

**Appliance  
Standards Program**

The FY 2003 Priority-  
Setting Summary  
Report and Actions  
Proposed



Date: August 22, 2002

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## EXECUTIVE SUMMARY

In May 2001, the National Energy Policy Development Group (NEPD Group) reported a National Energy Policy to the President. One of the recommendations called for the President to direct the Secretary of Energy to take steps to improve the energy efficiency of appliances. The recommendation included supporting the existing appliance standards program, setting higher standards and expanding the scope of the program to include additional products where technologically feasible and economically justified.

In response, the Department of Energy (DOE or Department) extended the scope of its annual priority-setting activities and held two informal public meetings. These meetings provided a forum for the Department and stakeholders to discuss the priorities of the existing program and any possible expansion of the scope of the program to include additional consumer products and commercial and industrial equipment. The Department received suggestions on the criteria it should use to reach decisions on these issues and on the factors, and data and analysis methods that might be used by DOE in its decision making process. The Department also obtained product-specific recommendations for further actions.

As a result of the priority-setting activities, the Department plans to take the following actions:

1. *Assess whether to class the following as “covered products:*
  - a. *Additional New Consumer Products:* In the course of this activity the Department considered which consumer products could be added to the program. The Department found that substantial energy savings could be achieved through wider use of certain types of incandescent reflector lamps (e.g. ER and BR), torchieres and ceiling fans that are more energy efficient than those which now dominate the marketplace. These products are not currently covered under the Energy Policy and Conservation Act (EPCA), and we intend to assess whether to classify them as “covered products” under Section 322 of the statute. If we do classify them as covered products, we would then review and decide what if any action to take with respect to adoption of test procedures and energy conservation standards for any product that we classify as covered. In addition, the Department plans to support energy efficiency for torchieres, ceiling fans, and consumer electronics through ENERGY STAR® initiatives
  - b. *Additional New Commercial and Industrial Equipment:* The Department found that substantial energy savings could be achieved through wider use of some categories of commercial refrigeration equipment (reach-in

freezers and reach-in refrigerators; vending machines and beverage merchandisers), that are more energy efficient than those which now predominate in the marketplace. Currently, EPCA prescribes no efficiency requirements for these products, and we intend to examine covering them under provisions of the statute that concern commercial products. If we do classify commercial refrigeration equipment as covered under the statute, we would then review and decide what if any action to take with respect to adoption of test procedures, labeling requirements, and energy conservation standards for such products covered.

2. *Existing Appliance Standards:* As a result of the expanded priority-setting activity, the Department is proposing to change the priority status of several products covered under existing regulations.
  - a. *ASHRAE Products:* In the January 2001 Final Rule for efficiency standards for commercial heating, air conditioning and water heating products, the Department announced its decision to consider more stringent standards than those adopted by ASHRAE for several categories of commercial products. The Department places a high priority on reassessing the energy savings potential for a subset of those product categories, specifically, Packaged Terminal Air Conditioning (PTACs), Commercial Oil- and Gas-fired boilers, and tankless instantaneous water heaters. If appropriate, the Department will reconsider adopting the ASHRAE standards levels for these products.

In the January 2001 Final Rule, the Department identified four categories of three-phase air conditioners and heat pumps with capacities less than 65 kBtu/h that may well have significant energy savings. Since these products were not considered by ASHRAE at the time, DOE took no action. During the 2002 summer meeting, ASHRAE proposed including these products at a 12 SEER level. The department plans to place these products on high priority once ASHRAE has taken final action.

- b. *High Intensity Discharge (HID) Lamps – Determination:* Given their high potential energy savings, the Department proposes to move HID lamps from low to high priority for standards determination.
- c. *Dishwasher Standards:* The Department proposes to promote dishwashers from low to medium priority for standards.
- d. *Small Motor Standards:* The Small Electric Motors determination process is continuing and remains a high priority.

## 1 Energy Conservation Program – Product Prioritization Process

The Department of Energy (referred to herein as DOE or the Department), and particularly the appliance standards program, plays a distinct role in the National Energy Policy of the current administration, as indicated in the “Report of the National Energy Policy Development Group”.<sup>1</sup> Specifically, the Energy Policy Development Group recommends that the Department of Energy explore ways of promoting energy efficiency, including expanding the Appliance Standard Program and improving the energy efficiency of appliances.

*The NEPD Group recommends that the President direct the Secretary of Energy to take steps to improve the energy efficiency of appliances.*

- Support appliance standards program for covered products, setting higher standards where technologically feasible and economically justified.
- Expand the scope of the appliance standard program, setting standards for additional appliances where technologically feasible and economically justified.

***National Energy Policy, pp. 4-5 and 4-6.***

Thus tasked by the President, the Department has expanded the annual priority setting process for the appliance standards program to include an examination of additional products that could be included in the program.

### 1.1 Background on Appliance Standards Program

The Department of Energy's Appliance Standards Program is conducted pursuant to Title III, Part B of the Energy Policy and Conservation Act (EPCA). (Pub. L. 94-163). In 1987, EPCA was amended to establish national efficiency standards for certain appliances by law and a schedule for DOE to conduct rulemakings to periodically review and update these standards. (National Appliance Energy Conservation Act, or NAECA, Pub. L. 100-12). The products covered by these standards included refrigerators and freezers, room air conditioners, central air conditioners and heat pumps, water heaters, furnaces, dishwashers, clothes washers and dryers, direct heating equipment, ranges and ovens, and pool heaters. Fluorescent lamp ballasts were added by an amendment in 1988. In conducting the rulemakings to update the standards, the Secretary of Energy is to set standards at levels that achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified.

