**DEPARTMENT OF ENERGY**

**10 CFR Part 431**

**[Docket Number EERE–2006–STD–0125]**

**RIN 1904–AB58**

# Energy Conservation Program: Energy Conservation Standards for Refrigerated Bottled or Canned Beverage Vending Machines

**AGENCY:** Office of Energy Efficiency and Renewable Energy, Department of Energy.

**ACTION:** Final rule.

**SUMMARY:** The U.S. Department of Energy (DOE) is adopting new energy conservation standards for refrigerated bottled or canned beverage vending machines. DOE has determined that energy conservation standards for these types of equipment would result in significant conservation of energy, and are technologically feasible and economically justified.

**DATES:** The effective date of this rule is October 30, 2009, except that the standards in 10 CFR 431.296 are effective August 31, 2011. The incorporation by reference of certain publications listed in this rule was approved by the Director of the Federal Register on October 30, 2009.

**ADDRESSES:** For access to the docket to read background documents, the technical support document, transcripts of the public meetings in this proceeding, or comments received, visit the U.S. Department of Energy, Resource Room of the Building Technologies Program, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC 20024, (202) 586–2945, between 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays. Please call Brenda Edwards at the above telephone number for additional information regarding visiting the Resource Room. (**Note:** DOE's Freedom of Information Reading Room no longer houses rulemaking materials.) You may also obtain copies of certain previous rulemaking documents in this proceeding (*i.e.*, framework document, advance notice of proposed rulemaking, notice of proposed rulemaking), draft analyses, public meeting materials, and related test procedure documents from the Office of Energy Efficiency and Renewable Energy's Web site at *http://www1.eere.energy.gov/buildings/appliance_standards/commercial/beverage_machines.html*.

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**SUPPLEMENTARY INFORMATION:**

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## I. Summary of the Final Rule and Its Benefits

### *A. The Standard Levels*

The Energy Policy and Conservation Act, as amended (42 U.S.C. 6295 *et seq.*; EPCA), directs the Department of Energy (DOE) to establish mandatory energy conservation standards for refrigerated bottled or canned beverage vending machines. (42 U.S.C. 6295(v)(1), (2) and (3)) These types of equipment are referred to collectively hereafter as ''beverage vending machines.'' Any such standard must be designed to ''achieve the maximum improvement in energy efficiency * * * which the Secretary determines is technologically feasible and economically justified.'' (42 U.S.C. 6295(o)(2)(A) and 6316(e)(1)) Furthermore, the new standard must ''result in significant conservation of energy.'' (42 U.S.C. 6295(o)(3)(B)) The standards in today's final rule, which apply to all beverage vending machines, satisfy these requirements. Currently, no mandatory Federal energy conservation standards exist for the beverage vending machine equipment covered by this rulemaking.

Table I.1 shows the standard levels that DOE is adopting today. These standards will apply to all beverage vending machines manufactured for sale in the United States, or imported to the United States, starting 3 years after publication of the final rule.

TABLE I.1—STANDARD LEVELS FOR BEVERAGE VENDING MACHINES

| Equipment class * | Proposed standard level ** maximum daily energy consumption (MDEC) *kWh/day**** |
|---|---|
| A | MDEC = 0.055 × V + 2.56.† |
| B | MDEC = 0.073 × V + 3.16.†† |

* *See* section IV.A.2 of the NOPR for a discussion of equipment classes.

** "V" is the refrigerated volume ($ft^3$) of the refrigerated bottled or canned beverage vending machine, as measured by the American National Standards Institute (ANSI)/Association of Home Appliance Manufacturers (AHAM) HRF–1–2004, "Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers." V is the volume of the case, as measured in ARI Standard 1200–2006, Appendix C.

*** Kilowatt hours per day.

† Trial Standard Level (TSL) 6.

†† TSL 3.

*B. Benefits to Customers of Beverage Vending Machines*

Table I.2 indicates the impacts on commercial customers of today's standards.

TABLE I.2—IMPLICATIONS OF NEW STANDARDS FOR COMMERCIAL CUSTOMERS

| Equipment class | Energy conservation standard | Total installed cost *$* | Total installed cost increase *$* | Life-cycle cost savings *$* | Payback period *years* |
|---|---|---|---|---|---|
| Class A | TSL 6 | 2,935 | 233 | 277 | 4.1 |
| Class B | TSL 3 | 2,070 | 86 | 37 | 6.8 |

The economic impacts on commercial customers (*i.e.*, the average life-cycle cost [LCC] savings) are positive for most equipment classes. For example, fully cooled (Class A) medium-capacity vending machines—the most common type currently being sold—have installed prices of $2,625 and annual energy costs of $188, respectively at national average values. To meet the new standards, DOE estimates that the installed prices of such equipment will be $2,864, an increase of $239, which will be offset by annual energy savings of approximately $69 and an increase in maintenance and repair cost of $13.

*C. Impact on Manufacturers*

Using a real corporate discount rate of 7 percent, DOE estimates the industry net present value (INPV) of the beverage vending machine industry to be $44.1 million for Class A units, and $33.7 million for Class B units (both figures in 2008$). For Class A machines, DOE expects the impact of today's standards on the INPV of manufacturers of beverage vending machines to be a loss of 18.0 to 25.1 percent ($7.9 million to $11.1 million) for Class A machines and a loss of 1.9 to 3.5 percent ($0.6 million to $1.2 million) for Class B machines. Based on DOE's interviews with manufacturers of beverage vending machines, DOE expects minimal plant closings or loss of employment as a result of the standards.

*D. National Benefits*

DOE estimates that the standards will save approximately 0.159 quads (quadrillion, or $10^{15}$) British thermal units (Btu) of energy over 30 years (2012–2042). This is equivalent to all the energy consumed by more than 830 thousand American households in a single year.

By 2042, DOE expects energy savings from the standards to eliminate the need for approximately 0.118 new 1,000-megawatt (MW) power plants. These energy savings will result in cumulative greenhouse gas emission reductions of approximately 9.6 million metric tons (Mt) of carbon dioxide ($CO_2$), an amount equal to that produced by approximately 2.0 million cars every year. Additionally, the standards will help alleviate air pollution by resulting in 3.28 kilotons (kt) of cumulative nitrogen oxide ($NO_X$) emission reductions and between 0 and 0.188 tons of cumulative mercury (Hg) emission reductions from 2012–2042. The estimated net present monetary values of these emissions reductions (expressed in 2007$) are between $5.5 and $266.3 million for $CO_2$, (expressed in 2007$), $354,000 and $3.6 million for $NO_X$ (expressed in 2007$), and $0 and $1.5 million for Hg (expressed in 2007$) at a 7-percent discount rate (discounted to 2009). At a 3 percent discount rate, the estimated net present values of these emissions reductions are between $11.3 and $543.5 million (2007$) for $CO_2$, $749,000 and $7.7 million (2007$) for $NO_X$, and $0 and $3.2 million (2007$) for Hg.

The national NPV of the standards is $0.182 billion using a 7 percent discount rate and $0.476 billion using a 3 percent discount rate, cumulative from 2012–2057 in 2008$. This is the estimated total value of future savings minus the estimated increased equipment costs, discounted to 2009.

The benefits and costs of today's final rule can also be expressed in terms of annualized (2008$) values from 2012–2042. Separate estimates of values for Class A and Class B equipment are shown in Table I.3 and Table I.4, respectively. In each table, the annualized monetary values are the sum of the annualized national economic value of operating savings benefits (energy, maintenance and repair), expressed in 2008$, plus the monetary values of the benefits of carbon dioxide emission reductions, otherwise known as the Social Cost of Carbon (SCC) expressed as $19 per metric ton of carbon dioxide, in 2007$. The $19 value is a central interim value from a recent interagency process. The derivation of this value is discussed in section VI.C.6. Although summing the value of operating savings to the values of $CO_2$ reductions provides a valuable perspective, please note the following: (1) The national operating savings are domestic U.S. consumer monetary savings found in market transactions while the $CO_2$ value is based on a range of estimates of imputed marginal social cost of carbon from $1.14 to $55 per metric ton (2007$), which are meant to reflect, for the most part, the global benefits of carbon dioxide reductions; (2) the national operating savings are measured in 2008$ while the $CO_2$ saving are measured in 2007$; and (3) the assessments of operating savings and $CO_2$ savings are performed with different computer models, leading to different time frames for analysis. The present value of national operating savings is measured for the period 2012–2057 (31 years from 2012 to 2042 inclusive, plus the lifetime of the longest-lived equipment shipped in the 31st year), then converted the annualized equivalent for the 31 years. The value of $CO_2$, on the other hand is meant to reflect the present value of all future climate related impacts, even those beyond 2057.

Using a 7 percent discount rate for the annualized cost analysis, the combined cost of the standards established in today's final rule for Class A and Class B beverage vending machines is $24.0 million per year in increased equipment and installation costs, while the annualized benefits are $41.8 million per year in reduced equipment operating costs and $9.0 million in $CO_2$ reductions, for a net benefit of $26.8 million per year. Using a 3 percent discount rate, the cost of the standards established in today's final rule is $23.1 million per year in increased equipment and installation costs, while the benefits of today's standards are $49.1 million per year in reduced operating costs and $10.3 million in $CO_2$ reductions, for a net benefit of $36.3 million per year. The separate estimates of values for Class A and Class B equipment are shown in Table I.3 and Table I.4 respectively.

TABLE I.3—ANNUALIZED BENEFITS AND COSTS FOR CLASS A EQUIPMENT

| Category | Primary estimate (AEO reference case) | Low estimate (low growth case) | High estimate (high growth case) | Units | | |
|---|---|---|---|---|---|---|
| | | | | Year dollars | Disc (percent) | Period covered |
| **Benefits** | | | | | | |
| Annualized Monetized (millions$/year) | 37.7 | 34.2 | 40.0 | 2008 | 7 | 31 |
| | 44.2 | 39.9 | 46.8 | 2008 | 3 | 31 |
| Annualized Quantified | 0.25 $CO_2$ (Mt) | 0.25 $CO_2$ (Mt) | 0.25 $CO_2$ (Mt) | NA | 7 | 31 |
| | 0.07 $NO_X$ (kt) | 0.07 $NO_X$ (kt) | 0.07 $NO_X$ (kt) | NA | 7 | 31 |
| | 0.004 Hg (t) | 0.004 Hg (t) | 0.004 Hg (t) | NA | 7 | 31 |
| | 0.26 $CO_2$ (Mt) | 0.26 $CO_2$ (Mt) | 0.26 $CO_2$ (Mt) | NA | 3 | 31 |
| | 0.039 $NO_X$ (kt) | 0.039 $NO_X$ (kt) | 0.039 $NO_X$ (kt) | NA | 3 | 31 |
| | 0.005 Hg (t) | 0.005 Hg (t) | 0.005 Hg (t) | NA | 3 | 31 |
| $CO_2$ Monetized Value (at $19/Metric Ton, millions$/year). | 7.9 | 7.9 | 7.9 | 2007 | 7 | 31 |
| | 9.0 | 9.0 | 9.0 | 2007 | 3 | 31 |
| Total Monetary Benefits (millions$/year)*. | 45.5 | 42.1 | 47.9 | 2008 & 2007 | 7 | 31 |
| | 53.2 | 48.9 | 55.8 | 2008 & 2007 | 3 | 31 |
| **Qualitative** | | | | | | |
| **Costs** | | | | | | |
| Annualized Monetized (millions$/year) | 19.6 | 19.6 | 19.6 | 2008 | 7 | 31 |
| | 18.8 | 18.8 | 18.8 | 2008 | 3 | 31 |
| **Qualitative** | | | | | | |
| **Net Benefits/Costs** | | | | | | |
| Annualized Monetized, including Carbon Benefits* (million$/year). | 26.0 | 22.6 | 28.4 | 2008 & 2007 | 7 | 31 |
| | 34.4 | 30.1 | 36.9 | 2008 & 2007 | 3 | 31 |
| **Qualitative** | | | | | | |

* Per the above discussion, this represents a simplified estimate that includes both 2007$ and 2008$.

TABLE I.4—ANNUALIZED BENEFITS AND COSTS FOR CLASS B EQUIPMENT

| Category | Primary estimate (AEO reference case) | Low estimate (low growth case) | High estimate (high growth case) | Units | | |
|---|---|---|---|---|---|---|
| | | | | Year dollars | Disc (percent) | Period covered |
| **Benefits** | | | | | | |
| Annualized Monetized (millions$/year) | 4.1 | 3.6 | 4.4 | 2008 | 7 | 31 |
| | 4.9 | 4.3 | 5.2 | 2008 | 3 | 31 |
| Annualized Quantified | 0.03 $CO_2$ (Mt) | 0.03 $CO_2$ (Mt) | 0.03 $CO_2$ (Mt) | NA | 7 | 31 |
| | 0.01 $NO_X$ (kt) | 0.01 $NO_X$ (kt) | 0.01 $NO_X$ (kt) | NA | 7 | 31 |
| | 0.001 Hg (t) | 0.001 Hg (t) | 0.001 Hg (t) | NA | 7 | 31 |
| | 0.04 $CO_2$ (Mt) | 0.04 $CO_2$ (Mt) | 0.04 $CO_2$ (Mt) | NA | 3 | 31 |
| | 0.012 $NO_X$ (kt) | 0.012 $NO_X$ (kt) | 0.012 $NO_X$ (kt) | NA | 3 | 31 |

TABLE I.4—ANNUALIZED BENEFITS AND COSTS FOR CLASS B EQUIPMENT—Continued

| Category | Primary estimate (AEO reference case) | Low estimate (low growth case) | High estimate (high growth case) | Units | | |
|---|---|---|---|---|---|---|
| | | | | Year dollars | Disc (percent) | Period covered |
| | 0.001 Hg (t) | 0.001 Hg (t) | 0.001 Hg (t) | NA | 3 | 31 |
| $CO_2$ Monetized Value (at $19/Metric Ton, millions$/year). | 1.1 | 1.1 | 1.1 | 2007 | 7 | 31 |
| | 1.3 | 1.3 | 1.3 | 2007 | 3 | 31 |
| Total Monetary Benefits (millions$/year)*. | 5.2 | 4.7 | 5.6 | 2008 & 2007 | 7 | 31 |
| | 6.1 | 5.5 | 6.5 | 2008 & 2007 | 3 | 31 |
| **Qualitative** | | | | | | |
| **Costs** | | | | | | |
| Annualized Monetized (millions$/year) | 4.4 | 4.4 | 4.4 | 2008 | 7 | 31 |
| | 4.3 | 4.3 | 4.3 | 2008 | 3 | 31 |
| **Qualitative** | | | | | | |
| **Net Benefits/Costs** | | | | | | |
| Annualized Monetized, including Carbon Benefits (million$/year)*. | 0.8 | 0.3 | 1.1 | 2008 & 2007 | 7 | 31 |
| | 1.9 | 1.3 | 2.2 | 2008 & 2007 | 3 | 31 |
| **Qualitative** | | | | | | |

* Per the above discussion, this represents a simplified estimate that includes both 2007$ and 2008$.

## II. Introduction

### *A. Authority*

Title III of EPCA sets forth a variety of provisions designed to improve energy efficiency. Part A of Title III (42 U.S.C. 6291–6309) provides for the Energy Conservation Program for Consumer Products Other Than Automobiles. The amendments to EPCA contained in the Energy Policy Act of 2005 (EPACT 2005), Public Law 109–58, include new or amended energy conservation standards and test procedures for some of these products, and direct DOE to undertake rulemakings to promulgate such requirements. In particular, section 135(c)(4) of EPACT 2005 amends EPCA to direct DOE to prescribe energy conservation standards for beverage vending machines. (42 U.S.C. 6295(v))

Because of its placement in Part A of Title III of EPCA, the rulemaking for beverage vending machine energy conservation standards is bound by the requirements of 42 U.S.C. 6295. However, since beverage vending machines are commercial equipment, DOE intends to place the new requirements for beverage vending machines in Title 10 of the Code of Federal Regulations (CFR), Part 431 (''Energy Efficiency Program for Certain Commercial and Industrial Equipment''), which is consistent with DOE's previous action to address the EPACT 2005 requirements for commercial equipment. The location of the provisions within the CFR does not affect either their substance or applicable procedure, so DOE is placing them in the appropriate CFR part based on their nature or type. DOE will refer to beverage vending machines as ''equipment'' throughout the notice because of their placement in 10 CFR part 431. DOE publishes today's final rule pursuant to Title III, Part A of EPCA, which provides for test procedures, labeling, and energy conservation standards for beverage vending machines and certain other equipment. The test procedures for beverage vending machines appear at sections 431.293 and 431.294.

EPCA provides criteria for prescribing new or amended standards for beverage vending machines. As indicated above, any new or amended standard for this equipment must be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)) Additionally, EPCA provides specific prohibitions on prescribing such standards. DOE may not prescribe an amended or new standard for any equipment for which DOE has not established a test procedure. (42 U.S.C. 6295(o)(3)) Further, DOE may not prescribe an amended or new standard if DOE determines by rule that such standard would not result in ''significant conservation of energy'' or ''is not technologically feasible or economically justified.'' (42 U.S.C. 6295(o)(3)(A) and (B))

EPCA also provides that in deciding whether such a standard is economically justified for equipment such as beverage vending machines, DOE must, after receiving comments on the proposed standard, determine whether the benefits of the standard exceed its burdens by considering, to the greatest extent practicable, the following seven factors:

1. The economic impact of the standard on manufacturers and consumers of the products subject to the standard;
2. The savings in operating costs throughout the estimated average life of the covered equipment in the type (or class) compared to any increase in the price, or in the initial charges for, or maintenance expenses of, the equipment likely to result from the imposition of the standard;
3. The total projected amount of energy savings likely to result directly from the imposition of the standard;
4. Any lessening of the utility or the performance of the products likely to result from the imposition of the standard;

5. The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the imposition of the standard;

6. The need for national energy conservation; and

7. Other factors the Secretary of Energy (Secretary) considers relevant. (42 U.S.C. 6295(o)(2)(B)(i))

In addition, EPCA, as amended (42 U.S.C. 6295(o)(2)(B)(iii) and 6316(a)), establishes a rebuttable presumption that any standard for covered products is economically justified if the Secretary finds that ''the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy (and as applicable, water) savings during the first year that the consumer will receive as a result of the standard, as calculated under the test procedure * * *'' in place for that standard.

EPCA further provides that the Secretary may not prescribe an amended or new standard if interested persons have established by a preponderance of the evidence that the standard is ''likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States at the time of the Secretary's finding.'' (42 U.S.C. 6295(o)(4) and 6316(e)(1))

Section 325(q)(1) of EPCA is applicable to promulgating standards for most types or classes of equipment, including beverage vending machines that have two or more subcategories. (42 U.S.C. 6295(q)(1) and 42 U.S.C. 6316(e)(1)) Under this provision, DOE must specify a different standard level than that which applies generally to such type or class of equipment for any group of products ''which have the same function or intended use, if * * * products within such group—(A) consume a different kind of energy from that consumed by other covered products within such type (or class); or (B) have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a higher or lower standard'' than applies or will apply to the other products. (42 U.S.C. 6295(q)(1)(A) and (B)) In determining whether a performance-related feature justifies such a different standard for a group of products, DOE must consider ''such factors as the utility to the consumer of such a feature'' and other factors DOE deems appropriate. (42 U.S.C. 6295(q)(1)) Any rule prescribing such a standard must include an explanation of the basis on which DOE established such a higher or lower level. (*See* 42 U.S.C. 6295(q)(2))

Federal energy conservation standards for commercial equipment generally supersede State laws or regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297(a)–(c); 42 U.S.C. 6316(e)(2)–(3)) DOE can, however, grant waivers of preemption for particular State laws or regulations, in accordance with the procedures and other provisions of section 327(d) of the Act. (42 U.S.C. 6297(d); 42 U.S.C. 6316(e)(2)–(3))

### *B. Background*

#### 1. History of Standards Rulemaking for Beverage Vending Machine Equipment

As discussed in the notice of proposed rulemaking (NOPR), 74 FR 26022 (May 29, 2009) (the May 2009 NOPR), the EPACT 2005 amendments to EPCA require that DOE issue energy conservation standards for the equipment covered by this rulemaking, which would apply to equipment manufactured 3 years after publication of the final rule establishing the energy conservation standards. (42 U.S.C. 6295(v)(1), (2) and (3)) The energy use of this equipment has not previously been regulated by Federal law.

Section 135(a)(3) of EPACT 2005 also amended section 321 of EPCA, in part, by adding definitions for terms relevant to this equipment. (42 U.S.C. 6291 (40)) EPCA defines ''refrigerated bottled or canned beverage vending machine'' as ''a commercial refrigerator that cools bottled or canned beverages and dispenses the bottled or canned beverages on payment.'' (42 U.S.C. 6291 (40)) Section 136(a)(3) of EPACT 2005 amended section 340 of EPCA, in part, by adding a definition for ''commercial refrigerator, freezer, and refrigerator-freezer.''

During the course of this rulemaking, Congress passed the Energy Independence Security Act of 2007 (EISA 2007), which the President signed on December 19, 2007 (Pub. L. 110–140). Section 310(3) of EISA 2007 amended section 325 of EPCA in part by adding subsection 325(gg) (42 U.S.C. 6295(gg)). This subsection requires any new or amended energy conservation standards adopted after July 1, 2010, to incorporate ''standby mode and off mode energy use.'' (42 U.S.C. 6295(gg)(3)(A)) In the NOPR, DOE stated that because any standards associated with this rulemaking are required by August 2009, the energy use calculations will not include ''standby mode and off mode energy use.'' To include standby mode and off mode energy use requirements for this rulemaking would take considerable analytical effort and would likely require changes to the test procedure. Given the statutory deadline, DOE has decided to address these additional requirements when the energy conservation standards for beverage vending machines are reviewed in August 2015. At that time, DOE will consider the need for possible amendment in accordance with 42 U.S.C. 6295(m). (74 FR 26023)

DOE commenced this rulemaking on June 28, 2006, by publishing a notice of a public meeting and of the availability of its framework document for the rulemaking. 71 FR 36715. The framework document described the approaches DOE anticipated using and issues to be resolved in the rulemaking. DOE held a public meeting in Washington, DC on July 11, 2006, to present the contents of the framework document, describe the analyses DOE planned to conduct during the rulemaking, obtain public comment on these subjects, and facilitate the public's involvement in the rulemaking. After the public meeting, DOE also allowed the submission of written statements in response to the framework document.

On June 16, 2008, DOE published an advance notice of proposed rulemaking (ANOPR) in this proceeding. 73 FR 34094 (the June 2008 ANOPR). In the June 2008 ANOPR, DOE sought comment on its proposed equipment classes for the rulemaking, and on the analytical framework, models, and tools that DOE used to analyze the impacts of energy conservation standards for beverage vending machines. In conjunction with the June 2008 ANOPR, DOE published on its Web site the complete ANOPR technical support document (TSD), which included the results of DOE's various preliminary analyses in this rulemaking. In the June 2008 ANOPR, DOE requested oral and written comments on these results and on a range of other issues. DOE held a public meeting in Washington, DC, on June 26, 2008, to present the methodology and results of the ANOPR analyses and to receive oral comments from those who attended. The oral and written comments DOE received focused on DOE's assumptions, approach, and equipment class breakdown, and were addressed in detail in the May 2009 NOPR.

In the May 2009 NOPR, DOE proposed new energy conservation standards for beverage vending machines. 74 FR 26020. In conjunction with the May 2009 NOPR, DOE also published on its Web site the complete

TSD for the proposed rule, which incorporated the final analyses that DOE conducted, and contained technical documentation for each step of the analysis. The TSD included the engineering analysis spreadsheets, the LCC spreadsheet, and the national impact analysis spreadsheet. The standards DOE proposed for beverage vending machines are shown in Table II.1.

TABLE II.1—MAY 2009 PROPOSED STANDARD LEVELS FOR BEVERAGE VENDING MACHINES

| Equipment class * | Proposed standard level ** maximum daily energy consumption (MDEC) *kWh/day* *** |
|---|---|
| A | MDEC = 0.055 × V + 2.56.† |
| B | MDEC = 0.073 × V + 3.16.†† |

* *See* section IV.A.2 of the NOPR (74 FR 26027) for a discussion of equipment classes.
** "V" is the refrigerated volume ($ft^3$) of the refrigerated bottled or canned beverage vending machine, as measured by ANSI/AHAM HRF–1–2004, "Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers."
*** Kilowatt hours per day.
† TSL 6.
†† TSL 3.

In the May 2009 NOPR, DOE identified issues on which it was particularly interested in receiving comments and views of interested parties. These included the magnitude of the estimated decline in INPV and what impact this level could have on industry parties including small businesses; whether the proposed linear equation used to describe the maximum daily energy consumption standards should be based on a two-point, three-point, or some other weighting strategy; whether the proposed standard risks industry consolidation; how small business manufacturers will be affected due to new energy conservation standards; the potential compliance costs and other impacts to small manufacturers that do not supply the high-volume customers of beverage vending machines; the impacts on small manufacturers for possible alternatives to the proposed rule; and whether the energy savings and related benefits outweigh the costs, including potential manufacturer impacts. After the publication of the May 2009 NOPR, DOE received written comments on these and other issues. DOE also held a public meeting in Washington, DC, on June 17, 2009, to hear oral comments on and solicit information relevant to the proposed rule. The May 2009 NOPR included additional background information on the history of this rulemaking. 74 FR 26023.

2. Miscellaneous Rulemaking Issues

a. Type of Standard

For the ANOPR, DOE received comments from interested parties regarding the type of standards it would be developing as part of this rulemaking. Some interested parties recommended that DOE set prescriptive standards, while others suggested that the choice of technologies used to achieve standards should be left to the discretion of the manufacturer. (73 FR 34100)

In response, DOE noted in the ANOPR that EPCA provides that an "energy conservation standard" must be either (A) "a * * * level of energy efficiency" or "a * * * quantity of energy use," or (B), for certain specified equipment, "a design requirement." (42 U.S.C. 6291(6)) Thus, an "energy conservation standard" cannot consist of both a design requirement and a level of efficiency or energy use. In addition, beverage vending machines are not one of the specified types of equipment for which EPCA allows a standard be set with a design requirement. (42 U.S.C. 6291(6)(B), 6292(a)) Item (A) above also indicates that, under EPCA, a single energy conservation standard cannot have measures of both energy efficiency and energy use. Furthermore, EPCA specifically requires DOE to base its test procedure for this equipment on ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 32.1–2004, Methods of Testing for Rating Vending Machines for Bottled, Canned or Other Sealed Beverages. (42 U.S.C. 6293(b)(15)) The test methods in ANSI/ASHRAE Standard 32.1–2004 consist of means to measure energy consumption, not energy efficiency. (73 FR 34100)

During the NOPR public meeting, the Appliance Standards Awareness Project (ASAP), stated that DOE's previous decisions to not allow multi-part standards needs to be revisited, but not as part of this rulemaking. Multi-part standards would allow performance standards and design requirements to be established. (ASAP, Public Meeting Transcript, No. 56 at p. 35) A notation in the form "ASAP, No. 56 at p. 35" identifies an oral comment that DOE received during the June 17, 2008, NOPR Public Meeting. This comment was recorded in the public meeting transcript in the docket for this rulemaking (Docket No. EERE–2006–BT–STD–0125). This particular notation refers to a comment (1) made during the public meeting by the Appliance Standards Awareness Project; (2) recorded in document number 35, which is the public meeting transcript filed in the docket of this rulemaking; and (3) appearing on page 35 of document number 56. In a written comment co-signed by Pacific Gas and Electric Company (PG&E), Southern California Edison, Southern California Gas Company (SCGC), San Diego Gas and Electric (SDGE), ASAP, and the National Resource Defense Council (NRDC), hereafter the Joint Comment, signatories urged DOE to include a design requirement for factory set controls in today's final rule. (Joint Comment, No. 67 at p. 2) For the reasons given above, DOE maintains that it does not have authority to develop standards that consist of both a design requirement and a level of efficiency or energy use. Instead, DOE has developed standards that would require that each beverage vending machine be subject to a maximum level of energy consumption, and manufacturers could meet these standards with their own choice of design methods.

In response to the NOPR, the University of Southern Maine (USM) recommended that DOE establish energy consumption standards that are based on beverage vending machines that have no lights, with the exception of lighting the coin slots. Or as an alternative, USM suggested that the standards be based on a machine that has lights controlled by proximity sensors that turn lights on only when prospective purchasers are nearby. (USM, No. 52 at p. 1) USM also supported setting a design standard that encourages the use of refrigerant gases that offer the lowest total life-cycle impacts. (USM, No. 52 at p. 1) As stated above, beverage vending machines are not one of the specified equipment for which EPCA allows a standard to consist of a design requirement. (42 U.S.C. 6291(6)(B), 6292(a))

b. Combination Vending Machines

Combination vending machines have a refrigerated volume for the purpose of cooling and vending "beverages in a sealed container," and are therefore covered by this rule. However, beverage vending is not their sole function. Combination vending machines also have non-refrigerated volumes for the purpose of vending other, non-"sealed beverage" merchandise. In the ANOPR, DOE addressed several comments from interested parties regarding combination vending machines. Specifically, these parties were concerned that regulating vending machines that contain both refrigerated and non-refrigerated products could result in confusion about what this rulemaking covers, or could result in manufacturers taking advantage of loopholes to produce equipment that does not meet the standards. In response, DOE stated that the language used in EPCA to define beverage vending machines is broad enough to include any vending machine, including a combination vending machine, as long as some portion of that machine cools bottled or canned beverages and dispenses them upon payment. (42 U.S.C. 6291 (40)) DOE interprets this language to cover any vending machine that can dispense at least one type of refrigerated bottled or canned beverage, regardless of the other types of vended products (some of which may not be refrigerated). 73 FR 34105–06.

At the NOPR public meeting, Dixie-Narco stated that combination vending machines were not specifically included in the analysis, which focused on glass front and stack-style beverage vending machines, and should be studied further. (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 204) Dixie-Narco asserted that the existing formulas for Class A and Class B machines create an energy threshold that cannot be met by combination machines. Dixie-Narco explained that with combination machines, the entire cabinet is illuminated, but they typically have smaller refrigerated volumes compared to other vending machines with similar exterior dimensions. Dixie-Narco suggested creating a Class C equipment class for zone-cooled glass front vending machines. It proposed the following equation: $MDEC = 0.073 \times V + 3.5$. Dixie-Narco also stated that it is open to other possible solutions suggested by DOE or other concerned parties. (Dixie-Narco, No. 64 at p. 3) Coca-Cola stated that combination vending machines may not scale down in efficiency because refrigeration components may not be available in small sizes. (Coca-Cola, Public Meeting Transcript, No. 56 at p. 210) Dixie-Narco noted that combination vending machines are not typically purchased by Coca-Cola and PepsiCo, and are manufactured by a group of manufacturers different from the beverage vending machine manufacturers. Dixie-Narco also stated that shipments for combination vending machines are very small. (Dixie-Narco, Public Meeting Transcript, No. 56 at pp. 204, 212)

In the analysis for the proposed rule, DOE did not consider combination vending machines as a separate equipment class. Rather, they were considered with all other Class A and Class B beverage vending machines. However, based on comments received, DOE recognizes that the design and manufacture of combination vending machines may be challenged by less component availability compared to other beverage vending machines. DOE concludes that combination vending machines have a distinct utility that limits the energy efficiency improvement potential possible for such beverage vending machines. While more efficient combination vending machines are technologically feasible, DOE does not have the data needed to estimate either the energy efficiency improvement potential or the cost of more efficient designs of combination vending machines. Furthermore, none of the interested parties' comments provided an economic analysis demonstrating that efficiency standards for such beverage vending machines would be cost-justified. Without engineering cost and efficiency data, DOE was not able to perform an analysis of the impacts of standards on combination vending machines. Thus, DOE is not able to determine whether energy conservation standards for combination vending machines are economically justified and would result in significant energy savings. Based on the above, DOE concludes that combination vending machines are a class of beverage vending machines, and, since DOE cannot determine whether standards would meet EPCA's statutory criteria, DOE is not setting standards for combination vending machines at this time. Instead, DOE is reserving standards for combination vending machines. EPCA does require that, not later than 6 years after issuance of any final rule establishing or amending a standard, the Secretary shall publish either a notice of determination that standards for the product do not need to be amended or a notice of proposed rulemaking including new proposed standards. 42 U.S.C. 6295(m).

So that interested parties understand what constitutes a combination vending machine, DOE is incorporating into today's final rule a definition for combination vending machine, and is modifying the definitions of Class A and Class B beverage vending machines (see section IV.A.2). DOE adopts the following definition for combination vending machine: ''Combination vending machine means a refrigerated bottled or canned beverage vending machine that also has non-refrigerated volumes for the purpose of vending other, non-''sealed beverage'' merchandise.''

DOE notes that this definition for combination vending machine could be refined if DOE initiates a rulemaking proceeding that evaluates energy conservation standards for combination vending machines.

c. Installed Base

USA Technologies stated that it does not believe that significant energy savings will be achieved by the standard unless the installed base is included. (USA Technologies, Public Meeting Transcript, No. 56 at p. 16)

DOE acknowledges that additional energy savings can be obtained by regulating the installed base of beverage vending machines. This would require existing, used machines to be rebuilt or refurbished to comply with the standards. However, in the ANOPR, DOE carefully considered its authority to establish energy conservation standards for rebuilt and refurbished beverage vending machines and concluded that its authority does not extend to rebuilt and refurbished equipment. (73 FR 34106–07)

As stated in the ANOPR, throughout the history of the energy conservation standards program, DOE has not regulated used consumer products or commercial equipment that has been refurbished, rebuilt, or undergone major repairs, since EPCA only covers new covered equipment distributed in commerce. Therefore, for this final rule, DOE maintains that rebuilt or refurbished beverage vending machines are not new covered equipment under EPCA and, therefore, are not subject to DOE's energy conservation standards or test procedures.

d. Rating Conditions

In the ANOPR, DOE stated that it planned to use a 75 °F/45 RH rating condition for all beverage vending machines covered by this rulemaking. (73 FR 34102) In a written comment on the NOPR, the National Automatic Merchandising Association (NAMA) stated that these rating conditions were appropriate. (NAMA, No. 65 at p. 3) Dixie-Narco also commented that it supports the 75 °F/45 percent relative humidity (RH) rating condition because it is a more realistic temperature for measuring energy efficiency compared to the 90 °F/65 percent RH condition. Therefore, for this final rule, DOE continues to use the 75 °F/45 RH rating condition for all beverage vending machines covered by this rulemaking.

e. Certification and Enforcement

Regal Beloit asked how certification and enforcement will be conducted for the energy conservation standards that DOE establishes for beverage vending machines. (Regal Beloit, No. 59 at p. 1)

To enforce energy conservation standards, DOE establishes both generally applicable regulations that apply to various types of products or equipment covered by standards, as well as a limited number of product-specific requirements. DOE has not adopted requirements that apply to beverage vending machines (an EPACT 2005 addition to the program). DOE is developing enforcement regulations for the EPACT 2005 equipment, which it expects will be based on the existing enforcement regulations that require manufacturers to certify compliance with the standards by filing two separate documents: (1) A compliance statement in which the manufacturer certifies its equipment meets the requirements; and (2) a certification report in which the manufacturer provides equipment-specific information, such as the model number, energy consumption and other model specific information that would enable DOE to determine which equipment class and standard the equipment is subject to and whether the equipment meets the standard.

