additionally, for the products sector, we reviewed documentation in support of the 2006 reported savings benefits.

Appendix C provides further details on our scope and methodology.

## Prior Review

An EPA Office of Inspector General (OIG) report, *ENERGY STAR Program Can Strengthen Controls Protecting the Integrity of the Label*,<sup>6</sup> reported that improvements should be made to better assure the integrity of the ENERGY STAR label for home and office products. Criteria for revising specifications were unclear, and EPA did not have reasonable assurance that the self-certification process was effective. EPA relied on some alternative verification mechanisms, but lacked any quality assurance or review of these reported results. EPA did not agree with all of the conclusions, but agreed to implement the OIG recommendations to strengthen management controls to protect the integrity of the ENERGY STAR label.

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<sup>5</sup> The residential and industrial program sectors were excluded from our review. The commercial and products sector combined encompassed 81.6 percent of the 2006 reported carbon emissions avoided.

<sup>6</sup> EPA OIG Report No. 2007-P-00028, issued August 1, 2007, at [www.epa.gov/oig/reports/2007/20070801-2007-P-00028.pdf](http://www.epa.gov/oig/reports/2007/20070801-2007-P-00028.pdf).

## Chapter 2

### Inaccurate and Unsupported Data Used to Calculate 2006 ENERGY STAR Product Annual Benefits

The ENERGY STAR program reported savings for 2006 that were inaccurate or unsupported. A key component of the program's annual and lifetime savings calculation process for consumer products is the total ENERGY STAR shipments for that year. We identified several concerns with shipment data, including: lack of quality review of the data submittals; reliance on estimates, forecasting, and third party reporting; and the potential inclusion of international shipments with domestic ENERGY STAR product shipments. When annual shipment data are not supportable or reliable, the validity of the savings calculation process is in question.

#### Process Used to Calculate Product Sector Savings

The product sector's annual savings are computed using the Climate Change Action Plan (CCAP) model. This model is used to compute the energy savings for each qualified EPA ENERGY STAR product. A key number in the computation is the annual ENERGY STAR-qualified shipment total by product category.<sup>7</sup>

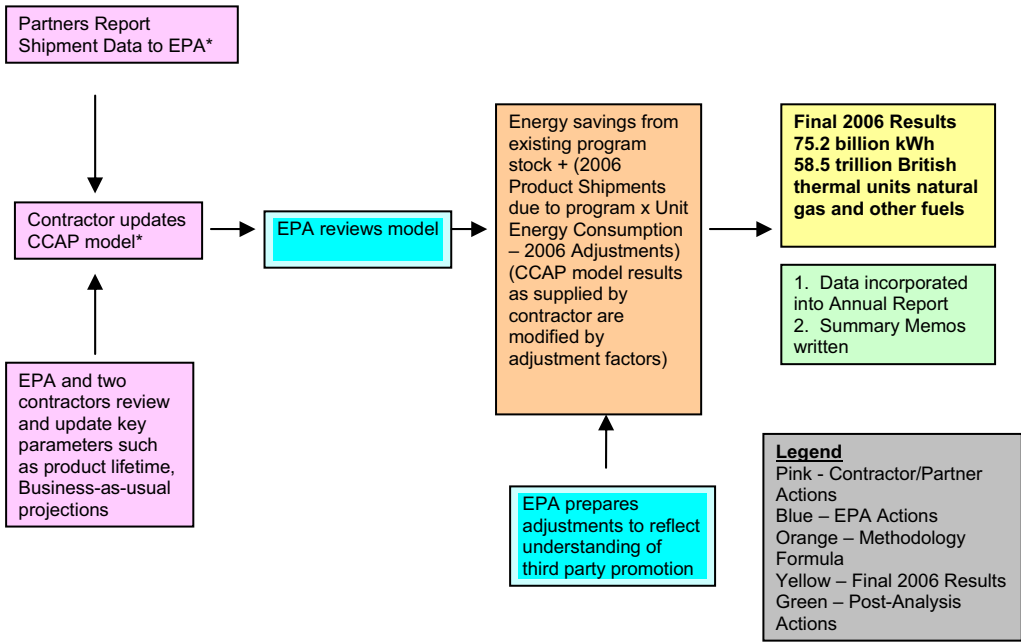
For the majority of the EPA product categories (29 of 37), the manufacturers annually submit shipment data in one of two ways. They either submit data directly via unit shipment data submittal forms or indirectly through third party associations. One EPA contractor has sole responsibility for the receipt of these data and the production of the annual summary report. This report includes the overall numbers of qualified ENERGY STAR units shipped by product category, which are used in the annual savings calculation process. Figure 2-1 depicts the process. Figure 2-2 illustrates how the annual shipments per qualified ENERGY STAR product category are multiplied by the unit energy savings<sup>8</sup> to derive the annual energy savings attributable to the program.

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<sup>7</sup> The ENERGY STAR program uses the term shipments interchangeably with sales. When a qualified ENERGY STAR manufacturer ships its ENERGY STAR-qualified product, the shipment is considered sold for annual savings calculation purposes. For the reporting period reviewed, EPA did not require manufacturers to submit annual shipment data for office products or for programmable thermostats. Office products consist of: computers, copiers, fax machines, mailing machines, multifunction devices, printers, and scanners.

<sup>8</sup> Unit energy savings for each product type is the difference between the business-as-usual unit energy consumption and the ENERGY STAR unit energy consumption in a given year. Unit energy savings change over time for most product types due to specification revisions, usage pattern changes, and changes to the business-as-usual efficiency.

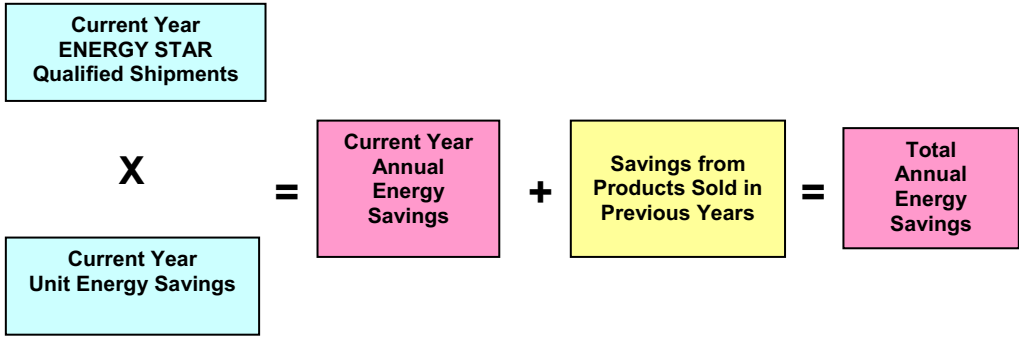
**Figure 2-1: ENERGY STAR Products Annual Savings Calculation Process**



\*Manufacturer submits data directly to EPA contractor or via third party associations

Source: EPA ENERGY STAR Immediate Office

**Figure 2-2: ENERGY STAR Products Annual Savings Calculation**



Source: OIG based on ENERGY STAR program materials

The total annual saving calculation also includes a portion of savings computed for products shipped in previous years but are assumed to still be in use. EPA continues to claim savings for shipped qualified products over the estimated lifetime of the product. The lengths for which the lifetime annual savings benefits are calculated vary from 4 to 20 years after initial product shipment. Additionally, the total annual savings calculation includes an estimate of benefits from sales of products that previously met ENERGY STAR specifications but no longer qualify (further details are in Chapter 3).

## Shipment Totals Used in Savings Calculations Are Unreliable

### *2006 Annual Shipment Data are Irreconcilable*

We found that the annual shipment data used for the 2006 savings calculations were unsupported. Based on our review of the documents provided, we were unable to reconcile the original shipment data with final reported totals for 18 of the 29 product categories. These reported totals are used to calculate ENERGY STAR program savings. Shipment totals for 13 product categories were understated and 5 were overstated. The results of our analysis are in Table 2-1.

**Table 2-1: OIG Reconciliation of Reported Product Shipment Totals for 18 of 29 ENERGY STAR Categories**

ENERGY STAR Qualified Product	2006 Unit Shipments Used in Benefits Calculation <sup>9</sup>	2006 Unit Shipment Totals Reported by Manufacturers and Associations <sup>10</sup>	Difference	Impact
Audio/DVD	3,572,316	3,881,346	-309,030	Understated
Boilers	382,770	405,573	-22,803	Understated
Commercial Hot Food Holding Cabinets	17,059	17,403	-344	Understated
Commercial Refrigerators & Freezers	83,493	106,658	-23,165	Understated
Dehumidifiers	1,203,216	776,431	+426,785	Overstated
End Use Products with Qualified External Power Supplies	18,446,331	19,623,346	-1,177,015	Understated
Exit Signs	1,425,554	3,450,117	-2,024,563	Understated
External Power Supplies	128,849,173	128,939,237	-90,064	Understated
Furnaces	1,172,843	1,170,124	+2,719	Overstated
Monitors	13,859,666	34,581,203	-20,721,537	Understated
Residential Light Fixtures	11,361,701	11,363,633	-1,932	Understated
Roofing - Commercial Gallons	21,352,516	15,966,045	+5,386,471	Overstated
Roofing - Commercial & Residential Sq. Ft.	1,916,655,032	2,227,937,102	-311,282,070	Understated
Room Air Cleaners	287,354	289,815	-2,461	Understated
Telephony	6,761,627	7,006,979	-245,352	Understated
Transformers (Commercial & Industrial)	173,390	166,669	+6,721	Overstated
TV/VCR	17,685,967	13,166,140	+4,519,827	Overstated
Ventilating Fans	853,406	857,232	-3,826	Understated

Source: OIG analysis of shipment data submittals

<sup>9</sup> Per ENERGY STAR Unit Shipment Data Report Calendar Year 2006, July 1, 2007. These figures are reported by the contractor and used in the annual savings calculation process.