The Energy Policy Act of 1992 (EPAct) further amended EPCA to expand the coverage of the standards program to include certain commercial and industrial equipment, including commercial heating and air-conditioning equipment, water heaters, certain incandescent and fluorescent lamps, distribution transformers, and electric motors. (Pub. L.102-486). EPAct established maximum water flow-rate requirements for certain plumbing products and provided for voluntary testing and consumer information

<sup>1</sup> *National Energy Policy*, 2001, “Report of the National Energy Policy Development Group”, May. Available at: <http://www.whitehouse.gov/energy/National-Energy-Policy.pdf>.

programs for office equipment and luminaries. EPCA also established a labeling program for commercial products.

EPCA provides for DOE to establish test procedures to be used in evaluating compliance with efficiency standards. These test procedures are revised periodically to reflect new product designs or technologies.

Any new or amended standard for consumer products must be designed so as to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. Section 325(o)(2)(A) of EPCA, 42 U.S.C. 6295(o)(2)(A). Section 325(o)(2)(B)(i) of EPCA, 42 U.S.C. 6295(o)(2)(B)(i), provides that before DOE determines whether a standard is economically justified, it must first solicit comments on a proposed standard. After reviewing comments on the proposal, DOE must then determine that the benefits of the standard exceed its burdens, based, to the greatest extent practicable, on a weighing of the following seven factors:

“I. The economic impact of the standard on the manufacturers and on the consumers of the products subject to such standard;

II. The savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard;

III. The total projected amount of energy savings likely to result directly from the imposition of the standard;

IV. Any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;

V. 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;

VI. The need for national energy conservation; and

VII. Other factors the Secretary considers relevant.”

These principles and criteria also apply for the most part to standards that EPCA authorizes DOE to promulgate for commercial products.

Section 327 of the Act addresses the effect of Federal rules on State energy conservation laws or regulations concerning testing, labeling, and standards. Generally, all such State laws or regulations are superseded by the Act unless specifically exempted in Section 327. The Department can grant a waiver of preemption in accordance with the procedures and other provisions of Section 327(d) of the Act. 42 U.S.C. 6297(d).

## **1.2 DOE Authority to Add Products**

The Department’s ability to act on the National Energy Policy’s recommendation to expand the scope of the appliance standard program is dependent on its statutory authority. This section discusses the Department’s understanding of its current authority with regard to consumer and commercial products. In summary, the Energy Policy and Conservation Act (EPCA, the Act, or the statute) authorizes DOE to impose energy

conservation standards and test procedures for 13 specified consumer products.<sup>2</sup> In addition, EPCA authorizes DOE to classify any other consumer product as a “covered product,” and to impose test procedures for that product, if DOE determines such classification is “necessary or appropriate” to carry out the purposes of EPCA and that the average energy use for the product by a household using it is likely to exceed 100 kilowatt-hours (kWh) per year. 42 U.S.C. (6292 (b)). DOE can also promulgate energy conservation standards for any such product if it determines that the product meets additional, more detailed criteria specified in EPCA. 42 U.S.C. 6295(l).

As for commercial products, the Department has the authority to promulgate energy conservation standards for both specific commercial equipment set forth in section 342 of EPCA, as well as other types of the commercial equipment which the Secretary classifies as covered equipment under section 341(b) of EPCA. With respect to “other covered equipment,” Section 345(a) of EPCA specifically references the criteria and procedural requirements in section 325(l)-(s) as applying to Part C of EPCA. These referenced sections concern prescribing new or amended energy conservation standards, including standards for “other covered products.”

Part C of EPCA covering commercial equipment parallels the statutory scheme of Part B for residential products. As with residential products, EPCA allows the Department to prescribe energy conservation standards and test procedures. In the case of commercial equipment, the Department also has the authority to prescribe labeling requirements. For residential products, the Federal Trade Commission has such authority.

### **1.2.1 Consumer Products**

EPCA provides energy conservation standards, and authorizes DOE to promulgate standards, for any energy using product of a type that “to any significant extent, is distributed in commerce for personal use or consumption by individuals”<sup>3</sup> and that is one of 13 products specified in the Act. EPCA Section 321 *et seq.*, 42 U.S.C. 6291 *et seq.* Of these 13 products, the statute does not provide definitions for the following seven products, and therefore DOE’s authority to impose standards, as well as test procedures, applies to all residential types of these seven products:

1. Room air conditioners;
2. Dishwashers;
3. Clothes washers;
4. Clothes dryers;
5. Direct heating equipment;
6. Kitchen ranges and ovens; and
7. Television sets.

EPCA does define the following six products, and therefore provides and authorizes standards only for types of products that are within the applicable definitions:

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<sup>2</sup> Section 322(a) of EPCA, 42 U.S.C. 6292(a), lists only 12 types of products, but one of the 12 (furnaces) is defined as including the 13<sup>th</sup> product, residential boilers. EPCA Section 321(23), 42 U.S.C. 6291(23).

<sup>3</sup> Such products are typically referred to, and are referred to in this section of this report, as “consumer” (or “residential”) products. Each unit of such a product is covered under EPCA as a consumer product, regardless of whether that unit “is in fact distributed . . . for personal use or consumption by an individual.” EPCA Section 321(1), 42 U.S.C. 6291(1). Thus, for example, if a type of product is to a significant extent distributed for personal use or consumption by individual consumers in their homes and is regulated under EPCA’s consumer product provisions, then the regulations would apply to any units of that same product distributed for commercial applications.

1. Refrigerators, refrigerator-freezers and freezers, EPCA Section 322(a)(1), 42 U.S.C. 6292(a)(1);
2. Central air conditioners and central air conditioning heat pumps, EPCA Section 321(21), 42 U.S.C. 6291(21);
3. Water heaters, EPCA Section 321(27), 42 U.S.C. 6291(27);
4. Furnaces, EPCA Section 321(23), 42 U.S.C. 6291(23);
5. Boilers, EPCA Section 321(23), 42 U.S.C. 6291(23); and
6. Pool heaters, EPCA Section 321(25), 42 U.S.C. 6291(25).