In instances where there are questions whether equipment meets the standards, existing regulations require DOE to consult with the manufacturer. If DOE remains unsatisfied with the manufacturer's explanation for the alleged noncompliance, DOE may test units of the allegedly non-complying product or equipment, to determine whether it meets the applicable standard. After DOE has completed testing, the manufacturer has the option to conduct additional tests for DOE to consider. DOE has never had to conduct enforcement testing, as it has been able to resolve all issues with manufacturers prior to taking that step.

The beverage vending machine standards will go into effect 3 years after the publication of the final rule. DOE anticipates that it will have enforcement regulations in place, applicable to beverage vending machines, by that time. But if such regulations are not in place when the standards go into effect, manufacturers will not be required to report to DOE. Moreover, if there is a question regarding compliance with the standards, DOE will confer with the manufacturer before pursuing enforcement action. A violation of these standards could subject a manufacturer to injunctive action or other relief. *See* 42 U.S.C. 6302–6305.

## III. General Discussion

### *A. Test Procedures*

On December 8, 2006, DOE published a final rule (the December 2006 final rule) in the **Federal Register** that incorporated by reference ANSI/ASHRAE Standard 32.1–2004, with two modifications, as the DOE test procedure for this equipment. 71 FR 71340, 71375; 10 CFR 431.294. In section 6.2 of ANSI/ASHRAE Standard 32.1–2004, Voltage and Frequency, the first modification specifies that equipment with dual nameplate voltages must be tested at the lower of the two voltages only. 71 FR 71340, 71355 The second modification specifies that (1) any measurement of ''vendible capacity'' of refrigerated bottled or canned beverage vending machines must be in accordance with the second paragraph of section 5 of ANSI/ASHRAE Standard 32.1–2004, Vending Machine Capacity; and (2) any measurement of ''refrigerated volume'' of refrigerated bottled or canned beverage vending machines must be in accordance with the methodology specified in section 5.2, Total Refrigerated Volume (excluding subsections 5.2.2.2 through 5.2.2.4) of ANSI/AHAM HRF–1–2004, ''Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers.''

The current version of ANSI/ASHRAE Standard 32.1–2004 defines standard bottled, canned, or other sealed beverage storage capacity; establishes uniform methods of testing for determining laboratory performance of vending machines for bottled, canned, or other sealed beverages; and defines three tests/test conditions, as seen in Table III.1.

TABLE III.1—ANSI/ASHRAE STANDARD 32.1–2004—STANDARD TEST CONDITIONS

| Test and pretest conditions | Energy consumption tests | Vend test | Recovery test |
|---|---|---|---|
| Ambient Temperature | Perform twice: At 90 ± 2 °F (32.2 ± 1 °C) and at 75 °F ± 2 °F (23.9 ± 1 °C). | 90 ± 2 °F (32.2 ± 1 °C) | 90 ± 2 °F (32.2 ± 1 °C). |
| Relative Humidity | 65 ± 5% for 90 ± 2 °F test and 45 ± 5% for 75 ± 2 °F test. | 65 ± 5% | 65 ± 5%. |
| Reloaded Product Temperature | | 90 ± 1 °F (32.2 ± 0.5 °C) | 90 ± 1 °F (32.2 ± 0.5 °C). |
| Average Beverage Temperature (for test). | 36 ± 1 °F (2.2 ± 0.5 °C) Throughout Test. | 40 °F or less (4.4 °C or less) Final Temperature. | 33–40 °F (0.6–4.4 °C) Final Temperature. |
| Average Beverage Temperature (for pretest conditions). | Not Applicable | 36 ± 1 °F (2.2 ± 0.6 °C) Pretest Conditions. | 36 ± 1 °F (2.2 ± 0.6 °C) Pretest Conditions. |

During the NOPR public meeting, ASAP stated that DOE's test procedures for beverage vending machines should be revised to capture technologies such as variable speed technologies and advanced controls. ASAP stated that there are energy savings that are not being achieved because the test procedure does not account for these types of technologies. (ASAP, Public Meeting Transcript, No. 56 at p. 36) In addition, Coca-Cola stated that the DOE test procedure does not accurately reflect actual operating conditions, because it does not regulate or dictate the control of the operating methods for all the powered elements in the equipment. (Coca-Cola, Public Meeting Transcript, No. 56 at p. 147) Coca-Cola also stated that lighting controls would not save as much energy in real world applications as the test procedure indicates, resulting in ''artificially low'' test results. (Coca-Cola, No. 63 at p. 1) Coca-Cola commented that very few of its vending machines go into applications where they are inactive for long periods of time. (Coca-Cola, Public Meeting Transcript, No. 56 at p. 193) For these reasons, Coca-Cola and NAMA conclude that TSL 6 for Class A machines is not ''practically feasible.'' (Coca-Cola, No. 63 at p. 1 and NAMA, No. 65 at p. 3) The Joint Comment recommends that the next revision to the current test procedure address; (1) the limitations of steady-state testing conditions, (2) the current test procedure's insufficient representation of real world conditions, and (3) the capture of increased energy use as a result of future, energy intensive beverage vending machine features, such as interactive displays. (Joint Comment, No. 67 at p. 4) Elstat stated that prohibiting the use of standby and off mode power does not support the goal of reduced energy consumption in beverage vending machines, and recommends that DOE revisit the use of energy management controls in 2010, or within one year of the rule statutory deadline (Elstat, No. 62 at p. 1) DOE notes, however, that it is not prohibiting the use of standby and off mode power consumption, but rather is not including standby mode and off mode power consumption in its calculation of energy use. As stated in the May 2009 NOPR, DOE has decided to address these additional requirements when the energy conservation standards for beverage vending machines are reviewed in August 2015 (*see* section II.B.1) and, as described below, must review the test procedures by 2013.

As stated above, DOE's test procedure for refrigerated beverage vending machines is based on ANSI/ASHRAE Standard 32.1–2004. Section 302(a) of EISA 2007 amended section 323 of EPCA, in part, by adding new subsection 323(b)(1). (42 U.S.C. 6293(b)(1)) This subsection provides that the Secretary shall review test procedures at least once every 7 years. Therefore, the test procedure for refrigerated beverage vending machines must be reviewed by December 8, 2013, to determine whether an amendment is necessary. In addition, DOE is aware that ASHRAE, via its Standards Project Committee 32.1, is working on an update to ANSI/ASHRAE Standard 32.1–2004. While specific changes to ASHRAE Standard 32.1–2004 are unknown at this time, DOE understands that the beverage vending machine industry is working closely with ASHRAE to develop an update to this test procedure. As part of the 7-year review of the test procedures for refrigerated beverage vending machines, DOE will consider any updates to ASHRAE Standard 32.1 standard, as well as any technologies to reduce energy consumption and/or increase energy efficiency and determine whether the test procedure and/or measure of energy efficiency warrant revisions.

*B. Technological Feasibility*

1. General

As stated above, any standards that DOE establishes for beverage vending machines must be technologically feasible. (42 U.S.C. 6295(o)(2)(A) and (o)(3)(B); 42 U.S.C. 6316(e)(1)) DOE considers a design option to be technologically feasible if it is in use by the respective industry or if research has progressed to the development of a working prototype. ''Technologies incorporated in commercially available equipment or in working prototypes will be considered technologically feasible.'' 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i).

This final rule considers the same design options as those evaluated in the May 2009 NOPR. (*See* chapter 4 of the TSD.) All the evaluated technologies have been used (or are being used) in commercially available products or working prototypes. Therefore, DOE has determined that all of the efficiency levels evaluated in this notice are technologically feasible.

2. Maximum Technologically Feasible Levels

As required by EPCA, (42 U.S.C. 6295(p)(2) and 42 U.S.C. 6316(e)(1)) in developing the May 2009 NOPR, DOE identified the energy use levels that would achieve the maximum reductions in energy use that are technologically feasible (''max-tech'' levels) for beverage vending machines. 74 FR 26025. For today's final rule, the max-tech levels for all classes are the levels provided in Table III.2. DOE identified these maximum technologically feasible levels for the equipment classes analyzed as part of the engineering analysis (chapter 5 of the TSD). For both equipment classes, DOE applied the most efficient design options available for energy-consuming components.

TABLE III.2—MAX-TECH ENERGY USE LEVELS

| Equipment class | Max-tech level *kWh/day* * |
|---|---|
| A | MDEC = 0.045 × V + 2.42. |
| B | MDEC = 0.068 × V + 2.63. |

''V'' is the refrigerated volume of the refrigerated bottled or canned beverage vending machine, as measured by ANSI/AHAM HRF–1–2004.
* Kilowatt hours per day.

*C. Energy Savings*

DOE forecasted energy savings in its national energy savings (NES) analysis through the use of a spreadsheet tool discussed in the May 2009 NOPR. 74 FR 26020, 26039–43, 26057.

One criterion that governs DOE's adoption of standards for refrigerated beverage vending machines is the standard must result in ''significant conservation of energy.'' (42 U.S.C. 6295(o)(3)(B) and 42 U.S.C. 6316(e)(1)) While EPCA does not define the term ''significant,'' the U.S. Court of Appeals in *Natural Resources Defense Council* v. *Herrington* 768 F.2d 1355, 1373 (DC Cir. 1985) indicated that Congress intended ''significant'' energy savings in this context to be savings that were not ''genuinely trivial.'' DOE's estimates of the energy savings for energy conservation standards at each of the TSLs in today's final rule indicate that the energy savings each would achieve are nontrivial. Therefore, DOE considers these savings ''significant'' within the meaning of section 325 of EPCA.

*D. Economic Justification*

1. Specific Criteria

As noted earlier, EPCA provides seven factors to evaluate in determining whether an energy conservation standard for refrigerated beverage vending machines is economically justified. (42 U.S.C. 6295(o)(2)(B)(i) and 42 U.S.C. 6316(e)(1)) The following sections discuss how DOE has addressed each of those seven factors in this rulemaking.

a. Economic Impact on Commercial Customers and Manufacturers

DOE considered the economic impact of the new refrigerated beverage vending machines standards on commercial customers and manufacturers. For customers, DOE measured the economic impact as the change in installed cost and life-cycle operating costs, *i.e.*, the LCC. (*See* sections IV.F and VI.C.1.a and chapter 8 of the TSD.) DOE investigated the impacts on manufacturers through the manufacturer impact analysis (MIA). (See sections IV.J and VI.C.2, and chapter 13 of the TSD.) The economic impact on commercial customers and manufacturers is discussed in detail in the May 2009 NOPR. 74 FR 26033–38, 26039–26044, 26044–47, 26050–53, 26053–56, 26063–67.

b. Life-Cycle Costs

DOE considered life-cycle costs of beverage vending machines, as discussed in the May 2009 NOPR. 74 FR at 26033–38, 26050–53

DOE calculated the sum of the purchase price and the operating expense (discounted over the lifetime of the equipment) to estimate the range in LCC benefits that commercial customers would expect to achieve due to the standards.

c. Energy Savings

Although significant conservation of energy is a separate statutory requirement for imposing an energy conservation standard, EPCA also requires DOE, in determining the economic justification of a standard, to consider the total projected energy savings that are expected to result directly from the standard. (42 U.S.C. 6295(o)(2)(B)(i)(III) and 42 U.S.C. 6316(e)(1)) As in the May 2009 NOPR (74 FR 26056–57), for today's final rule, DOE used the NES spreadsheet results in its consideration of total projected savings that are directly attributable to the standard levels DOE considered.

d. Lessening of Utility or Performance of Equipment

In selecting today's standard levels, DOE sought to avoid new standards for beverage vending machines that would lessen the utility or performance of that equipment. (42 U.S.C. 6295(o)(2)(B)(i)(IV) and 42 U.S.C. 6316(e)(1)); 74 FR 26059. Today's standards do not involve changes in design or unusual installation requirements that would reduce the utility or performance of the equipment.

e. Impact of Any Lessening of Competition

DOE considers any lessening of competition likely to result from standards. Accordingly, as discussed in the May 2009 NOPR (74 FR 26059, 26064–65, 26070–71), DOE requested that the Attorney General transmit to the Secretary a written determination of the impact (if any) of lessening of competition likely to result from today's standard, together with an analysis of the nature and extent of such impact. (42 U.S.C. 6295(o)(2)(B)(i)(V) and (B)(ii) and 42 U.S.C. 6316(e)(1))

To assist the Attorney General in making such a determination, DOE provided the Department of Justice (DOJ) with copies of May 2009 proposed rule and the NOPR TSD for review. (DOJ, No. 61 at pp. 1–2) The Attorney General's response is discussed in section VI.C.5 and is reprinted at the end of this rule. For Class A machines, DOJ concluded that the proposed TSL 6 could potentially lessen competition. DOJ requested that DOE ensure that the standard it adopts for Class A beverage vending machines will not require access to intellectual property owned by an industry participant, which would place other industry participants at a comparative disadvantage. For Class B machines, DOJ does not believe the proposed standard would likely lead to a lessening of competition. Compliance with a lesser standard does not appear to raise similar concerns.

f. Need of the Nation To Conserve Energy

In considering standards for refrigerated beverage vending machines, the Secretary must consider the need of the Nation to conserve energy. (42 U.S.C. 6295(o)(2)(B)(i)(VI) and 42 U.S.C. 6316(e)(1)) The Secretary recognizes that energy conservation benefits the Nation in several important ways. The non-monetary benefits of the standards are likely to be reflected in improvements to the security and reliability of the Nation's energy system. Today's standards will also result in environmental benefits. DOE has considered these factors in adopting today's standards.

g. Other Factors

In determining whether a standard is economically justified, EPCA directs the Secretary to consider any other factors deemed relevant. (42 U.S.C. 6295(o)(2)(B)(i)(VII) and 42 U.S.C. 6316(e)(1)) In adopting today's standard, DOE considered LCC impacts on identifiable groups, such as customers of different business types who may be disproportionately affected by any national energy conservation standard. In particular, DOE examined the LCC on businesses with high financing costs and low energy prices that may not be able to afford a significant increase in the purchase price (''first cost'') of beverage vending machines. Some of these customers may retain equipment past its useful life. Large increases in first cost could also preclude the purchase and use of equipment entirely. DOE identified no factors for analysis other than those already considered above.

2. Rebuttable Presumption

Section 325(o)(2)(B)(iii) of EPCA states that there is a rebuttable presumption that an energy conservation standard is economically justified if the additional cost to the consumer that meets the standard level is less than three times the value of the first-year energy (and as applicable, water) savings resulting from the standard, as calculated under the applicable DOE test procedure. (42 U.S.C. 6295(o)(2)(B)(iii) and 42 U.S.C. 6316(e)(1)) DOE's LCC and payback period (PBP) analyses generate values that calculate the PBP for customers of potential energy conservation standards, which includes, but is not limited to, the 3-year PBP contemplated under the rebuttable presumption test discussed above. However, DOE routinely conducts a full economic analysis that considers the full range of impacts, including those to the customer, manufacturer, Nation, and environment, as required under 42 U.S.C. 6295(o)(2)(B)(i) and 42 U.S.C. 6316(e)(1). The results of this analysis serve as the basis for DOE to evaluate definitively the economic justification for a potential standard level (thereby supporting or rebutting the results of any preliminary determination of economic justification).

## IV. Methodology and Discussion of Comments on Methodology

DOE used several previously developed analytical tools in setting today's standard. Each was adapted for this rule. One of these analytical tools is a spreadsheet that calculates LCC and PBP. Another calculates national energy savings and national NPV. A third tool is the Government Regulatory Impact Model (GRIM), the results of which are the basis for the MIA, among other methods. In addition, DOE developed an approach using the National Energy Modeling System (NEMS) to estimate impacts of energy efficiency standards for beverage vending machines on electric utilities and the environment. The TSD appendices discuss each of these analytical tools in detail. 74 FR 26026–49.

As a basis for this final rule, DOE has continued to use the spreadsheets and approaches explained in the May 2009 NOPR. DOE used the same general methodology but has revised some of the assumptions and inputs for this final rule in response to comments from interested parties. The following paragraphs discuss these revisions.

### *A. Market and Technology Assessment*

When beginning an energy conservation standards rulemaking, DOE develops information that provides an overall picture of the market for the equipment concerned, including the purpose of the equipment, the industry structure, and market characteristics. This activity includes both quantitative and qualitative assessments based primarily on publicly available information. DOE presented its market and technology assessment for this rulemaking in the May 2009 NOPR and chapter 3 of the NOPR TSD. The assessment included equipment definitions, equipment classes, manufacturers, quantities and types of equipment offered for sale, retail market trends, and regulatory and non-regulatory programs.

1. Definitions Related to Refrigerated Beverage Vending Machines

a. Definition of Bottled or Canned Beverage

EPCA defines the term ''refrigerated bottled or canned beverage vending machine'' as ''a commercial refrigerator that cools bottled or canned beverages and dispenses the bottled or canned beverages on payment.'' (42 U.S.C. 6291(40)) Thus, coverage of equipment under EPCA as a beverage vending machine, in part, depends on whether it cools and dispenses ''bottled beverages'' and/or ''canned beverages.'' DOE tentatively decided to consider a broader definition for the terms ''bottled'' and ''canned'' as they apply to beverage vending machines based on comments on the framework document. A bottle or can in this broader definition refers to ''a sealed container for beverages,'' so a bottled or canned beverage is ''a beverage in a sealed container.'' Such a definition would avoid unnecessary complications regarding the material composition of the container and eliminate the need to determine whether a particular container is a bottle or a can. In the ANOPR, DOE sought comment on this broader definition and on whether it is consistent with the intent of EPCA. (73 FR 34103) DOE did not receive any comments on this and thus proposed in the NOPR that a bottled or canned beverage mean ''a beverage in a sealed container.'' (74 FR 26027) Because DOE did not receive any comments in response to the proposed definition in the May 2009 NOPR, DOE is adopting the definition of bottled or canned beverage as proposed, without modification.

2. Equipment Classes

When evaluating and establishing energy conservation standards, DOE generally divides covered equipment into equipment classes by the type of energy used, capacity, or other performance-related features that affect efficiency and factors such as the utility of such feature(s). (42 U.S.C. 6295(q)) DOE routinely establishes different energy conservation standards for different equipment classes based on these criteria.

Certain characteristics of beverage vending machines have the potential to affect their energy use and efficiency. Accordingly, these characteristics could be the basis for separate equipment classes for these machines. DOE determined that the most significant criterion affecting beverage vending machine energy use is the method used to cool beverages. In the NOPR, DOE divided covered equipment into two equipment classes according to method of refrigeration: Class A and Class B. (74 FR 26027)

The Class A beverage vending machine equipment class comprises machines that cool product throughout the entire refrigerated volume of the machine. Class A machines generally use ''shelf-style'' vending mechanisms and a transparent (glass or polymer) front. Because the next-to-be-vended product is visible to the customer and any product can be selected by the customer off the shelf, all bottled or canned beverage containers are necessarily enclosed within the refrigerated volume.

In Class B beverage vending machines, refrigerated air is directed at a fraction (or zone) of the refrigerated volume of the machine. This cooling method is used to assure that the next-to-be-vended product will be the coolest product in the machine. These machines typically have an opaque front and use a ''stack-style'' vending mechanism.

Therefore, DOE defines Class A and Class B as follows:

- Class A means a refrigerated bottled or canned beverage vending machine that is fully cooled, and is not a combination vending machine.
- Class B means any refrigerated bottled or canned beverage vending machine not considered to be Class A, and is not a combination vending machine.

Because DOE did not receive any comments in response to the presentation of equipment classes in the May 2009 NOPR, DOE is adopting the equipment classes as proposed, with a modification to address combination vending machines as described in section II.B.2.b.

*B. Screening Analysis*

The purpose of the screening analysis is to evaluate the technology options identified as having the potential to improve the efficiency of equipment, to determine which technologies to consider further and which to screen out. DOE consulted with industry, technical experts, and other interested parties to develop a list of technologies for consideration. DOE then applied the following four screening criteria to determine which technologies are unsuitable for further consideration in the rulemaking:

1. *Technological Feasibility*. Technologies incorporated in commercial equipment or in working prototypes will be considered technologically feasible.

2. *Practicability to Manufacture, Install, and Service*. If mass production and reliable installation and servicing of a technology in commercial equipment could be achieved on the scale necessary to serve the relevant market at the time of the effective date of the standard, then that technology will be considered practicable to manufacture, install, and service.

3. *Adverse Impacts on Equipment Utility or Equipment Availability*. If a technology is determined to have significant adverse impact on the utility of the equipment to significant subgroups of customers, or result in the unavailability of any covered equipment type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as equipment generally available in the United States at the time, it will not be considered further.

4. *Adverse Impacts on Health or Safety*. If it is determined that a technology will have significant adverse impacts on health or safety, it will not be considered further.

10 CFR part 430, Subpart C, Appendix A at 4(a)(4) and 5(b).

In the ANOPR market and technology assessment, DOE developed an initial list of technologies expected to have the potential to reduce the energy consumption of beverage vending machines. In the screening analysis, DOE screened out technologies based on the four criteria discussed above. The list of remaining technologies became one of the key inputs to the engineering analysis. (73 FR 34108–09) For the engineering analysis each technology is referred to as a design option.

After the ANOPR screening analysis, DOE did not receive any comments suggesting a change to its list of design options. As a result, no changes were made for the NOPR. During the NOPR public meeting, multiple manufacturers expressed the ability to meet today's standard with the use of lighting controls. (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 188 and Royal Vendors, Public Meeting Transcript, No. 56 at p. 189) As a result, the signatories of the Joint Comment suggest that DOE consider lighting controls as a design option for the final rule because, if not considered, ''cost-effective energy-savings may be forgone.'' (Joint Comment, No. 67 at p. 3)

DOE disagrees with the Joint Commenters' assessment of lighting controls. The Joint Comment infers that a lighting control design option meets the screening analysis criteria. According to the screening criteria, however, a technology cannot be considered as a design option if it has adverse impacts on equipment utility. 10 CFR part 430, Subpart C, Appendix A at 4(a)(4) and 5(b) DOEs analysis ensures preservation of equipment utility by choosing design options that, when implemented, do not lessen utility relative to the engineering baseline unit. The energy-savings potential of lighting controls is realized when the control system automatically deactivates all or a portion of a machine's lighting system. While the lighting system is deactivated, the light output of the machine is reduced, leaving the machine's contents or signage less visible. If lighting controls were a design option in the engineering analysis, this reduction would represent a loss in utility relative to the baseline unit. Therefore, lighting controls do not meet the screening criteria, and DOE will not consider them as a design option in its analysis for the final rule.

In the ANOPR screening analysis, variable-speed compressors were eliminated from consideration. For the NOPR analysis, DOE did not receive any comments recommending that variable-speed compressors be reconsidered. For the final rule analysis, the Joint Comment recommended that DOE reconsider this technology, stating that it believes variable-speed compressors can provide some energy-use reduction, despite the current steady-state conditions that are prescribed in ANSI/ASHRAE Standard 32.1–2004 test procedure. The Joint Comment asserted that when DOE screened out variable-speed compressors, DOE did not consider that beverage vending machine manufacturers oversize their compressors to meet purchasers' pull down requirements. (Joint Comment, No. 67 at p. 2)

DOE screened out variable-speed compressors in the ANOPR analysis because the resulting energy efficiency ratio of a variable-speed compressor operating at steady state, according to the test procedure, would not be greater than the energy efficiency ratio of a properly sized single-speed compressor. DOE acknowledges that a variable-speed compressor operating at steady state may have energy savings compared to an oversized single-speed compressor operating at the same conditions. However, DOE is unaware of any data that quantifies and compares these energy savings specifically for beverage vending machines under these conditions. DOE was also unable to determine whether variable-speed compressors are a cost-effective design option. Due to a lack of any comparative data on the performance of variable speed compressors for these applications and evidence of the cost effectiveness of variable-speed compressors, DOE did not consider variable-speed compressors in its analysis.

In the framework document, DOE stated that, to the greatest extent possible, it would base its analysis on commercially available technologies that have not been screened out, including proprietary designs. DOE stated that it would consider a proprietary design in the subsequent analyses only if it is not a unique path to a given efficiency level. If the proprietary design is the only approach available to achieve a given efficiency level, then DOE will exclude that efficiency level from further analysis.

During the NOPR public meeting, PepsiCo stated that the use of LED lighting in glass front vendors is a proprietary design patented by Coca-Cola, which PepsiCo is precluded from using. (PepsiCo, Public Meeting Transcript, No. 56 at p. 52) In a written comment, NAMA stated similar concerns. (NAMA, No. 65 at p. 3) Coca-Cola stated that there are control strategies used in beverage vending machines (*e.g.*, certain lighting controls and certain motor controls) that are patented and are not widely available for use by all manufacturers. (Coca-Cola, No. 56 at p. 149 and Coca-Cola, No. 63 at p. 1) Coca-Cola added that TSL 6 for Class A machines cannot be achieved without these ''firmware'' control strategies. (Coca-Cola, No. 63 at p. 1) According to USA Technologies, there are patented, after-market lighting control products widely used in the industry. (USA Technologies, Public Meeting Transcript, No. 56 at p. 200) In addition, Dixie-Narco stated that it is not aware of any intellectual property issues that would prevent other manufactures from adopting lighting strategies similar to those that it has been using in its equipment. (Dixie-Narco, No. 64 at p. 3) ASAP stated that certain patented technologies may provide a cost-effective way to achieve a certain efficiency level, but they do not preclude a manufacturer from achieving the same efficiency level in a different manner. ASAP submits that there are historically multiple paths to achieve any given efficiency level. (ASAP, Public Meeting Transcript, No. 56 at p. 202)

DOE recognizes that there are existing patents that involve specific screened-in beverage vending machine technologies. For example, there is a U.S. patent on a ''Dispensing Apparatus with Directional LED Lighting'' (Patent No. U.S. 6,550,269 B2, April 22, 2003). DOE is not screening out proprietary technologies such as LED lighting or certain control strategies, solely because they are proprietary. In contrast, DOE is incorporating these technologies into its analysis because DOE believes that there are alternate pathways to achieve the efficiency levels associated with these technologies. Providing LED lighting in a vending machine in a manner other than directionally, employing an alternative lighting type, and/or providing various other control strategies that are not patented, have the potential to result in a vending machine that meets equivalent efficiency levels.

DOE notes that most patents do not convey market power to their owners because close substitutes for these inventions exist. Licensors will pay no more for patented technologies than the cost advantage they provide over the next best alternative pathway to compliance with the efficiency standard. Ultimately, the availability of cost-effective alternate technology pathways is what limits the ability of the owner of a proprietary technology to extract high fees for its use. It is DOE's opinion that a standard level which can only be met with a single proprietary technology which comes without assurances of open and free technology access should be rejected because it carries great risk of resulting in an anti-competitive market. This principle has been consistently applied in past DOE rulemakings. If standard levels were set based on proprietary technologies representing a unique path to compliance and not available to all equipment manufacturers, the standards-setting process itself would convey great market power because there would be no alternative means to satisfy the standard. In consideration of these factors, DOE maintains that it can consider proprietary designs as long as it is not a unique path to a given efficiency level. For the reasons discussed, DOE believes that neither directional LED lighting nor lighting controls represent a unique path to compliance with TSL 6 for Class A equipment.

### *C. Engineering Analysis*

The engineering analysis develops cost-efficiency relationships to show the manufacturing costs of achieving increased energy efficiency. As discussed in the May 2009 NOPR, DOE used the design-option approach, involving consultation with outside experts, review of publicly available cost and performance information, and modeling of equipment cost and energy consumption. 74 FR 26027–26030. Chapter 5 of the NOPR TSD contains a detailed discussion of the engineering analysis methodology.

#### 1. Approach

In this rulemaking, DOE is adopting a design-option approach, which calculates the incremental costs of increased efficiency. Efficiency increases are modeled by implementing specific energy saving technologies, referred to as design options, to a baseline model. Using the design-option approach, cost-efficiency relationship estimates are based on manufacturer or component supplier data or derived from engineering computer simulation models. Chapter 5 of the TSD contains a detailed description of the equipment classes analyzed and analytical models used to conduct the design-option approach based beverage vending machine engineering analysis.

2. Analytical Models

a. Cost Model

DOE used a cost model to estimate the core case cost of beverage vending machines. The core case cost is the cost of all non-energy-consuming components, such as the structure, walls, doors, shelving, and fascia. This model was adapted from a cost model developed for DOE's rulemaking on commercial refrigeration equipment (refer to *http://www1.eere.energy.gov/buildings/appliance_standards/commercial/refrigeration_equipment.html* for further detail on and validation of the commercial refrigeration equipment cost model). The approach for commercial refrigeration equipment involved disassembling a self-contained refrigerator, analyzing the materials and manufacturing processes for each component, and developing a parametric spreadsheet to model the cost to fabricate (or purchase) each component and the cost of assembly. Because of the similarities in manufacturing processes between self-contained commercial refrigeration equipment and beverage vending machines, DOE was able to adapt the commercial refrigeration equipment cost model for use in this rule. This adaptation involved maintaining many of the assumptions about materials and manufacturing processes but modifying the dimensions and types of components specific to beverage vending machines. To confirm the accuracy of the cost model, DOE obtained input from interested parties on beverage vending machine production cost estimates and on other assumptions DOE used in the model. Chapter 5 of the TSD provides details of the cost model.

b. Energy Consumption Model

The energy consumption model estimates the daily energy consumption (DEC) of beverage vending machines at various performance levels using the previously discussed design-option approach. The model is specific to the categories of equipment covered under this rulemaking, but is sufficiently generalized to model the energy consumption of both covered equipment classes. For a given equipment class, the model estimates the DEC for the baseline design and the energy consumption of several levels of performance above the baseline design. DOE uses the model to calculate each performance level separately. For the NOPR, DOE made updates to the energy consumption model by altering Class A can capacities (or vendible capacities) and verifying Class B can capacities. For both classes, DOE modified exterior case dimensions, which resulted in changes in infiltration loads, refrigerated volumes, and exterior wall areas. These alterations and their effects are detailed in chapter 5 of the TSD. DOE did not receive any comments in response to these changes. Therefore, DOE maintained these revised calculation methodologies for the final rule. DOE did, however, receive a comment regarding the energy consumption model DEC results. Royal Vendors and NAMA commented that, without lighting, a Class B machine will always consume less energy than a similarly equipped Class A machine due to differences in their thermodynamic properties. Royal Vendors cites the divergence from this expected outcome at TSL 4 as the origin of their skepticism for DOE's Class A analysis. (Royal Vendors, No. 60 at pp. 1 and 2; NAMA, No. 65 at pp. 3 and 4)

DOE's analysis results and selected TSLs adequately reflect the thermodynamic differences between Class A and Class B machines. DOE agrees that a Class B machine stripped of electricity consuming components that are not essential to the refrigeration system (*i.e.,* lighting) will consume less energy than a similarly equipped Class A machine. As described in chapter 5 of the final rule TSD, the engineering analysis' DEC results are modeled as the sum of the component electricity consumption and compressor electricity consumption. The physical and thermodynamic equipment differences described by Royal affect the total refrigeration load, which is factored into the compressor electricity consumption in DOE's energy consumption model. When comparing compressor electricity consumption results between a Class A and Class B machine with the same volume, the Class B machine compressor consumes less electricity at all engineering efficiency levels. The divergence in DEC described by Royal Vendors at higher TSLs occurs because the modeled Class A and Class B machines being compared are no longer ''similarly equipped.'' Different design options are implemented for each machine class at each TSL, and each design option has unique energy savings potential. For instance, at TSL 4 for Class A machines, LED lighting is implemented which has an incremental component energy savings of 0.89 kWh/day. At TSL 4 for Class B machines, an electronically commutated motor (ECM) condenser fan motor is implemented which has an incremental component energy savings of 0.05 kWh/day. These incremental component energy savings manifest themselves as reductions in the component electricity consumption addend of the DEC. The greater energy savings potential of some Class A design options results in component electricity consumption reductions significant enough to drive the overall DEC of Class A machines below that of Class B machines. See chapter 5 of the TSD for a detailed explanation of the engineering analysis energy consumption model.

Based on public comments, DOE proposed to use refrigerated volume instead of vendible capacity as the normalization metric for setting standards for beverage vending machines in the NOPR. (74 FR 26029) Following the NOPR, NAMA commented that volume was an appropriate normalization metric, rather than the number of cans. (NAMA, No. 65 at p. 3) Therefore, DOE will continue to use refrigerated volume as the normalization metric in the standard.

*D. Markups To Determine Equipment Price*

In the May 2009 NOPR, DOE explained how it developed the distribution channel markups used. 74 FR 26036. DOE did not receive comments on these markups; however, it updated the distribution channel markups by including 2009 sales tax data as well as the markups for refrigerated beverage vending machines wholesalers using 2009 financial data. DOE used these markups, along with sales taxes, installation costs, and manufacturer selling prices (MSPs) developed in the engineering analysis, to arrive at the final installed equipment prices for baseline and higher efficiency refrigerated beverage vending machines. As explained in the May 2009 NOPR (74 FR 26036), DOE defined three distribution channels for refrigerated beverage vending machines to describe how the equipment passes from the manufacturer to the customer. DOE retained the same distribution channel market shares described in the May 2009 NOPR.