<sup>10</sup> Total compiled by OIG based on supporting documents (manufacturer data shipment submittal forms and third party association summary spreadsheets) provided by contractor.

According to EPA's contractor, the differences may have been caused by a number of reasons, including:

- Subsequent to shipment data submittals, manufacturers may have called to update or correct previously provided written submissions.
- The contractor may have called the manufacturer to follow up concerning the data submittal and new information received.
- Some private labelers<sup>11</sup> and original manufacturers submit the shipment data for the same products, which causes double reporting of shipments.
- Some manufacturers who reported shipments were not qualified manufacturers for that product category.
- Manufacturers made errors in reporting.

However, the contractor could not provide evidence in support of these possible explanations.

If the shipment data used in the annual savings calculation are incorrect or unsupported, the Agency may be overstating or understating the savings benefits for the program. For example, in our reconciliation of the 2006 shipment data, the monitor category was understated by nearly 21 million unit shipments or 150 percent. Monitors are one of the six ENERGY STAR products that account for 70 percent of the ENERGY STAR product sector carbon reductions to date. TV/VCR, another one of the six large contributors to carbon reductions, was overstated by approximately 4.5 million unit shipments or 26 percent.

ENERGY STAR overall program benefit are the sum of the savings calculated for each individual product. The importance of accurate data is discussed within a recently published article<sup>12</sup> that summarizes the methodology used to compute the annual ENERGY STAR product program sector benefits. The article stated:

*We implement the bottom-up model with awareness that uncertainty for each product type contributes to uncertainty in total ENERGY STAR impacts. This means that many small inaccuracies are additive overall and any one inaccuracy for a product type with large energy savings can significantly affect the overall results.*

We could not reconcile shipment data in 2006 for 62 percent of the product categories reviewed. The significance of this deficiency extends beyond a single year's benefits calculation. The deficiency impacts the savings calculations for future years as well because savings are computed and claimed annually over the

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<sup>11</sup> Private labeling is defined as licensing a product to another company to sell under its own name, rather than under the name of the manufacturer.

<sup>12</sup> Marla C. Sanchez, Richard E. Brown, Carrie Webber, and Gregory K. Homan. 2008. Savings estimates for the United States Environmental Protection Agency's ENERGY STAR voluntary product labeling program. *Energy Policy*. vol. 36, no. 6, pp. 2098-2108.

lifetime of a product. As previously discussed, the lifetime of calculated annual benefits can reach up to 20 years after initial product shipment.

### ***Lack of Quality Review of Shipment Data***

The reported shipment data submitted annually by manufacturers were not being adequately reviewed. According to ENERGY STAR's guidance document,<sup>13</sup> the ENERGY STAR Product Labeling branch collects national shipment data from ENERGY STAR partner manufacturers and reconciles inconsistencies through the contractor. As described by the contractor, the contractor performs a limited review that involves reviewing the information to see if the data appears reasonable. EPA officials have not requested the supporting documentation;<sup>14</sup> therefore we found no evidence that EPA conducts any quality reviews of shipment data submittals. If a reconciliation of shipment data had occurred, the discrepancies we identified in our analysis could have been noted and addressed in a timely manner.

### ***Number of Manufacturers Submitting Data May be Wrong***

We were unable to reconcile the number of manufacturers who submitted their annual data to the number reported. In some cases, we found fewer manufacturers submitting data than the contractor reported. In other cases, more manufacturers reported than were qualified. Additionally, we noted some manufacturers reporting annual ENERGY STAR product shipments that were not listed as a manufacturer of ENERGY STAR-qualified products. For these, there was no evidence of any follow-up to address why this occurred.

## **Other Factors Contribute to Uncertainties**

### ***Third Party Association Reporting Inconsistent and Unsupported***

Reporting from third party associations was inconsistent and primarily included only summary totals by manufacturer. For most of the associations reporting shipment data, there was no way to verify the numbers based on any support or actual shipment data documentation, but we identified some problems. For example, there were cases where the manufacturer reported directly to both the contractor and the association, which resulted in shipment number differences. There was no evidence that the contractor questioned the differences or conducted any follow-up. The contractor acknowledged that the third party association reporting is inconsistent, lacks uniformity, and data has been submitted past agreed due dates. According to the contractor, in instances when there is a

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<sup>13</sup>OAR (Office of Air and Radiation) Climate Protection Partnerships Division's ENERGY STAR Performance Management Plan.

<sup>14</sup> The contractor had not been maintaining the supporting documentation for previous shipment totals, and the contractor is not required to do so by the contract. However, the contractor recently began retaining supporting documentation for reported overall numbers.



reporting difference, it has been its general practice to use the shipment totals reported by the third party association rather than the manufacturer. We could not verify from documentation provided whether these numbers were double counted.

### ***Use of Estimates and Forecasting Increases Uncertainty***

Selected manufacturer shipment data submittal forms provided shipment estimates rather than actual shipment totals. We found no documentation of any follow-up with these manufacturers as to why estimates were used, nor did the contractor mention this as a step taken.

EPA did not require manufacturers to submit annual shipment data for office products. For the 2006 annual reported savings, forecasting reports were used to estimate shipment totals for some office products. We reviewed the two primary forecasting reports used. We noted that one report used for this forecasting was dated 2001. The other report did not clearly indicate how domestic shipments were separated from international shipments. Concerns associated with using a dated forecasting report may be corrected due to recent office product specification revisions.<sup>15</sup> Also, beginning in 2008, manufacturers were required to submit shipment data annually for office products.

Annual programmable thermostat shipments were estimated by the contractor based on past conversations with one U.S.-based manufacturer. Currently there are over 50 qualified manufacturers in this category, including many companies outside of the United States. Further, the ENERGY STAR Partner Commitment Agreement for Programmable Thermostats<sup>16</sup> specifically requires that manufacturers submit the total number of qualified products shipped annually. We could not verify or reconcile the accuracy of support for benefits from this item since no actual shipment data were submitted, despite EPA's requirements.

### ***ENERGY STAR Totals May Include International Shipments***

According to ENERGY STAR staff, shipment totals used to calculate energy savings are supposed to be limited to U.S. shipments. However, ENERGY STAR's management plan states that as part of the partnership agreement, manufacturers must supply EPA with the "total number of ENERGY STAR qualified products shipped in the United States / Canada on annual basis." We noted discrepancies in manufacturer shipment submittal forms. For example, on one submittal the manufacturer was identified as Company X, Canada, but had been changed to Company X, USA, within the final contractor's reports. Also, on selected forms, the manufacturer said it could provide total international shipments with only an estimate of U.S. shipments. EPA's contractor said that it

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<sup>15</sup> In 2007, new specifications were made to the following office products: computers, copiers, facsimile, mailing machines, multifunction devices, printers, and scanners.

<sup>16</sup> To participate in the ENERGY STAR program and become eligible to become a partner, each manufacturer must agree to and adhere to this commitment.

was unaware of domestic and international shipments being commingled, but noted it has not done any detailed work in this area. We believe that being unaware of whether international shipments are being included in calculations is not a reason to conclude they are not.

### ***Late Shipment Data Not Included in Benefits Calculations***

We found that approximately 33 million units reported as shipped were not included in the shipment totals used to calculate saving benefits for 2006. Per the Performance Management Plan, manufacturers are to provide shipment data by March 1 of the subsequent year (i.e., March 2007 for 2006 shipments). EPA's contractor then compiles this information and prepares a July report of ENERGY STAR shipments to be used in the savings benefit calculations. The contractor prepares an updated report in October that includes shipment data submitted after the deadline. However, due to late submittals, we noted 33 million units captured in the October 2007 report that had not been captured in the July 2007 report. Therefore, savings benefits from these products were not captured in the 2006 reporting period.

According to the EPA Office of Air and Radiation's Director of the Climate Protection Partnership Division, these shipments were also not included in the 2007 calculations because the amount was considered immaterial. According to EPA's contractor, the late shipment numbers were folded into the 2007 calculations. However, the contractor was unable to provide evidence that this had occurred. Therefore, we concluded that the late shipments are not being captured by the current methodology. The lack of a methodology to capture potential savings benefits for late submittals reduces the reliability of ENERGY STAR reporting.

## **DOE Product Included in EPA ENERGY STAR Reported Savings**

EPA reports a portion of savings benefits from the shipments of compact fluorescent lights (CFLs) even though CFLs are managed by DOE. EPA's 2006 ENERGY STAR Annual Report claimed 75.2 billion kilowatt hours (kWh) in energy savings. However, 5.7 billion kWh of those savings, or 8 percent, came from the DOE-managed CFLs. EPA did not disclose in its Annual Report that savings benefits reported include benefits from DOE-managed products.