Section 321(21) of EPCA defines “central air conditioner” for example as being a product that is (A) powered by single phase electric current, (B) air cooled, (C) below 65,000 Btu per hour, (D) not in the same cabinet with a furnace having a rated capacity above 225,000 Btu per hour, and (E) a heat pump or cooling only unit. If a product were to be developed for residential use that met all of these criteria except that it was water cooled instead of air cooled, it would not be within this definition and hence would not be subject to regulation as a “central air conditioner” under EPCA.

EPCA does, however, authorize DOE to incorporate additional residential products into its program. EPCA Section 322(a) (19) and (b), 42 U.S.C. 6292(a)(19) and (b). DOE could add (1) for the six products listed above which EPCA defines, types of these products that are not within the EPCA definitions, such as a water cooled residential central air conditioner for example, and/or (2) products completely different from the listed products, such as, for example, ceiling fans or VCRs.

To be added as a covered product under the EPCA provisions that regulate consumer products, a product must consume or be designed to consume energy, and be distributed to “any significant extent . . . for personal use or consumption by individuals.” EPCA Sections 321(1) and 322, 42 U.S.C. 6291(1) and 6292. DOE would also have to determine that (1) including the product as a “covered product” is “necessary or appropriate” to carry out the purposes of EPCA and (2) the average energy use for that type of product by a household using it is likely to exceed 100 kWh per year. EPCA Section 322(b), 42 U.S.C. 6292(b). To prescribe an energy conservation standard for a product that met those criteria, DOE would also have to determine that,

“(A) the average per household energy use within the United States by products of such type (or class) exceeded 150 kWh (or its Btu equivalent) for any 12-month period ending before such determination;

”(B) the aggregate household energy use within the United States by products of such type (or class) exceeded 4.2 billion kWh (or its Btu equivalent) for any such 12-month period;

“(C) substantial improvement in the energy efficiency of products of such type (or class) is technologically feasible; and

“(D) the application of a labeling rule under . . . [EPCA] to such type (or class) is not likely to be sufficient to induce manufacturers to produce, and consumers and other persons to purchase, covered products of such type (or class) which

achieve the maximum energy efficiency which is technologically feasible and economically justified.”

EPCA Section 325(l), 42 U.S.C. 6295(l). In addition, the criteria that normally apply in setting an energy conservation standard under EPCA would apply to setting a standard for one of these added products. Thus, it is possible that a product could meet the criteria for being added as a “covered product” under EPCA, but not meet the criteria for setting a standard for that product. In such an instance, DOE could establish test procedures for the product and the product would be subject to labeling requirements. EPCA Sections 323(b) (1)(B) and 324(a)(3), 42 U.S.C. 6293(b)(1)(B) and 6394(a)(3).

EPCA does not specify a process for determining whether a product meets the criteria to be added as a new covered product or whether, having met those criteria, the product meets the additional criteria for having standards applied to it. Sections 325(l) and (p) of EPCA could reasonably be interpreted, however, as requiring the latter determination to be included as part of the standards rulemaking process for such a product. 42 U.S.C. 6296(l) and (p).

Finally, in some instances the EPCA provisions that prescribe standards for a consumer product limit the application of those standards to a narrower category of products than is covered by EPCA’s definition for the product, or, absent an EPCA definition, than would be covered by a commonly accepted definition. For example, Section 325(b)(2) of EPCA states that the standards prescribed for refrigerator products in Section 325(b)(1) “do not apply to refrigerators and refrigerator-freezers with total refrigerated volume exceeding 39 cubic feet or freezers with total refrigerated volume exceeding 30 cubic feet.” 42 U.S.C. 6295(b)(1). Since it is neither contained in EPCA’s definition of the covered product, nor worded so as to indicate a future limit on coverage, such a limitation does not appear to bar DOE from promulgating a standard for products that are within the limitation.

## **1.2.2 Commercial Products**

### **1.2.2.1 *Products Regulated under EPCA Provisions Concerning Consumer Products***

As part of its program for consumer products, EPCA provides energy conservation standards, directs DOE to adopt test procedures, and authorizes DOE to adopt amended standards, for the following three largely commercial products:

1. Fluorescent lamp ballasts;
2. General service fluorescent lamps; and
3. Incandescent reflector lamps.

EPCA Sections 321(1), 323 (b)(5)-(6), and 325(g)(5) and (i), 42 U.S.C. 6291(1), 6293(b)(5)-(6), 6295(g)(5) and (i). EPCA contains a definition for each of these products, using considerable specificity and detail for the latter two products. EPCA Section 321(29)-(30), 42 U.S.C. 6291(29)-(30). The test procedures and standards that EPCA prescribes for lamps cover all or virtually all products that fall within its definitions for these two products, but the statute’s requirements for ballasts apply only to certain of the products that meet its definition of “fluorescent lamp ballast.” EPCA

Sections 321(29)(A), 323(b)(5)-(6), and 325(g)(5) and (i), 42 U.S.C. 6291(29)(A), 6293(b)(5)-(6), 6295(g)(5) and (i). Moreover, although the language of the definitions and standard-setting provisions indicate that the standards and test procedures apply largely to equipment distributed for commercial use, they also apply to any consumer product that meets the definitions and other criteria that govern their application. EPCA Sections 321(1) and 322(a)(13)-(14), 42 U.S.C. 6291(1) and 6292(a)(13)-(14).