The new overall baseline and incremental markups for sales within each distribution channel are shown in Table IV.1 and Table IV.2. Chapter 6 of the TSD provides additional details on markups.

TABLE IV.1—OVERALL AVERAGE BASELINE MARKUPS BY DISTRIBUTION CHANNEL INCLUDING SALES TAX

| Markup category | Manufacturer direct | Wholesaler/ distributor | Overall weighted average |
|---|---|---|---|
| Markup | 1.000 | 1.460 | 1.069 |
| Sales tax | 1.071 | 1.071 | 1.071 |
| Overall markup | 1.071 | 1.564 | 1.145 |

TABLE IV.2—OVERALL AVERAGE INCREMENTAL MARKUPS BY DISTRIBUTION CHANNEL INCLUDING SALES TAX

| Markup category | Manufacturer direct | Wholesaler/ distributor | Overall weighted average |
|---|---|---|---|
| Markup | 1.000 | 1.200 | 1.030 |
| Sales tax | 1.071 | 1.071 | 1.071 |
| Overall markup | 1.071 | 1.285 | 1.103 |

*E. Energy Use Characterization*

The energy use characterization estimates the annual energy consumption of beverage vending machines. This estimate is used in the subsequent LCC and PBP analyses (chapter 8 of the TSD) and NIA (chapter 11 of the TSD). DOE estimated the energy use for machines in the two equipment classes examined (74 FR 26027) in the engineering analysis (chapter 5 of the TSD) based on the DOE test procedure. DOE incorporated ANSI/ ASHRAE Standard 32.1–2004 by reference with two modifications as the DOE test procedure for the beverage vending machines. 71 FR 71340, 71375 (Dec. 8, 2006); 10 CFR 431.294. DOE assumed all Class A machines to be installed indoors and subject to a constant air temperature of 75 °F and relative humidity of 45 percent, matching test conditions in the DOE test procedure. 73 FR 34114–15. Based on market data and discussions with several beverage vending machine distributors, DOE assumed that 25 percent of Class B machines are placed outdoors, with the remaining 75 percent placed indoors. DOE sought but did not receive comments on this distribution; thus, DOE maintained the same distribution of Class B machines for this final rule.

*F. Life-Cycle Cost and Payback Period Analyses*

In response to the requirements of section 325(o)(2)(B)(i) of EPCA, DOE conducted LCC and PBP analyses to evaluate the economic impacts of possible new beverage vending machine standards on individual customers. DOE used the same spreadsheet models to evaluate the LCC and PBP as it used for the NOPR analysis; however, DOE updated certain specific inputs to the models. Details of the spreadsheet model and of all the inputs to the LCC and PBP analyses are in TSD chapter 8. DOE conducted the LCC and PBP analyses using a spreadsheet model developed in Microsoft Excel for Windows 2003.

The LCC is the total cost for a unit of beverage vending machine equipment over the life of the equipment, including purchase and installation expense and operating costs (energy expenditures and maintenance). To compute the LCC, DOE summed the installed price of the equipment and its lifetime operating costs discounted to the time of purchase. The PBP is the change in purchase expense due to a given energy conservation standard divided by the change in first-year operating cost that results from the standard. DOE expresses PBP in years. DOE measures the changes in LCC and in PBP associated with a given energy use standard level relative to a base case equipment energy use. The base case forecast reflects the market in the absence of mandatory energy conservation standards.

The data inputs to the PBP calculation are the purchase expense (otherwise known as the total installed customer cost or first cost) and the annual operating costs for each selected design. The inputs to the equipment purchase expense were the equipment price and the installation cost, with appropriate markups. The inputs to the operating costs were the annual energy consumption, electricity price, and repair and maintenance costs. The PBP calculation uses the same inputs as the LCC analysis, but because it is a simple payback, the operating cost is for the year the standard takes effect, assumed to be 2012. DOE believes LCC is a better indicator of economic impacts on customers. For each efficiency level analyzed, the LCC analysis required input data for the total installed cost of the equipment, operating cost, and discount rate.

Table IV.3 summarizes the inputs and key assumptions DOE used to calculate the economic impacts of various energy consumption levels on customers. Equipment price, installation cost, and baseline and standard design selection affect the installed cost of the equipment. Annual energy use, electricity costs, electricity price trends, and repair and maintenance costs affect the operating cost. The effective date of the standard, the discount rate, and the lifetime of equipment affect the calculation of the present value of annual operating cost savings from today's standard. Table IV.3 also shows how DOE modified these inputs and key assumptions for the final rule relative to the May 2009 NOPR. Chapter 8 of the TSD provides the changes to the input data and discusses the overall approach to the LCC analysis.

TABLE IV.3—SUMMARY OF INPUTS AND KEY ASSUMPTIONS USED IN THE LCC AND PBP ANALYSES

| Input | NOPR description | Changes for final rule |
|---|---|---|
| Baseline Manufacturer Selling Price | Price charged by manufacturer to either a wholesaler or large customer for baseline equipment. Developed by using industry-supplied efficiency level data and a design option analysis. | Data reflect updated engineering analysis. |

TABLE IV.3—SUMMARY OF INPUTS AND KEY ASSUMPTIONS USED IN THE LCC AND PBP ANALYSES—Continued

| Input | NOPR description | Changes for final rule |
|---|---|---|
| Standard-Level Manufacturer Selling Price Increases. | Incremental change in manufacturer selling price for equipment at each of the higher efficiency standard levels. Developed by using a combination of energy consumption level and design option analyses. | Data reflect updated engineering analysis. |
| Markups and Sales Tax | Associated with converting the manufacturer selling price to a customer price (chapter 6 of TSD). Developed based on product distribution channels and sales taxes. | Markups updated based on revised data on sales tax and wholesaler financial data. |
| Installation Price | Cost to the customer of installing the equipment. This includes labor, overhead, and any miscellaneous materials and parts. The total installed cost equals the customer equipment price plus the installation price. Installation cost data provided by industry comment. | Data reflect updated installation costs. |
| Equipment Energy Consumption | Site energy use associated with the use of beverage vending machines, which includes only the use of electricity by the equipment itself. Taken from engineering analysis and validated in energy use characterization. (chapter 7 of the TSD). | Data reflect updated engineering analysis for each efficiency level. |
| Electricity Prices | Established average commercial electricity price ($/kWh) from EIA data for 2008 in 2007$. DOE then established scaling factors for beverage vending machine customers based on the 2003 *Commercial Building Energy Consumption Survey*. | No change. |
| Electricity Price Trends | Used the *AEO2009* Reference Case to forecast future electricity prices and extrapolated prices to 2042. | All price cases revised to reflect April 2009 update to AEO2009 values. |
| Maintenance Costs | Labor and material costs associated with maintaining the beverage vending machines (*e.g.,* cleaning heat exchanger coils, checking refrigerant charge levels, lamp replacement). Based on industry comment on the NOPR, included an updated annualized cost of one refurbishment/remanufacturing cycle. | No change in methodology; however, reinterpreted year's values. |
| Repair Costs | Labor and material costs associated with repairing or replacing components that have failed. Estimated based on replacement frequencies and costs for key components. | No change. |
| Equipment Lifetime | Age at which the beverage vending machine is retired from service. Based on industry comment on the ANOPR, reduced average service life to 10 years, with 15 years as a maximum. | No change. |
| Discount Rate | Computed by estimating the cost of capital for companies that purchase refrigeration equipment using business financial data from the Damodaran Online database from 2008. | Updated based on data available in the 2009 version of the Damodaran Web site. |
| Rebound Effect | A rebound effect was not taken into account in the LCC analysis | No change. |
| Analysis Period | The time span over which DOE calculated the LCC (*i.e.,* 2012–2042) | No change. |

The changes in the input data and the discussion of the overall approach to the LCC analysis are provided in chapter 8 of the TSD.

*G. Shipments Analysis*

The shipments analysis develops future shipments for each class of beverage vending machines based on current shipments and equipment life assumptions, and takes into account the existing stock and expected trends in markets that use beverage vending machines. DOE received several comments on the shipments analysis and the resulting shipments during the NOPR. Although DOE used the same shipments model for the final rule analysis as the NOPR, many of the underlying assumptions concerning future market behavior were changed as a result of the interested party comments.

1. Split Incentives

Coca-Cola (Coca-Cola, Public Meeting Transcript, No. 56 at p. 196 and Coca-Cola, No. 63 at p. 2) and PepsiCo (PepsiCo, Public Meeting Transcript, No. 56 at p. 94) stated that if costlier components and expensive control schemes are necessary to produce higher efficiency equipment, it would purchase less equipment. While DOE recognizes the principle that higher costs of equipment might possibly affect sales, neither major purchaser provided any data that would allow a quantitative assessment of the effect of higher prices on overall purchases (price elasticity) to be calculated. However, DOE notes that for Class A equipment, the increase in installed cost at TSL 6 is in the range of 5 to 10 percent; for Class B machines, the increase in installed cost is in the range of 2 to 4 percent. Even if shipments fell by the same percentage that installed cost increased by (*i.e.*, price elasticity equaled 1.0, a relatively large number), neither the net present value of TSL 6 for Class A equipment nor the net present value of TSL 3 for Class B equipment would be noticeably affected, nor would the choice of standard levels.

2. Sustainability of Sales Less Than 100 Thousand Units

USA Technologies (USA Tech, Public Meeting Transcript, No. 56 at pp. 78, 79, and 85) expressed a concern that the industry's current number of manufacturers could not stay in business if total production were under 100,000 machines per year. DOE acknowledges the concern about industry sustainability. However, for the final rule, DOE assumes a level of shipments of 190,000 units per year, as explained in section IV.G.4. This assumption mitigates the concern about sales declining below 100,000 units. One major manufacturer (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 86) stated that it can survive even at today's low sales levels (less than 100,000 units) by operating on one shift; additionally, neither manufacturer with a large market share believed that a costly investment was necessary to meet the proposed standard. (Dixie-Narco, Public Meeting Transcript, No. 56 at p.

186; Royal Vendors, Public Meeting Transcript, No. 56 at p. 188)

3. Distribution of Equipment Classes and Sizes

In the analysis conducted for the NOPR, DOE assumed based on interested party comments that Class A equipment would constitute 55 percent of new sales and Class B equipment would constitute 45 percent of new sales. PepsiCo (PepsiCo, Public Meeting Transcript, No. 56 at p. 89) commented that Class A sales would be between 50 and 60 percent and Coca-Cola (Coca-Cola, Public Meeting Transcript, No. 56 at p. 90) commented that, although they expected Class A equipment would be the majority of sales, currently Class B machines are more than 50 percent of sales. DOE has decided to shift to a ratio of 60 percent Class A machines to 40 percent Class B sales for the final rule. DOE also assumed in the analysis for the NOPR that small-size units would constitute approximately zero percent of future sales, medium-size units at 75 percent, and large-size units at 25 percent of sales. Coca-Cola (Coca-Cola, Public Meeting Transcript, No. 56 at p. 107) confirmed the distribution used for the NOPR. Dixie-Narco (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 107) commented that the small-size unit sales were zero, but that the large equipment share might be higher—by as much as 40 percent. Dixie-Narco also recommended that the NAMA could act as an intermediary to compile the data on sales and provide it to DOE. DOE asked NAMA, and NAMA was able to provide an estimate of the distribution between Class A and Class B units for a subset of the manufacturers, approximately 60 percent Class B machines and 40 percent Class A machines (NAMA, No. 65 at p. 2). To take account of all of the comments received, DOE has decided to shift to a ratio of 50 percent Class A machines to 50 percent Class B sales for the final rule. NAMA was not able to provide data on the size distribution within classes. In the absence of that data and to account for all comments received, DOE has modified its distribution of sales to account for as follows for both Class A and Class B units: Small-size units, zero percent; medium-size units, 67 percent; and large-size units, 33 percent.

4. Future Sales Decline

For the analysis at the NOPR stage, DOE assumed based on comments from interested parties on the ANOPR that future sales would all be replacement sales and would be flat at the then-current level of sales of about 90,000 units per year for the entire period of analysis. This level of replacements would result in a reduction in stock from today's level of about 2.3 million units to about 1 million units by 2020. The commenters agreed that the current economic situation would result in additional decline in the number of deployed units (Royal Vendors, Public Meeting Transcript, No. 56 at p. 74; Dixie-Narco, Public Meeting Transcript, No. 56 at p. 76); Coca-Cola, Public Meeting Transcript, No. 56 at pp. 77 and 91), but with a possibility of a near-term recovery based on the need to replace older equipment as it reaches the end of its lifetime and to continue to serve the current customer base. (Dixie-Narco, Public Meeting Transcript, No. 56 p. 79–80; Pepsi, Public Meeting Transcript, No. 56 at p. 88; Coca-Cola, Public Meeting Transcript, No. 56 at p. 91) Several commenters (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 76; Coca-Cola, Public Meeting Transcript, No. 56 at pp. 77 and 83; ASAP, Public Meeting Transcript, No. 56 at p. 87) stated that 1 million units was too small to sustain the current customer base and that the shipments would therefore have to be higher than the current level. During the public meeting, participants estimated the ultimate stock ranged from about 1.6 million (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 84) to above 2 million units. (Coca-Cola, Public Meeting Transcript, No. 56 at p. 83) In view of these comments that there would be some additional shrinkage of stock but that the eventual level of stock in 2020 will need to be approximately 2 million units, DOE assumed that future shipments would quickly recover to 190,000 units per year by 2011 and continue at that level for the foreseeable future. This allows for some continued stock shrinkage to about 1.6 million units in the short run as the 1998–2000 vintage equipment retires faster than it is replaced, but with stock recovering to 1.9 million units by 2020 and to approximately 2 million units by 2022. As ASAP observed (ASAP, Public Meeting Transcript, No. 56 at p. 87), this change in assumptions for the final rule significantly increases the overall economic benefit of the rule, but its effect is proportional to sales and does not significantly affect the choice between potential levels of the standards.

*H. National Impact Analysis*

The national impact analysis (NIA) assesses future NES and the national economic impacts of different efficiency levels. The analysis measures economic impacts using the NPV (future amounts discounted to the present) of total commercial customer costs and savings expected to result from new standards at specific efficiency levels. For the final rule analysis, DOE used the same spreadsheet model used in the NOPR to calculate the energy savings and the national economic costs and savings from new standards, but did so with updates to specific input data. Unlike the LCC analysis, the NES spreadsheet does not use distributions for inputs or outputs. DOE examined sensitivities by applying different scenarios. DOE used the NIA spreadsheet to perform calculations of NES and NPV using; (1) the annual energy consumption and total installed cost data from the LCC analysis, and (2) estimates of national shipments and stock for each beverage vending machine class from the shipments analysis. DOE forecasted the energy savings from each TSL from 2012 to 2042. DOE forecasted the energy cost savings, equipment costs, and NPV of benefits for all refrigerated beverage vending machines classes from 2012 to 2057. The forecasts provided annual and cumulative values for all four output parameters.

DOE calculated the NES by subtracting energy use under a standards scenario from energy use in a base case (no new standards) scenario. Energy use is reduced when a unit of refrigerated beverage vending machines in the base case efficiency distribution is replaced by a more efficient piece of equipment as a result of the standard. Energy savings for each equipment class are the same national average values as calculated in the LCC and PBP spreadsheet. Table IV.4 summarizes key inputs to the NIA analysis and the changes DOE made in the analysis for the final rule. Chapter 11 of the TSD provides additional information about the NIA spreadsheet.

TABLE IV.4—SUMMARY OF NATIONAL ENERGY SAVINGS AND NET PRESENT VALUE INPUTS

| Input data | Description of NOPR analysis | Changes for final rule |
|---|---|---|
| Shipments | No growth in shipments; based on industry comments on the NOPR, all shipments are replacements. | Shipments grow to 190,000 per year. |
| Effective Date of Standard | 2012 | No change. |
| Base Case Efficiencies | Distribution of base case shipments by efficiency level | No change. |
| Standards Case Efficiencies | Distribution of shipments by efficiency level for each standards case. Standards case annual market shares by efficiency level remain constant over time for the base case and each standards case. | No change. |
| Annual Energy Consumption per Unit. | Annual weighted-average values are a function of energy consumption level per unit, which are established in chapter 7 of the TSD. | No change. |
| Total Installed Cost per Unit | Annual weighted-average values are a function of energy consumption level (chapter 8 of the TSD). | No change in methodology. Installed costs reflect the updated final rule LCC. |
| Repair Cost per Unit | Annual weighted-average values are constant in real dollar terms for each energy consumption level (chapter 8 of the TSD). | No change in methodology. Repair costs reflect the updated final rule LCC values. |
| Maintenance Cost per Unit | Annual weighted-average value (chapter 8 of the TSD), plus lighting maintenance cost. | No change in methodology. |
| Escalation of Electricity Prices | Energy Information Administration (EIA) *Annual Energy Outlook 2009* (*AEO2009)* forecasts (to 2030) and extrapolates beyond 2030 (chapter 8 of the TSD). | All cases updated to April 2009 update to *AEO2009* forecasts (chapter 8 of the TSD). |
| Electricity Site-to-Source Conversion. | Conversion factor varies yearly and is generated by EIA's NEMS model. Includes the impact of electric generation, transmission, and distribution losses based on *AEO2008*. | Site-to-source ratio follows April 2009 update to *AEO2009.* |
| Discount Rate | 3 and 7 percent real | No change. |
| Present Year | Future costs are discounted to 2009 | No change. |
| Rebound Effect | A rebound effect (due to changes in shipments resulting from standards) was not considered in the NIA. | No change. |

The modifications DOE made to the NES and NIA analyses for the final rule primarily reflect the latest available updates to the same data sources used in the NOPR, but not changes in methodology. In addition, the underlying input data on equipment costs and energy savings by TSL are based on the LCC analysis results as revised in the final rule.

*Maintenance Costs Savings for LED Lighting in Machines*

At the NOPR stage, the Joint Comment (No. 67 at p. 3) indicated that there are maintenance costs savings and therefore potential life-cycle cost savings when LED lighting is used in place of the baseline T8 fluorescent lighting for beverage vending machines. The Joint Comment referenced an article in the September 3, 2008, edition of ''Automatic Merchandiser,'' *Energize Displays with LED Lighting*, accessed on Vendingmarketwatch.com for information on LED lighting maintenance costs versus maintenance costs for a beverage vending machine with a fluorescent lighting system (last accessed July 25, 2009). DOE also reviewed a more recent industry publication on maintenance cost savings for LED display lights in beverage vending machines in the April 15, 2009, edition of ''Automatic Merchandiser,'' *Tools to Enhance Energy Savings*, which was accessed on Vendingmarketwatch.com (last accessed July 25, 2009).

In response to this comment, DOE conducted a sensitivity analysis for today's final rule to estimate the net economic effect of reduced maintenance costs for using LED lighting in place of baseline T8 fluorescent lighting in beverage vending machine equipment. The sensitivity analysis estimated the annualized life cycle cost savings for LED lighting. For machines with T8 lighting, the analysis assumes two maintenance visits to a machine to change out three T8 lamps and a change out of the T8 lamps and the ballast at refurbishment (at 5 years) DOE assumed there was no additional labor for this change out, since this is undertaken at refurbishment. DOE estimated the total cost for maintenance (labor and materials) for machines with T8 lighting over the machine lifetime (10 years) to be $194.

For machines with LED lighting, no lighting maintenance visits would be required over the lifetime of the machine. The cost of replacing three LED strips at $50 each would take place during refurbishment and would be $150. DOE assumed there would be no additional labor charge for this change out since this was being undertaken at refurbishment.

The analysis estimated that the annualized net maintenance cost savings is $4.68 for a LED lighting system used to light a machine compared to the baseline T8 lighting system for a machine. This net annualized maintenance cost savings is very small and does not significantly affect the life cycle cost analysis and thus does not impact the standards levels for today's final rule. Chapter 8 of the TSD provides additional details of this sensitivity analysis.

1. Choice of Discount Rate

ASAP commented that the balance of DOE's discussion of the choice of proposed standard overemphasized the 7 percent discount rate when both 7 percent and 3 percent are mandated by the Office of Management and Budget (OMB). (ASAP, Public Meeting Transcript, No. 56 at p. 144) ASAP argued that the actual cost of capital the Department chose for the purchase of the machine was lower than 7 percent so that the 3 percent rate should be considered in the Department's analysis, and is required to be considered by OMB. In response, DOE notes that it follows the guidelines on discount factors set forth in guidance that OMB provides to Federal agencies on the development of regulatory analysis (OMB Circular A–4 (September 17, 2003), particularly section E, ''Identifying and Measuring Benefits and Costs''). Accordingly, DOE is continuing to use 3 percent and 7 percent real discount rates for the relevant calculations for this final rule.

2. Discounting of Physical Values

ASAP commented that DOE should not be applying financial discount rates to physical values such as energy savings. (ASAP, Public Meeting Transcript, No. 56 at p. 37) It said that doing so is an inappropriate application of financial evaluation tools and should be discontinued.

DOE continues to report both undiscounted and discounted values of energy savings and carbon emission reductions. DOE believes this allows for consideration of a range of policy perspectives, one of which is the view that a reduction in emissions today is more valuable than one in 30 years.

*I. Life-Cycle Cost Subgroup Analysis*

In analyzing the potential impact of new or amended standards on commercial customers, DOE evaluates the impact on identifiable groups (*i.e.*, subgroups) of customers, such as different types of businesses that may be disproportionately affected by a National standard level. For this rulemaking, DOE identified manufacturing and industrial facilities that purchase their own beverage vending machines as a relevant sub-group. This customer subgroup is likely to include owners of high-cost beverage vending machines because it has the highest capital costs. This group also faces the lowest electricity prices of any customer subgroup. These two conditions make it likely that this subgroup will have the lowest life-cycle cost savings of any major customer sub-group.

DOE determined the impact on this refrigerated beverage vending machines customer subgroup using the LCC spreadsheet model. DOE conducted the LCC and PBP analyses for customers represented by the subgroup. DOE did not receive comments on its identification of this class of customers as the key sub-group or on the assumptions applied to those subgroups. DOE relied on the same methodology outlined in the NOPR for the final rule analysis. The results of DOE's LCC subgroup analysis are summarized in section VI.C.1.b and described in detail in chapter 12 of the TSD.

*J. Manufacturer Impact Analysis*

DOE performed an MIA to estimate the financial impact of energy conservation standards on manufacturers of beverage vending machine equipment, and to assess the impact of such standards on employment and manufacturing capacity. DOE conducted the MIA for beverage vending machine equipment in three phases. Phase 1, Industry Profile, consisted of preparing an industry characterization, including data on market share, sales volumes and trends, pricing, employment, and financial structure. Phase 2, Industry Cash Flow Analysis, focused on the industry as a whole. In this phase, DOE used the GRIM to prepare an industry cash-flow analysis. Using publicly available information developed in Phase 1, DOE adapted the GRIM's generic structure to perform an analysis of beverage vending machine equipment energy conservation standards. In Phase 3, Subgroup Impact Analysis, DOE conducted interviews with manufacturers representing the majority of domestic beverage vending machine equipment sales. This group included large and small manufacturers, providing a representative cross-section of the industry. During these interviews, DOE discussed engineering, manufacturing, procurement, and financial topics specific to each company, and obtained each manufacturer's view of the industry. The interviews provided valuable information DOE used to evaluate the impacts of an energy conservation standard on manufacturer cash flows, manufacturing capacities, and employment levels.

The GRIM inputs consist of the beverage vending machine industry's cost structure, shipments, and revenues. This includes information from many of the analyses described above, such as manufacturing costs and selling prices from the engineering analysis and shipments forecasts from the NES.

The GRIM uses the manufacturer selling prices in the engineering analysis to calculate the manufacturer production costs for each equipment class at each TSL. By multiplying the production costs by different sets of markups, DOE derives the MSPs used to calculate industry revenues.

The GRIM estimates manufacturer revenues based on total-unit-shipment forecasts and the distribution of these shipments by efficiency. Changes in the efficiency mix at each standard level are a key driver of manufacturer finances. For the final rule analysis, DOE used the total shipments and efficiency distribution found in the final rule NES.

DOE estimates the equipment conversion costs and capital conversion costs that the industry would incur at each TSL. Equipment conversion costs include engineering, prototyping, testing, and marketing expenses incurred by a manufacturer as it prepares to comply with a standard. Capital conversion costs are the one-time outlays for tooling and plant changes required for the industry to comply.

During the NOPR public meeting, DOE asked manufacturers to discuss their ability to meet the proposed TSLs and describe the impacts of those standards. Both Royal Vendors and Dixie-Narco discussed their ability to meet the proposed standards in terms of the conversion costs each would incur to develop higher efficiency equipment. Royal Vendors stated that, in the past, considerable costs were incurred to get from pre-ENERGY STAR efficiency levels to ENERGY STAR Tier I efficiency levels. These costs included implementation of ECM fan motors, magnetic ballasts, and higher efficiency compressors. (Royal Vendors, Public Meeting Transcript, No. 56 at p. 185) Dixie-Narco agreed with Royal Vendors and stated that it faced a costly transition from ENERGY STAR Tier I to ENERGY STAR Tier II efficiency levels. (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 186) In a written comment, NAMA also noted the considerable funds already spent by its members to comply with ENERGY STAR standards. (NAMA, No. 65 at p. 2) For Class B machines, Royal Vendors expects meeting TSL 3 will not require a tremendous effort. (Royal Vendors, Public Meeting Transcript, No. 56 at p. 220) Dixie-Narco also stated that it will be able to achieve the proposed standard for Class B machines without investing significant costs that would need to be passed on to its customers. (Dixie-Narco, No. 64 at p. 4) Dixie-Narco noted that it achieved the TSL 6 energy consumption level with one of its Class A vending machines this year, using a lighting management system. (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 188) Royal Vendors stated that it could meet TSL 6 for Class A machines at relatively minor cost if it were not precluded by proprietary design restrictions from adopting a lighting management system similar to Dixie-Narco's. (Royal Vendors, Public Meeting Transcript, No. 56 at p. 189) Royal Vendors stated that implementing an energy management system is not an expensive addition to the machine and that it can be passed on at essentially no additional cost. (Royal Vendors, Public Meeting Transcript, No. 56 at p. 188)

Based on public comments, DOE believes that it accurately estimated the conversion costs for Class B vending machines and did not make any changes for the final rule. However, for Class A vending machines, DOE believes that the use of energy management systems (*e.g.*, lighting) could provide a method of achieving energy savings at minimal cost to manufacturers. To account for this possibility, DOE modified the assumed conversion costs required for manufacturers to meet the Class A energy consumption levels. In the NOPR, DOE assumed that since almost all of the market was already reaching TSL 1 (*i.e.*, ENERGY STAR Tier II) for Class A machines, the conversion costs at TSL 1 were zero. The conversion costs progressively increased from TSL 2 through TSL 7 (*i.e.*, max-tech). For the final rule, DOE accounted for the potential use of an energy management system by assuming there would be negligible conversion costs through TSL 2 for all Class A machines, shifting the conversion costs for TSLs 2 through 5 from the NOPR to TSLs 3 through 6 for the final rule. For TSL 7, DOE maintained the conversion costs from the NOPR since they represent the maximum possible conversion costs for the max-tech level. For more information about DOE's manufacturer impact assumptions, *see* chapter 13 of the TSD.

In a comment submitted on the NOPR, NAMA stated that one of its manufacturers would have difficulty achieving the reduction in energy consumption required by the proposed standard levels. The manufacturer could only meet the standards by changing the cabinet insulation thickness, which would require retooling its production lines at an estimated cost of over $1 million. (NAMA, No. 65 at p. 3)

DOE estimated the conversion costs to manufacturers of the standard levels for both equipment classes and reports the values in chapter 13 of the TSD. DOE's total estimated costs exceed the 1 million dollars reported by the manufacturer. Because DOE has accounted for conversion costs of this magnitude for the industry, DOE maintained the conversion costs reported in chapter 13 of the TSD.

For the final rule, DOE analyzed manufacturer impacts under two distinct markup scenarios: (1) The preservation-of-gross-margin-percentage markup scenario, and (2) the preservation-of-operating-profit markup scenario.

Under the first scenario, DOE applied a single uniform ''gross margin percentage'' markup that represents the current markup for manufacturers in the beverage vending machine industry. This markup scenario implies that as production costs increase with efficiency, the absolute dollar markup will also increase. DOE calculated that the non-production cost markup—which consists of selling, general, and administrative (SG&A) expenses; research and development (R&D) expenses; interest; and profit—is 1.26.

Under the second scenario, the implicit assumption behind the ''preservation-of-operating-profit'' scenario is that the industry can only maintain its operating profit (earnings before interest and taxes) from the baseline after implementation of the standard in 2012. The industry impacts occur in this scenario when manufacturers expand their capital base and production costs to make more expensive equipment, but the operating profit does not change from current conditions. DOE implemented this markup scenario in the GRIM by setting the manufacturer markups at each TSL to yield approximately the same operating profit in both the base case and the standard case in the standards effective year of 2012. Together, these two markup scenarios characterize the range of possible conditions that the beverage vending machine market will experience as a result of new energy conservation standards.

In the NOPR, DOE sought comments on whether and to what extent parties estimate they will be able to transfer costs of implementing TSL 6 to consumers. 74 FR 26022. During the NOPR public meeting, Coca-Cola stated that, 10 years ago, it only had to sell 20 cases for a vending machine to make a profit. Now, it has to sell 100 cases for a vending machine to make a profit. It continued that there are many factors driving the profitability model of a vending machine, and to assume that model will not change is erroneous. (Coca-Cola, Public Meeting transcript, No. 56 at p. 91) Coca-Cola stated that, historically, cost increases in equipment could not be passed through to the customer. It does not believe the increased cost of manufacturing higher efficiency equipment can be passed on to the consumer. As a result, the profit margin for each machine diminishes, resulting in an overall reduction in purchases. (Coca-Cola, Public Meeting Transcript, No. 56 at p. 183, Coca-Cola, No. 63 at p. 2, and NAMA, No. 65 at p. 5) As a result, Coca-Cola concluded that any increase in cost resulting from installing more energy-efficient technologies into a vending machine cannot be transferred over to consumers. (Coca-Cola, Public Meeting Transcript, No. 56 at p. 182 and NAMA, No. 65 at p. 2) Coca-Cola estimates that today's standard will result in an overall weighted average price markup of 14½. (Coca-Cola, No. 63 at p. 2)

The inability to pass on costs starts at the consumer level and ultimately travels throughout the entire distribution chain. As stated in comments from the NOPR public meeting, consumers are typically unwilling to incur additional costs for more energy-efficient equipment. In addition, end-users (*e.g.*, bottlers) are typically unwilling to incur additional costs for energy-efficient equipment, primarily due to the split-incentive issue. The split incentive issue is described in detail in the ANOPR. 73 FR 34101. Therefore, it is very difficult for manufacturers to transfer any cost increases for more energy-efficient equipment to their customers. The preservation-of-operating-profit scenario models the more negative potential impacts on the refrigerated beverage vending machine industry, and accounts for manufacturers' inability to transfer additional costs to end-users. For additional detail on the manufacturer impact analysis, refer to chapter 13 of the TSD. In addition, as stated earlier in section IV.J, multiple major manufacturers stated that their equipment could meet today's standard at little or no added cost. (Dixie-Narco, No. 64 at p. 2 and Royal Vendors, Public Meeting Transcript, No. 56 at p. 189)

*K. Utility Impact Analysis*

The utility impact analysis estimates the effects of reduced energy consumption due to improved equipment efficiency on the utility industry. This analysis compares forecast results for a case comparable to the April 2009 updated *AEO2009* Reference Case and forecast results for policy cases incorporating each of the beverage vending machines proposed TSLs.

DOE analyzed the effects of proposed standards on electric utility industry generation capacity and fuel consumption using a variant of EIA's NEMS model. EIA uses NEMS to produce its *AEO*, a widely recognized baseline energy forecast for the United States. DOE used a variant known as NEMS–BT, run similar to the April 2009 update to the NEMS, except that refrigerated beverage vending machines energy usage is reduced by the amount of energy (by fuel type) saved due to the TSLs. DOE obtained the inputs of national energy savings from the NES spreadsheet model. In response to the May 2009 NOPR, DOE did not receive comments directly on the methodology used for the utility impact analysis. DOE revised the final rule inputs to use the NEMS–BT consistent with the April 2009 update to *AEO2009* and to use the NES impacts developed in the beverage vending machines final rule analysis.

In the utility impact analysis, DOE reported the changes in installed capacity and generation by fuel type that result for each TSL as well as changes in end-use electricity sales.

Chapter 14 of the TSD provides details of the utility analysis methods and results.

*L. Employment Impact Analysis*

DOE considers direct and indirect employment impacts when developing a standard. In this case, direct employment impacts are any changes in the number of employees for beverage vending machines manufacturers, their suppliers, and related service firms. Indirect impacts are those changes in employment in the larger economy that occur due to the shift in expenditures and capital investment caused by the purchase and operation of more efficient beverage vending machines. In this rulemaking, the MIA addresses direct impacts (chapter 13 of the TSD), and the employment impact analysis addresses indirect impacts (chapter 15 of the TSD).

Indirect employment impacts from beverage vending machines standards consist of the net jobs created or eliminated in the national economy (other than in the manufacturing sector being regulated) as a consequence of (1) reduced spending by end users on electricity (offset to some degree by the increased spending on maintenance and repair); (2) reduced spending on new energy supply by the utility industry; (3) increased spending on the purchase price of new refrigerated beverage vending machines; and (4) the effects of those three factors throughout the economy. DOE expects the net monetary savings from standards to be redirected to other forms of economic activity. DOE also expects these shifts in spending and economic activity to affect the demand for labor.

DOE used a different methodology to estimate indirect national employment impacts using an input-output model of the U.S. economy called ImSET (Impact of Sector Energy Technologies) developed by DOE's Building Technologies Program. 74 FR 26047, 26058. The new method uses the most recent version of the U.S. input-output table and updated sector employment intensities. The ImSET model estimates changes in employment, industry output, and wage income in the overall U.S. economy resulting from changes in expenditures in various economic sectors. DOE estimated changes in expenditures using the NES spreadsheet. ImSET then estimated the net national indirect employment impacts of potential refrigerated beverage vending machines efficiency standards on employment by sector. In response to the May 2009 NOPR, DOE did not receive comments directly on the methodology used for the utility impact analysis. DOE updated its indirect employment impact analysis using Version 3 of the ImSET model in the final rule.