Also, we found differences in the total benefits claimed for CFLs by EPA and DOE. DOE reported 6.2 billion kWh in energy savings versus EPA's 7.6 billion kWh for 2006. Rather than obtain total savings benefits directly from DOE, EPA calculated the CFLs energy savings benefits in the same manner as other EPA product savings (this process is described earlier in this chapter). This difference in energy savings between DOE and EPA for the same product questions the reliability of the computing and reporting of energy savings.

EPA ENERGY STAR staff said they claim one-third of CFL energy savings because of EPA's marketing efforts. They also said they were involved in the specification development for CFLs. For these reasons, they claim a portion of the CFLs savings benefits. However, DOE ENERGY STAR staff were not aware that EPA claimed this percentage of CFL savings, and had claimed 100 percent of their calculated CFL savings in 2006. This resulted in double-counting of CFL benefits by EPA and DOE. A DOE ENERGY STAR representative said that while EPA does contribute to the success of CFLs by EPA's marketing efforts, EPA should coordinate with DOE regarding the calculation and reporting.

## Conclusion

We found that the reported savings claims were inaccurate and the reported annual savings unreliable. We identified several concerns with shipment data, including: lack of quality review of the data submittals; reliance on estimates, forecasting, and third party reporting; and potential inclusion of international shipments with domestic ENERGY STAR product shipments. After attempting to reconcile the support for these numbers by product category, we found the overall claims to be inaccurate due to irreconcilable manufacturer shipment data and use of estimates. We conclude that the savings reported are not accurate or verifiable. The accuracy of the program's reported energy savings is important in the United States' efforts to reduce greenhouse gas emissions.

## Recommendation

- 2-1 To improve the validity of reported annual savings for the ENERGY STAR program, we recommend that the Principal Deputy Assistant Administrator for the Office of Air and Radiation establish and perform quality controls to ensure that:
- Data in benefits calculations, whether from partners or third parties, are timely, complete, valid, and documented.
  - The contractor and third party associations receiving the manufacturer data submittal forms reconcile submittals in a manner that ensures the total annual shipments reported by product category are accurate and reflect actual numbers (not estimates) and are for domestic shipments only.
  - Agency officials improve contractor oversight by obtaining actual support for annual savings in a manner that demonstrates that the numbers are valid and can be reconciled.
  - Data in benefits calculations attributable to DOE products should be clearly identified and developed in consultation with DOE to avoid redundancy.

## Agency Comments and OIG Evaluation

EPA did not agree to the portions of Recommendation 2-1 that related to improvements needed to ensure data used in benefits calculations are timely, complete, valid, and documented. The Agency requested the OIG to delete the related portions of the recommendation. EPA said it addresses the quality of annual shipment numbers used for ENERGY STAR benefits calculations through a systematic review and improvement of the data submitted based on additional follow-up with reporting manufacturers. However, based on our findings in this area, we do not agree that the Agency currently has a systematic review process in place. The OIG evaluated the existing process and the findings show that the process used to collect and verify the data was deficient and needs improvement. OIG identified deficiencies with the process of collecting, reviewing, and reporting product data shipment information both from third parties or actual manufacturers. EPA also stated that estimates were not used as part of estimating annual program benefits. However, at the time of our review, estimates of shipment totals were used for both office products and programmable thermostats in calculating annual benefits.

EPA provided corrective actions to address the portions of the recommendation that relate to improving contractor oversight and reporting savings from DOE products. Specifically, EPA agreed to remove the benefits of CFL products from the program's 2007 benefits estimates and will only reintroduce these benefits after appropriate coordination with DOE. The OIG concurs with the Agency's plan to address the reporting of CFLs. However, the Agency's corrective actions for contractor oversight do not fully meet the intent of the recommendation. The OIG identified deficiencies with the process of collecting, reviewing, and reporting product data shipment information. The Agency's corrective action plan will need to address these shortcomings.

The recommendation remains open and unresolved. The Agency's comments and our evaluation of those comments are in Appendix D.

## Chapter 3

# ENERGY STAR Market Transformation Benefits Calculated Inconsistently

The reporting of ENERGY STAR market transformation benefits is not transparent. ENERGY STAR does not disclose that it includes savings from products that are not ENERGY STAR qualified. Further, the process does not compute the effect for products with stable or rising sales after a specification revision. EPA's market transformation benefits are generated when innovations are introduced into the marketplace and are accepted by a large portion of the market. However, EPA calculates the market transformation effect only when ENERGY STAR product shipments fall after a specification revision.

### Market Transformation Caused by Innovations in Efficiency

The ENERGY STAR programs attempt to transform the markets (i.e., consumer electronics, office equipment, lighting, etc.) from less to more energy-efficient products. Market transformation is the process whereby these efficiencies are introduced into the marketplace and are increasingly accepted by a large portion of the market. According to EPA, the ENERGY STAR program produces such an effect on the market. ENERGY STAR staff asserted that the program has two primary mechanisms to spur market transformation for labeled products:

- Introduce standards for new product categories.
- Revise specifications for existing products to further increase their energy efficiency.

According to EPA, the program has revised specifications for over 50 ENERGY STAR product categories. After a specification is revised, shipments of ENERGY STAR units may decrease until manufacturers institute product design changes to meet the new requirements. Nonetheless, products that once met program standards but are then no longer ENERGY STAR-qualified continue to be sold.<sup>17</sup> Shipments of these products are included in reported ENERGY STAR benefits; this assumes that the products continue to be manufactured as energy efficient despite not meeting the new ENERGY STAR revised standard.

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<sup>17</sup> The methodology does not address the loss of potential energy savings that occurs because the consumer purchased a formerly qualified product over a newly qualified higher performing alternative.

## Market Transformation Benefits Calculated with Assumed Data

EPA's ENERGY STAR market transformation benefits process calculates and reports savings based on a combination of assumed and actual shipment numbers. The ENERGY STAR program does not have data to support the assumptions the market transformation effect uses. Further, the assumed sales that are attributed to the market transformation effect represent non-qualified products.

A peer reviewed article<sup>18</sup> describing ENERGY STAR's market transformation effect included the following limitations statement:

*“General limitations to a bottom-up approach occur in two main areas: (1) the model requires numerous detailed inputs to generate the end result and (2) uncertainty in those inputs are additive through the process. These limitations mean that collecting and documenting high-quality inputs is essential...targeting data collection and verification activities at those areas is key to successful results.”*

In this market transformation effect the main input – previously qualified ENERGY STAR products – is based on assumptions rather than collected or verified data. Program requirements do not require manufacturers to report sales of formerly qualified ENERGY STAR products. EPA uses a model based on assumptions to calculate the market transformation effect in the absence of actual shipment data. By design, the model ensures that shipment amounts of products are never lower than the amount in the year prior to the specification change.

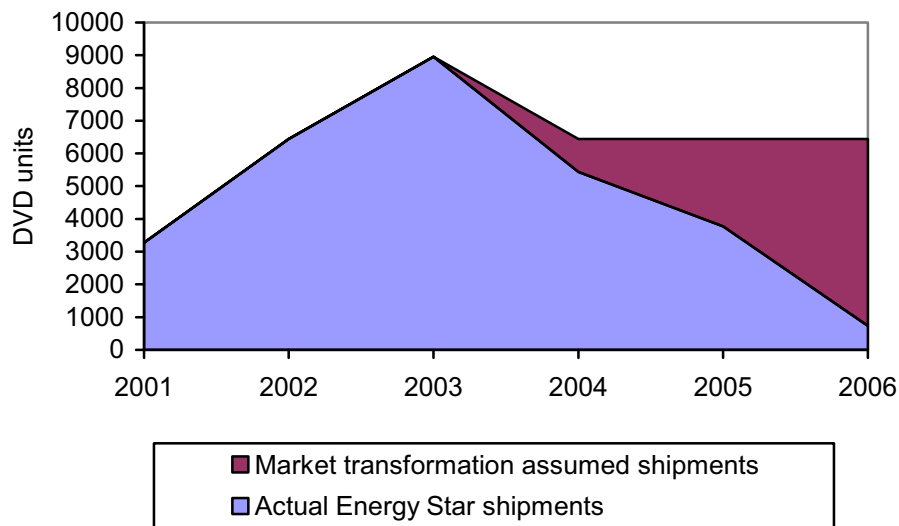
The specification revision for DVD players illustrates EPA's method of accounting for the market transformation effect. New specifications for DVD players took effect January 1, 2003. Shipments of ENERGY STAR-qualified DVD players rose that year, so no adjustment for the market transformation effect was made. However, in 2004 and beyond, manufacturer-reported shipments of ENERGY STAR-qualified DVD players fell below the 2003 level. To make up for this drop in sales, which was attributed to the specification revision, the model adjusted the current-year shipment figure based on the market transformation effect. The model increased the shipment totals for 2004 by adding in an estimated number of non-qualified ENERGY STAR DVD players shipped. This assumption is based on the theory that even though this estimated number represents non-qualified ENERGY STAR products, these products are more energy efficient than they would have been without Energy Star. Therefore, ENERGY STAR's impact was to transform the market to produce more efficient products. The model continued to rely on this estimated level of product

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<sup>18</sup> Marla C. Sanchez., Richard E. Brown, Carrie Webber, and Gregory K. Homan. 2008. Savings estimates for the United States Environmental Protection Agency's ENERGY STAR voluntary product labeling program. *Energy Policy*. vol. 36, no. 6.

shipments for 2005 and 2006 despite further decline in the number of units shipped. This is shown in Figure 3-1.