Although EPCA specifies requirements only for certain types of ballasts, the statute specifically authorizes DOE to determine in subsequent rulemakings whether to adopt standards for other products that meet EPCA's definition of "fluorescent lamp ballast." EPCA Section 325(g)(7), 42 U.S.C. 6295(g)(7). For lamps, the statute authorizes DOE, in a rulemaking to begin within 24 months after labeling requirements become effective under EPCA, to determine if it should adopt standards for "additional . . . general service incandescent lamps," a category that includes but is broader than the incandescent reflector lamps for which the statute prescribes standards. EPCA Section 325(i)(5), 42 U.S.C. 6295(i)(5).<sup>4</sup> EPCA also contemplates a third rulemaking concerning lamps, to begin "not less than eight years after October 24, 1992," in which DOE must "determine if the standards in effect for fluorescent lamps and incandescent lamps should be amended." EPCA Section 325(i)(4), 42 U.S.C. 6295(i)(4). Arguably, this provision authorizes the Department to promulgate standards for products that meet the definition of "fluorescent lamp" or "incandescent lamp" in Section 321(30)(A) and (C) of EPCA, 6291(30)(A) and (C).

For products that are within EPCA's definition of "fluorescent lamp ballast," "general service fluorescent lamp," or "incandescent reflector lamp," clearly any rulemaking could cover commercial products. See EPCA Section 321(1), 42 U.S.C. 6291(1). As discussed below, EPCA also authorizes DOE, subject to certain conditions, to promulgate standards for commercial (as well as consumer) high-intensity discharge lamps. EPCA Section 346, 42 U.S.C. 6317. But EPCA does not expressly authorize DOE to promulgate standards for any other commercial lighting product. See EPCA Sections 321(1), 322, and 325(l), 42 U.S.C. 6291(1), 6292, and 6295(l). Nevertheless, since Section 325(i) of EPCA, 42 U.S.C. 6295(i), authorizes DOE to amend the standards for commercial incandescent reflector lamps to include standards for "additional general service incandescent lamps," EPCA may be construed as authorizing standards for commercial versions of general service incandescent lamps. For essentially the same type of reason, if DOE were to conclude that Section 325(i)(4) of EPCA, 42 U.S.C. 6295(i)(4), authorizes it to prescribe standards for "fluorescent lamps" and "incandescent lamps," a sound argument could be made that the Department can set standards for commercial versions of these products. (For the reasons discussed in Section 1.2.1 above, under Sections 321(1), 322(a) and (b) and 325(l) of EPCA, 42 U.S.C. 6291(1), 6292(a) and (b) and 6295(l), DOE can also add to its energy conservation program any consumer lighting product that meets the applicable criteria in those sections.) The net effect of the foregoing would be that DOE could adopt standards for any lamp, whether commercial or consumer, that met EPCA's definition of "fluorescent lamp" or "incandescent lamp." But for lamps excluded from these definitions, such as for example reflector lamps with elliptical reflector (ER) and bulge

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<sup>4</sup> This provision also authorizes DOE to consider adopting standards for "additional general service fluorescent lamps." But it is difficult to discern what "additional" lamps might be contemplated here, since section 325(i)(1) of EPCA appears to prescribe standards for all or virtually all lamps that meet the statute's definition of "general service fluorescent lamp."

reflector (BR) shapes or wattages over 205 Watts (W), under section 322 and 325(l) of EPCA DOE could adopt standards for products that are distributed to any significant extent for personal use or individual consumption. In addition, if reflector lamps with ER or BR shapes meet the criteria for other covered industrial equipment, then standards could be set for such lamps that are distributed to any significant extent for industrial or commercial use.

Finally, as will be discussed in Section 1.2.2.2. which follows, the EPCA provisions that specifically concern commercial products can be construed as authorizing DOE to promulgate standards for both the types of products for which those provisions already prescribe standards and for other industrial equipment the Secretary classifies as covered equipment under section 341(b). These would include some lighting products, since DOE is authorized to add to its program, for example, types of “electric lights” that are distributed for commercial or industrial use. EPCA Sections 340(1)-(3) and 341((b), 42 U.S.C. 6311(1)-(3) and 6312(b).

### **1.2.2.2 Products Regulated under EPCA Provisions Concerning Commercial Products**

Sections 340 through 345 of EPCA concern “covered equipment,” which consists of certain “industrial equipment” that “to any significant extent . . . [is] distributed . . . for industrial or commercial use” and is not covered under the EPCA provisions for consumer products. EPCA Section 340(1)-(2), 42 U.S.C. 6311(1)-(2). Sections 342 and 343, 42 U.S.C. 6313-6314, prescribe energy conservation standards and test procedures for certain types of the following commercial products:

1. Electric motors;
2. Small commercial package air conditioning and heating equipment;
3. Large commercial package air conditioning and heating equipment;
4. Warm air furnaces;
5. Packaged boilers;
6. Packaged terminal air conditioners and heat pumps;
7. Storage and instantaneous water heaters; and
8. Unfired hot water storage tanks.

EPCA contains a definition for each of these products. For the first five the statute prescribes standards for most but not all of the products that meet the applicable definition, and for the last three it provides standards for all products that meet the definition. EPCA Sections 340(1)-(13), and 342(a)(1)-(5) and (b), 42 U.S.C. 6311(1)-(13), and 6313 (a)(1)-(5) and (b).