*M. Environmental Assessment*

Pursuant to the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 *et seq.*) and 42 U.S.C. 6295(o)(2)(B)(i)(VI), DOE prepared an environmental assessment (EA) of the potential impacts of the proposed standards it considered for today's final rule, which it has included as chapter 16 of the TSD for the final rule. DOE found that the environmental effects associated with the standards for beverage vending machines were not significant. Therefore, DOE is issuing a Finding of No Significant Impact (FONSI), pursuant to NEPA, the regulations of the Council on Environmental Quality (40 CFR parts 1500–1508), and DOE's regulations for compliance with NEPA (10 CFR part 1021). The FONSI is available in the docket for this rulemaking.

In the EA, DOE estimated the reduction in total emissions of $CO_2$ and $NO_X$ using the NEMS–BT computer model. DOE calculated a range of estimates for reduction in Hg emissions using current power sector emission rates. The EA does not include the estimated reduction in power sector impacts of sulfur dioxide ($SO_2$), because DOE is uncertain that an energy conservation standard would not affect the overall level of $SO_2$ emissions in the United States due to the presence of national caps on $SO_2$ emissions. These topics are addressed further below; see chapter 16 of the TSD for additional detail.

The NEMS–BT is run similarly to the April 2009 update of NEMS, except that the refrigeration energy use is reduced by the amount of energy saved due to the trial standard levels. The inputs of national energy savings come from the NIA analysis. For the EA, the output is the forecasted physical emissions. The net benefit of the standard is the difference between emissions estimated by NEMS–BT and the April 2009 updated *AEO2009* Reference Case. The NEMS–BT tracks $CO_2$ emissions using a detailed module that provides results with a broad coverage of all sectors and inclusion of interactive effects.

Title IV of the Clean Air Act sets an annual emissions cap on $SO_2$ for all affected Electric Generating Units. The attainment of the emissions cap is flexible among generators and is enforced through the use of emissions allowances and tradable permits. Thus, DOE is not certain that there will be reduced overall $SO_2$ emissions from the standards. However, there may be an economic benefit from reduced demand for $SO_2$ emission allowances. Electricity savings decrease the generation of $SO_2$ emissions from power production, which can lessen the need to purchase $SO_2$ emissions allowance credits, and thereby decrease the costs of complying with regulatory caps on emissions.

$NO_X$ emissions from 28 eastern States and the District of Columbia (DC) are limited under the Clean Air Interstate Rule (CAIR), published in the **Federal Register** on May 12, 2005. 70 FR 25162 (May 12, 2005). Although CAIR has been remanded to EPA by the DC Circuit, it will remain in effect until it is replaced by a rule consistent with the Court's July 11, 2008 opinion in *North Carolina* v. *EPA*. 531 F.3d 896 (D.C. Cir. 2008); *see* also *North Carolina* v. *EPA*, 550 F.3d 1176 (DC Cir. 2008). These court positions were taken into account in the May 2009 NOPR. Thus, the same methodology was followed in estimating future $NO_X$ in the May 2009 NOPR as in the final rule. Because all States covered by CAIR opted to reduce $NO_X$ emissions through participation in cap-and-trade programs for electric generating units, emissions from these sources are capped across the CAIR region.

For the 28 eastern States and DC where CAIR is in effect, no $NO_X$ emissions reductions will occur due to the permanent cap. Under caps, physical emissions reductions in those States would not result from the energy conservation standards under consideration by DOE, but standards might have produced an environmentally related economic impact in the form of lower prices for emissions allowance credits, if they were large enough. However, DOE determined that in the present case, such standards would not produce an environmentally related economic impact in the form of lower prices for emissions allowance credits, because the estimated reduction in $NO_X$ emissions or the corresponding allowance credits in States covered by the CAIR cap would be too small to affect allowance prices for $NO_X$ under the CAIR. In contrast, new or amended energy conservation standards would reduce $NO_X$ emissions in those 22 States not affected by the CAIR. As a result, DOE used the NEMS–BT to forecast emission reductions from the beverage vending machine standards that are considered in today's final rule.

Similar to $SO_2$ and $NO_X$, future emissions of Hg would have been subject to emissions caps under the Clean Air Mercury Rule (CAMR) [70 FR 28606 (May 18, 2005)], which would have permanently capped emissions of mercury for new and existing coal-fired power plants in all States beginning in 2010, but the CAMR was vacated by the DC Circuit in its decision in *New Jersey* v. *Environmental Protection Agency* prior to publication of the May 2009 NOPR. 517 F 3d 574 (DC Cir. 2008).

After CAMR was vacated, DOE was unable to use the NEMS–BT model to estimate any changes in the quantity of mercury emissions (anywhere in the country) that would result from standard levels it considered for the proposed rule. Instead, DOE used a range of Hg emissions rates (in tons of Hg per unit energy produced) based on the *AEO2008* for the May 2009 NOPR. Because virtually all mercury emitted from electricity generation is from coal-fired power plants, DOE based the high-end emissions rate on the tons of mercury emitted per terawatt hour (TWh) of coal-generated electricity. To estimate the reduction in mercury emissions, DOE multiplied the emissions rate by the reduction in coal-generated electricity associated with the standards considered. DOE's low estimate assumed that future standards would displace electrical generation only from natural gas-fired power plants, thereby resulting in an effective emission rate of zero. The low end of the range of Hg emissions rates is zero because natural gas-fired powered power plants have virtually no Hg emissions associated with their operations. Because the CAMR remains vacated, DOE continued to use the approach it used for the May 2009 NOPR to estimate the Hg emission reductions due to standards for today's final rule. To estimate the reduction in Hg emissions, DOE multiplied the emissions rates by the reduction in electricity generation associated with the standards proposed in today's final rule.

Earthjustice commented that DOE's approach to estimating mercury emissions arbitrarily ignores the results of the Department's own utility impact analysis, which models cumulative avoided electricity from all sources and a breakout disclosing cumulative generation from several sources (coal, petroleum, natural gas, and renewables). (Earthjustice, No. 66 at pp. 1–2) Given that DOE's own utility impact analysis models the energy savings from each source of electricity generation, DOE may not refuse to apply that information to estimate the cumulative mercury emissions reductions without a rational explanation. EarthJustice added that DOE need only refer to the AEO Reference Case average emissions rates to obtain updated projections for future Hg emissions factors.

DOE estimates its emission factors based on marginal emissions rates for energy savings for the primary energy saved by the standard. Diagnosis of NEMS–BT model runs leaves significant uncertainty concerning which generating fuels would be affected at the margin at the scale of energy savings expected as a result of the standard. The differences in emission rates are particularly important for Hg because some fuels generate almost no Hg. Therefore, DOE has elected to keep a range of emissions values in this rule. DOE also notes that the average Hg emissions values suggested by Earthjustice fell between the two values used by DOE.

DOE notes that neither EPCA nor NEPA requires that the economic value of emissions reductions be incorporated in the LCC or NPV analysis of energy savings. DOE has chosen to report these benefits separately from the net benefits of energy savings. A summary of the monetary results is shown in section VI.C.6 of this final rule. DOE considered both values when weighing the benefits and burdens of standards.

### *N. Monetizing Carbon Dioxide and Other Emissions Impacts*

DOE also calculated the possible monetary benefit of $CO_2$, $NO_X$, and Hg reductions. Cumulative monetary benefits discounted from the year of the emission reduction to the present using discount rates of 3 and 7 percent. DOE monetized reductions in $CO_2$ emissions due to the standards proposed in this final rule based on a range of monetary values drawn from studies that attempt to estimate the present value of the marginal economic benefits (based on the avoided marginal social costs of carbon) likely to result from lowering future atmospheric concentrations of greenhouse gases. The marginal social cost of carbon is an estimate of the monetary value to society of the environmental damages of $CO_2$ emissions. One comment was provided on the economic valuation of $CO_2$ at the NOPR public meeting.

ASAP stated that it is important for DOE to reevaluate its approach to carbon valuation. (ASAP, Public Meeting Transcript, No. 56 at p. 37) ASAP believes that DOE's estimate for the value of carbon is low, but did not provide data for analysis. As discussed in section VI.C.6, DOE has updated the approach described in the May 2009 NOPR for its monetization of environmental emissions reductions for today's final rule. DOE continues to work with other Federal agencies on a common approach and values to be used in monetizing carbon and other emissions.

Although this rulemaking may not affect $SO_2$ emissions nationwide and does not affect $NO_X$ emissions in the 28 eastern States and D.C. where CAIR is in effect, there are markets for $SO_2$ and $NO_X$ emissions allowances. The market clearing price of $SO_2$ and $NO_X$ emissions allowances is roughly the marginal cost of meeting the regulatory cap, not the marginal value of the cap itself. Further, because national $SO_2$ and $NO_X$ emissions are regulated by a cap-and-trade system, the cost of meeting these caps is included in the price of energy. Thus, the value of energy savings already includes the value of $SO_2$ and $NO_X$ control for those customers experiencing energy savings. The economic cost savings associated with $SO_2$ and $NO_X$ emissions caps is approximately equal to the change in the price of traded allowances resulting from energy savings multiplied by the number of allowances that would be issued each year. That calculation is uncertain because the energy savings from new standards for beverage vending machines would be so small relative to the entire electricity generation market that the resulting emissions savings would have almost no impact on price formation in the allowances market. These savings would most likely be outweighed by uncertainties in the marginal costs of compliance with $SO_2$ and $NO_X$ emissions caps.

The current NEMS–BT model used in projecting the environmental impacts includes the CAIR rule, as described above, which is projected to reduce $SO_2$ and $NO_X$ emissions. NEMS–BT also takes into account the current set of State level renewable portfolio standards, the effect of the Northeastern states Regional Greenhouse Gas Initiative (RGGI), and utility investor reactions to the possibility of future $CO_2$ cap and trade programs, all of which affect electricity prices and reduce the projected carbon intensity of generation. The most recent Reference Case, *AEO2009,* is available at *http://www.eia.doe.gov/oiaf/servicerpt/stimulus/index.html,* and documentation of the *AEO2009* assumptions is available at *http://www.eia.doe.gov/oiaf/aeo/assumption/index.html.*

## V. Discussion of Other Comments

Since DOE opened the docket for this rulemaking, it has received more than 100 written comments from a diverse set of parties, including manufacturers and their representatives, wholesalers and distributors, energy conservation advocates, State officials and agencies, and electric utilities. Section IV of this preamble discusses comments DOE received on the analytic methodologies it used. Additional comments DOE received in response to the May 2009 NOPR addressed the information DOE used in its analyses, results of and inferences drawn from the analyses, impacts of standards, the merits of the different TSLs and standards options DOE considered, and other issues affecting adoption of standards for beverage vending machines. DOE addresses these comments in this section.

*A. Information and Assumptions Used in Analyses*

1. Engineering Analysis

During the NOPR public meeting, Royal Vendors commented that the data used for Class A fluorescent lighting systems in the engineering analysis is not consistent with the specifications of the fluorescent lighting systems it uses in its glass-front machines. Specifically, it stated that DOEs estimated energy consumption of 32 watts (W) per fixture is too high. Royal Vendors claims its fluorescent fixtures only consume 22 W (Royal Vendors, Public Meeting Transcript, No. 56 at p. 68).

DOE uses aggregate values for its engineering analysis inputs. These values are derived using publicly available data or information provided by multiple manufacturers and/or component suppliers. Analysis inputs are generalized so as to better represent the industry as a whole. DOE's estimate of 32 W of energy consumed for T8 fluorescent fixtures in Class A machines is adequate for the beverage vending machine industry and it has not made any adjustments for the final rule.

*B. Benefits and Burdens*

Royal Vendors stated that the proposed standards appeared to be reversed for Class A machines and Class B machines. It stated that Class A machines typically use more energy than Class B machines. (Royal Vendors, Public Meeting Transcript, No. 56 at p. 27) Dixie-Narco disagreed with Royal Vendors, stating that the proposed standards are correct and appropriate. (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 29) ASAP stated that it generally supports DOE's proposed standard levels. It stated that for Class A machines, DOE's proposal, TSL 6, is the maximum level that is cost effective. However, for Class B machines, ASAP suggested that DOE consider selecting TSL 4 rather than TSL 3 because the economic results for these two levels are very similar. (ASAP, Public Meeting Transcript, No. 56 at p. 31) Dixie-Narco stated that when you consider that the standards equations are based on refrigerated volume and not can capacity (or vendible capacity), the equations for the standards are appropriate for both equipment classes. (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 152) Dixie-Narco further stated that it is currently achieving the proposed efficiency level for Class A machines but not for Class B machines, and therefore would have to make modifications to meet the proposed level for Class B machines. (Dixie-Narco, Public Meeting Transcript, No. 56 at p. 163, 219) Royal Vendors stated that for Class A machines, they do not currently meet those levels, but given no proprietary design problems, they could meet them fairly easily. For Class B machines, Royal Vendors stated that they do not meet the proposed standards currently, but could without tremendous effort. (Royal Vendors, Public Meeting Transcript, No. 56 at p. 220) Coca-Cola commented that an appropriate standard for Class A equipment would be one that is ''on par'' with the ENERGY STAR Tier II level. (Coca-Cola, No. 63 at p. 2)

In a written comment, NAMA stated that it received a mixed response from its members regarding the technological feasibility and economic benefits of the standard levels proposed by DOE. One manufacturer stated that it would have difficulty achieving additional reductions for Class A and Class B machines, while another stated that it could achieve the standard for both Class A and Class B machines without significant costs to them or their customers. However, most responses to NAMA's request for information indicated that the proposed standard for Class B machines was appropriate and achievable. One manufacturer specifically stated that TSL 3 for Class B could be reached without significant costs. The proposed standard for Class A, on the other hand, raised questions among many manufacturers, although one manufacturer stated that it already exceeds the Class A standard without adding significant costs. (NAMA, No. 65 at pp. 3, 4) DOE considers these comments on its selection of the final energy conservation standard level for beverage vending machines. See section VI.D.

## VI. Analytical Results and Conclusions

*A. Trial Standard Levels*

DOE analyzed seven energy consumption levels for Class A equipment and six energy consumption levels for Class B equipment in the LCC and NIA analyses. For the May 2009 NOPR, DOE determined that each of these levels should be presented as a possible TSL and correspondingly identified seven TSLs for Class A and six TSLs for Class B equipment. For each equipment class, the range of TSLs selected includes the energy consumption level providing the maximum NES level for the class, the level providing the maximum NES while providing a positive NPV, the level providing the maximum NPV, and the level approximately equivalent to ENERGY STAR Tier II. Many of the higher levels selected correspond to equipment designs that incorporate specific noteworthy technologies that can provide energy savings benefits. For Class A machines, DOE also included two intermediate efficiency levels to fill in significant energy consumption gaps between the levels identified above the ENERGY STAR Tier II equivalent level. For Class A equipment, the ENERGY STAR Tier II level is equivalent to TSL 1, which allows for the highest energy consumption. For Class B equipment, DOE included one TSL with energy consumption higher than that provided by ENERGY STAR Tier II level.

For the May 2009 NOPR, four of the TSLs for each equipment class were based on the levels that provided maximum energy savings, maximum efficiency level with positive LCC savings, maximum LCC savings, and the highest efficiency level with a payback of less than 3 years.

DOE preserved energy consumption levels from the NOPR that met the same economic criteria in the final rule but also included the ENERGY STAR Tier II equivalency level and several additional TSLs. These additional levels either provide additional intermediate efficiency levels or include specific noteworthy technologies examined in the engineering analysis. Table VI.1 and Table VI.2 show the TSL levels DOE selected for the equipment classes and sizes analyzed. For Class A equipment, TSL 7 is the max-tech level for each equipment class. TSL 6 is the maximum efficiency level with a positive NPV at the 7 percent discount rate, achieved by incorporating an ECM condenser fan. TSL 5 is the efficiency level with the maximum NPV and maximum LCC savings, achieved by using an advanced refrigerant condenser design. TSL 4 is the level that first incorporated light-emitting diode (LED) lighting as a design feature in the engineering analysis. TSL 3 and TSL 2 were intermediate efficiency levels chosen to bridge the gap between TSL 4, and the

ENERGY STAR Tier II equivalent level, which is TSL 1.

TABLE VI.1—TRIAL STANDARD LEVELS FOR CLASS A EQUIPMENT EXPRESSED IN TERMS OF DAILY ENERGY CONSUMPTION (KWH/DAY)

| Size | TSL | Trial standard level in order of efficiency | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Baseline | TSL 1 | TSL 2 | TSL 3 | TSL 4 | TSL 5 | TSL 6 | TSL 7 |
| | LCC Efficiency level. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Small | Engineering Level. | 1 | 5 | *NA | *NA | 6 | 7 | 9 | 11 |
| | kWh/day | 6.10 | 5.27 | 4.75 | 4.25 | 3.95 | 3.73 | 3.58 | 3.25 |
| Medium | Engineering Level. | 1 | 5 | *NA | *NA | 6 | 7 | 9 | 11 |
| | kWh/day | 6.53 | 5.51 | 5.25 | 4.75 | 4.19 | 3.95 | 3.79 | 3.43 |
| Large | Engineering Level. | 1 | 4 | *NA | *NA | 5 | 6 | 8 | 10 |
| | kWh/day | 6.75 | 6.21 | 5.75 | 5.25 | 4.89 | 4.60 | 4.41 | 3.94 |

* Not applicable. These levels established as intermediate points along the engineering cost curves.

TABLE VI.2—TRIAL STANDARD LEVELS FOR CLASS B EQUIPMENT EXPRESSED IN TERMS OF DAILY ENERGY CONSUMPTION (KWH/DAY)

| Size | TSL | Trial standard level in order of efficiency | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Baseline | TSL 1 | TSL 2 | TSL 3 | TSL 4 | TSL 5 | TSL 6 |
| | LCC Efficiency Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Small | Engineering Level | 1 | 2 | 4 | 4 | 5 | 6 | 7 |
| | kWh/day | 4.96 | 4.62 | 4.31 | 4.31 | 4.28 | 3.78 | 3.69 |
| Medium | Engineering Level | 1 | 2 | 4 | 5 | 6 | 7 | 8 |
| | kWh/day | 5.56 | 5.20 | 4.99 | 4.76 | 4.72 | 4.22 | 4.12 |
| Large | Engineering Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | kWh/day | 5.85 | 5.48 | 5.33 | 5.07 | 5.03 | 4.52 | 4.41 |

* Not applicable. These levels established as intermediate points along the engineering cost curves.

For Class B equipment, TSL 6 is the max-tech level for each equipment size. TSL 5 is the level that first incorporated LED lighting as a design option in the engineering analysis. TSL 4 is the next highest efficiency level incorporating an ECM condenser fan motor. TSL 3 was achieved by using an advanced refrigerant condenser design. This TSL provided an NPV value of essentially 0, with total capital expenditures for new equipment balanced by total operating cost savings over the NIA analysis period, based on a 7 percent discount rate. TSL 2 is the ENERGY STAR Tier II level for Class B machines. This TSL provided the maximum LCC savings and maximum NPV savings at a 7 percent discount rate. TSL 1, which provided an energy consumption level approximately 4 percent higher than TSL 2, was also included in the analysis. TSL 1 represented the first level incorporating an evaporator fan driven by an ECM in the engineering analysis.

As stated in the May 2009 NOPR, DOE chose to characterize the proposed TSL levels in terms of equations that establish a maximum daily energy consumption (MDEC) limit through a linear equation of the following form:

$$MDEC = A \times V + B$$

Where:

A is expressed in terms of kWh/day/ft$^3$ of measured volume,
V is the measured refrigerated volume (ft$^3$) calculated for the equipment, and
B is an offset factor expressed in kWh/day.

Coefficients A and B are uniquely derived for each equipment class based on a linear equation passing between the daily energy consumption values for equipment of different refrigerated volumes. For the A and B coefficients, DOE used the energy consumption values shown in Table VI.1 and Table VI.2 for the medium and large equipment sizes within each class of beverage vending machine. DOE did not use the small sizes in either equipment class because information from the May 2009 NOPR indicated that there are no significant shipments of this equipment size. Results are described in more detail in chapter 9 of the TSD.

Chapter 9 of the TSD also explains the methodology DOE used for selecting TSLs and developing the equations shown in Table VI.3.

TABLE VI.3—TRIAL STANDARD LEVELS EXPRESSED IN TERMS OF EQUATIONS AND COEFFICIENTS FOR CLASS A AND CLASS B EQUIPMENT

| Trial standard level | Test metric | Class A | Class B |
|---|---|---|---|
| Baseline | kWh/day | MDEC = 0.019 × V + 6.09 | MDEC = 0.068 × V + 4.07. |
| 1 | kWh/day | MDEC = 0.062 × V + 4.12 | MDEC = 0.066 × V + 3.76. |
| 2 | kWh/day | MDEC = 0.044 × V + 4.26 | MDEC = 0.080 × V + 3.24. |
| 3 | kWh/day | MDEC = 0.044 × V + 3.76 | MDEC = 0.073 × V + 3.16. |

TABLE VI.3—TRIAL STANDARD LEVELS EXPRESSED IN TERMS OF EQUATIONS AND COEFFICIENTS FOR CLASS A AND CLASS B EQUIPMENT—Continued

| Trial standard level | Test metric | Class A | Class B |
|---|---|---|---|
| 4 | kWh/day | MDEC = 0.062 × V + 2.80 | MDEC = 0.073 × V + 3.12. |
| 5 | kWh/day | MDEC = 0.058 × V + 2.66 | MDEC = 0.070 × V + 2.68. |
| 6 | kWh/day | MDEC = 0.055 × V + 2.56 | MDEC = 0.068 × V + 2.63. |
| 7 | kWh/day | MDEC = 0.045 × V + 2.42. | NA.* |

* Not applicable. There is no TSL 7 for Class B equipment.

*B. Significance of Energy Savings*

To estimate the energy savings through 2042 due to new standards, DOE compared the energy consumption of beverage vending machines under the base case (no standards) to energy consumption of this equipment under each TSL that DOE considered. Table VI.4 and Table VI.5 show DOE's NES estimates, which it based on the April 2009 update of the *AEO2009* Reference Case, for each TSL. Chapter 11 of the TSD describes these estimates in more detail. DOE reports both undiscounted and discounted values of energy savings. Discounted energy savings represent a policy perspective where energy savings farther in the future are less significant than energy savings closer to the present. Table VI.4 shows the forecasted aggregate national energy savings, both discounted and undiscounted, of Class A equipment at each TSL. The table also shows the magnitude of the estimated energy savings if the savings are discounted at the 7 percent and 3 percent real discount rates. Each TSL considered in this rulemaking would result in significant energy savings, and the amount of savings increases with higher energy conservation standards (ranging from an estimated 0.007 quads to 0.170 quads, undiscounted, for TSLs 1 through 7) (*see* chapter 11 of the TSD).

TABLE VI.4—SUMMARY OF CUMULATIVE NATIONAL ENERGY SAVINGS FOR CLASS A EQUIPMENT

[Energy savings for units sold from 2012 to 2042]

| Trial standard level | Primary national energy savings (quads) | | |
|---|---|---|---|
| | Undiscounted | 3% Discounted | 7% Discounted |
| 1 | 0.007 | 0.004 | 0.002 |
| 2 | 0.031 | 0.018 | 0.010 |
| 3 | 0.069 | 0.040 | 0.021 |
| 4 | 0.107 | 0.061 | 0.032 |
| 5 | 0.127 | 0.073 | 0.038 |
| 6 | 0.139 | 0.080 | 0.042 |
| 7 | 0.170 | 0.097 | 0.051 |

In Table VI.5, DOE reports both undiscounted and discounted values of energy savings for Class B equipment. As with Class A equipment, each TSL considered would result in significant energy savings, and the amount of energy savings increases with higher energy conservation standards (ranging from an estimated 0.003 quads to 0.068 quads, undiscounted, for TSLs 1 through 6.

TABLE VI.5—SUMMARY OF CUMULATIVE NATIONAL ENERGY SAVINGS FOR CLASS B EQUIPMENT ]

[Energy savings for units sold from 2012 to 2042]

| Trial standard level | Primary national energy savings (quads) | | |
|---|---|---|---|
| | Undiscounted | 3% Discounted | 7% Discounted |
| 1 | 0.003 | 0.002 | 0.001 |
| 2 | 0.004 | 0.002 | 0.001 |
| 3 | 0.020 | 0.012 | 0.006 |
| 4 | 0.023 | 0.013 | 0.007 |
| 5 | 0.061 | 0.035 | 0.018 |
| 6 | 0.068 | 0.039 | 0.020 |

*C. Economic Justification*

1. Economic Impact on Commercial Customers

a. Life-Cycle Costs and Payback Period

To evaluate the economic impact of the TSLs on customers, DOE conducted an LCC analysis for each TSL. More efficient beverage vending machines are expected to affect customers in two ways: Annual operating expense is expected to decrease and purchase price is expected to increase. DOE analyzed the net effect by calculating the LCC. Inputs used for calculating the LCC include total installed costs (*i.e.,* equipment price plus installation costs), annual energy savings, average electricity costs by customer, energy price trends, repair costs, maintenance costs, equipment lifetime, and discount rates.

DOE's LCC and PBP analyses provided five outputs for each TSL that are reported in Table VI.6 through Table VI.8 for Class A equipment. The first three outputs are the percentages of standard-compliant machine purchases that would result in (1) a net LCC increase, (2) no impact, or (3) a net LCC savings for the customer. DOE used the estimated distribution of shipments by efficiency level for each equipment class to determine the affected customers. The fourth output is the average net LCC savings from standard-compliant equipment. The fifth output is the average PBP for the customer investment in standard-compliant equipment. The PBP is the number of years it would take for the customer through energy savings to recover the increased costs of higher efficiency equipment compared to baseline efficiency equipment.

TABLE VI.6—SUMMARY LCC AND PBP RESULTS FOR CLASS A EQUIPMENT—LARGE

| Results | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Equipment with Net LCC Increase *(%)* | 0 | 1 | 3 | 3 | 3 | 5 | 100 |
| Equipment with No Change in LCC *(%)* | 90 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equipment with Net LCC Savings *(%)* | 10 | 99 | 97 | 97 | 97 | 95 | 0 |
| Mean LCC Savings *($)* | 84 | 132 | 184 | 222 | 244 | 240 | (1,481) |
| Mean Payback Period *(years)* | 2.3 | 3.1 | 3.4 | 3.6 | 3.8 | 4.3 | 83.8 |

**Note:** Numbers in parentheses indicate negative values.

TABLE VI.7—SUMMARY LCC AND PBP RESULTS FOR CLASS A EQUIPMENT—MEDIUM

| Results | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Equipment with Net LCC Increase *(%)* | 0 | 0 | 1 | 1 | 3 | 5 | 100 |
| Equipment with No Change in LCC *(%)* | 90 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equipment with Net LCC Savings *(%)* | 10 | 100 | 99 | 99 | 97 | 95 | 0 |
| Mean LCC Savings *($)* | 162 | 207 | 235 | 296 | 305 | 295 | (1,183) |
| Mean Payback Period *(years)* | 2.1 | 2.0 | 3.1 | 3.3 | 3.6 | 4.0 | 71.0 |

**Note:** Numbers in parentheses indicate negative values.

TABLE VI.8—SUMMARY LCC AND PBP RESULTS FOR CLASS A EQUIPMENT—SMALL

| Results | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Equipment with Net LCC Increase *(%)* | 0 | 1 | 3 | 3 | 3 | 5 | 100 |
| Equipment with No Change in LCC *(%)* | 90 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equipment with Net LCC Savings *(%)* | 10 | 99 | 97 | 97 | 97 | 95 | 0 |
| Mean LCC Savings *($)* | 130 | 179 | 227 | 255 | 265 | 255 | (1,153) |
| Mean Payback Period *(years)* | 2.1 | 2.9 | 3.3 | 3.5 | 3.8 | 4.2 | 80.9 |

**Note:** Numbers in parentheses indicate negative values.

For the Class A equipment, there are positive net LCC savings on average for TSL 1 through 6. Only 10 percent of all equipment purchased is expected to achieve a net LCC savings at TSL 1, since about 90 percent of the equipment on the market in 2012 is expected to meet that standard. LCC savings consistently peak at TSL 5, but about 95 percent of purchasers of Class A equipment are projected to achieve LCC savings even at TSL 6. Simple average PBPs are projected to be less than 3 years for all Class A equipment for TSL 1, and PBPs are less than 4 years from TSL 1 through 5.

DOE's LCC and PBP analyses provided the same five outputs for each TSL for Class B equipment. These outputs are reported in Table VI.9 through Table VI.11.

TABLE VI.9—SUMMARY LCC AND PBP RESULTS FOR CLASS B EQUIPMENT—LARGE

| Results | Trial standard level | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Equipment with Net LCC Increase (%) | 0 | 9 | 27 | 35 | 100 | 100 |
| Equipment with No Change in LCC (%) | 90 | 0 | 0 | 0 | 0 | 0 |
| Equipment with Net LCC Savings (%) | 10 | 91 | 73 | 65 | 0 | 0 |
| Mean LCC Savings (*$*) | 43 | 46 | 40 | 30 | (545) | (2,414) |
| Mean Payback Period (*years*) | 3.3 | 4.5 | 6.5 | 7.5 | 83.8 | 100.0 |

**Note:** Numbers in parentheses indicate negative values.

TABLE VI.10—SUMMARY LCC AND PBP RESULTS FOR CLASS B EQUIPMENT—MEDIUM

| Results | Trial standard level | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Equipment with Net LCC Increase (%) | 0 | 9 | 29 | 39 | 100 | 100 |
| Equipment with No Change in LCC (%) | 90 | 0 | 0 | 0 | 0 | 0 |
| Equipment with Net LCC Savings (%) | 10 | 91 | 71 | 61 | 0 | 0 |
| Mean LCC Savings (*$*) | 41 | 49 | 36 | 26 | (558) | (2,230) |
| Mean Payback Period (*years*) | 3.4 | 4.6 | 6.9 | 7.9 | 85.4 | 99.9 |

**Note:** Numbers in parentheses indicate negative values.

TABLE VI.11—SUMMARY LCC AND PBP RESULTS FOR CLASS B EQUIPMENT—SMALL

| Results | Trial standard level | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Equipment with Net LCC Increase (%) | 1 | 41 | 41 | 55 | 100 | 100 |
| Equipment with No Change in LCC (%) | 90 | 0 | 0 | 0 | 0 | 0 |
| Equipment with Net LCC Savings (%) | 10 | 59 | 59 | 45 | 0 | 0 |
| Mean LCC Savings (*$*) | 35 | 16 | 16 | 2 | (612) | (2,129) |
| Mean Payback Period (*years*) | 3.9 | 8.7 | 8.7 | 10.9 | 94.7 | 100.0 |

**Note:** Numbers in parentheses indicate negative values.

For Class B equipment, there are positive net LCC savings on average for TSLs 1 through 4. Only 10 percent of all equipment purchased is expected to achieve a net LCC savings at TSL 1, since about 90 percent of the equipment on the market in 2012 is expected to meet that standard. LCC savings consistently peak at TSL 2, but for 26 to 65 percent of purchasers, Class B equipment is projected to achieve LCC savings at TSL 4. Simple average PBPs are projected to be 3.3 to 3.4 years for large and medium size Class B equipment at TSL 1. PBPs are about 4.5 to 4.6 years for large and medium size Class B equipment for TSLs 1 and 2 and under 7 years for TSLs 1 through 3.

b. Life-Cycle Cost Subgroup Analysis

Using the LCC spreadsheet model, DOE estimated the impact of the TSLs on the following customer subgroup: Manufacturing facilities that have purchased their own beverage vending machines. This is the largest component of the 5 percent of site owners, who also own their own beverage vending machines, and comprises about 2 percent of all beverage vending machines. About 95 percent of beverage vending machines are owned by bottlers and vendors. The manufacturing facilities subgroup was analyzed because, in addition to being the largest independent block of owners, it had among the highest financing costs (based on weighted average cost of capital) and faced the lowest energy costs of any customer subgroup. The group was therefore expected to have the least LCC savings and longest PBP of any identifiable customer subgroup.

DOE estimated the LCC and PBP for the manufacturing facilities subgroup. Table VI.12 shows the mean LCC savings for equipment that meets the energy conservation standards in today's final rule for the manufacturing facilities subgroup, and Table VI.13 shows the mean PBP (in years) for this subgroup. Chapter 12 of the TSD provides more detailed discussion on the LCC subgroup analysis and results.

TABLE VI.12—MEAN LIFE-CYCLE COST SAVINGS FOR REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT PURCHASED BY THE MANUFACTURING FACILITIES LCC SUBGROUP (2008$)

| Equipment class | Size | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| A | S | 92 | 118 | 143 | 158 | 159 | 142 | (1,258) |
| | M | 115 | 148 | 154 | 190 | 188 | 171 | (1,302) |
| | L | 62 | 86 | 116 | 137 | 146 | 134 | (1,585) |
| B | S | 28 | 24 | 8 | (3) | (590) | (2,433) | NA |
| | M | 26 | 26 | 4 | (8) | (603) | (2,251) | NA |
| | L | 28 | 24 | 8 | (3) | (590) | (2,433) | NA |

**Note:** Numbers in parentheses indicate negative values. NA = not applicable.

TABLE VI.13—MEAN PAYBACK PERIOD FOR REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT PURCHASED BY THE MANUFACTURING FACILITIES LCC SUBGROUP (YEARS)

| Equipment class | Size | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| A | S | 2.6 | 3.6 | 4.1 | 4.3 | 4.7 | 5.2 | 90.6 |
| | M | 2.6 | 2.4 | 3.7 | 4.0 | 4.4 | 5.0 | 82.7 |
| | L | 2.7 | 3.8 | 4.2 | 4.4 | 4.7 | 5.3 | 92.2 |

TABLE VI.13—MEAN PAYBACK PERIOD FOR REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT PURCHASED BY THE MANUFACTURING FACILITIES LCC SUBGROUP (YEARS)—Continued

| Equipment class | Size | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| B | S | 4.9 | 11.9 | 11.9 | 15.5 | 99.5 | 100.0 | NA |
| | M | 4.2 | 5.8 | 9.0 | 10.5 | 94.1 | 100.0 | NA |
| | L | 4.1 | 5.7 | 8.4 | 9.9 | 93.0 | 100.0 | NA |

**Note:** NA = not applicable.

For beverage vending machines, the positive LCC and PBP impacts for manufacturing facilities that own their own beverage vending machines are less than those of all customers. Because they face lower energy costs, the lower value of energy savings lengthens the period over which the original investment is paid back and also reduces operating cost savings over the lifetime of more efficient beverage vending machines. In addition, because they face higher financing costs, these customers sites have a relatively high opportunity cost for investment, so the value of future electricity savings from higher efficiency equipment is further reduced. Even so, for this subgroup of customers, LCC savings are still positive for all but TSL 7 for Class A and is positive at TSL 3 and below for Class B. PBP is lengthened by about a year for Class A and 2 years for Class B but is still less about 5 years at TSL 6 for Class A and less than 9 years for medium-size Class B equipment (which is less than the equipment lifetime) at TSL 3.