**Figure 3-1: DVD Players Market Transformation Effect**



Source: OIG analysis of CCAP

## Market Transformation Obscures Program Accomplishments

Based on our review of ENERGY STAR products that had specification revisions, the market transformation effect was calculated for nine product categories in 2006:

- DVD players
- Monitors
- Telephony
- Home audio equipment
- TVs
- TVs/VCRs
- VCR & VCR/DVDs
- Air source heat pumps
- Central air conditioners

The savings derived from the market transformation effect may have a significant impact on ENERGY STAR reported savings, because energy savings will continue to accumulate for the lifetime of a product. To illustrate the impact of the market transformation effect, we recomputed ENERGY STAR benefits by eliminating assumed shipment data and comparing these to the original benefit calculation. Based on our recalculation, ENERGY STAR energy savings reported in 2006 were overstated, as shown in Table 3.1.<sup>19</sup>

<sup>19</sup> This calculation represents one year; it does not include the potential overstatement from prior or future year benefits calculated for the same products.

**Table 3-1: Market Transformation Effect**

	<b>ENERGY STAR Summary<sup>20</sup></b>	<b>OIG Re-calculation</b>	<b>Overstatement</b>
<b>Energy Saved (Billion kWh)</b>	70.5	66.3	<b>4.2</b>
<b>Carbon Avoided (MMTCE)</b>	14.3	13.5	<b>0.8</b>

Source: OIG analysis of EPA data

Shipment amounts were not based on actual or reported shipment data. EPA counted benefits from non-qualified ENERGY STAR products into its annual ENERGY STAR benefits amounts for 2006. Also, EPA did not compute a market transformation effect for products with stable or rising sales after a specification revision. The model is therefore inconsistently applied, since there should be a benefit derived from products with increasing as well as decreasing shipments.

## Conclusion

ENERGY STAR does not disclose that it includes savings from products that are not ENERGY STAR-qualified. The computation of the market transformation effect does not use shipment or sales data, and only applies to products with both specification revisions and decreasing sales. Further, reported ENERGY STAR energy savings for 2006 omit mention of the market transformation effect, though it is included in individual product energy savings calculations. ENERGY STAR needs to improve controls over estimating and reporting benefits from the market transformation effect. Partnership agreements should include requirements for reporting shipment data of formerly qualified products, and the “effect” should be applied consistently. Also, market transformation benefits should be separately disclosed in ENERGY STAR’s annual reporting.

## Recommendation

- 3-1 We recommend that the Principal Deputy Assistant Administrator for the Office of Air and Radiation develop and consistently apply a data-driven methodology to compute the market transformation effect of all product categories and report the benefits separately from ENERGY STAR-qualified products.

## Agency Comments and OIG Evaluation

EPA said that the OIG did not provide a basis for recommending a change in the market transformation methodology and suggested removing the recommendation. The methodology is based on assumed shipment amounts and

<sup>20</sup> The 70.5 billion kWh of energy saved comes from EPA-managed ENERGY STAR products.



reports savings from non-qualified products as ENERGY STAR qualified product savings without proper disclosure. Therefore, the OIG does not agree with EPA's suggestion to remove the recommendation. The recommendation is open and unresolved. The Agency's comments and our evaluation of those comments are in Appendix D.

## Chapter 4

# ENERGY STAR Commercial Benefits Model Utilizes Unverified Assumptions

The methodology used to compute the ENERGY STAR commercial sector savings was based on unverified assumptions. EPA calculates program savings as the difference between all commercial sector gains in energy efficiency and claims by utility and State programs for that year. However, we do not believe the formula is sufficiently tailored to the specific needs of the ENERGY STAR program. The formula needs to be verified to ensure that the end results – benefits attributable to ENERGY STAR’s commercial activities – are valid and accurately represent ENERGY STAR’s contributions to energy savings.

### Formula Used to Calculate Commercial Sector Savings

EPA’s ENERGY STAR program uses a formula created, operated, and maintained by its contractor to compute the annual commercial sector savings. In this formula, the contractor (a) calculates all commercial sector gains in energy efficiency, (b) subtracts amounts from utility and State programs, and (c) concludes that the remaining energy savings are attributed to the ENERGY STAR program. ENERGY STAR staff said they review the formula with the contractor but they do not document the review results. The formula uses data from other agencies, along with related energy studies; it does not use any data from the ENERGY STAR program.

### Methodology Not Tailored for ENERGY STAR

The methodology used for ENERGY STAR is not tailored specifically to calculate impacts attributable to that program and contains unverified assumptions. The methodology, which calculates the commercial benefits amount, is described in a 2007 paper by EPA’s contractor.<sup>21</sup> This paper states: “In this study, *energy efficiency programs* refer collectively to all such governmental efforts, irrespective of organizational origin or mode.” This methodology looks at all energy efficiency programs in total; it is not tailored to pull out the impacts of the ENERGY STAR program. There is only one mention of ENERGY STAR in the paper, because it is used to define the start of the treatment period.

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<sup>21</sup> Horowitz, Marvin J. (2007). “Changes in Electricity Demand in the United States from the 1970s to 2003.” *The Energy Journal*, Vol. 28, No. 3, pp. 93-119.

The paper's goal was to answer the following three questions:

- How has electricity demand changed in the United States over the past three decades?
- If electricity demand changed, do these changes differ between States depending on their degree of commitment to encouraging energy efficiency?
- Does program commitment have observable, long-term impacts on the behaviors that affect electricity demand?

These questions are not related directly to ENERGY STAR's impact on electricity demand. Rather, they seek to determine energy efficiency programs' effects on energy demand.

The methodology was peer reviewed, but its application as the basis for measuring ENERGY STAR's impact on the commercial sector was not part of the published methodology. EPA needs to verify that the benefits attributed to ENERGY STAR are supported. Specifically, EPA should verify that the methodology: (a) avoids double counting savings from the product sector, (b) accounts for impacts of other federal energy efficiency programs, and (c) accounts for impacts of non-federal energy efficiency programs.

### ***Method to Avoid Double Counting Products Savings Unclear***

The formula used to compute ENERGY STAR commercial sector energy savings does not use any data, results, or statistics from the EPA's ENERGY STAR program. Rather, the formula uses databases maintained by other government agencies, such as the Federal Reserve Board, National Climate Data Center, and Energy Information Administration. EPA ENERGY STAR staff said that the formula uses the best information available. To account for benefits from the ENERGY STAR products sector, the formula uses a Federal Reserve Bank's market group index for information processing and related equipment.

Approximately half of all ENERGY STAR product savings in 2006 were for commercial products, totaling 37.1 billion kWh. When the Agency reports total annual savings it includes savings from products, residential, industrial and commercial. If the commercial savings do not account for the savings from commercial products reported by the Agency, there may be the potential for overstatement of savings. The contractor and EPA officials asserted there was no double counting, but they could provide no evidence to support that position.

### ***Method for Accounting for Impacts of DOE Program Unclear***

The ENERGY STAR program's methods for accounting for the impacts of a DOE program are unclear. The Energy Policy Act of 1992 set standards for certain commercial equipment and set schedules requiring DOE to make, review,

and update standards. The DOE's Building Technologies Program works to improve the efficiency of buildings and the equipment, components, and systems within them. These DOE programs should contribute to some of the energy savings within the commercial sector. However, EPA's formula does not evaluate or compensate for the energy efficiency contributions from DOE programs. Rather, the formula only deducts savings from utility, State, and local programs. ENERGY STAR staff said that the formula accounts for the DOE programs through the use of the Federal Reserve Board's market index group. The accuracy of using this index compared to actual reported data from both EPA and DOE should be validated to determine if the formula is reporting ENERGY STAR commercial benefits accurately.

### ***Method for Accounting for Impacts of Non-federal Energy Efficiency Programs Unclear***

The method for accounting for the impacts of non-federal energy efficiency programs is unclear. The formula subtracts energy savings that are attributable to utility companies, States, and local programs – such as demand-side management (DSM) and public benefits charges (PBC) from total commercial savings – to arrive at net ENERGY STAR savings for the commercial sector. The contractor calculates savings from these other programs<sup>22</sup> by using information on DSM and PBC programs from the study *A Nationwide Assessment of Utility Sector Efficiency Spending, Savings, and Integration with Utility System Resource Acquisition*. The contractor performs the following alterations to the numbers taken from this study:

1. Project or estimate DSM and PBC savings from 2004 to 2006. (The study's results were from 2004; the contractor updated this data to 2006 by using a growth rate that it determines.)
2. Allocate the share of energy savings that occur in the commercial sector. (The study's reported amounts were a combination of residential, commercial, and industrial savings.)
3. Apply a net-realization rate that lowers the computed DSM and PBC savings because, as explained by the contractor, the full amount of energy saved reported by electric utilities for their DSM programs cannot be taken at face value.