As to DOE’s authority to promulgate standards for these products, EPCA provides standards for “electric motors” ranging from one to 200 horsepower, and authorizes the Department to amend these standards. EPCA Section 342(b), 42 U.S.C. 6313(b). The statute does not explicitly address whether such amendments can include standards for electric motors smaller than one or larger than 200 horsepower, but arguably DOE has authority to adopt such standards. See EPCA Sections 341(a) and 342(b)(3)(A), 42 U.S.C. 6312(a) and 6313(b)(3)(A). EPCA provides no explicit authority to adopt

standards for any other type of motor, with the exception of small electric motors as discussed below.<sup>5</sup>

For each of the remaining seven commercial products listed above, EPCA states that DOE can amend the Federal energy conservation standard for a product if and when the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 90.1 is amended for that product.<sup>6</sup> EPCA Section 342(a)(6), 42 U.S.C. 6313(a)(6). Thus, if EPCA, or at a later point DOE's regulations, contains a standard for one of these products, or for a subcategory of one of these products, and ASHRAE amends the standard in ASHRAE 90.1 for such product or subcategory, then DOE could amend the corresponding Federal standard.<sup>7</sup>

EPCA also authorizes DOE to determine if energy conservation standards are warranted, and if so to promulgate such standards, for the following three largely commercial products:

1. Distribution transformers;
2. High-intensity discharge lamps; and
3. Small electric motors.

EPCA Section 346, 42 U.S.C. 6317.

For any product that falls within one of the EPCA definitions for commercial heating, air conditioning and water heating products, but for which the statute did not set a standard, EPCA authorizes DOE to set a standard if ASHRAE Standard 90.1 were revised to set or amend a standard for that product.<sup>8</sup>

EPCA does allow the Department to classify as "covered equipment" certain specific types of commercial and industrial equipment, if (1) they meet EPCA's general criteria for covered equipment (presented at the outset of this section) and (2) DOE determines that such classification "is necessary to carry out the purposes of" the EPCA provisions concerning such equipment. EPCA Section 340(1)(G) and (2)(A), and 341(b), 42 U.S.C. 6311(1)(G) and 2(A), and 6312(b). Those products are as follows:

1. Compressors;
2. Fans;
3. Blowers;
4. Refrigeration equipment;
5. Electric lights;
6. Electrolytic equipment;
7. Electric arc equipment;
8. Steam boilers;
9. Ovens;

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<sup>5</sup> It should be noted that Section 340(1)(A) also specifies "pumps" as "covered equipment."

<sup>6</sup> DOE has taken the position that an "amendment" to ASHRAE 90.1 consists either of a change in an efficiency standard in 90.1, or a decision by ASHRAE not to change such a standard after having reviewed it to determine whether a change is warranted.

<sup>7</sup> EPCA does not set standards for commercial unit heaters or duct furnaces, and the statute's definition of "warm air furnace" specifically excludes these products. EPCA Sections 340(11)(A) and 342(a), 42 U.S.C. 6311(11)(A) and 6313(a). Thus, DOE may lack authority to regulate these products.

<sup>8</sup> For example, EPCA defines "large commercial package air conditioning and heating equipment" as including "water source" products, but prescribes no standard for large water source air conditioners. If ASHRAE were to amend Standard 90.1 to change or include a standard for that product, then DOE could adopt a standard for that product.

10. Kilns;
11. Evaporators; and
12. Dryers.

DOE can prescribe test procedures and labeling requirements for any of these products that it classifies as “covered equipment.” EPCA Sections 343(a)(1) and 344(a), 42 U.S.C. 6314(a)(1) and 6315(a). And because (1) the purpose of this part of EPCA is to improve the efficiency of “certain . . . industrial equipment,” 42 U.S.C. 6312(a), and (2) the standards rulemaking provisions for consumer products are made applicable to any products DOE classifies as “covered equipment,” 42 U.S.C. 6316(a), DOE also has authority to set standards for these products.

### **1.2.3 Potential Impact of Pending Legislation**

Neither H.R. 4, the energy bill passed by the U.S. House of Representative (the House bill), nor the bill passed by the Senate (the Senate bill), would limit DOE’s authority to add consumer products to its energy conservation program, and to promulgate energy conservation standards for such newly added products. Both bills would add authority for DOE to address energy consumed by products in the standby mode, although the standby loss provisions in the two bills differ from one another. The Senate bill specifically directs DOE to initiate rulemaking as to standby mode energy use of battery chargers and external power supplies.

Section 143 (b) of the House bill would require DOE to identify any consumer products not currently listed as covered products in EPCA that (1) meet the statute’s criteria for being added as covered products and (2) are major users of electricity. DOE would be required to adopt energy conservation standards for any such product. The bill would also require the Department to adopt test procedures and standards for the following products:

1. Residential furnace fans;
2. Residential central air conditioner and heat pump circulation fans;
3. Suspended ceiling fans; and
4. Cold drink vending machines.

Except insofar as some of these products are commercial, the House bill does not address commercial products.

The Senate bill would require DOE to develop and adopt test procedures and standards for the following products:

1. Suspended ceiling fans;
2. Cold drink vending machines;
3. Commercial unit heaters; and
4. Commercial refrigerators, freezers and refrigerator-freezers.

The bill would also prescribe standards for the following four products, and require DOE to adopt test procedures for the first three:

1. Illuminated exit signs;
2. Low voltage dry-type transformers;
3. Traffic signal modules; and
4. Torchieres.

Finally, Section 922 of the Senate bill is entitled “Authority to Set Standards for Commercial Products.” It would give DOE the authority to add commercial products as “covered products” under the provisions of EPCA that cover primarily consumer products. (DOE already has this same authority for consumer products.) Notwithstanding the title of Section 922, however, because it amends neither Section 322(a)(19) nor Section 325(l) of EPCA, which taken together empower DOE to promulgate standards for newly added consumer products, Section 922 arguably would not authorize DOE to promulgate standards for newly added commercial products. Rather, read literally, the amendments in Section 922 would appear to allow DOE only to promulgate test procedures for newly added commercial products. See, e.g., paragraph (9) of Section 922 of the Senate bill.