2. Economic Impact on Manufacturers

DOE determined the economic impacts of today's standard on manufacturers, as described in the proposed rule. 74 FR 26053–56. As updated for today's final rule, DOE analyzed manufacturer impacts under two distinct markup scenarios: (1) The preservation-of-gross-margin-percentage markup scenario, and (2) the preservation-of-operating-profit (absolute dollars) markup scenario.

Together, these two markup scenarios characterize the range of possible conditions the beverage vending machine market will experience as a result of new energy conservation standards. See chapter 13 of the TSD for additional details of the markup scenarios and analysis.

a. Industry Cash-Flow Analysis Results

Using two different markup scenarios, DOE estimated the impact of new standards for beverage vending machines on the INPV of the beverage vending machine industry. The impact consists of the difference between INPV in the base case and INPV in the standards case. INPV is the primary metric used in the MIA, and represents one measure of the fair value of the industry in today's dollars. DOE calculated the INPV by summing all of the net cash flows, discounted at the beverage vending machine industry's cost of capital or discount rate.

Table VI.14 through Table VI.17 show the changes in INPV that DOE estimates would result from the TSLs DOE considered for this final rule using the preservation-of-gross-margin-percentage and preservation-of-operating-profit scenarios described above. The tables also present the equipment conversion costs and capital conversion costs that the industry would incur at each TSL. Equipment conversion costs include engineering, prototyping, testing, and marketing expenses incurred by a manufacturer as it prepares to comply with a standard. Capital conversion costs are the one-time outlays for tooling and plant changes required for the industry to comply.

TABLE VI.14—MANUFACTURER IMPACT ANALYSIS FOR CLASS A REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT UNDER THE PRESERVATION-OF-GROSS-MARGIN-PERCENTAGE MARKUP SCENARIO

| Preservation of gross margin percentage markup scenario | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Metric | Units | Base case | Trial standard level | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| INPV | 2008$ millions | 44.1 | 44.2 | 44.3 | 44.5 | 42.9 | 42.8 | 36.2 | 41.0 |
| Change in INPV | 2008$ millions | | 0.0 | 0.2 | 0.3 | (1.3) | (1.3) | (7.9) | (3.2) |
| | % | | 0.1 | 0.5 | 0.7 | (2.9) | (3.0) | (18.0) | (7.2) |
| Equipment Conversion Costs | 2008$ millions | | 0.0 | 0.0 | 0.6 | 0.6 | 1.2 | 2.9 | 3.5 |
| Capital Conversion Costs | 2008$ millions | | 0.0 | 0.0 | 0.0 | 2.2 | 2.2 | 9.1 | 14.1 |
| Total Investment Required | 2008$ millions | | 0.0 | 0.0 | 0.6 | 2.8 | 3.4 | 11.9 | 17.6 |

Numbers in parentheses indicate negative values.

TABLE VI.15—MANUFACTURER IMPACT ANALYSIS FOR CLASS A REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT UNDER THE PRESERVATION-OF-OPERATING-PROFIT MARKUP SCENARIO

| Preservation of operating profit markup scenario | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Metric | Units | Base case | Trial standard level | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| INPV | 2008$ millions | 44.1 | 44.1 | 43.9 | 43.0 | 40.6 | 40.1 | 33.1 | 15.8 |
| Change in INPV | 2008$ millions | | (0.0) | (0.3) | (1.1) | (3.5) | (4.1) | (11.1) | (28.3) |
| | % | | (0.1) | (0.6) | (2.5) | (7.9) | (9.3) | (25.1) | (64.2) |

TABLE VI.15—MANUFACTURER IMPACT ANALYSIS FOR CLASS A REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT UNDER THE PRESERVATION-OF-OPERATING-PROFIT MARKUP SCENARIO—Continued

| Preservation of operating profit markup scenario | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Metric | Units | Base case | Trial standard level | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Equipment Conversion Costs. | 2008$ millions | ........... | 0.0 | 0.0 | 0.6 | 0.6 | 1.2 | 2.9 | 3.5 |
| Capital Conversion Costs | 2008$ millions | ........... | 0.0 | 0.0 | 0.0 | 2.2 | 2.2 | 9.1 | 14.1 |
| Total Investment Required | 2008$ millions | ........... | 0.0 | 0.0 | 0.6 | 2.8 | 3.4 | 11.9 | 17.6 |

Numbers in parentheses indicate negative values.

TABLE VI.16—MANUFACTURER IMPACT ANALYSIS FOR CLASS B REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT UNDER THE PRESERVATION-OF-GROSS-MARGIN-PERCENTAGE MARKUP SCENARIO

| Preservation of gross margin percentage markup scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Units | Base case | Trial standard level | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| INPV | 2008$ millions | 33.7 | 33.7 | 33.7 | 33.1 | 32.7 | 26.3 | 30.5 |
| Change in INPV | 2008$ millions | ............. | 0.0 | 0.0 | (0.6) | (1.0) | (7.4) | (3.2) |
| | % | ............. | 0.1 | 0.1 | (1.9) | (3.0) | (21.9) | (9.5) |
| Equipment Conversion Costs | 2008$ millions | ............. | 0.0 | 0.0 | 1.7 | 2.6 | 3.5 | 6.9 |
| Capital Conversion Costs | 2008$ millions | ............. | 0.0 | 0.0 | 0.0 | 0.0 | 11.0 | 14.7 |
| Total Investment Required | 2008$ millions | ............. | 0.0 | 0.0 | 1.7 | 2.6 | 14.5 | 21.6 |

Numbers in parentheses indicate negative values.

TABLE VI.17—MANUFACTURER IMPACT ANALYSIS FOR CLASS B REFRIGERATED BEVERAGE VENDING MACHINE EQUIPMENT UNDER THE PRESERVATION-OF-OPERATING-PROFIT MARKUP SCENARIO

| Preservation of operating profit markup scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Units | Base case | Trial standard level | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| INPV | 2008$ millions | 33.7 | 33.7 | 33.7 | 32.5 | 32.0 | 17.2 | 0.2 |
| Change in INPV | 2008$ millions | ............. | (0.0) | (0.0) | (1.2) | (1.7) | (16.5) | (33.5) |
| | % | ............. | (0.1) | (0.2) | (3.5) | (5.0) | (48.9) | (99.4) |
| Equipment Conversion Costs. | 2008$ millions | ............. | 0.0 | 0.0 | 1.7 | 2.6 | 3.5 | 6.9 |
| Capital Conversion Costs | 2008$ millions | ............. | 0.0 | 0.0 | 0.0 | 0.0 | 11.0 | 14.7 |
| Total Investment Required | 2008$ millions | ............. | 0.0 | 0.0 | 1.7 | 2.6 | 14.5 | 21.6 |

Numbers in parentheses indicate negative values.

The May 2009 NOPR discusses the estimated impact of new beverage vending machine standards on INPV for each equipment class. 74 FR 26053–55. See chapter 13 of the TSD for details.

b. Cumulative Regulatory Burden

While any one regulation may not impose a significant burden on manufacturers, the combined effects of several regulations may have serious consequences for some manufacturers, groups of manufacturers, or an entire industry. Assessing the impact of a single regulation may overlook this cumulative regulatory burden.

DOE recognizes that each regulation can significantly affect manufacturers' financial operations. Multiple regulations affecting the same manufacturer can reduce manufacturers' profits and possibly cause manufacturers to exit from the market. During the public meeting, PepsiCo stated that pending regulation would mandate that the beverage vending machine industry add nutrition labels to the exterior of all machines that specify the nutritional information for its contents. (PepsiCo, Public Meeting Transcript, No. 56 at p. 178)

On May 14, 2009, the Menu Education and Labeling (MEAL) Act, a bill to amend the Federal Food, Drug, and Cosmetic Act to extend the food labeling requirements of the Nutrition Labeling and Education Act of 1990, was introduced into Congress. The bill includes a provision to require the vending machine industry to post labels on their machines containing certain nutrition information about their contents. While this legislation may potentially result in an additional labeling requirement for beverage vending machine manufacturers, DOE cannot consider in its cumulative regulatory burden analysis any legislation that has not yet been enacted. Furthermore, DOE has not found or received any quantitative or qualitative information regarding the magnitude of the financial burden that may accompany the pending nutritional information regulation.

DOE did not identify any other DOE regulations that would affect the manufacturers of beverage vending machines or their parent companies. DOE requested information about the cumulative regulatory burden during manufacturer interviews. In general, manufacturers were not greatly concerned about other Federal, State, or international regulations. The requirements of their major customers have a greater impact on their business than any of these other regulations. For further information about the cumulative regulatory burden, see chapter 13 of the TSD.

c. Impacts on Employment

DOE used the GRIM to assess the impacts of energy conservation standards on beverage vending machine industry employment. DOE used statistical data from the U.S. Census Bureau's 2006 Annual Survey of Manufacturers, the results of the engineering analysis, and interviews with manufacturers to estimate the inputs necessary to calculate industry-wide labor expenditures and employment levels. Results of the U.S. Census Bureau's 2007 Annual Survey of Manufacturers are not yet available.

The vast majority of beverage vending machines are manufactured in the United States. Based on results of the GRIM, DOE expects that there would be slightly positive direct employment impacts among domestic beverage vending machine manufacturers for TSLs 1 through 6 for Class A equipment and TSLs 1 through 5 for Class B equipment. The GRIM estimates that employment would increase by fewer than 36 employees for Class A equipment at TSLs 1 through 6 and fewer than 97 employees for Class B equipment at TSLs 1 though 5. The employment impacts are more positive at the max-tech levels (TSL 7 for Class A equipment and TSL 6 for Class B equipment) because more labor is required and the production costs of the most efficient equipment greatly increase. The employment impacts calculated in the GRIM are shown in Table VI.35 and Table VI.36 in section VI.D.

The results calculated in the GRIM do not account for the possible relocation of domestic jobs to lower-labor-cost countries, which may occur independently of new standards or may be influenced by the level of investments new standards require. Manufacturers stated that although there are no current plans to relocate production facilities, higher TSLs would increase pressure to cut costs, which could result in relocation. The labor impacts would be different if manufacturers chose to relocate to lower cost countries or if manufacturers consolidated. In addition, standards could increase pressure to consolidate within the industry due to the low profitability and existing excess production capacity. Chapter 13 of the TSD further discusses how the employment impacts are calculated and shows the projected changes in employment levels by TSL.

The conclusions in this section are independent of any conclusions regarding employment impacts from the broader U.S. economy estimated in the employment impact analysis. Those impacts are documented in chapter 15 of the TSD.

d. Impacts on Manufacturing Capacity

According to the majority of beverage vending machine manufacturers, new energy conservation standards will not affect manufacturers' production capacity. Within the last decade, annual shipments of beverage vending machines have decreased almost three-fold. Due to the decline in shipments, it is likely that any of the major manufacturers has the capacity to meet most of the recent market demand. Consequently, the industry has the capacity to make many times more units than are currently sold each year. Thus, DOE believes manufacturers will be able to maintain manufacturing capacity levels and continue to meet market demand under new energy conservation standards.

e. Impacts on Subgroups of Manufacturers

As discussed in the May 2009 NOPR, 74 FR 26044–45, 26056, 26069–72, DOE evaluated the impacts of new energy conservation standards on small manufacturers as defined by the U.S. Small Business Administration (SBA). DOE identified six small manufacturers and requested information that would determine if there are differential impacts that may result from new energy conservation standards. In the NOPR, DOE specifically requested comments on how small business manufacturers will be affected by new energy conversation standards. 74 FR 26071. However, DOE did not receive any comments in response to this request. For a discussion of the impacts on small business manufacturers, see chapter 13 of the TSD and section VII.B of this preamble (''Review Under the Regulatory Flexibility Act'').

3. National Impact Analysis

a. Amount and Significance of Energy Savings

Because the pattern and strategies for improving the energy performance of beverage vending machines is somewhat different between Class A and B equipment, energy savings are reported separately for each class of equipment by TSL. The national energy savings are between 0.003 and 0.170 quads, beyond that achieved in ENERGY STAR Tier 1 equipment, depending on the TSL and equipment class, an amount of energy savings that DOE considers significant. As stated previously, energy savings increase as TSLs grow progressively more stringent than the baseline efficiency level.

To estimate the energy savings through 2042 due to new energy conservation standards, DOE compared the energy consumption of beverage vending machines under the base case to energy consumption under a new standard. The energy consumption calculated in the NIA is source energy, taking into account energy losses in the generation and transmission of electricity as discussed in section VI.B.

DOE tentatively determined the amount of energy savings at each of the seven TSLs being considered for Class A equipment and six TSLs for Class B equipment, then analyzed and aggregated the results across the three sizes for each equipment class.

Table VI.18 shows the forecasted aggregate national energy savings, both discounted and undiscounted, of Class A equipment at each TSL. The table also shows the magnitude of the estimated energy savings if the savings are discounted at the 7 percent and 3 percent real discount rates. Each TSL considered in this rulemaking would result in significant energy savings, and the amount of savings increases with higher energy conservation standards (ranging from an estimated 0.007 to 0.170 quads, undiscounted, for Class A equipment for TSLs 1 through 7). *See* chapter 11 of the TSD for details of the NIA.

TABLE VI.18—SUMMARY OF CUMULATIVE NATIONAL ENERGY SAVINGS FOR CLASS A EQUIPMENT (ENERGY SAVINGS FOR UNITS SOLD FROM 2012 TO 2042)

| Trial standard level | Primary national energy savings *quads* | | |
|---|---|---|---|
| | Undiscounted | 3% Discounted | 7% Discounted |
| 1 | 0.007 | 0.004 | 0.002 |
| 2 | 0.031 | 0.018 | 0.010 |
| 3 | 0.069 | 0.040 | 0.021 |
| 4 | 0.107 | 0.061 | 0.032 |
| 5 | 0.127 | 0.073 | 0.038 |
| 6 | 0.139 | 0.080 | 0.042 |
| 7 | 0.170 | 0.097 | 0.051 |

In Table VI.19, DOE reports both undiscounted and discounted values of energy savings for Class B equipment. Each TSL considered would result in significant energy savings, and the amount of savings increases with higher energy conservation standards (ranging from an estimated 0.003 to 0.068 quads, undiscounted, for Class B equipment for TSLs 1 through 6).

TABLE VI.19—SUMMARY OF CUMULATIVE NATIONAL ENERGY SAVINGS FOR CLASS B EQUIPMENT (ENERGY SAVINGS FOR UNITS SOLD FROM 2012 TO 2042)

| Trial standard level | Primary national energy savings *quads* | | |
|---|---|---|---|
| | Undiscounted | 3% Discounted | 7% Discounted |
| 1 | 0.003 | 0.002 | 0.001 |
| 2 | 0.004 | 0.002 | 0.001 |
| 3 | 0.020 | 0.012 | 0.006 |
| 4 | 0.023 | 0.013 | 0.007 |
| 5 | 0.061 | 0.035 | 0.018 |
| 6 | 0.068 | 0.039 | 0.020 |

b. Net Present Value

The NPV analysis is a measure of the cumulative benefit or cost of standards to the Nation. In accordance with OMB guidelines on regulatory analysis (OMB Circular A–4, section E, September 17, 2003), DOE calculated an estimated NPV using both a 7 percent and 3 percent real discount rate. The 7 percent rate is an estimate of the average before-tax rate of return to private capital in the U.S. economy. This rate reflects the returns to real estate and small business capital as well as corporate capital. DOE used this discount rate to approximate the opportunity cost of capital in the private sector, since recent OMB analysis has found the average rate of return to capital to be near this rate. DOE also used the 3 percent discount rate to capture the potential effects of standards on private consumption (*e.g.*, through higher prices for equipment and purchase of reduced amounts of energy). This rate represents the rate at which society discounts future consumption flows to their present value. This rate can be approximated by the real rate of return on long-term Government debt (*e.g.*, the yield on Treasury notes minus the annual rate of change in the Consumer Price Index), which has averaged about 3 percent on a pre-tax basis for the last 30 years.

Table VI.20 shows the estimated cumulative NPV calculated for all Class A equipment. Table VI.20 assumes the *AEO2009* Reference Case forecast for electricity prices. At a 7 percent discount rate, TSLs 1 through 6 show positive cumulative NPVs. The highest NPV is provided by TSL 5 at $0.192 billion. TSL 6 showed an NPV at $0.185 billion. TSL 7 showed an NPV at −$1.449 billion, the result of negative NPV observed in all sizes of this equipment class.

TABLE VI.20—SUMMARY OF CUMULATIVE NET PRESENT VALUE FOR CLASS A EQUIPMENT (AEO2009 REFERENCE CASE)

| Trial standard level | NPV* billion 2008$ | |
|---|---|---|
| | 7% Discount rate | 3% Discount rate |
| 1 | 0.015 | 0.034 |
| 2 | 0.068 | 0.153 |
| 3 | 0.112 | 0.268 |
| 4 | 0.175 | 0.415 |
| 5 | 0.192 | 0.464 |
| 6 | 0.185 | 0.465 |
| 7 | (1.449) | (2.466) |

**Note:** Numbers in parentheses indicate negative NPV (*i.e.*, net cost).

At a 3 percent discount rate, all but TSL 7 showed a positive NPV, with the highest NPV provided at TSL 6 ($0.465 billion). TSL 5 showed a near equivalent NPV at $0.464 billion. TSL 7 showed an NPV of −$2.466 billion. DOE observed that all Class A equipment at TSL 7 has a negative NPV at a 3 percent discount rate.

Table VI.21 shows the estimated cumulative NPV for beverage vending machines resulting from the sum of the NPV calculated for Class B equipment. This table assumes the *AEO2009* Reference Case forecast for electricity prices. At a 7 percent discount rate, TSLs 1 and 2 show positive cumulative NPVs. The highest NPV is provided by TSL 2 at $0.006 billion. TSL 3 showed −$0.003 billion NPV. TSLs 4 through 6 also show a negative NPV. TSL 6 has a −$2.452 billion NPV, the result of negative NPV observed in all sizes of Class B equipment.

TABLE VI.21—SUMMARY OF CUMULATIVE NET PRESENT VALUE FOR CLASS B EQUIPMENT (AEO2009 REFERENCE CASE)

| Trial standard level | NPV billion 2008$ | |
|---|---|---|
| | 7% Discount rate | 3% Discount rate |
| 1 | 0.005 | 0.011 |
| 2 | 0.006 | 0.014 |
| 3 | (0.003) | 0.011 |
| 4 | (0.014) | (0.006) |
| 5 | (0.621) | (1.083) |
| 6 | (2.452) | (4.427) |

**Note:** Numbers in parentheses indicate negative NPV (*i.e.*, net cost).

At a 3 percent discount rate, TSLs 1 through 3 showed a positive NPV, with the highest NPV of $0.014 billion provided at TSL 2. TSL 1 and 3 provided a near equivalent NPV at $0.009 billion. TSL 4 showed an NPV of −$0.006 billion. DOE observed that all Class B equipment sizes at TSL 5 have a negative NPV at a 3 percent discount rate.

In addition to the Reference Case, DOE examined the NPV under the *AEO2009* high-growth and low-growth electricity price forecasts. Chapter 11 of the TSD presents the results of this examination.

c. Impacts on Employment

Besides the direct impacts on manufacturing employment discussed in section VI.C.2.c, DOE develops general estimates of the indirect employment impacts of proposed standards on the economy. As discussed above, DOE expects energy conservation standards for beverage vending machines to reduce energy bills for commercial customers, and the resulting net savings to be redirected to other forms of economic activity. DOE also realizes that these shifts in spending and economic activity by beverage vending machine operators and site owners could affect the demand for labor. The impact comes in a variety of businesses not directly involved in the decision to make, operate, or pay the utility bills for beverage vending machines. Thus, the economic impact is ''indirect.'' To estimate these indirect economic effects, DOE used an input/output model of the U.S. economy using U.S. Department of Commerce, Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS) data (as described in section IV.L. See chapter 15 of the TSD for details of the net national employment impact.

In this input/output model, the spending of the money saved on utility bills when more efficient vending machines are deployed is centered in economic sectors that create more jobs than are lost in electric utilities when spending is shifted from electricity to other products and services. Thus, today's refrigerated beverage vending machine energy conservation standards are likely to slightly increase the net demand for labor in the economy. However, the net increase in jobs is so small that it would be imperceptible in national labor statistics and might be offset by other, unanticipated effects on employment. Neither the BLS data nor the input/output model used by DOE includes the quality of jobs. As shown in Table VI.22 and Table VI.23, DOE estimates that net indirect employment impacts from a proposed beverage vending machine standard are likely to be very small.

TABLE VI.22—NET NATIONAL CHANGE IN INDIRECT EMPLOYMENT FROM CLASS A EQUIPMENT: NUMBER OF JOBS FROM 2012 TO 2042

| Trial standard level | Net national change in employment | | | |
|---|---|---|---|---|
| | 2012 | 2022 | 2032 | 2042 |
| 1 | 0 | 13 | 13 | 13 |
| 2 | 4 | 67 | 69 | 82 |
| 3 | 17 | 142 | 159 | 172 |
| 4 | 30 | 221 | 238 | 265 |
| 5 | 42 | 256 | 285 | 313 |
| 6 | 44 | 286 | 316 | 344 |
| 7 | 157 | 402 | 444 | 475 |

**Note:** Numbers in parentheses indicate negative values.

TABLE VI.23—NET NATIONAL CHANGE IN INDIRECT EMPLOYMENT FROM CLASS B EQUIPMENT: NUMBER OF JOBS FROM 2012 TO 2042

| Trial standard level | Net national change in employment | | | |
|---|---|---|---|---|
| | 2012 | 2022 | 2032 | 2042 |
| 1 | 1 | 6 | 6 | 6 |
| 2 | 1 | 9 | 9 | 10 |
| 3 | 8 | 41 | 45 | 49 |
| 4 | 9 | 47 | 52 | 55 |
| 5 | 58 | 138 | 150 | 162 |
| 6 | 166 | 193 | 204 | 216 |

**Note:** Numbers in parentheses indicate negative values.

4. Impact on Utility or Performance of Equipment

As indicated in section V.B.4 of the May 2009 NOPR, the new standards DOE is adopting today will not lessen the utility or performance of any beverage vending machine. 74 FR 26059.

5. Impact of Any Lessening of Competition

As discussed in the May 2009 NOPR, 74 FR 26059, and in section III.D.1.e of this preamble, DOE considers any lessening of competition likely to result from standards. The Attorney General determines the impact, if any, of any lessening of competition.

The DOJ believes that the Class B standards contained in the proposed rule would not likely lead to a lessening of competition. (DOJ, No. 61 at p. 1)

For Class A machines, DOJ concluded that the proposed TSL 6 could potentially lessen competition. DOJ commented that beverage vending machine manufacture is a highly concentrated industry in the United States, and compliance with the proposed Class A standard could require a disproportionate investment by some manufacturers, potentially placing them at a disadvantage with respect to others and leading to greater concentration. DOJ requested that DOE take this possible competitive impact into account and to ensure that the standard it adopts for Class A beverage vending machines will not require access to intellectual property owned by an industry participant, which would place other industry participants at a comparative disadvantage. (DOJ, No. 61 at pp. 1–2)

DOE agrees with DOJ that the market is highly concentrated, with three major manufacturers supplying the vast majority of the U.S. market. In the May 2009 NOPR, DOE stated that it did not believe there would be differential impacts among manufacturers at TSL 6 for Class A equipment. At this level the manufacturers would have to redesign all their existing equipment and make capital investments in their production lines to comply with the standard, but the investments would be similar for each manufacturer at this level. (74 FR 26054)

For today's final rule, DOE modified the assumed conversion costs required for manufacturers to meet the Class A energy consumption levels by accounting for the potential use of an energy management system (*see* section IV.J). This change mitigates the overall impacts at TSL 6, but does not impose disproportionate investments on some manufacturers.

In addition, DOE received a written comment on the NOPR from NAMA suggesting that there could be a differential impact among manufacturers for part of the standards proposed in the NOPR. NAMA stated that it received a mixed response from its members regarding the technological feasibility and economic benefits of the standard levels proposed by DOE. One manufacturer stated that it would have difficulty achieving additional reductions for Class A and Class B machines, while another stated that it could achieve the standards for both Class A and Class B machines without significant costs to them or their customers. However, most responses to NAMA's request for information indicated that the proposed standard for Class B machines was appropriate and achievable, but the proposed standard for Class A raised questions among some manufacturers. (NAMA, No. 65 at p. 3) Dixie-Narco indicated for the NOPR that they could achieve the proposed TSL 6 for Class A machines without the use of intellectual property owned by an industry participant. Dixie-Narco stated that it is currently achieving the proposed efficiency level for Class A machines. (Dixie-Narco, Public Meeting Transcript, No. 56 at pp. 163 and 219) Royal Vendors stated that for Class A machines, they do not currently meet those levels, but given no proprietary design issues, they could meet them fairly easily. (Royal Vendors, Public Meeting Transcript, No. 56 at p. 220; Royal Vendors, No. 60 at p. 1) Dixie-Narco addressed the proprietary design issue by stating that it is not aware of any intellectual property issues that would prevent its competitors from achieving the levels in the proposed standards (Dixie-Narco, No. 64 at p. 2) The Joint Comment also stated that the proposed standards could be met without using LED lighting, which addresses concerns raised by interested parties concerning patent limitations on LED lighting use in vending machines. (Joint Comment, No. 67 at p. 1).

For today's final rule, DOE did not receive comments that indicated that the energy conservation standards would result in the unavailability of standards-compliant products. DOE recognizes that there was a mixed response from manufacturers regarding their ability to meet the standards for Class A machines. However, DOE notes that the technology options that could be used to meet the standard are available to all manufacturers, and DOE does not believe manufacturers will have to obtain proprietary technologies to meet the energy conservation standards set forth by today's rule. As stated in section IV.B, all major manufacturers have access to alternative technology pathways to meet the efficiency levels in the analysis, including TSL 6, without the use of proprietary technology. DOE did not receive any information or comments that would indicate that the identified alternative technologies that could be used to meet energy conservation standards set forth by today's final rule will lead to any lessening of competition. Section IV.B of today's final rule further discusses alternative technology pathways and proprietary technologies.

In the NOPR, DOE requested comment on whether the proposed standard could result in industry consolidation. NAMA submitted a comment stating that the industry has experienced a trend of industry consolidation that would continue, if not accelerate, if equipment costs escalate due to the proposed standard. (NAMA, No. 65 at p. 6)

DOE believes that an increase in equipment costs due to standards would have a comparable impact on all manufacturers. Therefore, industry participants would not be placed at a comparative disadvantage.

The Attorney General's response is reprinted at the end of today's rulemaking.

6. Need of the Nation To Conserve Energy

Improving the energy efficiency of beverage vending machines, where economically justified, would likely improve the security of the Nation's energy system by reducing overall demand for energy, thus reducing the Nation's reliance on foreign sources of energy. Reduced demand would also likely improve the reliability of the electricity system, particularly during peak-load periods. As a measure of this reduced demand, DOE expects the energy savings from the adopted standards to eliminate the need for approximately 0.103 Gigawatts (GW) of generating capacity for Class A equipment and 0.015 GW for Class B equipment by 2042.

Enhanced energy savings also produces environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with energy production. Table VI.24 provides DOE's estimate of cumulative $CO_2$, $NO_X$, and Hg emissions reductions that would result from the TSLs considered in this rulemaking for both Class A and Class B equipment. The expected energy savings from these standards for beverage vending machines may also reduce the cost of maintaining nationwide emissions standards and constraints. In the EA (chapter 16 of the TSD), DOE reports estimated annual changes in $CO_2$, $NO_X$, and Hg emissions attributable to each TSL.

TABLE VI.24—CUMULATIVE $CO_2$ $NO_X$ AND HG EMISSIONS REDUCTIONS FOR CLASSES A AND B EQUIPMENT

[Cumulative reductions for equipment sold from 2012 to 2042]

| Results | Trial standard levels for Class A equipment | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **Emissions reductions** | | | | | | | |
| $CO_2$ *(Mt)* | 0.40 | 1.89 | 4.18 | 6.45 | 7.63 | 8.40 | 10.22 |
| $NO_X$ *(kt)* | 0.13 | 0.65 | 1.43 | 2.20 | 2.60 | 2.87 | 3.49 |
| **Hg (tons)** | | | | | | | |
| Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High | 0.008 | 0.037 | 0.082 | 0.127 | 0.150 | 0.165 | 0.201 |

| Results | Trial standard levels for Class B equipment | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Emissions reductions** | | | | | | |
| $CO_2$ *(Mt)* | 0.16 | 0.24 | 1.19 | 1.36 | 3.66 | 4.08 |
| $NO_X$ *(kt)* | 0.05 | 0.08 | 0.41 | 0.46 | 1.25 | 1.39 |
| **Hg (tons)** | | | | | | |
| Low | 0 | 0 | 0 | 0 | 0 | 0 |
| High | 0.003 | 0.005 | 0.023 | 0.027 | 0.072 | 0.080 |

Mt = million metric tons.
kt = thousand tons.
**Note:** Detail may not sum to total due to rounding.

As noted in section IV.M of this final rule, DOE does not report $SO_2$ emissions reductions from power plants because DOE is uncertain that an energy conservation standard would affect the overall level of U.S. $SO_2$ emissions due to emissions caps.

$NO_X$ emissions from 28 eastern States and the District of Columbia (DC) are limited under the CAIR, published in the **Federal Register** on May 12, 2005. 70 FR 25162 (May 12, 2005). Although CAIR has been remanded to EPA by the DC. Circuit, it will remain in effect until it is replaced by a rule consistent with the Court's December 23, 2008, opinion in *North Carolina* v. *EPA. North Carolina* v. *EPA,* 550 F.3d 1176 (DC Cir. 2008). These court positions were taken into account in the May 2009 NOPR. Thus, the same methodology was followed in estimating future $NO_X$ emission reductions in the May 2009 NOPR as in the final rule. Because all States covered by CAIR opted to reduce $NO_X$ emissions through participation in cap-and-trade programs for electric generating units, emissions from these sources are capped across the CAIR region.

For the 28 eastern States and DC where CAIR is in effect, no $NO_X$ emissions reductions will occur due to the permanent cap. Under caps, physical emissions reductions in those States would not result from the energy conservation standards under consideration by DOE, but standards might have produced an environmentally related economic impact in the form of lower prices for emissions allowance credits, if they were large enough. However, DOE determined that in the present case, such standards would not produce an environmentally related economic impact in the form of lower prices for emissions allowance credits, because the estimated reduction in $NO_X$ emissions or the corresponding allowance credits in States covered by the CAIR cap would be too small to affect allowance prices for $NO_X$ under the CAIR. In contrast, new or amended energy conservation standards would reduce $NO_X$ emissions in those 22 States that are not affected by the CAIR, and these emissions could be estimated from NEMS–BT. As a result, DOE used the NEMS–BT to forecast emission reductions from the beverage machine standards in today's final rule.

As noted in section IV.M, DOE was able to estimate the changes in Hg emissions associated with an energy conservation standard as follows. DOE notes that the NEMS–BT model used for the NOPR, and used as an integral part of today's rulemaking, does not estimate Hg emission reductions due to new energy conservation standards, as it assumed that Hg emissions would be subject to EPA's CAMR. 70 FR 28606 (May 18, 2005). CAMR would have permanently capped emissions of mercury for new and existing coal-fired plants in all States by 2010. DOE assumed that under such a system, energy conservation standards would have resulted in no physical effect on these $NO_X$ emissions, but might have resulted in an environmentally related economic benefit in the form of a lower price for emissions allowance credits if those credits were large enough. DOE estimated that the change in the Hg emissions from energy conservation standards would not be large enough to influence allowance prices under CAMR.

On February 8, 2008, the DC Circuit issued its decision in *New Jersey* v. *Environmental Protection Agency* to vacate CAMR. 517 F.3d 574 (DC Cir. 2008). In light of this development and because the NEMS–BT model could not be used to directly calculate Hg emission reductions, DOE used the Hg emission rates discussed below to calculate emissions reductions in the NOPR. This same methodology is used for the final rule as well due to the continued fluid environment ''* * * with many States planning to enact new laws or make existing laws more stringent.'' EIA *AEO2009* (March 2009), p. 18. The NEMS–BT has only rough estimates of mercury emissions, and it was felt that the range of emissions used in the NOPR remain appropriate given these circumstances.

Therefore, rather than using the NEMS–BT model, DOE established a range of Hg emission rates to estimate the Hg emissions that could be reduced through energy conservation standards. The estimate should provide the full range of possible outcomes and DOE has therefore selected the low and high values to bracket the uncertainties associated with estimating mercury emission reductions. DOE's low estimate assumed that future standards would displace electrical generation only from natural gas-fired power plants, thereby resulting in an effective emission rate of zero. (Under this scenario, coal-fired power plant generation would remain unaffected.) The low-end emission rate is zero because natural gas-fired power plants have virtually zero Hg emissions associated with their operation.