Based on the first two steps, the computed savings from the DSM and PBC programs were 38,502 gigawatt hours, but EPA's contractor took 42.5 percent<sup>23</sup> of this amount, lowering the savings figure to 16,363 gigawatt hours. This was

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<sup>22</sup> Other programs consist of State, utility and local energy efficiency programs.

<sup>23</sup> This percentage is supported by a memorandum prepared by the contractor that spells out how the program allocation factor for the formula was calculated. Specifically, the 42.5 percent is referred to as a net-to-gross factor, or a net realization rate.

then attributed to the other energy efficiency programs. The application of the net-realization rate significantly impacts the ENERGY STAR-derived energy benefit. The lower the rate the greater the portion of savings is attributable to ENERGY STAR. ENERGY STAR staff said that all formula inputs are from the best available and/or peer reviewed data.

## Formula Methodologies and Assumptions Need to Be Verified

The spreadsheet used to calculate the energy savings for the commercial sector was not verified to ensure that its results are an accurate computation of energy savings attributable specifically to the ENERGY STAR commercial sector. ENERGY STAR plans to expand the use of this formula to compute energy savings for the industrial sector, so it is additionally important to verify and validate the formula's results.

The *EPA Quality Manual for Environmental Programs CIO 2105-P-01-0* (formerly 5360 A1) defines a peer review as:

*A documented critical review of work by qualified individuals (or organizations) who are independent of those who performed the work, but are collectively equivalent in technical expertise. A peer review is conducted to ensure that activities are technically adequate, competently performed, properly documented, and satisfy established technical and quality requirements. The peer review is an in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria, and conclusions pertaining to specific work and of the documentation that supports them.*

A peer review could accomplish two objectives. First, it could validate that the formula reasonably computes all energy savings. Second, it could provide assurance that savings are attributable to EPA's ENERGY STAR commercial sector's activities. The validation should be conducted in accordance with *EPA Quality Manual for Environmental Programs CIO 2105-P-01-0*.

## Conclusion

The methodology used to compute the ENERGY STAR commercial savings is based on unverified assumptions that impact the accuracy of the reported energy savings. The methodology is based on a study of the impact of all energy efficiency programs on electric demand, not only ENERGY STAR; it assumes that all net savings are attributable to the ENERGY STAR commercial program. EPA needs an independent assessment or validation of how ENERGY STAR savings are computed to establish a reasonable assurance that the energy saved is accurate.

## Recommendation

- 4-1 We recommend that the Principal Deputy Assistant Administrator for the Office of Air and Radiation validate the formula (methodology) used for calculating the benefits of the ENERGY STAR commercial program in accordance with *EPA Quality Manual for Environmental Programs CIO 2105-P-01-0*, to ensure that it accurately reflects the impacts of EPA actions.

## Agency Comments and OIG Evaluation

EPA maintains that the estimates generated by the methodology are rigorous, that where marginal uncertainties are present they have been handled conservatively, and that the results are sound. EPA said that it will secure additional outside expert review of the entire methodology being used to estimate the benefits of the ENERGY STAR program in the commercial sector. The EPA action meets the intent of the recommendation; however the recommendation remains open until the completion of the expert review. The review should assure that assumptions, data sources, and methods used to estimate the ENERGY STAR commercial benefits savings are reasonable and supported. The Agency's comments and our evaluation of those comments are in Appendix D.

## **Status of Recommendations and Potential Monetary Benefits**

RECOMMENDATIONS						POTENTIAL MONETARY BENEFITS (in \$000s)	
Rec. No.	Page No.	Subject	Status <sup>1</sup>	Action Official	Planned Completion Date	Claimed Amount	Agreed To Amount
2-1	13	<p>To improve the validity of reported annual savings for the ENERGY STAR program, establish and perform quality controls to ensure that:</p> <ul style="list-style-type: none"> <li>• Data in benefits calculations, whether from partners or third parties, are timely, complete, valid, and documented.</li> <li>• The contractor and third party associations receiving the manufacturer data submittal forms reconcile submittals in a manner that ensures the total annual shipments reported by product category are accurate and reflect actual numbers (not estimates) and are for domestic shipments only.</li> <li>• Agency officials improve contractor oversight by obtaining actual support for annual savings in a manner that demonstrates that the numbers are valid and can be reconciled.</li> <li>• Data in benefits calculations attributable to DOE products should be clearly identified and developed in consultation with DOE to avoid redundancy.</li> </ul>	O	Principal Deputy Assistant Administrator, Office of Air and Radiation			
3-1	18	Develop and consistently apply a data-driven methodology to compute the market transformation effect of all product categories and report the benefits separately from ENERGY STAR-qualified products.	O	Principal Deputy Assistant Administrator, Office of Air and Radiation			
4-1	24	Validate the formula (methodology) used for calculating the benefits of the ENERGY STAR commercial program in accordance with EPA Quality Manual for Environmental Programs CIO 2105-P-01-0, to ensure that it accurately reflects the impacts of EPA actions.	O	Principal Deputy Assistant Administrator, Office of Air and Radiation			

<sup>1</sup> 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

Logic Model for ENERGY STAR Products

Long Term

Intermediate Outcomes

Assessment/ Outcomes

Outputs Reassessment

Activities

Resources

Program Administration  
 -- Up to date product lists  
 -- Up to date partner information  
 -- Data collection on product shipments

Build Supply of Efficient products  
 -- Add new products (using established guidelines)

Revise Product Specs  
 -- as appropriate (using established guidelines)

Build Demand -- Outreach  
 -- robust web-based info  
 -- consumer hotline  
 -- direct consumer efforts  
 -- key product strategies  
 -- partner by partner assistance  
 -- coordinated national campaigns  
 -- train distribution channels  
 -- product procurement

Ensure Quality  
 -- require proper use of logo in ads  
 -- spot test products  
 -- improve retail experience

Evaluation  
 -- consumer awareness, understanding, etc  
 -- progress assessments

Products  
 -- # product categories  
 -- # product models  
 -- # product sales (annual)  
 -- market penetration

Partners  
 -- # manufacturers  
 -- # retailers  
 -- # program sponsors  
 -- # states and others

Partner activity  
 -- activity/investment by retailers, program sponsors, manufacturers

Outreach  
 -- # web visitors  
 -- key visitor interests  
 -- # media impressions  
 -- # media impressions by key strategy and product

Compliance/Quality  
 -- # advertising clips  
 -- # companies advertising  
 -- # violations  
 -- # companies with violations

-- Indication of manufacturer QA/QC issues  
 -- lighting fixture violations  
 -- Indication of retailer issues

Brand Information  
 -- level of consumer awareness, understanding, etc

Benefits Protections  
 -- estimates by product of future sales/benefits based on continued efforts

Annual review of key outputs against program near, mid, and long term goals for program and key product areas and revision of strategies, as appropriate

Energy Savings  
 -- in kWh  
 -- by product area  
 -- program level

Reductions in GHG emissions  
 -- in mmtce  
 -- by product area  
 -- program level

Investment in technology  
 -- in \$\$  
 -- program level

Net Savings on Energy bills  
 -- in \$\$  
 -- program level

Program Cost-effectiveness

Behavioral Change

Improved Energy Efficiency Policies for Product Efficiency

Cleaner Air  
 Reduced Risk of Climate Change  
 Improved Public Health  
 Cost Savings  
 Institutionalized Behavior Change

Source: ENERGY STAR program



Appendix B

Logic Model for ENERGY STAR Commercial & Industrial Programs



Source: ENERGY STAR program

**Appendix C*****Details on Scope and Methodology***

To determine whether the savings reported for products and commercial ENERGY STAR program sectors were valid and fully supportable, we analyzed supporting documentation for 2006 reported annual savings. We reviewed the *ENERGY STAR and Other Climate Protection Partnerships 2006 Annual Report (September 2007)* and the *U.S. Climate Action Report – 2006* for savings and benefits claims made by the program. We also reviewed relevant reports and spreadsheets by Lawrence Berkeley National Laboratory and various contractors.

We conducted a review of the savings benefits for the products and commercial sectors, which combined encompassed 81.6 percent of the 2006<sup>24</sup> reported carbon emissions avoided; we did not conduct a detailed review of the residential and industrial sectors. To analyze the methods used to calculate the annual savings by sector, we met with EPA ENERGY STAR officials and the primary contractors involved. For the product sector, we obtained available support data and documented the roles of both EPA and the contractor in the computation and methodology process. Specifically, we requested the supporting documentation for the 2006 shipment totals used in the savings benefit calculation for 2006 (as described in Chapter 2). We were provided manufacturer shipment data submittal forms and shipment reports from third party associations. We performed a detailed analysis and reconciliation of the manufacturer shipment data submittals for all 2006 reported amounts by qualified ENERGY STAR product category. We documented the forecasting methods for the other EPA product categories for which submission of direct data shipment data was not required for 2006 reporting. We judgmentally selected a sample of four qualified products based on a number of factors including: ENERGY STAR shipment totals for 2006 and specification revision history. We traced and reconciled these four qualified products through the Lawrence Berkeley National Laboratory CCAP model. These products were computers, DVDs, external power supplies, and monitors.