### **1.3 The Product Prioritization Process**

In September, 1995, the Department announced a formal effort to consider further improvements to the process used to develop appliance efficiency standards, calling on energy efficiency groups, manufacturers, trade association, state agencies, utilities and other interested parties to provide input to guide the Department. On July 15, 1996, the Department published a Final Rule: Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products (hereinafter referred to as the Process Rule), 61 FR 36974.

The Process Rule set forth guidelines for developing efficiency standards. These guidelines are designed to provide for greater, and more productive, interaction between the Department and interested parties throughout the process. It is also designed so that key analyses are performed earlier in the process, with early opportunities for public input to and comment on the analyses. The guidelines are consistent with the procedural requirements of law, but add some important steps to enhance the process.

#### **1.3.1 Annual Priority-Setting Analysis and Development of Priorities List**

As contemplated in the 1996 Process Rule, at least once a year the Department prepares an analysis of pending or prospective rulemaking using several factors (identified below) based on existing literature, direct communications with interested parties and other experts, and other available information. The results of this analysis are used to develop rulemaking priorities and proposed schedules for the development and issuance of all rulemakings. Each year, DOE invites public input to review and comment on the priority analysis. Finally, each fall, the Department issues, simultaneously with the issuance of the Administration’s Regulatory Agenda, a final set of rulemaking priorities, the accompanying analysis, and the schedules for all priority rulemakings that it anticipates within the next two years.

Based on the guidelines set forth in EPCA, the Department compiled the following initial list of factors to be considered in developing priorities and establishing schedules for conducting rulemakings:

1. Potential energy savings;
2. Potential economic benefits;
3. Potential environmental or energy security benefits;
4. Applicable deadlines for rulemakings;
5. Incremental DOE resources required to complete rulemaking process;
6. Other relevant regulatory actions affecting products;
7. Stakeholder recommendations;
8. Evidence of energy efficiency gains in the market absent new or revised standards;
9. Status of required changes to test procedures; and
10. Other relevant factors.

### 1.3.2 Process to Expand the Program.

Generally, the annual Priority-Setting Process focuses on products already covered by the energy conservation program under EPCA. The Department viewed the Priority-Setting Process as an opportunity to work with stakeholders to define which products could be added to an expanded appliance standards program.

The overarching goal of the extended prioritization process was to identify the products that offer the largest and most readily-attainable energy savings, and that, taking into account a variety of other important factors, warrant further, more detailed evaluation. Ultimately, some of the new products considered may be subject to a rulemaking or other actions by the DOE, including (but not limited to) voluntary programs and research and develop (R&D) programs.

Table 1-1 provides a chronologically-based overview of the prioritization process, including a description of key events and documents generated to support the process.

**Table 1-1: Timeline of the Prioritization Process**

<b>Date</b>	<b>Event</b>	<b>Documents Made Available</b>
09/11/2001	First Prioritization Meeting	Initial Prioritization Criteria and Product Lists
10/26/2001	Data Sheets for Potential New Products Posted on DOE Website	Data Sheets for Potential New Products
11/06/2001	Second Prioritization Meeting	Revised Prioritization Criteria List
12/06/2001	Deadline for Receipt of Stakeholder Comments	Response to meetings and data sheets

The rest of this section describes the most recent prioritization process in chronological order, beginning with the September 11 meeting.

## 1.4 Refining the Prioritization Process – September 11, 2001 Meeting

For the September 11, 2001, meeting, DOE developed an initial list of 36 products for possible inclusion in an extended program. These products are listed in Table 1-2.

**Table 1-2: Initial List of Potential New Products**

Commercial	Residential
Clothes Washers	Inkjet Printers*
Clothes Dryers	Automatic Coffee Makers
Electric Cooking	Set Top Boxes
Gas Cooking	Compact Audio
Supermarket Refrigeration	Dehumidifier
Walk-In Refrigerators	Furnace Fans
Vending Machines	Microwave Ovens
Beverage Merchandisers	Pool Pumps
Reach-In Refrigerators	RACK/Component Audio
Ice Machines	Torchiere Lamps
Traffic Signals	(VCR) Video Cassette Recorder
Pedestrian Crossing Signs	Waterbed Heaters
Exit Signs	Well Pumps
General Service Incandescent Lamps	Window/Stand/Desk Fans
Gas Unit Heaters#	Ceiling Fans
Oil Unit Heaters#	
Gas Duct Furnaces#	
Ground-Coupled Heat Pumps#	
Desktop (PC) Personal Computers*	
Monitors*	
Low-End Server Computers*	
Copy Machines*	
Laser Printers*	
Facsimile Machines*	

\*Denotes commercial and residential devices; initially, energy consumption and savings calculations were performed separately for commercial and residential uses.

# Denotes that the product has a minimum energy efficiency specified by ASHRAE Standard 90.1

In addition, as it does every year, the Department provided information relative to all products existing in the current program. Existing covered products are listed in Table 1-3.