DOE's high estimate, which assumed that standards would displace only coal-fired power plants, was based on a nationwide Hg emission rate from *AEO2008.* (Under this scenario, gas-fired power plant generation would remain unaffected.) Because power plant emission rates are a function of local regulation, scrubbers, and the mercury content of coal, it is extremely difficult to identify a precise high-end emission rate. Therefore, the most reasonable estimate is based on the assumption that all displaced coal generation would have been emitting at the average emission rate for coal generation as specified in the April update to *AEO2009.* As noted previously, because virtually all Hg emitted from electricity generation is from coal-fired power plants, DOE based the emission rate on the tons of Hg emitted per TWh of coal-generated electricity. Based on the emission rate for 2006, DOE derived a high-end emission rate of 0.0255 tons per TWh. To estimate the reduction in Hg emissions, DOE multiplied the emission rate by the reduction in coal-generated electricity due to the standards considered in the utility impact analysis. These changes in Hg emissions are extremely small, ranging from 0 to 0.04 percent of the national base-case emissions forecast by NEMS–BT, depending on the TSL.

In the May 2009 NOPR, DOE indicated that it intended to consider the likely monetary benefits of $CO_2$ emission reductions associated with standards. 74 FR 102, 26020 (May 29, 2009). To put the potential monetary benefits from reduced $CO_2$ emissions into a form that would likely be most useful to decision makers and interested parties, DOE used methods that were similar to those it used to calculate the net present value of consumer cost savings. DOE converted the estimated yearly reductions in $CO_2$ emissions into monetary values that represented the present value, in that year, of future benefits resulting from that reduction in emissions, which were then discounted from that year to the present using both 3 percent and 7 percent discount rates.

In the May 2009 NOPR, DOE proposed to use the range $0 to $20 per ton for 2007 in 2007$. These estimates were originally derived to represent the lower and upper bounds of the costs and benefits likely to be experienced in the United States. The lower bound was based on an assumption of no benefit and the upper bound was based on an estimate of the mean value of worldwide impacts due to climate change that was reported by the Intergovernmental Panel on Climate Change (IPCC) in its ''Fourth Assessment Report.'' For today's final rule, DOE is relying on a new set of values recently developed by an interagency process that conducted a more thorough review of existing estimates of the social cost of carbon (SCC).

The SCC is intended to be a monetary measure of the incremental damage resulting from greenhouse gas (GHG) emissions, including, but not limited to, net agricultural productivity loss, human health effects, property damages from sea level rise, and changes in ecosystem services. Any effort to quantify and to monetize the harms associated with climate change will raise serious questions of science, economics, and ethics. But with full regard for the limits of both quantification and monetization, the SCC can be used to provide estimates of the social benefits of reductions in GHG emissions.

For at least three reasons, any single estimate of the SCC will be contestable. First, scientific and economic knowledge about the impacts of climate change continues to grow. With new and better information about relevant questions, including the cost, burdens, and possibility of adaptation, current estimates will inevitably change over time. Second, some of the likely and potential damages from climate change—for example, the value society places on adverse impacts on endangered species—are not included in all of the existing economic analyses. These omissions may turn out to be significant, in the sense that they may mean that the best current estimates are too low. Third, controversial ethical judgments, including those involving the treatment of future generations, play a role in judgments about the SCC (see in particular the discussion of the discount rate, below).

To date, regulations have used a range of values for the SCC. For example, a regulation proposed by the U.S. Department of Transportation (DOT) in

2008 assumed a value of $7 per ton $CO_2$ (2006$) for 2011 emission reductions (with a range of $0–14 for sensitivity analysis). Regulation finalized by DOE used a range of $0–$20 (2007$). Both of these ranges were designed to reflect the value of damages to the United States resulting from carbon emissions, or the ''domestic'' SCC. In the final Model Year 2011 Corporate Average Fuel Economy rule, DOT used both a domestic SCC value of $2/t$CO_2$ and a global SCC value of $33/t$CO_2$ (with sensitivity analysis at $80/t$CO_2$), increasing at 2.4 percent per year thereafter.

In recent months, a variety of agencies have worked to develop an objective methodology for selecting a range of interim SCC estimates to use in regulatory analyses until improved SCC estimates are developed. The following summary reflects the initial results of these efforts and proposes ranges and values for interim social costs of carbon used in this rule. It should be emphasized that the analysis described below is preliminary. These complex issues are of course undergoing a process of continuing review. Relevant agencies will be evaluating and seeking comment on all of the scientific, economic, and ethical issues before establishing final estimates for use in future rulemakings.

The interim judgments resulting from the recent interagency review process can be summarized as follows: (a) DOE and other Federal agencies should consider the global benefits associated with the reductions of $CO_2$ emissions resulting from efficiency standards and other similar rulemakings, rather continuing the previous focus on domestic benefits; (b) these global benefits should be based on SCC estimates (in 2007$) of $55, $33, $19, $10, and $5 per ton of $CO_2$ equivalent emitted (or avoided) in 2007; (c) the SCC value of emissions that occur (or are avoided) in future years should be escalated using an annual growth rate of 3 percent from the current values); and (d) domestic benefits are estimated to be approximately 6 percent of the global values. These interim judgments are based on the following:

1. *Global and domestic estimates of SCC.* Because of the distinctive nature of the climate change problem, estimates of both global and domestic SCC values should be considered, but the global measure should be ''primary.'' This approach represents a departure from past practices, which relied, for the most part, on measures of only domestic impacts. As a matter of law, both global and domestic values are permissible; the relevant statutory provisions are ambiguous and allow the agency to choose either measure. (It is true that Federal statutes are presumed not to have extraterritorial effect, in part to ensure that the laws of the United States respect the interests of foreign sovereigns. But use of a global measure for the SCC does not give extraterritorial effect to Federal law and hence does not intrude on such interests.)

It is true that under OMB guidance, analysis from the domestic perspective is required, while analysis from the international perspective is optional. The domestic decisions of one nation are not typically based on a judgment about the effects of those decisions on other nations. But the climate change problem is highly unusual in the sense that it involves (a) a global public good in which (b) the emissions of one nation may inflict significant damages on other nations and (c) the United States is actively engaged in promoting an international agreement to reduce worldwide emissions.

In these circumstances, the global measure is preferred. Use of a global measure reflects the reality of the problem and is expected to contribute to the continuing efforts of the United States to ensure that emission reductions occur in many nations.

Domestic SCC values are also presented. The development of a domestic SCC is greatly complicated by the relatively few region- or country-specific estimates of the SCC in the literature. One potential estimate comes from the DICE (Dynamic Integrated Climate Economy, William Nordhaus) model. In an unpublished paper, Nordhaus (2007) produced disaggregated SCC estimates using a regional version of the DICE model. He reported a U.S. estimate of $1/tCO2 (2007 value, 2007$), which is roughly 11 percent of the global value.

An alternative source of estimates comes from a recent EPA modeling effort using the FUND (Climate Framework for Uncertainty, Negotiation and Distribution, Center for Integrated Study of the Human Dimensions of Global Change) model. The resulting estimates suggest that the ratio of domestic to global benefits varies with key parameter assumptions. With a 3 percent discount rate, for example, the U.S. benefit is about 6 percent of the global benefit for the ''central'' (mean) FUND results, while, for the corresponding ''high'' estimates associated with a higher climate sensitivity and lower global economic growth, the U.S. benefit is less than 4 percent of the global benefit. With a 2 percent discount rate, the U.S. share is about 2 to 5 percent of the global estimate.

Based on this available evidence, a domestic SCC value equal to 6 percent of the global damages is used in this rulemaking. This figure is in the middle of the range of available estimates from the literature. It is recognized that the 6 percent figure is approximate and highly speculative and alternative approaches will be explored before establishing final values for future rulemakings.

2. *Filtering existing analyses.* There are numerous SCC estimates in the existing literature, and it is legitimate to make use of those estimates to produce a figure for current use. A reasonable starting point is provided by the meta-analysis in Richard Tol, ''The Social Cost of Carbon: Trends, Outliers, and Catastrophes, Economics: The Open-Access, Open-Assessment E-Journal,'' Vol. 2, 2008–25. *http://www.economics-ejournal.org/economics/journalarticles/2008–25* (2008). With that starting point, it is proposed to ''filter'' existing SCC estimates by using those that (1) are derived from peer-reviewed studies; (2) do not weight the monetized damages to one country more than those in other countries; (3) use a ''business as usual'' climate scenario; and (4) are based on the most recent published version of each of the three major integrated assessment models (IAMs): FUND, DICE and PAGE (Policy Analysis of the Greenhouse Effect) Policy.

Proposal (1) is based on the view that those studies that have been subject to peer review are more likely to be reliable than those that have not been. Proposal (2) is based on a principle of neutrality and simplicity; it does not treat the citizens of one nation differently on the basis of speculative or controversial considerations. Proposal (3) stems from the judgment that as a general rule, the proper way to assess a policy decision is by comparing the implementation of the policy against a counterfactual state where the policy is not implemented. A departure from this approach would be to consider a more dynamic setting in which other countries might implement policies to reduce GHG emissions at an unknown future date, and the United States could choose to implement such a policy now or in the future.

Proposal (4) is based on three complementary judgments. First, the FUND, PAGE, and DICE models now stand as the most comprehensive and reliable efforts to measure the damages from climate change. Second, the latest versions of the three IAMs are likely to reflect the most recent evidence and learning, and hence they are presumed to be superior to those that preceded them. It is acknowledged that earlier versions may contain information that is missing from the latest versions. Third, any effort to choose among them, or to reject one in favor of the others, would be difficult to defend at this time. In the absence of a clear reason to choose among them, it is reasonable to base the SCC on all of them.

The agency is keenly aware that the current IAMs fail to include all relevant information about the likely impacts from greenhouse gas emissions. For example, ecosystem impacts, including species loss, do not appear to be included in at least two of the models. Some human health impacts, including increases in food-borne illnesses and in the quantity and toxicity of airborne allergens, also appear to be excluded. In addition, there has been considerable recent discussion of the risk of catastrophe and of how best to account for worst-case scenarios. It is not clear whether the three IAMs take adequate account of these potential effects.

3. *Use a model-weighted average of the estimates at each discount rate.* At this time, there appears to be no scientifically valid reason to prefer any of the three major IAMs (FUND, PAGE, and DICE). Consequently, the estimates are based on an equal weighting of estimates from each of the models. Among estimates that remain after applying the filter, the average of all estimates within a model is derived. The estimated SCC is then calculated as the average of the three model-specific averages. This approach ensures that the interim estimate is not biased towards specific models or more prolific authors.

4. *Apply a 3 percent annual growth rate to the chosen SCC values.* SCC is assumed to increase over time, because future emissions are expected to produce larger incremental damages as physical and economic systems become more stressed as the magnitude of climate change increases. Indeed, an implied growth rate in the SCC is produced by most studies that estimate economic damages caused by increased GHG emissions in future years. But neither the rate itself nor the information necessary to derive its implied value is commonly reported. In light of the limited amount of debate thus far about the appropriate growth rate of the SCC, applying a rate of 3 percent per year seems appropriate at this stage. This value is consistent with the range recommended by IPCC (2007) and close to the latest published estimate (Hope, 2008).

For climate change, one of the most complex issues involves the appropriate discount rate. OMB's current guidance offers a detailed discussion of the relevant issues and calls for discount rates of 3 percent and 7 percent. It also permits a sensitivity analysis with low rates for intergenerational problems. (''If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent.'') The SCC is being developed within the general context of the current guidance.

The choice of a discount rate, especially over long periods of time, raises highly contested and exceedingly difficult questions of science, economics, philosophy, and law. *See,* e.g., William Nordhaus, ''The Challenge of Global Warming (2008); Nicholas Stern, ''The Economics of Climate Change'' (2007); ''Discounting and Intergenerational Equity'' (Paul Portney and John Weyant, eds., 1999). Under imaginable assumptions, decisions based on cost-benefit analysis with high discount rates might harm future generations—at least if investments are not made for the benefit of those generations. *See* Robert Lind, ''Analysis for Intergenerational Discounting,'' id. at 173, 176–177. At the same time, use of low discount rates for particular projects might itself harm future generations, by ensuring that resources are not used in a way that would greatly benefit them. In the context of climate change, questions of intergenerational equity are especially important.

Reasonable arguments support the use of a 3 percent discount rate. First, that rate is among the two figures suggested by OMB guidance, and hence it fits with existing National policy. Second, it is standard to base the discount rate on the compensation that people receive for delaying consumption, and the 3 percent rate is close to the risk-free rate of return, proxied by the return on long term inflation-adjusted U.S. Treasury Bonds. (In the context of climate change, it is possible to object to this standard method for deriving the discount rate.) Although these rates are currently closer to 2.5 percent, the use of 3 percent provides an adjustment for the liquidity premium that is reflected in these bonds' returns.

At the same time, other arguments support use of a 5 percent discount rate. First, that rate can also be justified by reference to the level of compensation for delaying consumption, because it fits with market behavior with respect to individuals' willingness to trade off consumption across periods as measured by the estimated post-tax average real returns to private investment (*e.g.,* the S&P 500). In the climate setting, the 5 percent discount rate may be preferable to the riskless rate because it is based on risky investments and the return to projects to mitigate climate change is also risky. In contrast, the 3 percent riskless rate may be a more appropriate discount rate for projects where the return is known with a high degree of confidence (*e.g.,* highway guardrails).

Second, 5 percent, and not 3 percent, is roughly consistent with estimates implied by reasonable inputs to the theoretically derived Ramsey equation, which specifies the optimal time path for consumption. That equation specifies the optimal discount rate as the sum of two components. The first reflects the fact that consumption in the future is likely to be higher than consumption today (even accounting for climate impacts), so diminishing marginal utility implies that the same monetary damage will cause a smaller reduction of utility in the future. Standard estimates of this term from the economics literature are in the range of 3 to 5 percent. The second component reflects the possibility that a lower weight should be placed on utility in the future, to account for social impatience or extinction risk, which is specified by a pure rate of time preference (PRTP). A conventional estimate of the PRTP is 2 percent. (Some observers believe that a principle of intergenerational equity suggests that the PRTP should be close to zero.) It follows that discount rate of 5 percent is within the range of values which are able to be derived from the Ramsey equation, albeit at the low end of the range of estimates usually associated with Ramsey discounting.

It is recognized that the arguments above—for use of market behavior and the Ramsey equation—face objections in the context of climate change, and of course there are alternative approaches. In light of climate change, it is possible that consumption in the future will not be higher than consumption today, and if so, the Ramsey equation will suggest a lower figure. Some people have suggested that a very low discount rate, below 3 percent, is justified in light of the ethical considerations calling for a principle of intergenerational neutrality. *See* Nicholas Stern, ''The Economics of Climate Change'' (2007); for contrary views, see William Nordhaus, The A Question of Balance (2008); Martin Weitzman, ''*Review* of the *Stern Review* on the Economics of Climate Change.'' *Journal of Economic Literature,* 45(3): 703–724 (2007). Additionally, some analyses attempt to deal with uncertainty with respect to interest rates over time; a possible approach enabling the consideration of such uncertainties is discussed below. Richard Newell and William Pizer, ''Discounting the Distant Future: How Much do Uncertain Rates Increase Valuations?'' J. Environ. Econ. Manage. 46 (*2003*) 52–71.

The application of the methodology outlined above yields estimates of the SCC that are reported in Table VI.25. These estimates are reported separately using 3 percent and 5 percent discount rates. The cells are empty in rows 10 and 11, because these studies did not report estimates of the SCC at a 3 percent discount rate. The model-weighted means are reported in the final or summary row; they are $33 per $tCO_2$ at a 3% discount rate and $5 per $tCO_2$ with a 5% discount rate.

TABLE VI.25—GLOBAL SOCIAL COST OF CARBON (SCC) ESTIMATES ($/$tCO_2$ IN 2007 (2006$)), BASED ON 3% AND 5% DISCOUNT RATES *

| | Model | Study | Climate scenario | 3% | 5% |
|---|---|---|---|---|---|
| 1 | FUND | Anthoff *et al.* 2009 | FUND default | 6 | −1 |
| 2 | FUND | Anthoff *et al.* 2009 | SRES A1b | 1 | −1 |
| 3 | FUND | Anthoff *et al.* 2009 | SRES A2 | 9 | −1 |
| 4 | FUND | Link and Tol 2004 | No THC | 12 | 3 |
| 5 | FUND | Link and Tol 2004 | THC continues | 12 | 2 |
| 6 | FUND | Guo *et al.* 2006 | Constant PRTP | 5 | −1 |
| 7 | FUND | Guo *et al.* 2006 | Gollier discount 1 | 14 | 0 |
| 8 | FUND | Guo *et al.* 2006 | Gollier discount 2 | 7 | −1 |
| | | | FUND Mean | 8.25 | 0 |
| 9 | PAGE | Wahba & Hope 2006 | A2-scen | 57 | 7 |
| 10 | PAGE | Hope 2006 | | | 7 |
| 11 | DICE | Nordhaus 2008 | | | 8 |
| | Summary | | Model-weighted Mean | 33 | 5 |

* The sample includes all peer reviewed, non-equity-weighted estimates included in Tol (2008), Nordhaus (2008), Hope (2008), and Anthoff *et al.* (2009), that are based on the most recent published version of FUND, PAGE, or DICE and use business-as-usual climate scenarios. All values are based on the best available information from the underlying studies about the base year and year dollars, rather than the Tol (2008) assumption that all estimates included in his review are 1995 values in 1995$. All values were updated to 2007 using a 3 percent annual growth rate in the SCC, and adjusted for inflation using GDP deflator.

Analyses have been conducted at $33 and $5 as these represent the estimates associated with the 3 percent and 5 percent discount rates, respectively. The 3 percent and 5 percent estimates have independent appeal and at this time a clear preference for one over the other is not warranted. Thus, DOE has also included—and centered its current attention on—the average of the estimates associated with these discount rates, which is $19. (Based on the $19 global value, the domestic value would be $1.14 per ton of $CO_2$ equivalent.)

It is true that there is uncertainty about interest rates over long time horizons. Recognizing that point, Newell and Pizer have made a careful effort to adjust for that uncertainty. See Newell and Pizer, supra. This is a relatively recent contribution to the literature.

There are several concerns with using this approach in this context. First, it would be a departure from current OMB guidance. Second, an approach that would average what emerges from discount rates of 3 percent and 5 percent reflects uncertainty about the discount rate, but based on a different model of uncertainty. The Newell-Pizer approach models discount rate uncertainty as something that evolves over time; in contrast, one alternative approach would assume that there is a single discount rate with equal probability of 3 percent and 5 percent.

Table VI.26 reports on the application of the Newell-Pizer adjustments. The precise numbers depend on the assumptions about the data generating process that governs interest rates. Columns (1a) and (1b) assume that ''random walk'' model best describes the data and uses 3 percent and 5 percent discount rates, respectively. Columns (2a) and (2b) repeat this, except that it assumes a ''mean-reverting'' process. As Newell and Pizer report, there is stronger empirical support for the random walk model.

TABLE VI.26—GLOBAL SOCIAL COST OF CARBON (SCC) ESTIMATES ($/$tCO_2$ IN 2007 (2006$)),* USING NEWELL & PIZER (2003) ADJUSTMENT FOR FUTURE DISCOUNT RATE UNCERTAINTY **

| | Model | Study | Climate scenario | Random-walk model | | Mean-reverting model | |
|---|---|---|---|---|---|---|---|
| | | | | 3% | 5% | 3% | 5% |
| | | | | (1a) | (1b) | (2a) | (2b) |
| 1 | FUND | Anthoff *et al.* 2009 | FUND default | 10 | 0 | 7 | −1 |
| 2 | FUND | Anthoff *et al.* 2009 | SRES A1b | 2 | 0 | 1 | −1 |
| 3 | FUND | Anthoff *et al.* 2009 | SRES A2 | 15 | 0 | 10 | −1 |
| 4 | FUND | Link and Tol 2004 | No THC | 20 | 6 | 13 | 4 |
| 5 | FUND | Link and Tol 2004 | THC continues | 20 | 4 | 13 | 2 |
| 6 | FUND | Guo *et al.* 2006 | Constant PRTP | 9 | 0 | 6 | −1 |
| 7 | FUND | Guo *et al.* 2006 | Gollier discount 1 | 14 | 0 | 14 | 0 |
| 8 | FUND | Guo *et al.* 2006 | Gollier discount 2 | 7 | −1 | 7 | −1 |

TABLE VI.26—GLOBAL SOCIAL COST OF CARBON (SCC) ESTIMATES ($/t$CO_2$ IN 2007 (2006$)),* USING NEWELL & PIZER (2003) ADJUSTMENT FOR FUTURE DISCOUNT RATE UNCERTAINTY **—Continued

| | Model | Study | Climate scenario | Random-walk model | | Mean-reverting model | |
|---|---|---|---|---|---|---|---|
| | | | | 3% | 5% | 3% | 5% |
| | | | | (1a) | (1b) | (2a) | (2b) |
| | | | FUND Mean | 12 | 1 | 9 | 0 |
| 9 | PAGE | Wahba & Hope 2006 | A2-scen | 97 | 13 | 63 | 8 |
| 10 | PAGE | Hope 2006 | | | 13 | | 8 |
| 11 | DICE | Nordhaus 2008 | | | 15 | | 9 |
| | Summary | | Model-weighted Mean | 55 | 10 | 36 | 6 |

* The sample includes all peer reviewed, non-equity-weighted estimates included in Tol (2008), Nordhaus (2008), Hope (2008), and Anthoff et al. (2009), that are based on the most recent published version of FUND, PAGE, or DICE and use business-as-usual climate scenarios. All values are based on the best available information from the underlying studies about the base year and year dollars, rather than the Tol (2008) assumption that all estimates included in his review are 1995 values in 1995$. All values were updated to 2007 using a 3 percent annual growth rate in the SCC, and adjusted for inflation using GDP deflator.

** Assumes a starting discount rate of 3 percent. Newell and Pizer (2003) based adjustment factors are not applied to estimates from Guo *et al.* (2006) that use a different approach to account for discount rate uncertainty (rows 7–8).

The resulting estimates of the social cost of carbon are necessarily greater. When the adjustments from the random walk model are applied, the estimates of the social cost of carbon are $10 and $55, with the 3 percent and 5 percent discount rates, respectively. The application of the mean-reverting adjustment yields estimates of $6 and $36.

Since the random walk model has greater support from the data, analyses are also conducted with the value of the SCC set at $10 and $55.

Based on this analysis, DOE has concluded that it is appropriate to consider the global benefits of reducing $CO_2$ emissions, while also presenting the domestic benefits. Consequently, DOE considered in its decision process for this final rule the potential global benefits resulting from reduced $CO_2$ emissions valued at $5, $10, $19, $30 and $55 per metric ton, and has also presented the domestic benefits derived using a value of $1.14 per metric ton. All of these values represent emissions that are valued in 2007$. As indicated in the analysis summarized above, the value of future emissions is determined using a 3 percent escalation rate. The resulting range is based on current peer-reviewed estimates of the value of SCC and, DOE believes, fairly represents the uncertainty surrounding the global benefits resulting from reduced $CO_2$ emissions and, at the $1.14 level, also encompasses the likely domestic benefits, DOE also concluded, based on the most recent Tol analysis, that it was appropriate to escalate these values at 3 percent per year to represent the expected increases, over time, of the benefits associated with reducing $CO_2$ and other greenhouse gas emissions. Estimates of SCC are assumed to increase over time since future emissions are expected to produce larger incremental damages as physical and economic systems become more stressed as the magnitude of climate change increases. Although most studies that estimate economic damages caused by increased GHG emissions in future years produce an implied growth rate in the SCC, neither the rate itself nor the information necessary to derive its implied value is commonly reported. Given the limited amount of debate thus far about the appropriate growth rate of the SCC, applying a rate of 3 percent per year seems appropriate at this stage. This value is consistent with the range recommended by IPCC (2007).

Table VI.27 and Table VI.28 present the resulting estimates of the potential range of NPV benefits associated with reducing $CO_2$ emissions for both Class A and Class B equipment based on the range of values used by DOE for this final rule.

TABLE VI.27—ESTIMATES OF SAVINGS FROM $CO_2$ EMISSIONS REDUCTIONS AT ALL TSLS AND $CO_2$ PRICES AT A 7 PERCENT DISCOUNT RATE FOR CLASS A EQUIPMENT

| TSL | Estimated cumulative $CO_2$ (MMt) emission reductions | Value of estimated $CO_2$ emission reductions (million 2007$)** | | | | | |
|---|---|---|---|---|---|---|---|
| | | $CO_2$ Value of $1.14/metric ton $CO_2$* *$* | $CO_2$ Value of $5/metric ton $CO_2$ *$* | $CO_2$ Value of $10/metric ton $CO_2$ *$* | $CO_2$ Value of $19/metric ton $CO_2$ *$* | $CO_2$ Value of $33/metric ton $CO_2$ *$* | $CO_2$ Value of $55/metric ton $CO_2$ *$* |
| 1 | 0.40 | 0.23 | 1.00 | 1.99 | 3.79 | 6.58 | 10.97 |
| 2 | 1.89 | 1.09 | 4.77 | 9.54 | 18.13 | 31.49 | 52.48 |
| 3 | 4.18 | 2.41 | 10.56 | 21.12 | 40.12 | 69.69 | 116.14 |
| 4 | 6.45 | 3.71 | 16.28 | 32.55 | 61.85 | 107.43 | 179.04 |
| 5 | 7.63 | 4.39 | 19.25 | 38.49 | 73.13 | 127.02 | 211.70 |
| 6 | 8.40 | 4.84 | 21.21 | 42.42 | 80.61 | 140.00 | 233.34 |
| 7 | 10.22 | 5.88 | 25.80 | 51.60 | 98.04 | 170.28 | 283.80 |

* This value per ton represents the domestic negative externalities of $CO_2$ only.

TABLE VI.28—ESTIMATES OF SAVINGS FROM $CO_2$ EMISSIONS REDUCTIONS AT ALL TSLS AND $CO_2$ PRICES AT A 3 PERCENT DISCOUNT RATE FOR CLASS A EQUIPMENT

| TSL | Estimated cumulative $CO_2$ (MMt) emission reductions | Value of estimated $CO_2$ emission reductions (million 2007$)** | | | | | |
|---|---|---|---|---|---|---|---|
| | | $CO_2$ Value of $1.14/metric ton $CO_2$* $ | $CO_2$ Value of $5/metric ton $CO_2$ $ | $CO_2$ Value of $10/metric ton $CO_2$ $ | $CO_2$ Value of $19/metric ton $CO_2$ $ | $CO_2$ Value of $33/metric ton $CO_2$ $ | $CO_2$ Value of $55/metric ton $CO_2$ $ |
| 1 | 0.40 | 0.46 | 2.04 | 4.07 | 7.73 | 13.43 | 22.39 |
| 2 | 1.89 | 2.22 | 9.74 | 19.47 | 36.99 | 64.25 | 107.09 |
| 3 | 4.18 | 4.91 | 21.55 | 43.09 | 81.87 | 142.20 | 237.00 |
| 4 | 6.45 | 7.57 | 33.21 | 66.43 | 126.21 | 219.21 | 365.35 |
| 5 | 7.63 | 8.95 | 39.27 | 78.54 | 149.23 | 259.20 | 432.00 |
| 6 | 8.40 | 9.87 | 43.29 | 86.57 | 164.48 | 285.68 | 476.14 |
| 7 | 10.22 | 12.00 | 52.65 | 105.29 | 200.06 | 347.46 | 579.11 |

* This value per ton represents the domestic negative externalities of $CO_2$ only.

TABLE VI.29—ESTIMATES OF SAVINGS FROM $CO_2$ EMISSIONS REDUCTIONS AT ALL TSLS AND $CO_2$ PRICES AT A 7 PERCENT DISCOUNT RATE FOR CLASS B EQUIPMENT

| TSL | Estimated cumulative $CO_2$ (MMt) emission reductions | Value of estimated $CO_2$ emission reductions (million 2007$)** | | | | | |
|---|---|---|---|---|---|---|---|
| | | $CO_2$ Value of $1.14/metric ton $CO_2$* $ | $CO_2$ Value of $5/metric ton $CO_2$ $ | $CO_2$ Value of $10/metric ton $CO_2$ $ | $CO_2$ Value of $19/metric ton $CO_2$ $ | $CO_2$ Value of $33/metric ton $CO_2$ $ | $CO_2$ Value of $55/metric ton $CO_2$ $ |
| 1 | 0.16 | 0.09 | 0.40 | 0.81 | 1.53 | 2.66 | 4.43 |
| 2 | 0.24 | 0.14 | 0.60 | 1.20 | 2.27 | 3.95 | 6.58 |
| 3 | 1.19 | 0.68 | 3.00 | 6.00 | 11.40 | 19.81 | 33.01 |
| 4 | 1.36 | 0.78 | 3.43 | 6.86 | 13.04 | 22.65 | 37.75 |
| 5 | 3.66 | 2.11 | 9.24 | 18.48 | 35.11 | 60.98 | 101.64 |
| 6 | 4.08 | 2.35 | 10.29 | 20.58 | 39.10 | 67.91 | 113.18 |

* This value per ton represents the domestic negative externalities of $CO_2$ only.

TABLE VI.30—ESTIMATES OF SAVINGS FROM $CO_2$ EMISSIONS REDUCTIONS AT ALL TSLS AND $CO_2$ PRICES AT A 3 PERCENT DISCOUNT RATE FOR CLASS B EQUIPMENT

| TSL | Estimated cumulative $CO_2$ (MMt) emission reductions | Value of estimated $CO_2$ emission reductions (million 2007$)** | | | | | |
|---|---|---|---|---|---|---|---|
| | | $CO_2$ Value of $1.14/metric ton $CO_2$* $ | $CO_2$ Value of $5/metric ton $CO_2$ $ | $CO_2$ Value of $10/metric ton $CO_2$ $ | $CO_2$ Value of $19/metric ton $CO_2$ $ | $CO_2$ Value of $33/metric ton $CO_2$ $ | $CO_2$ Value of $55/metric ton $CO_2$ $ |
| 1 | 0.16 | 0.19 | 0.82 | 1.64 | 3.12 | 5.42 | 9.04 |
| 2 | 0.24 | 0.28 | 1.22 | 2.44 | 4.64 | 8.05 | 13.42 |
| 3 | 1.19 | 1.40 | 6.12 | 12.25 | 23.27 | 40.42 | 67.36 |
| 4 | 1.36 | 1.60 | 7.00 | 14.01 | 26.61 | 46.22 | 77.04 |
| 5 | 3.66 | 4.30 | 18.85 | 37.71 | 71.65 | 124.44 | 207.40 |
| 6 | 4.08 | 4.79 | 21.00 | 41.99 | 79.78 | 138.57 | 230.95 |

* This value per ton represents the domestic negative externalities of $CO_2$ only.

DOE recognizes that scientific and economic knowledge about the contribution of $CO_2$ and other GHG to changes in the future global climate and the potential resulting damages to the world economy continues to evolve rapidly. Thus, any value placed in this rulemaking on reducing $CO_2$ emissions is subject to change.

DOE, together with other Federal agencies, will continue to review various methodologies for estimating the monetary value of reductions in $CO_2$ and other greenhouse gas emissions. This ongoing review will consider the comments on this subject that are part of the public record for this and other rulemakings, as well as other methodological assumptions and issues. However, consistent with DOE's legal obligations, and taking into account the uncertainty involved with this particular issue, DOE has included in this final rule the most recent values and analyses resulting from the ongoing interagency review process.

DOE also investigated the potential monetary benefit of reduced $SO_2$, $NO_X$, and Hg emissions from the TSLs it considered. As previously stated, DOE's initial analysis assumed the presence of nationwide emission caps on $SO_2$ and Hg, and caps on $NO_X$ emissions in the 28 States covered by the CAIR. In the presence of these caps, DOE concluded that no physical reductions in power sector emissions would occur, but that the standards could put downward pressure on the prices of emissions allowances in cap-and-trade markets. Estimating this effect is very difficult because such factors as credit banking can change the trajectory of prices. DOE has concluded that the effect from energy conservation standards on $SO_2$ allowance prices is likely to be negligible based on runs of the NEMS–

BT model. See chapter 16 of the TSD for further details.

Because the courts have decided to allow the CAIR rule to remain in effect, projected annual $NO_X$ allowances from NEMS–BT are relevant. The update to the *AEO2009*-based version of NEMS–BT includes the representation of CAIR. As noted above, standards would not produce an economic impact in the form of lower prices for emissions allowance credits in the 28 eastern States and D.C. covered by the CAIR cap. New or amended energy conservation standards would reduce $NO_X$ emissions in those 22 States that are not affected by the CAIR. For the area of the United States not covered by the CAIR, DOE estimated the monetized value of $NO_X$ emissions reductions resulting from each of the TSLs considered for today's final rule based on environmental damage estimates from the literature. Available estimates suggest a very wide range of monetary values for $NO_X$ emissions, ranging from $370 per ton to $3,800 per ton of $NO_X$ from stationary sources, measured in 2001$ (equivalent to a range of $432 to $4,441 per ton in 2007$). Refer to the OMB, Office of Information and Regulatory Affairs, ''2006 Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities,'' Washington, DC, for additional information.

For Hg emissions reductions, DOE estimated the national monetized values resulting from the TSLs considered for today's rule based on environmental damage estimates from the literature. DOE conducted research for today's final rule and determined that the impact of mercury emissions from power plants on humans is considered highly uncertain. However, DOE identified two estimates of the environmental damage of mercury based on two estimates of the adverse impact of childhood exposure to methyl mercury on intelligence quotient (IQ) for American children, and subsequent loss of lifetime economic productivity resulting from these IQ losses. The high-end estimate is based on an estimate of the current aggregate cost of the loss of IQ in American children that results from exposure to mercury of U.S. power plant origin ($1.3 billion per year in year 2000$), which works out to $32.6 million per ton emitted per year (2007$). Refer to L. Trasande *et al.*, ''Applying Cost Analyses to Drive Policy that Protects Children,'' 1076 Ann. N.Y. Acad. Sci. 911 (2006) for additional information. The low-end estimate is $0.66 million per ton emitted (in 2004$) or $0.729 million per ton in 2007$. DOE derived this estimate from a published evaluation of mercury control using different methods and assumptions from the first study but also based on the present value of the lifetime earnings of children exposed. See Ted Gayer and Robert Hahn, ''Designing Environmental Policy: Lessons from the Regulation of Mercury Emissions,'' Regulatory Analysis 05–01, AEI–Brookings Joint Center for Regulatory Studies, Washington, DC (2004). A version of this paper was published in the *Journal of Regulatory Economics* in 2006. The estimate was derived by back-calculating the annual benefits per ton from the net present value of benefits reported in the study. Table VI.31 through Table VI.34 present the resulting estimates of the potential range of present value benefits associated with reducing national $NO_X$ and Hg emissions for Class A and B equipment.