For the commercial sector, we reviewed the methodologies used to calculate ENERGY STAR reported benefits. We met with the contractor to obtain an understanding on how commercial benefits are calculated. We also analyzed the contractor's spreadsheet, containing the inputs and assumptions used in calculating the 2006 commercial ENERGY STAR reported benefits.

To determine what management controls EPA had in place to ensure the validity and accuracy of reported annual savings, we analyzed available data and met with EPA and contracting officials. We reviewed the *OAR (Office of Air and Radiation) Climate Protection Partnerships Division's ENERGY STAR Performance Management Plan*. Our review included a detailed follow-up with the ENERGY STAR Director on plan specifics. We met with the contractor involved in implementing the plan to determine the role quality assurance/quality control plays in its work in the computation process. We also analyzed some of the controls/procedures within the plan to verify whether they were applicable and had been adequately performed as described within Chapter 2. All internal control weaknesses noted during our evaluation are discussed in Chapters 2, 3, and 4 of this report.

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<sup>24</sup> At the time of our evaluation, 2006 was the most current data available.

To determine the basis for goal setting, we meet with ENERGY STAR staff and reviewed the program's logic models. We also reviewed recent U.S. Climate Action Reports, *Guidelines for Designing EPA Partnership Programs*, *Government Performance Results Act of 1993*, and the *Energy Policy Act of 2005*.

## Appendix D

## ***Agency Comments and OIG Evaluation***

### **MEMORANDUM**

**SUBJECT:** Response to Draft Evaluation Report: Improvements Needed to Validate Reported ENERGY STAR Benefits: Project No. 2007-0081

**FROM:** Robert J. Meyers  
Principal Deputy Assistant Administrator

**TO:** Jeffrey Harris  
Director for Special Studies  
Office of the Inspector General

We appreciate the opportunity to review the OIG’s draft report on the benefits of the ENERGY STAR program and their recommendations for improving the benefit estimation methods OAR employs. OAR has or will address two of the three recommendations and asks that the third recommendation be removed.

OAR maintains a strong commitment to using and continually improving the methods it employs to provide robust estimates of the benefits of the ENERGY STAR programs. In this context, OAR will proceed to address the OIG recommendations, where they have not already been addressed.

**OIG Response:** OIG understands the ENERGY STAR program reports estimates. The statement that, “More than 37 million metric tons of greenhouse gas emissions were avoided, equivalent to the greenhouse gas emissions from 25 million vehicles,” does not disclose that reported program benefits are robust estimates. The other reportable program benefits are reported in a similar matter.

OAR is very concerned about the tone and exaggeration of issues in the OIG report as well as the general implication that OAR’s estimates of ENERGY STAR program benefits are not valid. OAR stands by the validity of the reported estimates of the ENERGY STAR program benefits.

- OAR methods and procedures conform to Agency policy and guidance.
- OAR employs peer-reviewed methods and appropriate QA/QC procedures.
- OAR approaches are consistent with well-documented best practices for developing estimates of the benefits of energy efficiency programs.
- OIG did not identify any issues that have a significant impact on the reported results for the ENERGY STAR program.

**OIG Response:** OIG reported that the data used to calculate benefits was inaccurate and unsupported; therefore we could not attest to the overall validity of the actual reported numbers. For the product and commercial program sectors we documented how benefits were calculated, evaluated the supporting data, and outcome of EPA's calculations with the claimed impacts. In our opinion there were numerous deficiencies in the processes and data supporting the benefit calculations.

It is important to understand that program benefit estimates are estimates. Such estimates are routinely based on available data and reasonable assumptions. OAR employs conservative estimates for assumptions where there is a lack of available data and some uncertainty.

Further, OAR does not believe that the OIG identified any issues that have a significant impact on the reported results for the ENERGY STAR program. The OIG review of the ENERGY STAR benefits calculations was narrowly focused on several issues and processes. In addition, there are important inaccuracies in the OIG report and misunderstandings of the methods that OAR employs (see supporting information).

**OIG Response:** It is the OIG's opinion that the Agency approach for estimating program benefits is not conservative. For example, we do not believe that the Agency's use of the market transformation effect is a conservative approach. The OIG takes no position on the validity of the market transformation effect, but we disagree with the methodology used by the Agency to compute this effect. An additional issue we noted was the lack of disclosure in the annual report. Benefits derived from the market transformation are not identified in the annual report and are included along with benefits from ENERGY STAR qualified products.

Furthermore, the OIG's objective was to determine the validity of the ENERGY STAR benefit calculations. We conducted a comprehensive review of the methodology, data, and analysis used by EPA to calculate over 80 percent of the ENERGY STAR reported carbon emissions avoided in 2006. We found deficiencies in the design, data, and execution of the benefit calculations. We did not attempt to quantify the net numerical impact of these deficiencies. OIG believes that the net impact of reported deficiencies may be significant. For example, when calculating individual consumer product benefits if the initial data shipment numbers are unsupported or inaccurate, not only is the benefit calculation for that current year invalid but the subsequent calculation of benefits are impacted over the lifetime of that product category. As noted in the Agency's peer reviewed article:

*We implement the bottom-up model with awareness that uncertainty for each product type contributes to uncertainty in total ENERGY STAR impacts. This means that many small inaccuracies are additive overall and any one inaccuracy for a product type with large energy savings can significantly affect the overall results.*

We do not agree that the OIG report contains inaccuracies. The Agency's response did not provide evidence in support of this statement.

The result of the OIG review is that

- The OIG identified several ways for OAR to improve its documentation of data and QA/QC procedures, steps that OAR has already or will undertake this coming year.
- The OIG questions an approach that OAR uses to represent the market transformation benefits of the ENERGY STAR product labeling program; however, because this approach is a well accepted practice, has been peer-reviewed, addresses the uncertainty in a conservative manner, and represents about 2 percent of overall program benefits, OAR does not believe a change is necessary.
- The OIG identified two addition errors that would serve to increase the ENERGY STAR program benefits for 2006 by about 1 percent. These errors have been corrected.

**OIG Response:** OIG does not agree with the above assessment of the results of the OIG's review. The supporting information OAR provided in this response will be addressed by each subject as deemed necessary.

In addition, the OIG made three recommendations to improve the methods and processes OAR uses for estimating the annual benefits for the ENERGY STAR program. These recommendations and OAR's responses are provided below.

**Recommendation 2-1** To improve the validity of reported annual savings for the ENERGY STAR program, we recommend that the Principal Deputy Assistant Administrator for the Office of Air and Radiation establish and perform quality controls to ensure that:

- Data in benefits calculations, whether from partners or third parties, are timely, complete, valid and documented.
- The contractor and third party associations receiving the manufacturer data submittal forms reconcile submittals in a manner that ensures the total annual shipments reported by product category are accurate and reflect actual numbers (not estimates) and are for domestic shipments only.
- Agency officials improve contractor oversight by obtaining actual support for annual savings in a manner that demonstrates that the numbers are valid and can be reconciled.
- Data in benefits calculations attributable to DOE products should be clearly identified and developed in consultation with DOE to avoid redundancy.

**OAR Response:** OAR addresses the quality of annual shipment numbers used for ENERGY STAR benefits calculations through a systematic review and improvement of the data submitted based on additional follow up with reporting manufacturers. There are clear deadlines for the reporting of data and ramifications for partners not reporting data by these deadlines. Estimates and international shipments, while collected in a few limited cases, are not used as part of estimating annual program benefits. Documentation of these requirements, data submittal timelines and penalties for not meeting them is available at [www.energystar.gov/usd](http://www.energystar.gov/usd).

**OIG Response:** OIG evaluated the existing process. The findings show that the process used to collect and verify the data was deficient and needs improvement. Corrective action may include improved implementation and oversight of the existing process as well as new procedures. For example, we found large discrepancies in the shipment data used in the benefits calculation for exit signs and monitors. The table provided by the Agency not only acknowledges errors occurred, but validates the lack of a quality control system. The large “spreadsheet errors,” uncorrected until disclosed by OIG, demonstrate deficiencies in the existing Quality Assurance/Quality Control process. Additionally, at the time of our review, estimates of shipment totals were used for both office products and for programmable thermostats in calculating annual benefits.

**Status:** *Suggest removing the first two bullets.* The remaining two recommendations have been addressed: 1) The EPA contractor has been directed to fully document the data collection and review process for product shipment data for 2007 and subsequent years. This has been completed for 2007 2) For the future, EPA has removed the benefits estimates attributable to EPA efforts with compact fluorescent lighting (CFL) products as of the 2007 program benefits estimates and will only reintroduce these benefits after appropriate coordination with DOE.

**OIG Response:** OIG does not agree with the removing of the first two bullets. Further, the Agency’s corrective action plan will need to address the shortcomings related to improving contractor oversight. The Agency should identify improvements in management controls over the existing process. OIG identified deficiencies with the process of collecting, reviewing, and reporting product data shipment information both from third parties or actual manufacturers. The status of the recommendations reported by the Agency does not meet the intent of the recommendation. This recommendation is open and unresolved.