Table 1-3: Existing Covered Products

Commercial	Residential
Central AC and HP (3-phase > 65kBtu/h)#	Clothes Dryers
Central AC and HP, 65-240kBtu/h #	Clothes Washers
Tankless Gas-Fired Instantaneous Water Heaters#	Cooking Products
Commercial Furnaces and Boilers#	Direct Heating Equipment, Gas
Commercial Water Heaters#	Dishwashers
Distribution Transformers	Fluorescent Lamp Ballasts
Electric Motors, 1-200HP#	Fluorescent Lamps
Commercial Oil- and Gas-Fired Packaged Boilers#	Mobile Home Furnaces
High-Intensity Discharge Lamps	Plumbing Fixtures/Fittings
Packaged Terminal A/C and HP# (PTAC)	Pool Heaters, Gas
Small Electric Motors (<1 horsepower (HP))	Refrigerators
	Residential Water Heaters
	Room Air Conditioners
	Residential Central AC/HP
	Residential Furnaces and Boilers

#Denotes that the product has a minimum energy efficiency specified by ASHRAE Standard 90.1

For the September meeting, the Department offered for consideration all of the products in Tables 1-1 through 1-3. The Department compiled the list of potential new products by drawing from similar lists prepared by independent organizations, and supplemented with products the Department identified as consuming significant amounts of energy. Inclusion of a given product on the initial list did not constitute a final decision by DOE to initiate further action. Instead, the initial list sought to include a broad range of potential products that might stimulate a discussion of different prioritization criteria.

During the meeting, the Department received input on the prioritization process. Specifically, participants suggested what criteria, besides those already outlined in the process rule, should influence the selection of products for further action. These suggestions, and comments received after the meeting, enabled the Department to refine its list of prioritization criteria as shown in Table 1-4.

Table 1-4: Product Prioritization Criteria

Prioritization Criteria	
Energy savings potential	
Potential economic benefits	
Potential environmental or energy security benefits	
Applicable deadlines for rulemakings	
Incremental DOE resources required to complete rulemaking process	
Evidence of energy efficiency gains in the market absent new or revised standards	
Status of required changes to test procedures	
Impact of potential regulation on product innovation	✓
Fuel neutrality	✓
Impact on peak demand for electricity	✓
Impact of potential regulation on small businesses	
Cumulative regulative burden on products, related products manufactured by the same manufacturers	

✓<sup>9</sup>New Criteria

<sup>9</sup> Denotes new criterion developed for or during the workshop.

## 1.5 Refining the Priority Products List – November 6, 2001, Meeting

In light of the revised prioritization criteria, the Department developed preliminary “data sheets” for all of the products under consideration. The preliminary data sheets, which offer product-specific information under each prioritization criterion, were posted on the DOE website<sup>10</sup> and made available for the November 6, 2001, meeting. Table 1-5 summarizes the type of information contained in preliminary data sheets.

During the September meeting, stakeholders emphasized the need for energy savings estimates for all products. The Department made every effort to develop energy savings calculations using the most up-to-date and complete data available. In practice, the sheer number of new products under initial consideration limited the quantity and depth of analysis applied to each product. Consequently, the energy savings calculations derived were intended to be preliminary, yet reasonable estimates based on available literature.

**Table 1-5: Information Contained in the Preliminary Data Sheets**

Information Type	Information Included
Energy	Annual Energy Consumption; Energy Savings potential of different standard levels/technologies
Sales	Annual sales; installed base; product lifetime
Efficiency Levels	Installed base; typical new; best available; ENERGY STAR <sup>®</sup> (as applicable); future/posited technologies/standard levels
Test Procedures	Status of test procedures (DOE; Industry [e.g., ASHRAE], ENERGY STAR <sup>®</sup> , other); overview of procedure(s); future test procedures under consideration; correlation between test procedure and energy consumption; correlation between test procedure and peak electricity demand; potential ways to improve test procedure relevance to energy consumption
Cumulative Regulatory Burden	Current regulations affecting product (and related products), including energy efficiency
Evidence of Market-Driven or Voluntary Efficiency Improvements	Market shares of products meeting technology/standard levels; ENERGY STAR <sup>®</sup> product market share; other evidence/reasons for market movement to technology/standard level (e.g., move to light emitting diodes (LED) traffic signals because of much longer lifetime and reduced maintenance costs)

Using the updated prioritization criteria, the Department developed information for both “new” and “existing” products, which enabled comparison of all products on a common basis. By evaluating existing products side-by-side with the proposed new products the Department could propose a revised list of “high,” “medium” and “low” priority products. Existing medium and high priority products from the 2001 Regulatory Agenda are shown in Table 1-6, for Standards and Determinations, and Table 1-7 for Test Procedures. Section 6 of this report presents a proposed revision to these priorities.

<sup>10</sup>At: [http://www.eren.doe.gov/buildings/codes\\_standards/notices/notc0044/index.html](http://www.eren.doe.gov/buildings/codes_standards/notices/notc0044/index.html)

**Table 1-6: Existing Products with High and Medium Priority – Standards and Determinations**

High	Medium
Residential Central AC/HP	Central AC/HP, Three-Phase, <65k Btu
Distribution Transformers	Oil- and Gas-Fired Commercial Packaged Boilers
Residential Furnaces and Boilers	Tankless Gas-Fired Instantaneous Water Heaters
Central AC/HP, 65-240k Btu	
Small Electric Motors - Determination	
Packaged Terminal AC/HP	

**Table 1-7: Existing Products with High and Medium Priority – Test Procedures**

High	Medium
Dishwashers	Compact Refrigerators
Residential Central AC/HP	Ductless Split Central AC/HP
Commercial A/C and Heat Pumps	
Commercial Furnaces	
Commercial Water Heaters	

Following the September meeting, the Department reduced the list of products under consideration primarily on the basis of maximum energy savings potential.

The “short” list developed from the original list of 36 (Table 1-2) included 12 products with an energy saving potential in excess of one quad<sup>11</sup> and included both new and existing products. (Table 1-8). This list did not seek to exclude other products from consideration, but was intended to serve as a focal point for product prioritization discussions at the meeting. Furthermore, the Department recognized that this “short” list would need to be changed in light of revised energy savings calculations and of the other prioritization criteria.