TABLE VI.31—ESTIMATES OF SAVINGS FROM REDUCING $NO_X$ AND HG EMISSIONS AT ALL TRIAL STANDARD LEVELS AT A 7 PERCENT DISCOUNT RATE FOR CLASS A EQUIPMENT

| TSL | Estimated cumulative $NO_X$ emission reductions<br>*kt* | Value of estimated $NO_X$ emission reductions<br>*thousand 2007$* | Estimated cumulative Hg emission reductions<br>*tons* | Value of estimated Hg emission reductions<br>*thousand 2007$* |
|---|---|---|---|---|
| 1 | 0.13 | 15–150 | 0.008 | 0–61 |
| 2 | 0.65 | 70–716 | 0.037 | 0–293 |
| 3 | 1.43 | 154–1,584 | 0.082 | 0–649 |
| 4 | 2.20 | 238–2,442 | 0.127 | 0–1,001 |
| 5 | 2.60 | 281–2,888 | 0.150 | 0–1,183 |
| 6 | 2.87 | 310–3,183 | 0.165 | 0–1,304 |
| 7 | 3.49 | 377–3,871 | 0.201 | 0–1,586 |

TABLE VI.32—ESTIMATES OF SAVINGS FROM REDUCING $NO_X$ AND HG EMISSIONS AT ALL TRIAL STANDARD LEVELS AT A 7 PERCENT DISCOUNT RATE FOR CLASS B EQUIPMENT

| TSL | Estimated cumulative $NO_X$ emission reductions<br>*kt* | Value of estimated $NO_X$ emission reductions<br>*thousand 2007$* | Estimated cumulative Hg emission reductions<br>*tons* | Value of estimated Hg emission reductions<br>*thousand 2007$* |
|---|---|---|---|---|
| . | | | | |
| 1 | 0.05 | 6–60 | 0.003 | 0–25 |
| 2 | 0.08 | 9–90 | 0.005 | 0–37 |
| 3 | 0.41 | 44–450 | 0.023 | 0–185 |
| 4 | 0.46 | 50–515 | 0.027 | 0–211 |
| 5 | 1.25 | 135–1,386 | 0.072 | 0–568 |
| 6 | 1.39 | 150–1,544 | 0.080 | 0–633 |

TABLE VI.33—ESTIMATES OF SAVINGS FROM REDUCING $NO_X$ AND HG EMISSIONS AT ALL TRIAL STANDARD LEVELS AT A 3 PERCENT DISCOUNT RATE FOR CLASS A EQUIPMENT

| TSL | Estimated cumulative $NO_X$ emission reductions<br>*kt* | Value of estimated $NO_X$ emission reductions<br>*thousand 2007$* | Estimated cumulative Hg emission reductions<br>*tons* | Value of estimated Hg emission reductions<br>*thousand 2007$* |
|---|---|---|---|---|
| 1 | 0.13 | 31–317 | 0.008 | 0–132 |
| 2 | 0.65 | 148–1,516 | 0.037 | 0–633 |
| 3 | 1.43 | 326–3,356 | 0.082 | 0–1,401 |
| 4 | 2.20 | 503–5,174 | 0.127 | 0–2,160 |
| 5 | 2.60 | 595–6,117 | 0.150 | 0–2,554 |
| 6 | 2.87 | 656–6,742 | 0.165 | 0–2,815 |
| 7 | 3.49 | 798–8,200 | 0.201 | 0–3,424 |

TABLE VI.34—ESTIMATES OF SAVINGS FROM REDUCING $NO_X$ AND HG EMISSIONS AT ALL TRIAL STANDARD LEVELS AT A 3 PERCENT DISCOUNT RATE FOR CLASS B EQUIPMENT

| TSL | Estimated cumulative $NO_X$ emission reductions<br>*kt* | Value of estimated $NO_X$ emission reductions<br>*thousand 2007$* | Estimated cumulative Hg emission reductions<br>*tons* | Value of estimated Hg emission reductions<br>*thousand 2007$* |
|---|---|---|---|---|
| 1 | 0.05 | 12–128 | 0.003 | 0–53 |
| 2 | 0.08 | 18–190 | 0.005 | 0–79 |
| 3 | 0.41 | 93–954 | 0.023 | 0–398 |
| 4 | 0.46 | 106–1,091 | 0.027 | 0–455 |
| 5 | 1.25 | 286–2,937 | 0.072 | 0–1,226 |
| 6 | 1.39 | 318–3,270 | 0.080 | 0–1,365 |

7. Other Factors

EPCA allows the Secretary of Energy, in determining whether a standard is economically justified, to consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6295(o)(2)(B)(i) and (v)) Under this provision, DOE considered LCC impacts on identifiable groups of customers, such as customers of different business types who may be disproportionately affected by any national energy conservation standard level. DOE also considered the reduction in generated capacity that could result from the imposition of any national energy conservation standard level. DOE identified no factors other than those already considered above for analysis.

*D. Conclusion*

EPCA specifies that any new or amended energy conservation standard for any type (or class) of covered equipment shall be designed to achieve the maximum improvement in energy efficiency that the Secretary determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A) and 6316(e)(1)) In determining whether a standard is economically justified, the Secretary must determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6295(o)(2)(B)(i) and 6316(e)(1)) The new or amended standard must ''result in significant conservation of energy.'' (42 U.S.C. 6295(o)(3)(B) and 6316(e)(1))

DOE established a separate set of TSLs for Class A and B beverage vending machines. DOE considered seven TSLs for Class A and six TSLs for Class B beverage vending machines. The following discussion briefly explains the development of the TSLs, consideration of the TSLs (starting with the most stringent) under the statutory factors, and DOE's conclusions.

Table VI.35 and Table VI.36 present summaries of quantitative analysis results for each TSL for Class A and B equipment, respectively, based on the assumptions and methodology discussed above. These tables present the results or, in some cases, ranges of results, for each TSL. The ranges reported for industry impacts represent the results of the different markup scenarios DOE used to estimate impacts.

TABLE VI.35—SUMMARY OF RESULTS FOR CLASS A EQUIPMENT BASED UPON THE *AEO2009* REFERENCE CASE ENERGY PRICE FORECAST *

| Results | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Primary Energy Saved (*quads*). | 0.007 | 0.031 | 0.069 | 0.107 | 0.127 | 0.139 | 0.170. |
| 7% Discount Rate | 0.002 | 0.010 | 0.021 | 0.032 | 0.038 | 0.042 | 0.051. |
| 3% Discount Rate | 0.004 | 0.018 | 0.040 | 0.061 | 0.073 | 0.080 | 0.097. |

TABLE VI.35—SUMMARY OF RESULTS FOR CLASS A EQUIPMENT BASED UPON THE *AEO2009* REFERENCE CASE ENERGY PRICE FORECAST *—Continued

| Results | Trial standard level | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Generation Capacity Reduction (*GW*) **. | 0.005 | 0.023 | 0.051 | 0.079 | 0.094 | 0.103 | 0.126. |
| NPV *2008$ billion:* | | | | | | | |
| 7% Discount Rate | 0.015 | 0.068 | 0.112 | 0.175 | 0.192 | 0.185 | (1.449). |
| 3% Discount Rate | 0.034 | 0.153 | 0.268 | 0.415 | 0.464 | 0.465 | (2.466). |
| Industry Impacts: | | | | | | | |
| Industry NPV (*2008$ million*). | 0.0–(0.0) | 0.2–(0.3) | 0.3–(1.1) | (1.3)–(3.5) | (1.3)–(4.1) | (7.9)–(11.1) | (3.2)–(28.3). |
| Industry NPV (*% change*) | 0.1–(0.1) | 0.5–(0.6) | 0.7–(2.5) | (2.9)–(7.9) | (3.0)–(9.3) | (18.0)–(25.1) | (7.2)–(64.2). |
| Cumulative Emissions Impacts†: | | | | | | | |
| $CO_2$ Reductions (*Mt*) | 0.4 | 1.9 | 4.2 | 6.4 | 7.6 | 8.4 | 10.2. |
| Value of $CO_2$ Reductions at 7% Discount Rate (*million 2007$*). | 0.2 to 11 | 1.1 to 52.5 | 2.4 to 116.1 | 3.7 to 179 | 4.4 to 211.7 | 4.8 to 233.3 | 5.9 to 283.8. |
| Value of $CO_2$ Reductions at 3% Discount Rate (*million 2007$*). | 0.5 to 22.4 | 2.2 to 107.1 | 4.9 to 237 | 7.6 to 365.4 | 9 to 432 | 9.9 to 476.1 | 12 to 579.1. |
| $NO_X$ Reductions (*kt*) | 0.1 | 0.6 | 1.4 | 2.2 | 2.6 | 2.9 | 3.5. |
| Value of $NO_X$ Reductions at 7% Discount Rate (*thousand 2007$*). | 15–150 | 70–716 | 154–1,584 | 238–2,442 | 281–2,888 | 310–3,183 | 377–3,871. |
| Value of $NO_X$ Reductions at 3% Discount Rate (*thousand 2007$*). | 31–317 | 148–1,516 | 326–3,356 | 503–5,174 | 595–6,117 | 656–6,742 | 798–8,200. |
| Hg Reductions (*tons*) | 0.008 | 0.037 | 0.082 | 0.127 | 0.150 | 0.165 | 0.201. |
| Value of Hg Reductions at 7% Discount Rate (*thousand 2007$*). | 0–61 | 0–293 | 0–649 | 0–1,001 | 0–1,183 | 0–1,304 | 0–1,586. |
| Value of Hg reductions at 3% Discount Rate (*thousand 2007$*). | 0–132 | 0–633 | 0–1,401 | 0–2,160 | 0–2,554 | 0–2,815 | 0–3,424. |
| Life-Cycle Cost: | | | | | | | |
| Net Savings (*%*) | 10 | 100 | 98 | 98 | 97 | 95 | 0. |
| Net Increase (*%*) | 0 | 0 | 2 | 2 | 3 | 5 | 100. |
| No Change (*%*) | 90 | 0 | 0 | 0 | 0 | 0 | 0. |
| Mean LCC Savings (*2008$*). | 136 | 182 | 218 | 272 | 285 | 277 | (1,281). |
| Mean PBP (*years*) | 2.2 | 2.4 | 3.2 | 3.4 | 3.7 | 4.1 | 75.2. |
| Direct Domestic Employment Impacts (2012) (*jobs*). | 1 | 5 | 15 | 23 | 30 | 36 | 259. |
| Indirect Domestic Employment Impacts (2042) (*jobs*). | 13 | 82 | 172 | 265 | 313 | 344 | 475. |

* Parentheses indicate negative values. For LCCs, a negative value means an increase in LCC.
** Change in installed generation capacity by 2042 based on April 2009 update to the *AEO2009* Reference Case.
† $CO_2$ emissions impacts include physical reductions at power plants. $NO_X$ emissions impacts include physical reductions at power plants as well as production of emissions allowance credits where $NO_X$ emissions are subject to emissions caps.

TABLE VI.36—SUMMARY OF RESULTS FOR CLASS B EQUIPMENT BASED ON THE *AEO2009* REFERENCE CASE ENERGY PRICE FORECAST *

| Results | Trial standard level | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Primary Energy Saved (quads) | 0.003 | 0.004 | 0.020 | 0.023 | 0.061 | 0.068. |
| 7% Discount Rate | 0.001 | 0.001 | 0.006 | 0.007 | 0.018 | 0.020. |
| 3% Discount Rate | 0.002 | 0.002 | 0.012 | 0.013 | 0.035 | 0.039. |
| Generation Capacity Reduction (GW) ** | 0.002 | 0.003 | 0.015 | 0.017 | 0.045 | 0.050. |
| NPV (2008$ billion): | | | | | | |
| 7% Discount Rate | 0.005 | 0.006 | (0.003) | (0.014) | (0.621) | (2.452). |
| 3% Discount Rate | 0.011 | 0.014 | 0.011 | (0.006) | (1.083. | (4.427) |
| Industry Impacts: | | | | | | |
| Industry NPV (2008$ million) | 0 | 0 | (0.6)–(1.2) | (1.0)–(1.7) | (7.4)–(16.5) | (3.2)–(33.5). |
| Industry NPV (% Change) | 0.1–(0.1) | 0.1–(0.2) | (1.8)–(3.5) | (3.0)–(5.0) | (21.9)–(48.9) | (9.5)–(99.4). |
| Cumulative Emissions Impacts†: | | | | | | |
| $CO_2$ Reductions (Mt) | 0.2 | 0.2 | 1.2 | 1.4 | 3.7 | 4.1. |

TABLE VI.36—SUMMARY OF RESULTS FOR CLASS B EQUIPMENT BASED ON THE *AEO2009* REFERENCE CASE ENERGY PRICE FORECAST *—Continued

| Results | Trial standard level | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Value of $CO_2$ reductions at 7% discount rate (million 2007$). | 0.1 to 4.4 | 0.1 to 6.6 | 0.7 to 33 | 0.8 to 37.8 | 2.1 to 101.6 | 2.3 to 113.2. |
| Value of $CO_2$ reductions at 3% discount rate (million 2007$). | 0.2 to 9 | 0.3 to 13.4 | 1.4 to 67.4 | 1.6 to 77 | 4.3 to 207.4 | 4.8 to 230.9. |
| $NO_X$ Reductions (kt) | 0.1 | 0.1 | 0.4 | 0.5 | 1.3 | 1.4. |
| Value of $NO_X$ reductions at 7% discount rate (thousand 2007$). | 6–60 | 9–90 | 44–450 | 50–515 | 135–1,386 | 150–1,544. |
| Value of $NO_X$ reductions at 3% discount rate (thousand 2007$). | 12–128 | 18–190 | 93–954 | 106–1,091 | 286–2,937 | 318–3,270. |
| Hg Reductions (t) | 0.003 | 0.005 | 0.023 | 0.027 | 0.072 | 0.080. |
| Value of Hg reductions at 7% discount rate (thousand 2007$). | 0–25 | 0–37 | 0–185 | 0–211 | 0–568 | 0–633. |
| Value of Hg reductions at 3% discount rate (thousand 2007$). | 0–53 | 0–79 | 0–398 | 0–455 | 0–1,226 | 0–1,365. |
| Life-Cycle Cost: | | | | | | |
| Net Savings (%) | 10 | 91 | 72 | 62 | 0 | 0. |
| Net Increase (%) | 0 | 9 | 28 | 38 | 100 | 100. |
| No Change (%) | 90 | 0 | 0 | 0 | 0 | 0. |
| Mean LCC Savings (2008$) | 42 | 48 | 37 | 27 | (554) | (2,291). |
| Mean PBP (years) | 3.4 | 4.5 | 6.8 | 7.8 | 84.9 | 99.9. |
| Direct Domestic Employment Impacts (2012) (jobs). | 0 | 1 | 8 | 11 | 97 | 316. |
| Indirect Employment Impacts (2042) (jobs) | 6 | 10 | 49 | 55 | 162 | 216. |

* Parentheses indicate negative values. For LCCs, a negative value means an increase in LCC.
** Change in installed generation capacity by 2042 based on the April 2009 update to the *AEO2009* reference case.
† $CO_2$ emissions impacts include physical reductions at power plants. $NO_X$ emissions impacts include physical reductions at power plants as well as production of emissions allowance credits where $NO_X$ emissions are subject to emissions caps.

1. Class A Equipment

First, DOE considered TSL 7, the most efficient level for Class A beverage vending machines that was determined to be technologically feasible. TSL 7 would save a cumulative 0.170 quads of energy through 2042, an amount DOE considers significant. For the Nation as a whole, DOE projects that TSL 7 would result in a net decrease of $1.449 billion in NPV using a discount rate of 7 percent and $2.47 billion discounted at 3 percent. The emissions reductions at TSL 7 are 10.22 Mt of $CO_2$, up to 3.49 kt of $NO_X$, and up to 0.201 ton of Hg. These reductions have a value in 2007$ of up to $283.8 million for $CO_2$, up to $3.9 million for $NO_X$, and up to $1.6 million for Hg at a discount rate of 7 percent. These reductions have a value in 2007$ of up to $579.1 million for $CO_2$, up to $8.2 million for $NO_X$, and up to $3.4 million for Hg at a discount rate of 3 percent. DOE also estimates that at TSL 7, total electric generating capacity in 2042 will decrease compared to the base case by 0.126 GW.

At TSL 7, DOE projects that the average Class A beverage vending machine customer will experience an increase in LCC of $1,281 compared to the baseline. At TSL 7, DOE estimates the fraction of customers experiencing LCC increases will be 100 percent. The mean PBP for the average Class A beverage vending machine customer at TSL 7 compared to the baseline level is projected to be 75.2 years.

At higher TSLs, manufacturers have a more difficult time maintaining current operating profit levels, as higher standards increase recurring operating costs such as capital expenditures, purchased materials, and carrying inventory. Therefore, TSL 7 is more likely to cause impacts in the higher end of the ranges (*i.e.*, a drop of 64.2 percent in INPV). Manufacturers expressed great concern about high capital and equipment conversion costs necessary to convert production to standards-compliant equipment. At TSL 7, all manufacturers would have to completely redesign their production lines, and the risk of very large negative impacts on the industry from reduction in manufacturers' operating profits levels is high.

After carefully considering the analysis and weighing the benefits and burdens of TSL 7, DOE finds that the benefits to the Nation of TSL 7 (*i.e.*, energy savings and emissions reductions, including environmental and monetary benefits) do not outweigh the burdens (*i.e.*, a decrease of $1,738 million in NPV and a decrease of 64.2 percent in INPV). Because the burdens of TSL 7 outweigh the benefits, TSL 7 is not economically justified. Therefore, DOE rejects TSL 7 for Class A equipment.

DOE then considered TSL 6, which provides for Class A equipment the maximum efficiency level that the analysis showed to have positive NPV to the Nation. TSL 6 would likely save a cumulative 0.139 quads of energy through 2042, an amount DOE considers significant. For the Nation as a whole, DOE projects that TSL 6 would result in a net increase of $185 million in NPV using a discount rate of 7 percent and $465 million using a discount rate of 3 percent. The estimated emissions reductions at TSL 6 are up to 8.4 Mt of $CO_2$, up to 2.87 kt of $NO_X$, and up to 0.165 tons of Hg. These reductions have a value in 2007$ of up to $233.3 million for $CO_2$, up to $3.2 million for NOx, and up to $1.3 million for Hg, at a discount rate of 7 percent, and a value in 2007$ of up to $476.1 million for $CO_2$, up to $6.7 million for $NO_X$, and up to $2.8 million for Hg, at a discount rate of 3 percent. Total electric generating capacity in 2042 is estimated to decrease compared to the base case by 0.103 GW under TSL 6.

At TSL 6, DOE projects that the average beverage vending machine customer will experience a reduction in LCC of $277 compared to the baseline. The mean PBP for the average beverage vending machine customer at TSL 6 is projected to be 4.1 years compared to the purchase of baseline equipment.

At TSL 6, DOE believes the majority of manufacturers would need to completely redesign all Class A equipment offered for sale. Therefore, DOE expects beverage vending machine manufacturers would have some difficulty maintaining current operating profit levels with higher production costs. Similar to TSL 7, it is more likely that the higher end of the range of impacts would be reached at TSL 6 (*i.e.*, a decrease of 25.1 percent in INPV). However, the higher end of the range of impacts at TSL 6 is lower than the higher end of the range of impacts for TSL 7. In addition, Class A equipment showed significant positive LCC savings on a national average basis and customers did not experience an increase in LCC with a standard at TSL 6 compared to the baseline. The PBP calculated for Class A equipment was less than the life of the equipment.

After carefully considering the analysis and weighing the benefits and burdens of TSL 6, DOE finds that for Class A equipment, TSL 6 represents the maximum improvement in energy efficiency that is technologically feasible and economically justified. TSL 6 is technologically feasible because the technologies required to achieve these levels are already in existence. TSL 6 is economically justified because the benefits to the Nation [*i.e.*, increased energy savings of 0.139 quads, emissions reductions including environmental and monetary benefits of, for example, up to 8.4 Mt of carbon dioxide emissions reduction with an associated value in 2007$ of up to $233.3 million at a discount rate of 7 percent ($476.1 million at 3 percent), and an increase in NPV of $185 million at 7 percent discount rate to $465 million at 3 percent discount rate] outweigh the costs (*i.e.*, a decrease of 25.1 percent in INPV). In addition, the carbon dioxide reductions at the central value of $19 would further increase NPV by $80.6 million (2007$) at 7% discount rate and by $164 million at a 3 percent discount rate. The combined NPV, including the value of $CO_2$ emissions reductions, would be $265.6 million at 7 percent discount rate and $629.0 million at a 3 percent discount rate. There is also the added benefit of a reduction in total electrical generating capacity in 2042 compared to the base case of 0.103 GW under the TSL 6 scenario. Therefore, DOE establishes TSL 6 as the energy conservation standard for Class A beverage vending machines in this final rule.

2. Class B Equipment

First, DOE considered TSL 6, the most efficient level for Class B beverage vending machines. TSL 6 would likely save a cumulative 0.068 quads of energy through 2042, an amount DOE considers significant. For the Nation as a whole, DOE projects that TSL 6 would result in a net decrease of $2.452 billion in NPV using a discount rate of 7 percent, and $4.427 billion in NPV using a discount rate of 3 percent. The emissions reductions at TSL 6 are up to 4.08 Mt of $CO_2$, up to 1.39 kt of $NO_X$, and up to 0.080 ton of Hg. These reductions have a value in 2007$ of up to $113.2 million for $CO_2$, up to $1.5 million for $NO_X$, and up to $633,000 for Hg at a discount rate of 7 percent and a value of up to $230.9 million for $CO_2$, up to $3.3 million for $NO_X$, and up to $1.4 million for Hg at a discount rate of 3 percent. DOE also estimates that at TSL 6, total electric generating capacity in 2042 will decrease compared to the base case by 0.050 GW.

At TSL 6, DOE projects that for the average customer, the LCC of Class B beverage vending machines will increase by $2,291 compared to the baseline. At TSL 6, DOE estimates the fraction of customers experiencing LCC increases will be 100 percent. The mean PBP for the average Class B beverage vending machine customer at TSL 6 compared to the baseline is projected to be almost 100 years.

At higher TSLs, manufacturers have large increases in production costs, resulting in difficulty maintaining operating profit. Therefore, it is more likely that the higher end of the range of impacts would be reached at TSL 6 (*i.e.*, a decrease of 99.4 percent in INPV). At TSL 6, all manufacturers would have to completely redesign their production lines, and there is the risk of very large negative impacts on the industry if manufacturers' operating profit levels are reduced.

After carefully considering the analysis and weighing the benefits and burdens of TSL 6, DOE finds that the benefits to the Nation of TSL 6 (*i.e.*, energy savings and emissions reductions including environmental and monetary benefits) do not outweigh the burdens (*i.e.*, a decrease of $2.45 to $4.43 billion in NPV, a decrease of 99.4 percent in INPV, and an economic burden on customers). DOE finds that the burdens of TSL 6 outweigh the benefits and TSL 6 is not economically justified. Therefore, DOE rejects TSL 6 for Class B equipment.

TSL 5, the next most efficient level, would likely save a cumulative 0.061 quads of energy through 2042, an amount DOE considers significant. For the Nation as a whole, DOE projects that TSL 5 would result in a net decrease of $621 million in NPV, using a discount rate of 7 percent and $1.083 billion in NPV, using a discount rate of 3 percent. The estimated emissions reductions at TSL 5 are up to 3.66 Mt of $CO_2$, up to 1.25 kt of $NO_X$, and up to 0.072 ton of Hg. These reductions have a value in 2007$ of up to $101.6 million for $CO_2$, up to $1.4 million for $NO_X$, and up to $568,000 for Hg at a discount rate of 7 percent, and a value in 2007$ of up to $207.4 million for $CO_2$, up to $2.9 million for $NO_X$, and up to $1.2 million for Hg at a discount rate of 3 percent. Total electric generating capacity in 2042 is estimated to decrease compared to the base case by 0.045 GW at TSL 5.

At TSL 5, DOE projects that the average Class B beverage vending machine customer will experience an increase in LCC of $554 compared to the baseline. The mean PBP for the average Class B beverage vending machine customer at TSL 5 is projected to be 84.9 years compared to the purchase of baseline equipment.

At TSL 5, DOE believes the majority of manufacturers would need to completely redesign all Class B equipment offered for sale at TSL 5. Therefore, DOE expects that manufacturers will have difficulty maintaining operating profit with larger cost increases. Though the higher end of the range of expected impacts is lower for TSL 5 than for TSL 6, TSL 5 would likely cause impacts at the higher end of the range (*i.e.*, a decrease of 48.9 percent in INPV).

After carefully considering the analysis and evaluating the benefits and burdens of TSL 5, DOE finds that the benefits to the Nation of TSL 5 (*i.e.*, energy savings and emissions reductions, including environmental and monetary benefits) do not outweigh the burdens (*i.e.*, a decrease of $621 to 1.08 billion in NPV and a decrease of 48.9 percent in INPV as well as the economic burden on customers). DOE finds that the burdens of TSL 5 outweigh the benefits and TSL 5 is not economically justified. Therefore, DOE rejects TSL 5 for Class B equipment.

TSL 4 would save a cumulative 0.023 quads of energy through 2042, an amount DOE considers significant. For the Nation as a whole, DOE projects that TSL 4 would result in a net decrease of $14 million in NPV using a discount rate of 7 percent and a net decrease of $6 million in NPV using a discount rate of 3 percent. The estimated emissions reductions at TSL 4 are up to 1.36 Mt of $CO_2$, up to 0.46 kt of $NO_X$, and up to 0.027 ton of Hg. Based on previously developed estimates, these reductions could have a value in 2007$ of up to $37.8 million for $CO_2$, up to $515,000 for $NO_X$, and up to $211,000 for Hg at a discount rate of 7 percent and a value in 2007$ of up to $77.0 million for $CO_2$, up to $1.1 million for $NO_X$, and up to $455,000 for Hg at a discount rate of 3 percent. Total electric generating capacity in 2042 is estimated to decrease compared to the base case by 0.017 GW at TSL 4.

At TSL 4, DOE projects that the average Class B beverage vending machine customer will experience a reduction in LCC of $27 compared to the baseline. The mean PBP for the average Class B beverage vending machine customer at TSL 4 is projected to be 7.8 years compared to the purchase of baseline equipment.

At TSL 4, DOE believes that while a complete redesign would not be required, manufacturers would need to redesign most existing Class B equipment offered for sale. Therefore, while perhaps to a somewhat lesser extent than for TSL 5 and TSL 6, DOE expects that manufacturers will have difficulty maintaining operating profit with high increases in production costs. In addition, while the higher end of the range of impacts expected from TSL 4 is less than those for TSL 5 and TSL 6, it is still likely that the higher end of the range of impacts would be reached at TSL 4 (*i.e.*, a decrease of 5.0 percent in INPV). However, compared to the baseline, Class B equipment showed positive LCC savings on a national average and most customers did not experience an increase in LCC at TSL 4. The PBP calculated for Class B equipment was less than the lifetime of the equipment.

After carefully considering the analysis and evaluating the benefits and burdens of TSL 4, DOE finds that the benefits to the Nation of TSL 4 (*i.e.*, energy savings and emissions reductions, including estimates of the monetary value of the environmental benefits) do not outweigh the burdens (*i.e.*, a decrease of $6 million to $14 million in NPV and a decrease of up to 5.0 percent in INPV, primarily from equipment redesigns). DOE finds that the burdens, especially the likelihood of net economic losses indicated by negative NPV values at both discount rates, of TSL 4 outweigh the benefits and TSL 4 is not economically justified. Therefore, DOE rejects TSL 4 for Class B equipment.

TSL 3 would save a cumulative 0.020 quads of energy through 2042, an amount DOE considers significant. For the Nation as a whole, DOE projects that TSL 3 would result in a decrease in NPV of $3 million, using a discount rate of 7 percent. However, using a 3 percent discount rate, DOE projects that TSL 3 would result in a net increase of $11 million in NPV. The estimated emissions reductions at TSL 3 are up to 1.2 Mt of $CO_2$, up to 0.41 kt of $NO_X$, and up to 0.023 ton of Hg. Based on previously developed estimates, these reductions could have a value in 2007$ of up to $33.0 million for $CO_2$, up to $450,000 for $NO_X$, and up to $185,000 for Hg at a discount rate of 7 percent. At a 3 percent discount rate, these reductions could have a value in 2007$ of up to $67.4 million for $CO_2$, up to $954,000 for $NO_X$, and up to $398,000 for Hg. Total electric generating capacity in 2042 is estimated to decrease compared to the base case by 0.015 GW at TSL 3.

At TSL 3, DOE projects that the average Class B beverage vending machine customer will experience a reduction in LCC of $37 compared to the baseline. The mean PBP for the average Class B beverage vending machine customer at TSL 3 is projected to be 6.8 years compared to the purchase of baseline equipment.

At TSL 3, DOE believes manufacturers would have to make some component switches to comply with the standard, but most manufacturers will not have to significantly alter their production process. These minor design changes would not raise the production costs beyond the cost of most equipment sold today, resulting in minimal impacts on industry value. Compared to the baseline, Class B equipment showed significant positive LCC savings on a national average and customers did not experience an increase in LCC at TSL 3. The PBP calculated for Class B equipment was less than the lifetime of the equipment.

After carefully considering the analysis and weighing the benefits and burdens of TSL 3, DOE finds that for Class B equipment, TSL 3 represents the maximum improvement in energy efficiency that is technologically feasible and economically justified. TSL 3 is technologically feasible because the technologies required to achieve these levels are already in existence. TSL 3 is economically justified because DOE finds that the benefits to the Nation [*i.e.*, an increase of $11 million in NPV using a 3 percent discount rate, energy savings, and emissions reductions, including environmental and monetary benefits of, for example, up to 1.2 Mt of carbon dioxide emissions reduction with an associated value in 2007$ of up to $33 million at a discount rate of 7 percent and $67.4 million at a discount rate of 3 percent, and an increase in NPV of $11 million at 3 percent discount rate] outweigh the costs (*i.e.*, a $3 million loss in NPV at a 7 percent discount rate and a decrease of 3.5 percent in INPV, primarily from upgraded components). In addition, the carbon dioxide reductions at the central value of $19 would further increase NPV by $11.4 million (2007$) at 7% discount rate and by $23.3 million at a 3 percent discount rate. The combined NPV, including the value of $CO_2$ emissions reductions, would be $8.4 million at a 7 percent discount rate and $34.3 million at a 3 percent discount rate. DOE finds that, while there is a greater likelihood of net economic losses at TSL 4 (indicated by negative NPV values at 3 percent and 7 percent discount rates), TSL 3 is more favorable since it shows a greater possibility of a net economic benefit (indicated by a positive NPV value at a 3 percent discount rate). There is also the added benefit of a reduction in total electrical generating capacity in 2042 compared to the base case of 0.015 GW under the TSL 3 scenario. Therefore, DOE establishes TSL 3 as the energy conservation standard for Class B beverage vending machines in this final rule.

DOE also calculated the annualized values for certain benefits and costs at the various TSLs. Table VI.37 shows the annualized values for Class A equipment and Table VI.38 shows the annualized values for Class B equipment.