**Recommendation 3-1** We recommend that the Principal Deputy Assistant Administrator for the Office of Air and Radiation develop and consistently apply a data-driven methodology to compute the market transformation effect of all product categories and report the benefits separately from ENERGY STAR-qualified products.

**OAR Response:** Calculating market transformation benefits is a widely accepted concept within the energy community and is a meaningful indicator of the ongoing effect of ENERGY STAR in the market. The current methodology for calculating market transformation benefits has been peer reviewed (see below) and is applied consistently across the product categories, where applicable. Further, the market transformation effect accounts for a small fraction of overall ENERGY STAR program savings (e.g. less than 2 percent), meaning that uncertainty in the data and assumptions behind the calculations (uncertainty that has already been addressed through conservative assumptions) have a relatively low impact on overall modeled results.

Method has been peer reviewed in the journal *Energy Policy*:

Sanchez, Marla C., Richard E. Brown, Carrie Webber, and Gregory K. Homan. 2008. Savings estimates for the United States Environmental Protection Agency's ENERGY STAR voluntary product labeling program. *Energy Policy*. vol. 36, no. 6, pp. 2098-2108

**OIG Response:** OIG did not question the concept, only the Agency's methodology and data sources used to compute benefits for ENERGY STAR. The methodology and data used to calculate ENERGY STAR market transformation benefits has not been validated. Additionally, the peer reviewed article includes a limitations section which provides the following:

*These limitations mean that collecting and documenting high-quality inputs is essential, which can be a labor-intensive and expensive process. As a result, identifying areas of critical uncertainty and sensitivity and then targeting data collection and verification activities at those areas is key to successful results.* [Emphasis added]

The OIG evaluated reported benefits incurred in 2006. For 2006, the market transformation effect was 6 percent of the reported benefits for the product category. The significance of savings from the market transformation calculation can vary depending on the number of new specifications in a year, as well as the reported shipment totals. We do not consider using unsupported shipment totals to compute benefit savings in the market transformation calculation a conservative assumption. Furthermore, the OIG analysis does not take into account the reported savings that can be realized in future years since these units will be counted for their expected product life.

Status: Since, the OIG has not provided a basis for recommending a change in methodology, particularly in light of the complexity and cost associated with doing so, OAR suggests removing this recommendation.

**OIG Response:** It is the OIG's opinion that the computation of the market transformation effect requires identifying areas of critical uncertainty and sensitivity and then targeting data collection and verification activities at those areas for successful results. That has not been done. While the benefits calculated from market transformation make up 6% of the product savings, given the downturn in the economy and changes to major consumer products (like DVDs) the impact of a market transformation calculation is likely to grow larger. This recommendation is open and unresolved.

**Recommendation 4-1:** We recommend that the Principal Deputy Assistant Administrator for the Office of Air and Radiation validate the formula (methodology) used for calculating the benefits of the ENERGY STAR commercial program in accordance with EPA Quality Manual for Environmental Programs CIO-2105-P-01-0, to ensure that it accurately reflects the impacts of EPA actions.



OAR Response: OAR's approach to estimating the benefits of the ENERGY STAR program in the commercial sector has evolved as the program has expanded and adopted up-to-date econometric analysis and information. Each refinement has been reviewed by outside experts. OAR believes that the estimates generated by the methodology are rigorous, that where marginal uncertainties are present they have been handled conservatively, and that the results are sound. OAR's program benefits estimates are performed in accordance with the EPA Quality Manual as the Office of Atmospheric Programs has established a Quality Management Plan and these benefits estimates have been developed in accordance with that plan.

**OIG Response:** The peer reviewed methodology does not directly support Office of Air and Radiation's claimed benefits for the ENERGY STAR commercial sector. EPA uses parts of that methodology to derive the estimated benefits for commercial sector. The actual computation methodology used needs to be validated.

Further, OAR recommends that the title for Chapter 4 be modified to be "Further Validate Commercial Sector Methods"

**OIG Response:** The OIG believes the current title accurately reflects the content of the chapter.

Status: OAR will secure additional outside expert review of the entire methodology being used to estimate the benefits of the ENERGY STAR program in the commercial sector. We can provide the OIG for a schedule for this review within two months.

**OIG Response:** The Office of Air and Radiation action meets the intent of the recommendation. The expert review should assure that assumptions, data sources, and methods used to estimate the ENERGY STAR commercial benefits savings are reasonable and supported.

## Supporting Information

OAR has identified a number of errors in the OIG report and several important misunderstandings in the OIG report as detailed below.

### 2006 Annual Shipment Data

OAR has reviewed the table the OIG presented in its draft report showing that it could not reproduce the 2006 product shipment totals in a July 2007 ICF report for 18 of the 29 product categories that it examined. OAR looked at eleven of the eighteen product categories that the OIG examined, the ones which would potentially have the most significant impact on the 2006 stated program results due to the size of the differences in the OIG table. OAR has the following observations based on its review (see attached summary table):

- OAR has confirmed the validity of the shipment numbers used in the 2006 benefits calculation for nine of the eleven product categories OAR examined.

- The differences that the OIG found are largely explained by the OIG not completing the QA/QC process that is in place to review and improve the raw submittal data.
- Two computational errors were uncovered as a result of the audit. These two errors serve to increase the ENERGY STAR program benefits and together represent a small fraction (about 1%) of the programs overall reported benefits. These errors have been corrected.
- The OIG findings do not support the broad claim that the ENERGY STAR program benefits are invalid.

**OIG Response:** The Agency provided no additional documentation or support for its analysis, so we cannot comment on its accuracy. However, given the quality of the documentation supporting ENERGY STAR benefit calculations, OIG understands Office of Air and Radiation’s difficulty. OIG analysis and numbers were based on the documentation provided by the EPA contractor tasked with reporting these numbers. In fact, we met with the contractor concerning this issue and it was unable to provide us with any further documentation that would change any of our reported numbers or discrepancies. Our detailed analysis identified large inaccuracies in the reported shipment totals used and in what the actual shipment data supported for products such as exit signs and monitors. The Agency’s table provided in this response acknowledges that there were in fact “spreadsheet errors” for both products and the numbers should have been the much larger number as identified by the OIG. These two “spreadsheet errors” demonstrate deficiencies with the existing Quality Assurance/Quality Control process since large errors were not identified. The errors were reported by the OIG. The Agency work was done after the fact, in an attempt to verify the original numbers. It should also be noted that the underestimates were already used in the 2006 benefits calculations process and were already reported within the Annual Report.

Further, OAR disagrees with the characterization of the OIG in a number of other areas in the report and provides the following clarifications.

Quality Review of Data. OAR’s contractor responsible for collecting and compiling shipment data performs a systematic review of all shipment reports that looks for and addresses a number of potential issues. The contractor has been directed to document the results of this quality review. The issues the contractor addresses include:

- Multiple submissions received from a single partner
- Inclusion of a partner's data in an aggregate submission from an association, when the partner had already reported to contractor directly
- An apparent math error on the data collection form
- Submission of shipment data for a product that cannot earn the ENERGY STAR, e.g., qualified shipments reported for ENERGY STAR camcorders
- Submission of data on a non-standard form, e.g., a NYSERDA form
- Indication that reported, qualified shipments went to a private labeler, who was also required to report
- Alteration of the standard form, e.g., partner modification of units of measure

- Failure of the partner to break data into requested subcategories
- ENERGY STAR qualified shipments exceeding total shipments
- Indication that the submission is only an estimate
- Indication of negative shipments for a partner
- A partner's claim of qualified shipments for a product they do not manufacturer, have not yet qualified with ENERGY STAR, or for which they've not partnered with ENERGY STAR.

In addition to working with partners and third party associations to resolve data anomalies, the contractor performs the following steps to improve the quality of the report:

- Reviews past year's process recommendations and reviews with EPA if any changes are needed to solicit the most accurate information from partners in the clearest way.
- Shares information including contact lists with third party associations well in advance, to ensure that all eligible partners contribute to the collection effort.
- Contractor product leads review submitted data for their respective categories to flag any apparent discrepancies or unexpected changes from previous years.
- Task Order Manager checks data entry, calculations, and consistency among summary and breakout tables.

The EPA contractor has been directed to fully document the data collection and review process for product shipment data for 2007 and subsequent years. This is complete for 2007.

**OIG Response:** If the Quality Assurance/Quality Control system the Agency summarizes in this section was implemented and enforced as the Agency implies then the errors we identified would have been caught by either the contractor or EPA. The Quality Assurance/Quality Control process existing at the time of the OIG's review was deficient as demonstrated by the errors identified in the report. Many of these steps were either not in place or had not been implemented during our review. We were advised by the EPA contractor that follow-up actions were not always documented, which may have contributed to the discrepancies in shipment totals used in the benefit calculations. The EPA contractor told us that the third party reporting was inconsistent, lacked uniformity, and information was often submitted late.

- Data Submitted Through Third Parties. The ENERGY STAR partnership agreement explicitly allows for the submittal of shipment data through a third party aggregator in the event a partner has competitiveness concerns associated with releasing data. OAR's contractor works closely with the relevant trade associations to ensure that any potential data issues are resolved as the data is compiled. This is an appropriate and necessary practice to employ as part of collecting information for a partnership program.

**OIG Response:** OIG took no position on the use of third parties. OIG identified deficiencies with the reporting of the data received by the contractor. The contractor recognized there were problems with the third party association data submittals. We were told that it was the contractor's practice to accept the third party reported numbers even if a manufacturer had self-reported a different set of numbers.

- International Shipments. The OIG did not provide any credible basis for OAR to question that shipment totals used in the benefits calculations include anything but U.S. shipments. In fact, the two instances cited give no indication other than that the submitter clearly understood the request to be for U.S. data alone. OAR does not use international shipment information to estimate program benefits.

**OIG Response:** OIG provided examples of potential control issues with accounting for international shipments.

### Compact Fluorescent Light (CFL) Bulbs

OAR estimated benefits from EPA efforts with compact fluorescent light bulbs. EPA has made important contributions to the area of ENERGY STAR CFLs for more than eight years. This includes contributions to key aspects of the ENERGY STAR specification for CFLs, quality testing for CFLs, and ramping up consumer awareness and interest in purchasing ENERGY STAR qualifying CFLs. EPA has removed these benefits from its ENERGY STAR program benefits as of 2007.

**OIG Response:** OIG reported that EPA and DOE were both claiming the CFL benefits which results in double counting of the greenhouse gas savings. OIG did not question EPA's contribution to CFLs. We agree that removal of the CFL benefits until they are discussed with the appropriate DOE officials is the appropriate action.

### Market Transformation Effect

OAR employs a widely accepted concept within the energy community for estimating the market transformation benefits of the ENERGY STAR program. This captures the set of products in the marketplace, that are more efficient than they otherwise would have been, that were once eligible for the ENERGY STAR, but are no longer due to increased stringency of the ENERGY STAR specification. The current methodology for calculating these market transformation benefits has been peer reviewed in the journal *Energy Policy*:

Sanchez, Marla C., Richard E. Brown, Carrie Webber, and Gregory K. Homan. 2008. Savings estimates for the United States Environmental Protection Agency's ENERGY STAR voluntary product labeling program. *Energy Policy*. vol. 36, no. 6, pp. 2098-2108.

The method is applied consistently across the product categories for which an ENERGY STAR specification has been revised and a substantial number of products are still in the market that met the earlier specification. Further, the market transformation effect accounts for a small fraction of overall ENERGY STAR program savings (about 2%). This means that uncertainty in the data and assumptions behind the calculations (uncertainty that has already been addressed through conservative assumptions) has a relatively low impact on program estimates. Accordingly, the OIG has not provided a basis for recommending a change in methodology, particularly in light of the complexity and cost associated with doing so.

**OIG Response:** The method is not applied consistently across the product categories. The computation for market transformation is only used when shipment of units falls after a specification change. The market transformation concept as stated would also apply to units that increased in sales after a specification, which has occurred, but there was no computation of the savings derived from these units. The ENERGY STAR contractor's formula does not account for market transformation savings for units that increase after a specification change.

Furthermore, the OIG believes the savings reported from the market transformation units have a potential to significantly impact reported savings. We do not consider knowingly reporting unsupported and possibly incorrect data as a conservative practice even if it were properly disclosed, which is not done in ENERGY STAR reports. The number of formerly qualified units used in the computation is derived from reported shipments of ENERGY STAR qualified units. There is no actual relationship, it is an assumption. The result is a flawed process that will produce an inaccurate result, particularly given current economic conditions.

	<b>July 2007 Report Total</b>	<b>OIG Total</b>	<b>Summer 2008 Review*</b>	<b>Notes</b>
<b>Boilers</b>	382,770	405,573	382,770	Reported values add up to 382,770. <b>No underestimation.</b>
<b>Commercial Refrigerators/ Freezers</b>	83,493	106,658	83,493	OIG appears to have <ul style="list-style-type: none"> <li>excluded one manufacturer's data, because their brand name, rather than their manufacturer name, was listed on their reporting form which ICF addressed through their QA/QC process</li> <li>excluded another manufacturer's data because the company was not on the list of partners required to submit data, though this was addressed by ICF through their QA/QC process</li> <li>Included one manufacturer's reported data that was excluded as a result of the ICF QA/QC process.</li> </ul> <b>No underestimation.</b>
<b>Dehumidifiers</b>	1,203,216	776,431	1,203,216	Reported values add up to 1,203,216. <b>No overestimation.</b>

<b>Exit Signs</b>	1,425,554	3,450,117	3,460,176	Spreadsheet error. Compiled number should have been 3,460,176. This underestimate has been corrected in subsequent analysis
<b>Furnaces</b>	1,172,843	1,170,124	1,172,843	OIG appears to have excluded data that was reported by one furnace manufacturer on their air-source heat pump data form which was addressed through the QA/QC process. <b>No overestimation.</b>
<b>Monitors</b>	13,859,666	34,581,203	32,584,882	Spreadsheet error. Compiled number should have been 32,584,882. This underestimate has been corrected in subsequent analysis
<b>Roof Products (Commercial Gallons)</b>	21,352,516	15,966,045	21,358,657	Shipments reported by one company were inadvertently not included. ICF number should have been 21,358,657. <b>No significant effect.</b>
<b>Room Air Cleaners</b>	287,354	289,815	287,354	OIG appears to have included one manufacturer's reported data that was excluded as a result of the QA/QC process. <b>No underestimation.</b>
<b>Transformers</b>	173,390	166,669	173,390	OIG appears to have <ul style="list-style-type: none"> <li>excluded one manufacturer's data because their brand name(s) rather than their manufacturer name was listed on their reporting forms which ICF addressed through their QA/QC process</li> <li>chosen to use data from one of the two forms submitted by one manufacturer whereas ICF confirmed with the manufacturer that the other form was the correct one.</li> </ul> <b>No overestimation.</b>
<b>TV/VCR</b>	17,685,967	13,166,140	17,689,230	Shipments reported by one company for one product type (TV/VCR combination units) were inadvertently not included. ICF total should have been 17,689,230. <b>No significant effect.</b>
<b>Ventilating Fans</b>	853,406	857,232	853,406	OIG appears to have <ul style="list-style-type: none"> <li>included one manufacturer's reported data that was excluded as a result of the QA/QC process</li> <li>included incorrect data for one company that had been addressed through ICF's QA/QC process.</li> </ul> <b>No underestimation.</b>

\* Re-examination of what shipment totals were supportable based on manufacturer information provided as of May 2007.

**OIG Response:** The OIG analysis was based on the documentation used to produce EPA’s report of ENERGY STAR benefits in 2006. We do note that the Agency’s analysis does not address all the irreconcilable products as reported on by the OIG within Chapter 2, Table 2-1. Based on the Agency's chart provided, the Agency only reviewed 11 of the 18 products and thus the Agency's analysis does not address the differences noted for the following product categories:

- Audio/DVD
- Commercial Hot Food Holding Cabinets
- End Use Products
- External Power Supplies
- Residential Light Fixtures
- Roofing Commercial & Residential Sq. Ft.
- Telephony

#### Commercial Program Methodology (Addressed in Chapter 4 of OIG Report)

OAR uses best available information to estimate program benefits in the commercial market and updates the methodology and inputs as the program evolves and new information is made available. These methods can be summarized as follows:

- Program estimates are based on well-documented peer-reviewed methods.
- The data inputs are either peer-reviewed or publicly available data themselves or based on reasonable and well-documented assumptions.
- In areas of marginal uncertainty, OAR applies program evaluation best practice methods to avoid overstatement of program benefits.
- The current program benefits estimation method includes techniques to account for the energy savings from commercial products associated with information processing and related equipment used by businesses. The method was peer-reviewed, found to be appropriate and sounds, and published in a 2007 *Energy Journal* article.
- The current program benefits estimation method also includes techniques to account for benefits from energy efficiency programs across the country. The approach of subtracting state-utility savings from the national total was peer-reviewed and published in a 2001 *Energy Journal* article.

OAR disagrees with the OIG characterization of the methods used to avoid double-counting with federal programs like ENERGY STAR qualified products and DOE’s Building Technologies Program (BTP) as “unclear” and “questionable.” Again, these methods have been peer-reviewed by experts in the field and found to be sound and appropriate.

OAR continues to improve the models it uses to estimate ENERGY STAR program benefits. OAR will undertake another peer-review of the overall approach and its key elements.

**OIG Response:** The peer-reviewed methodology referenced by the Office of Air and Radiation does not directly support the claimed benefits for the ENERGY STAR commercial sector. The contractor who prepares EPA's estimate uses parts of the methodology in its computation of the benefits. The contractor's computation of estimated benefits for commercial sector is what needs to be validated.



**Appendix E**

***Distribution***

Office of the Administrator  
Principal Deputy Assistant Administrator, Office of Air and Radiation  
Agency Follow-up Official (the CFO)  
Agency Follow-up Coordinator  
Office of General Counsel  
Associate Administrator for Congressional and Intergovernmental Relations  
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