TABLE VI.37—ANNUALIZED BENEFITS AND COSTS FOR CLASS A MACHINES

| TSL | Category | Unit | Primary estimate (AEO reference case) | | Low estimate (low growth case) | | High estimate (high growth case) | |
|---|---|---|---|---|---|---|---|---|
| | | | 7% | 3% | 7% | 3% | 7% | 3% |
| 1 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 1.96 | 2.29 | 1.79 | 2.09 | 2.07 | 2.41 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | | $NO_X$ (kT) | 0.003 | 0.004 | 0.003 | 0.004 | 0.003 | 0.004 |
| | | Hg (T) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ | 0.45 | 0.43 | 0.45 | 0.43 | 0.45 | 0.43 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ | 1.50 | 1.86 | 1.34 | 1.65 | 1.62 | 1.98 |
| 2 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 9.23 | 10.81 | 8.46 | 9.83 | 9.76 | 11.38 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| | | $NO_X$ (kT) | 0.016 | 0.019 | 0.016 | 0.019 | 0.016 | 0.019 |
| | | Hg (T) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ | 2.56 | 2.46 | 2.56 | 2.46 | 2.56 | 2.46 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ | 6.67 | 8.34 | 5.90 | 7.37 | 7.20 | 8.92 |
| 3 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 19.32 | 22.66 | 17.61 | 20.51 | 20.50 | 23.93 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.12 | 0.13 | 0.12 | 0.13 | 0.12 | 0.13 |
| | | $NO_X$ (kT) | 0.035 | 0.041 | 0.035 | 0.041 | 0.035 | 0.041 |
| | | Hg (T) | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ | 8.33 | 8.02 | 8.33 | 8.02 | 8.33 | 8.02 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ | 10.99 | 14.64 | 9.29 | 12.50 | 12.17 | 15.92 |
| 4 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 29.80 | 34.96 | 27.18 | 31.65 | 31.62 | 36.92 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.19 | 0.20 | 0.19 | 0.20 | 0.19 | 0.20 |
| | | $NO_X$ (kT) | 0.054 | 0.064 | 0.054 | 0.064 | 0.054 | 0.064 |
| | | Hg (T) | 0.003 | 0.004 | 0.003 | 0.004 | 0.003 | 0.004 |

TABLE VI.37—ANNUALIZED BENEFITS AND COSTS FOR CLASS A MACHINES—Continued

| TSL | Category | Unit | Primary estimate (AEO reference case) | | Low estimate (low growth case) | | High estimate (high growth case) | |
|---|---|---|---|---|---|---|---|---|
| | | | 7% | 3% | 7% | 3% | 7% | 3% |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ ..... | 12.74 | 12.26 | 12.74 | 12.26 | 12.74 | 12.26 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ ..... | 17.06 | 22.70 | 14.44 | 19.39 | 18.89 | 24.66 |
| 5 ............... | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ ..... | 34.83 | 40.87 | 31.72 | 36.95 | 36.98 | 43.19 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.22 | 0.24 | 0.22 | 0.24 | 0.22 | 0.24 |
| | | $NO_X$ (kT) | 0.064 | 0.036 | 0.064 | 0.036 | 0.064 | 0.036 |
| | | Hg (T) .... | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ ..... | 16.10 | 15.50 | 16.10 | 15.50 | 16.10 | 15.50 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ ..... | 18.73 | 25.37 | 15.63 | 21.46 | 20.88 | 27.69 |
| 6 ............... | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ ..... | 37.67 | 44.22 | 34.24 | 39.91 | 40.04 | 46.78 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.25 | 0.26 | 0.25 | 0.26 | 0.25 | 0.26 |
| | | $NO_X$ (kT) | 0.070 | 0.039 | 0.070 | 0.039 | 0.070 | 0.039 |
| | | Hg (T) .... | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ ..... | 19.56 | 18.83 | 19.56 | 18.83 | 19.56 | 18.83 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ ..... | 18.11 | 25.40 | 14.68 | 21.08 | 20.48 | 27.95 |
| 7 ............... | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ ..... | (0.59) | 1.02 | (4.76) | (4.22) | 2.30 | 4.13 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.30 | 0.32 | 0.30 | 0.32 | 0.30 | 0.32 |
| | | $NO_X$ (kT) | 0.085 | 0.048 | 0.085 | 0.048 | 0.085 | 0.048 |
| | | Hg (T) .... | 0.005 | 0.006 | 0.005 | 0.006 | 0.005 | 0.006 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ ..... | 141.02 | 135.74 | 141.02 | 135.74 | 141.02 | 135.74 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ ..... | (141.61) | (134.72) | (145.77) | (139.97) | (138.72) | (131.61) |

TABLE VI.38—ANNUALIZED BENEFITS AND COSTS FOR CLASS B MACHINES

| TSL | Category | Unit | Primary estimate (AEO reference case) | | Low estimate (low growth case) | | High estimate (high growth case) | |
|---|---|---|---|---|---|---|---|---|
| | | | 7% | 3% | 7% | 3% | 7% | 3% |
| 1 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 0.73 | 0.86 | 0.66 | 0.77 | 0.77 | 0.90 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | $NO_X$ (kT) | 0.001 | 0.002 | 0.001 | 0.002 | 0.001 | 0.002 |
| | | Hg (T) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ | 0.26 | 0.25 | 0.26 | 0.25 | 0.26 | 0.25 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ | 0.47 | 0.61 | 0.41 | 0.53 | 0.52 | 0.66 |
| 2 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 1.03 | 1.21 | 0.94 | 1.09 | 1.10 | 1.28 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | | $NO_X$ (kT) | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | | Hg (T) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ | 0.48 | 0.46 | 0.48 | 0.46 | 0.48 | 0.46 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ | 0.56 | 0.76 | 0.46 | 0.63 | 0.62 | 0.83 |
| 3 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 4.11 | 4.87 | 3.62 | 4.26 | 4.44 | 5.23 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 |
| | | $NO_X$ (kT) | 0.010 | 0.012 | 0.010 | 0.012 | 0.010 | 0.012 |
| | | Hg (T) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ | 4.44 | 4.28 | 4.44 | 4.28 | 4.44 | 4.28 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ | (0.34) | 0.59 | (0.82) | (0.02) | (0.00) | 0.95 |
| 4 | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ | 4.36 | 5.19 | 3.81 | 4.49 | 4.75 | 5.60 |
| | Annualized Emission Reductions. | $CO_2$ (Mt) | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| | | $NO_X$ (kT) | 0.011 | 0.013 | 0.011 | 0.013 | 0.011 | 0.013 |
| | | Hg (T) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |

TABLE VI.38—ANNUALIZED BENEFITS AND COSTS FOR CLASS B MACHINES—Continued

| TSL | Category | Unit | Primary estimate (AEO reference case) | | Low estimate (low growth case) | | High estimate (high growth case) | |
|---|---|---|---|---|---|---|---|---|
| | | | 7% | 3% | 7% | 3% | 7% | 3% |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ ...... | 5.72 | 5.51 | 5.72 | 5.51 | 5.72 | 5.51 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ ...... | (1.36) | (0.32) | (1.91) | (1.02) | (0.97) | 0.09 |
| 5 ............... | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ ...... | (7.83) | (8.30) | (9.32) | (10.18) | (6.80) | (7.18) |
| | Annualized Emission Reductions. | $CO_2$ (Mt) .. | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |
| | | $NO_X$ (kT) .. | 0.031 | 0.036 | 0.031 | 0.036 | 0.031 | 0.036 |
| | | Hg (T) ...... | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ ...... | 52.84 | 50.86 | 52.84 | 50.86 | 52.84 | 50.86 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ ...... | (60.67) | (59.16) | (62.16) | (61.04) | (59.63) | (58.05) |
| 6 ............... | **Benefits** | | | | | | | |
| | Annualized Consumer Benefits ($millions/year). | 2008$ ...... | (67.78) | (76.40) | (69.44) | (78.49) | (66.63) | (75.16) |
| | Annualized Emission Reductions. | $CO_2$ (Mt) .. | 0.12 | 0.13 | 0.12 | 0.13 | 0.12 | 0.13 |
| | | $NO_X$ (kT) .. | 0.034 | 0.040 | 0.034 | 0.040 | 0.034 | 0.040 |
| | | Hg (T) ...... | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | **Costs** | | | | | | | |
| | Annualized Consumer Costs ($millions/year). | 2008$ ...... | 171.92 | 165.49 | 171.92 | 165.49 | 171.92 | 165.49 |
| | **Net Consumer Benefits/Costs** | | | | | | | |
| | Net Consumer Benefits (excluding emission benefits) ($millions/year). | 2008$ ...... | (239.70) | (241.89) | (241.36) | (243.98) | (238.55) | (240.65) |

## VII. Procedural Issues and Regulatory Review

### *A. Review Under Executive Order 12866*

Executive Order 12866 requires that each agency identify in writing the problem the agency intends to address that warrants new agency action (including, where applicable, the failures of private markets or public institutions), as well as assess the significance of that problem to determine whether any new regulation is necessary. Executive Order 12866, section 1(b)(1).

Because today's regulatory action is a significant regulatory action under section 3(f)(1) of Executive Order 12866, section 6(a)(3) of the Executive Order requires DOE to prepare and submit for review to the Office of Information and Regulatory Affairs (OIRA) in OMB an assessment of the costs and benefits of today's rule. Accordingly, DOE presented to OIRA for review the draft final rule and other documents prepared for this rulemaking, including a regulatory impact analysis (RIA). These documents are included in the rulemaking record and are available for public review in the Resource Room of the Building Technologies Program, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC 20024, (202) 586–2945, between 9 a.m. and 4 p.m. Monday through Friday, except Federal holidays.

The May 2009 NOPR contained a summary of the RIA, which evaluated the extent to which major alternatives to standards for beverage vending machines could achieve significant energy savings at reasonable cost, as compared to the effectiveness of the proposed rule. 74 FR 26067–69. The complete RIA (Regulatory Impact

Analysis for Proposed Energy Conservation Standards for Beverage Vending Machines) is contained in the TSD prepared for today's rule. The RIA consists of: (1) A statement of the problem addressed by this regulation and the mandate for government action, (2) a description and analysis of the feasible policy alternatives to this regulation, (3) a quantitative comparison of the impacts of the alternatives, and (4) the national economic impacts of today's standards.

The major alternatives DOE analyzed were: (1) No new regulatory action; (2) financial incentives, including tax credits and rebates; (3) revisions to voluntary energy efficiency targets; (4) early replacement; (5) bulk government purchases; and (6) prescriptive standards that would mandate design requirements. As explained in detail in Section VI. of the May 2009 NOPR, none of the alternatives DOE examined would save as much energy or have an NPV as high as the proposed standards. The same conclusion applies to the standards in today's rule. Also, several of the alternatives would require new enabling legislation, because DOE does not have authority to implement those alternatives. Additional detail on the regulatory alternatives is found in the RIA chapter in the TSD.

*B. Review Under the Regulatory Flexibility Act*

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (IRFA) for any rule that by law must be proposed for public comment, and a final regulatory flexibility analysis (FRFA) for any such rule that an agency adopts as a final rule, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. A regulatory flexibility analysis examines the impact of the rule on small entities and considers alternative ways of reducing negative impacts. Also, as required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003 to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of General Counsel's Web site: *http://www.gc.doe.gov*.

For the beverage vending machine manufacturing industry, the SBA defines small businesses as manufacturing enterprises with 500 or fewer employees. *See http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.* DOE used this small business definition to determine whether any small entities would be required to comply with the rule. (65 FR 30836, 30848 (May 15, 2000), as amended at 65 FR 53533, 53544 (September 5, 2000) and codified at 13 CFR part 121.) The size standards are listed by North American Industry Classification System (NAICS) code and industry description. Beverage vending machine manufacturing is classified under NAICS 333311, ''Automatic Vending Machine Manufacturing.''

As explained in the May 2009 NOPR, the beverage vending machine industry is characterized by both large and small manufacturers that service a wide range of customers, including large bottlers and direct end-users. Almost all beverage vending machines sold in the United States are manufactured domestically. Three major companies supply roughly 90 percent of all equipment sold. Most of the sales for these companies are made to a few major bottlers. One of the major manufacturers with significant market share is considered a small business. The remaining 10 percent of industry shipments is believed to be supplied by five manufacturers. All of these companies not supplying the major bottlers are considered small businesses.

Before issuing this notice of proposed rulemaking, DOE contacted all identified small business manufacturers and provided a questionnaire seeking information to better understand the impacts of the proposed standards on small businesses and how these impacts differ between large and small manufacturers. The small business interview questionnaire is a condensed version of the manufacturer interview guide described in the manufacturer impact analysis, chapter 13 of the TSD.

In accordance with the Regulatory Flexibility Act, during the NOPR stage of this rulemaking, DOE prepared an IRFA which describes potential impacts on small businesses associated with beverage vending machine design and manufacture, and incorporates information received in response to the questionnaire. The IRFA addresses the following: (1) The reasons the regulatory action is being considered, (2) the objectives of and legal basis for the proposed rule, (3) a description and estimate of the number of small entities that would be affected by the rule, (4) an estimate of the reporting, recordkeeping, and other compliance costs for the proposed rule, (5) an analysis of significant alternatives to the proposed rule that could lessen any disproportionate burdens on small entities, and (6) a discussion of any duplicative, overlapping, and conflicting rules. (''A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act, Chapter 2, Office of Advocacy, U.S. Small Business Administration, 2003,'' available at *http://www.sba.gov/advo/laws/rfaguide.pdf*) DOE divided the estimate of the compliance costs for small businesses into two categories representing potential impacts to small business manufacturers with major market shares, and potential impacts to small business manufacturers with small market shares. DOE also analyzed alternatives that could reduce the disproportionate impact of the proposed standards on small vending machine manufacturers. DOE provided the complete IRFA in the May 2009 NOPR, 74 FR 26069–72, for review by the Chief Counsel for Advocacy of the SBA and the public. Chapter 13 of the TSD contains more information about the impact of this rulemaking on manufacturers.

For today's final rule, DOE has prepared a FRFA, which is presented in the following discussion. DOE developed this FRFA for review by the Chief Counsel for Advocacy of the SBA and the public. The FRFA below is written in accordance with the requirements of the Regulatory Flexibility Act.

1. Need for and Objectives of the Final Rule

Part A of subchapter III (42 U.S.C. 6291–6309) provides for the Energy Conservation Program for Consumer Products Other Than Automobiles (this part was originally titled Part B, but was redesignated Part A after Part B of Title III was repealed by Pub. L. 109–58; similarly, Part C, Certain Industrial Equipment, was redesignated Part A–1). The amendments to EPCA contained in the EPACT 2005, Public Law 109–58, include new or amended energy conservation standards and test procedures for some of these products, and direct DOE to undertake rulemakings to promulgate such requirements. In particular, section 135(c)(4) of EPACT 2005 amends EPCA to direct DOE to prescribe energy conservation standards for beverage vending machines. (42 U.S.C. 6295(v)) Hence, DOE is publishing today's final rule on energy conservation standards for refrigerated bottle or canned beverage vending machines pursuant to Part A of EPCA. Because of its placement in Part A of Title III of EPCA, the rulemaking for beverage vending machine energy conservation standards is bound by the requirements of 42 U.S.C. 6295. However, since beverage vending machines are commercial equipment, DOE intends to place the new requirements for beverage vending machines in Title 10 of the CFR, Part 431 (Energy Efficiency Program for Certain Commercial and Industrial Equipment), which is consistent with DOE's previous action to incorporate the EPACT 2005 requirements for commercial equipment. The location of the provisions within the CFR does not affect either their substance or applicable procedure, so DOE is placing them in the appropriate CFR part based on their nature or type.

EPCA provides that any new or amended standard for beverage vending machines must be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A) and (v)) EPCA precludes DOE from adopting any standard that would not result in significant conservation of energy. (42 U.S.C. 6295(o)(3)(B) and (v)) Moreover, DOE may not prescribe a standard for certain equipment if no test procedure has been established for that equipment, or if DOE determines by rule that the standard is not technologically feasible or economically justified and will not result in significant conservation of energy. (42 U.S.C. 6295(o)(3)(A)(B) and (v)) To determine whether economic justification exists, DOE reviews comments received and conducts analysis to determine whether the economic benefits of the proposed standard exceed the burdens to the greatest extent practicable, taking into consideration seven factors set forth in 42 U.S.C. 6295(o)(2)(B) and (v). (*See* section II.A of this preamble.)

EPCA also states that the Secretary may not prescribe an amended or new standard if interested parties have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States of any equipment type (or class) with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States. (42 U.S.C. 6295(o)(4) and (v))

As set forth above, DOE has determined that the standards adopted in today's rule are designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. DOE has also determined that the standards will result in a significant conservation of energy and will not result in the unavailability in the United States of any equipment type or class with performance characteristics that are substantially the same as those generally available in the United States. Chapter 1 of the TSD provides further background information on this rulemaking.

2. Significant Issues Raised by Public Comments

DOE summarized comments from interested parties, including beverage vending machine manufacturers, in sections IV and V of this preamble. DOE did not receive any comments regarding impacts specific to small business manufacturers for the adoption of TSL 6 for Class A machines and TSL 3 for Class B machines in today's final rule or the alternatives identified in section 6 of the IRFA, "Significant Alternatives to the Rule." No changes were made to the IRFA as a result of public comment.

3. Description and Estimated Number of Small Entities Regulated

To establish a list of small beverage vending machine manufacturers, DOE examined publicly available data and contacted manufacturers to determine if they meet the SBA's definition of a small manufacturing facility and if their manufacturing facilities are located within the United States. Based on this analysis, DOE confirmed that there are six small manufacturers of beverage vending machines.

One of these six small manufacturers is one of the top three major manufacturers, who supply roughly 90 percent of all equipment sales. The full line of products offered by this small manufacturer and the remaining two major manufacturers, which are considered large businesses, are covered under this rulemaking (*i.e.*, equipment that dispenses refrigerated bottled or canned beverages). The remaining five small manufacturers comprise approximately 10 percent of industry shipments for covered equipment. *See* chapter 3 of the TSD for further details on the beverage vending machine market. In its examination of the beverage vending machine industry, DOE has determined that these small business manufacturers with small market shares differ significantly from the major manufacturers. The primary difference between these small business manufacturers and the major manufacturers is that these five small business manufacturers produce a wide variety of specialty and niche equipment that are not covered under this rulemaking, such as machines that dispense a wide range of items including snacks, heated drinks, electronic goods, DVDs, bowling supplies, and medical products. Furthermore, unlike the major manufacturers, these small business manufacturers do not sell equipment to the major bottlers because they do not produce covered equipment in the necessary volumes. Instead, these manufacturers rely on providing customized equipment in much smaller volumes.

Before issuing the NOPR, requests for interviews were delivered electronically to the six manufacturers that met the small business criteria. DOE received responses from fewer than half and conducted an on-site interview with the single manufacturer who agreed to be interviewed. In the questionnaire and during the interview, DOE requested information that would determine if there are differential impacts on small manufacturers that may result from new energy conservation standards. *See* chapter 13 of the TSD for further discussion about the methodology DOE used in its analysis of manufacturer impacts, including small manufacturers.

4. Description and Estimate of Reporting, Recordkeeping, and Other Compliance Requirements

Potential impacts on manufacturers include impacts associated with beverage vending machine design and manufacturing. The level of research and development needed to meet energy conservation standards increases with more stringent standards. As mentioned previously, DOE examined the level of impacts that small manufacturers would incur by identifying small business manufacturers and sending them a short questionnaire seeking information to better understand the impacts of the proposed standard that are unique to small manufacturers. Because not all of the small business manufacturers responded to the questionnaire, it is difficult to specifically quantify how the impacts of the proposed standards differ between large and small manufacturers. However, as explained below, DOE found that the impacts of the proposed standard on the small business manufacturer with a major market share would not differ greatly from those of its larger competitors; the impacts would not be significant for the remaining small business manufacturers.

a. Small Business Manufacturer With a Major Market Share

The small business manufacturer that has a major market share in covered equipment will not be disproportionately disadvantaged by the proposed standard. It has a large shipment volume as a major supplier to the large bottlers and its access to capital is nearly identical to its larger competitors. Its large shipment volume allows it to distribute the added cost of compliance across its products, similar to the large manufacturers. Correspondingly, it echoed the large manufacturers' concerns about new energy conservation standards, including conversion costs needed to meet standards, meeting customer needs, and current market conditions. DOE found no significant differences in the R&D emphasis or marketing strategies between this small business manufacturer with a major market share and large manufacturers. As a result, DOE does not believe the impacts of the proposed standard will be significantly different for the small business manufacturer with a large market share when compared to those expected for the large business manufacturers.

b. Small Business Manufacturers With Small Market Shares

DOE does not expect the small businesses with small market shares to be compromised by the energy conservation standard finalized in today's rule. DOE estimates that only approximately 40 percent of their offered vending equipment is covered by the standard. The majority of equipment offered is specialty or niche equipment. As a result, the primary source of revenue for these small manufacturers comes from supplying a market underserved by the major manufacturers of covered equipment. These small manufacturers may balance the cost disadvantage experienced in making their covered equipment compliant with today's standard by charging premium prices for their non-covered niche equipment. As a result, DOE believes the standard will not affect the competitive position of the small business manufacturers with small market shares in covered equipment.

DOE was able to estimate a portion of the differential impacts of the standard on the small manufacturers with small market shares by evaluating costs associated with equipment testing and certification. Manufacturers must test the energy performance of each basic model it manufactures to determine compliance with energy conservation standards and testing requirements. Therefore, DOE examined the number of basic models available from each manufacturer to determine an estimate for the differential in overall compliance costs. The number of basic models attributed to each manufacturer is based on an examination of the different models advertised by each. DOE estimates the cost of testing a piece of covered equipment to be approximately $2,000. A typical major manufacturer has approximately 23 basic models, approximately 85 percent of which are covered and would require separate standards compliance certifications. Therefore, DOE estimates that a typical major manufacturer will incur approximately $44,013 in annual costs for standards compliance certifications. DOE estimates that a typical small manufacturer with small market share has approximately 27 basic models, 44 percent of which are covered and would require separate standards compliance certifications. DOE estimates that a typical small manufacturer will incur approximately $14,380 in annual costs for standards compliance certifications. According to this comparison, the cost of certification for a small manufacturer with small market share is significantly lower than that of a major manufacturer.

As stated above, DOE estimated that there would be some differential impacts associated with beverage vending machine design and manufacturing on small manufacturers. DOE requested comments on how small business manufacturers would be affected due to new energy conversation standards. Specifically, DOE requested comments on the compliance costs and other impacts to small manufacturers that do not supply the high-volume customers of beverage vending machines. However, DOE did not receive any comments regarding impacts specific to small business manufacturers.

5. Steps DOE Has Taken To Minimize the Economic Impact on Small Manufacturers

In consideration of the benefits and burdens of standards, including the burdens posed on small manufacturers, DOE concluded that TSL 6 for Class A machines and TSL 3 for Class B machines are the highest levels that can be justified for beverage vending machines. Therefore, while the lower TSLs analyzed may lessen the impacts on small entities, DOE is precluded from adopting them based on the requirements of EPCA.

Section VI.C.2 discusses how business impacts, including small business impacts, entered into DOE's selection of today's standards for beverage vending machines. DOE made its decision regarding standards by beginning with the highest level considered (TSL 7 for Class A machines and TSL 6 for Class B machines) and successively eliminating TSLs until it found a TSL that is both technically feasible and economically justified, taking into account other EPCA criteria. DOE expects today's standard to have little or no differential impact on small manufacturers of beverage vending machines.

As explained in part 6 of the IRFA, Significant Alternatives to the Rule, DOE expects that the differential impact on small beverage vending machine manufacturers would be less severe in moving from TSL 5 to TSL 6 for Class A than it would be in moving from TSL 6 to TSL 7. For Class B machines, DOE expects that the differential impact on small beverage vending machine manufacturers would be less significant in moving from TSL 2 to TSL 3 than it would be in moving from TSL 4 to TSL 5. Higher TSLs would place excessive burdens on manufacturers, including small manufacturers of beverage vending machines. Such burdens would include research and development costs and also a potential reduction of profit margins by limiting the flexibility of customers to choose design options. However, the differential impact on small businesses is expected to be lower at TSL 6 for Class A machines and TSL 3 for Class B machines because research and development efforts are less at lower TSLs. Chapter 13 of the TSD contains additional information about the impact of this rulemaking on manufacturers.

The TSD includes a regulatory impact analysis (RIA) (chapter 17), which discusses the following policy alternatives to the standards announced today that may lessen impacts on small entities: (1) No new regulatory action, (2) financial incentives including rebates or tax credits, (3) revisions to voluntary energy efficiency targets such as ENERGY STAR program criteria, (4) bulk government purchases, (5) early replacement incentive programs, and (6) prescriptive standards that would mandate design requirements (*e.g.*, lighting and refrigeration controls). DOE did not consider these alternatives further because they are either not feasible to implement, or not expected to result in energy savings as large as those that would be achieved by the standard levels under consideration.

DOE considered the following alternatives in its IRFA in accordance with Section 603(c) of the RFA: (1) Establishment of different compliance or reporting requirements for small entities or timetables that take into account the resources available to small entities, (2) clarification, consolidation, or simplification of compliance and reporting requirements for small entities, (3) use of performance rather than design standards, and (4) exemption for certain small entities from coverage of the rule, in whole or in part. For reasons described in the May 2009 NOPR, DOE did not choose any of these alternatives to the proposed rule. 73 FR 26071–26072.

*C. Review Under the Paperwork Reduction Act*

DOE stated in the May 2009 NOPR that this rulemaking would impose no new information and recordkeeping requirements, and that OMB clearance is not required under the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*). 74 FR 26072. DOE received no comments on this in response to the May 2009 NOPR, and, as with the proposed rule, today's final rule imposes no information and recordkeeping requirements. Therefore, DOE has taken no further action in this rulemaking with respect to the Paperwork Reduction Act.

*D. Review Under the National Environmental Policy Act*

DOE prepared an environmental assessment of the impacts of today's standards which it published as chapter 16 within the TSD for the final rule. DOE found the environmental effects associated with today's various standard levels for beverage vending machines to be insignificant. Therefore, DOE is issuing a FONSI pursuant to NEPA (42 U.S.C. 4321 *et seq.*), the regulations of the Council on Environmental Quality (40 CFR parts 1500–1508), and DOE's regulations for compliance with NEPA (10 CFR part 1021). The FONSI is available in the docket for this rulemaking.

*E. Review Under Executive Order 13132*

DOE reviewed this rule pursuant to Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 4, 1999), which imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. In accordance with DOE's statement of policy describing the intergovernmental consultation process it will follow in the development of regulations that have federalism implications, 65 FR 13735 (March 14, 2000), DOE examined the May 2009 proposed rule and determined that the rule would not have a substantial direct effect on the States, on the relationship between the National Government and the States, or on the distribution of power and responsibilities among the various levels of Government. 74 FR 26072. DOE received no comments on this issue in response to the May 2009 NOPR, and its conclusions on this issue are the same for the final rule as they were for the proposed rule. Therefore, DOE has taken no further action in today's final rule with respect to Executive Order 13132.

*F. Review Under Executive Order 12988*

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' 61 FR 4729 (February 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity, (2) write regulations to minimize litigation, and (3) provide a clear legal standard for affected conduct rather than a general standard and promote simplification and burden reduction. Section 3(b) of Executive Order 12988 specifically requires that executive agencies make every reasonable effort to ensure that the regulation: (1) Clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, the final regulations meet the relevant standards of Executive Order 12988.

*G. Review Under the Unfunded Mandates Reform Act of 1995*

As indicated in the May 2009 NOPR, DOE reviewed the proposed rule under Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) (UMRA), which imposes requirements on Federal agencies when their regulatory actions will have certain types of impacts on State, local, and Tribal governments and the private sector. 74 FR 26073. DOE concluded that this rule would not contain an intergovernmental mandate, nor result in expenditures of $100 million or more in one year by the private sector. *Id.* In the May 2009 NOPR, DOE addressed the UMRA requirements to prepare a statement as to the basis, costs, benefits, and economic impacts of the proposed rule, and that it identify and consider regulatory alternatives to the proposed rule. *Id.* DOE received no comments concerning the UMRA in response to the May 2009 NOPR, and its conclusions on this issue are the same for the final rule as they were for the proposed rule. Therefore, DOE has taken no further action in today's final rule with respect to the UMRA.

*H. Review Under the Treasury and General Government Appropriations Act, 1999*

DOE determined that, for this rulemaking, it need not prepare a Family Policymaking Assessment under Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277). *Id.* DOE received no comments concerning Section 654 in response to the May 2009 NOPR, and, therefore, has taken no further action in today's final rule with respect to this provision.

*I. Review Under Executive Order 12630*

DOE determined under Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (March 18, 1988), that today's rule would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution. 74 FR 26073. DOE received no comments concerning Executive Order 12630 in response to the May 2009 NOPR, and, therefore, has taken no further action in today's final rule with respect to this Executive Order.

*J. Review Under the Treasury and General Government Appropriations Act, 2001*

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (February 22, 2002), and DOE's guidelines were published at 67 FR 62446 (October 7, 2002). DOE has reviewed today's final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

*K. Review Under Executive Order 13211*

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001) requires Federal agencies to prepare and submit to OIRA a Statement of Energy Effects for any significant energy action. DOE determined that today's rule, which sets energy conservation standards for beverage vending machines, is not a ''significant energy action'' within the meaning of Executive Order 13211. 74 FR 26073. Accordingly, DOE did not prepare a Statement of Energy Effects on the proposed rule. DOE received no comments on this issue in response to the May 2009 NOPR. As with the proposed rule, DOE has concluded that today's final rule is not a significant energy action within the meaning of Executive Order 13211, and has not prepared a Statement of Energy Effects on the final rule.

*L. Review Under the Information Quality Bulletin for Peer Review*

On December 16, 2004, OMB, in consultation with the Office of Science and Technology, issued its ''Final Information Quality Bulletin for Peer Review'' (the Bulletin). 70 FR 2664 (January 14, 2005). The purpose of the Bulletin is to enhance the quality and credibility of the Government's scientific information. The Bulletin establishes that certain scientific information shall be peer reviewed by qualified specialists before it is disseminated by the Federal Government. As indicated in the May 2009 NOPR, this includes influential scientific information related to agency regulatory actions, such as the analyses in this rulemaking. 74 FR 26073–74.

As set forth in the May 2009 NOPR, DOE held formal in-progress peer reviews of the types of analyses and processes that DOE has used to develop the energy efficiency standards in today's rule, and issued a report on these peer reviews. The report is available at *http://www.eere.energy.gov/buildings/appliance_standards/peer_review.html. Id.*

*M. Congressional Notification*

As required by 5 U.S.C. 801, DOE will submit to Congress a report regarding the issuance of today's final rule prior to the effective date set forth at the outset of this notice. The report will state that it has been determined that the rule is a ''major rule'' as defined by 5 U.S.C. 804(2). DOE also will submit the supporting analyses to the Comptroller General in the U.S. Government Accountability Office (GAO) and make them available to each House of Congress.

**VIII. Approval of the Office of the Secretary**

The Secretary of Energy has approved publication of today's final rule.

**List of Subjects in 10 CFR Part 431**

Administrative practice and procedure, Confidential business information, Energy conservation, Incorporation by reference.

Issued in Washington, DC, on August 5, 2009.

**Cathy Zoi,**

*Assistant Secretary, Energy Efficiency and Renewable Energy.*

■ For the reasons set forth in the preamble, chapter II of title 10, Code of Federal Regulations, part 431 is amended to read as set forth below.

## PART 431—ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 1. The authority citation for part 431 continues to read as follows:

**Authority:** 42 U.S.C. 6291–6317.

■ 2. In § 431.292 add, in alphabetical order, new definitions for ''bottled or canned beverage,'' ''Class A,'' ''Class B,'' ''combination vending machine,'' and ''V'' to read as follows:

**§ 431.292 Definitions concerning refrigerated bottled or canned beverage vending machines.**

* * * * *

*Bottled or canned beverage* means a beverage in a sealed container.

*Class A* means a refrigerated bottled or canned beverage vending machine that is fully cooled, and is not a combination vending machine.

*Class B* means any refrigerated bottled or canned beverage vending machine not considered to be Class A, and is not a combination vending machine.

*Combination vending machine* means a refrigerated bottled or canned beverage vending machine that also has non-refrigerated volumes for the purpose of vending other, non-''sealed beverage'' merchandise.

* * * * *

*V* means the refrigerated volume ($ft^3$) of the refrigerated bottled or canned beverage vending machine, as measured by ANSI/AHAM HRF–1–2004 (incorporated by reference, see § 431.293).

■ 3. Section 431.293 is revised to read as follows:

**§ 431.293 Materials incorporated by reference.**

(a) *General.* DOE incorporates by reference the following standards into Subpart Q of Part 431. The material listed has been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Any subsequent amendment to a standard by the standard-setting organization will not affect the DOE regulations unless and until amended by DOE. Material is incorporated as it exists on the date of the approval and a notice of any change in the material will be published in the **Federal Register.** All approved material is available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741–6030 or visit *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* This material is also available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024, 202–586–2945, or visit *http://www1.eere.energy.gov/buildings/appliance_standards.* Standards can be obtained from the sources listed below.

(b) *ANSI.* American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, 212–642–4900, or visit *http://www.ansi.org.*

(1) ANSI/AHAM HRF–1–2004, Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers, approved July 7, 2004, IBR approved for §§ 431.292 and 431.294.

(2) ANSI/ASHRAE Standard 32.1–2004, Methods of Testing for Rating Vending Machines for Bottled, Canned, and Other Sealed Beverages, approved December 2, 2004, IBR approved for § 431.294.

■ 4. In Subpart Q, add an undesignated center heading and § 431.296 to read as follows:

**Energy Conservation Standards**

**§ 431.296 Energy conservation standards and their effective dates.**

Each refrigerated bottled or canned beverage vending machine manufactured on or after [Insert date 3 years from the date of publication of this final rule] shall have a maximum daily energy consumption (in kilowatt hours per day), when measured at the 75 °F ± 2 °F and 45 ± 5% RH condition, that does not exceed the following:

| Equipment class | Maximum daily energy consumption (kilowatt hours per day) |
| --- | --- |
| Class A | MDEC = 0.055 × V + 2.56. |
| Class B | MDEC = 0.073 × V + 3.16. |
| Combination Vending Machines | [RESERVED]. |

[The following letter from the Department of Justice will not appear in the Code of Federal Regulations.]

## Appendix

**Department of Justice**

Antitrust Division.

**Christine A. Varney**

Assistant Attorney General.

Main Justice Building, 950 Pennsylvania Avenue, NW., Washington, DC 20530–0001, (202) 514–2401/(202) 616–2645 (f), *E-mail: antitrust@justice.usdoj.gov*, *Web site: http://www.usdoj.gov*.

July 23, 2009.

Eric J. Fygi, Deputy General Counsel, Department of Energy, Washington, DC 20585.

Dear Deputy General Counsel Fygi: I am responding to your May 22, 2009 letter seeking the views of the Attorney General about the potential impact on competition of proposed energy conservation standards for Class A and Class B refrigerated beverage vending machines (''BVMs''). Your request was submitted pursuant to Section 325(o)(2)(B)(i)(V), which requires the Attorney General to make a determination of the impact of any lessening of competition that is likely to result from the imposition of proposed energy conservation standards. The Attorney General's responsibility for responding to requests from other departments about the effect of a program on competition has been delegated to the Assistant Attorney General for the Antitrust Division in 28 CFR 0.40(g).

In conducting its analysis the Antitrust Division examines whether a proposed standard may lessen competition, for example, by substantially limiting consumer choice, leaving consumers with fewer competitive alternatives, placing certain manufacturers of a product at an unjustified competitive disadvantage compared to other manufacturers, or by inducing avoidable inefficiencies in production or distribution of particular products.

We have reviewed the proposed standard contained in the Notice of Proposed Rulemaking (''NOPR'') (74 FR 26020) and attended the June 17, 2009 public hearing on the proposed standard. In addition, we have conducted interviews with members of the industry.

Based on our review of the record and information we have gathered, we do not believe the proposed standard for Class B BVMs would likely lead to a lessening of competition. We are concerned, however, that the proposed Trial Standard Level 6 for Class A BVMs could potentially lessen competition. BVM manufacture is a highly concentrated industry in the United States, and compliance with the proposed Class A standard could require a disproportionate investment by some manufacturers, potentially placing them at a disadvantage vis-à-vis others and leading to greater concentration. Compliance with a lesser standard does not appear to raise similar concerns.

We ask the Department of Energy to take this possible competitive impact into account. We further ask the Department of Energy to ensure that the standard it adopts for Class A BVMs will not require access to intellectual property owned by an industry participant, which would place other industry participants at a comparative disadvantage.

Sincerely,
Christine A. Varney,
*Assistant Attorney General.*

[FR Doc. E9–19392 Filed 8–28–09; 8:45 am]

**BILLING CODE 6450–01–P**