**Table 1-8: Products with a Maximum Energy Savings Potential Exceeding One Quad (Includes New and Existing Products)**

Commercial Products	Energy * Savings (Quads)	Residential Products	Energy * Savings (Quads)
High Intensity Discharge (HID) Lamps	8.3	Televisions	4.1
Monitors	4.4	Incandescent General Service Lamps	3.7
Personal Computers	4.2	Residential Clothes Dryers	3.5
Incandescent Reflector Lamps	2.2	Ceiling Fans (including Lighting)	2.4
Fluorescent Lamps	2.1	Set-Top Boxes	1.9
		Torchiere Lamps	1.7
		Dishwashers	1.7

Source: 2002 Priority Setting Data Sheets

\* Energy Savings Cumulative to 2030

<sup>11</sup> A “quad” denotes one quadrillion Btus, or 10<sup>15</sup> Btus.

Table 1-9 shows the products that fell under the one quad criterion.

**Table 1-9: Products with Energy Savings Potential under One Quad (Includes New and Existing Products)**

	Commercial	Energy * Savings (Quads)	Residential Products	Energy * Savings (Quads)
<b>Existing Products</b>	Commercial Furnaces	N.S.	Clothes Washers	NS
	Commercial Oil- and Gas-Fired Packaged Boilers	.28	Cooking Products	.6
	Commercial Water Heaters	N.S.	Direct Heating Equipment	.1
	Electric Motors	N.A.	Pool Heater	.7
	Packaged Terminal AC&HP	.56	Refrigerators, Refrigerator/Freezers	N.S.
	Tankless Instantaneous Water Heaters	.10	Residential Water Heater	N.S.
			Room Air Conditioners	N.S.
<b>New Products</b>	Commercial Clothes Washers	.46	Compact Audio	.57
	Commercial Clothes Dryers	.81	Dehumidifier	.53
	All Cooking <sup>Ⓢ</sup>	1.024	Pool Pumps	.21
	Super Market Refrigeration	.31	RACK/Component Audio	.87
	Walk-in Refrigerators	.37	VCR	.38
	Vending Machines	.45	Well Pumps	.24
	Beverage Merchandisers	.22		
	Reach-in Refrigerators/Freezers	.89		
	Ice Machines	.21		
	Exit Signs	.35		
	Gas Unit Heaters	.73		
	Oil Unit Heaters	.01		
	Gas Duct Furnaces	.13		
	Low-end Server Computers	.92		
	Copy Machines	.81		
	Laser Printers	.50		
	Facsimile Machines	.48		
	Water Coolers	.26		
	Traffic Signals	.60		

<sup>12</sup>

Source: 2002 Priority Setting Data Sheets.

\* Energy Savings Cumulative to 2030

N.S. Recently adopted standard

N.A. Not available

<sup>Ⓢ</sup> Includes Broilers, Fryers, Griddles, Ovens, Ranges and Steamers.

For the November meeting, the Department had several objectives. Specifically the Department wanted to:

- Complete the discussions concerning the program’s existing priorities.
- Review the prioritization criteria and the process to expand the program’s scope through the addition of new products.
- Receive comments on the preliminary data sheets.

<sup>12</sup> Energy Savings estimates as presented during the November workshop.

- Obtain product-specific recommendations for further actions.

Although discussion at the meeting centered on whether or not to pursue a standards rulemaking for these products, future actions could follow a variety of different paths, including:

- Initiating a rulemaking;
- Developing a test procedure;
- Conducting further analysis to assess the viability of a rulemaking or other action;
- Considering non-regulatory actions to influence the products sold in the market (e.g., an ENERGY STAR<sup>®</sup> program for the product); and
- Suspending further action at this time.

During the meeting, the Department and stakeholders refined the “short” list of products for further consideration (Table 1-10). The need to limit the number of products under consideration reflects the Department’s resource constraints, which allow the Department to pursue approximately four priority rulemakings a year.

**Table 1-10: Refined list of Products Selected for Further Consideration**

Commercial Products	Energy Savings (Quads)	Residential Products	Energy Savings (Quads)
High Intensity Discharge (HID) Lamps	2.2	Televisions	1.7
Monitors	4.44	Incandescent General Service Lamps	8.7
Personal Computers	4.08	Residential Clothes Dryers	3.5
Incandescent Reflector Lamps	2.7	Ceiling Fans (including Lighting)	3.7
Fluorescent Lamps	2.6	Set-Top Boxes	1.55
Gas Unit Heaters and Gas Duct Furnaces*	1.6	Torchiere Lamps	1.7
Commercial Refrigeration*	4.3	Dishwashers	1.7
		Home Audio (Compact and RACK/Component)*	1.44

\*13 Products Added based on updated energy savings potential.

Several products not appearing on the initial list (Table 1-8) warranted further consideration. Gas Unit Heaters were added to the list based on their revised maximum energy savings potential (1.3 quads). In addition, gas duct furnaces were added in recognition of their historical link to gas unit heaters, as to energy efficiency levels in ASHRAE 90.1 and as to test procedures in American National Standards Institute (ANSI) Z38. Commercial refrigeration equipment encompasses several different kinds

<sup>13</sup> \*Denotes added to short list for consideration based upon input received at meeting.

of systems: supermarket refrigeration systems; ice machines; refrigerated vending machines; reach-in refrigerators; reach-in freezers; and beverage merchandisers. Collectively, these products have an energy savings potential of up to 4.3 quads, which formed the rationale for further study. In addition, home audio equipment, including compact audio and RACK/component audio products, warranted further study based on their collective energy savings potential (up to 1.44 quads).

Several questions arose at the November meeting concerning the derivation of energy savings calculations. A companion Technical Support Document (TSD) describes the derivation of energy consumption and savings estimates for all products listed in Table 1-10.<sup>14</sup> In addition, the TSD provides product-specific information relating to the other prioritization criteria. The TSD is continued in Appendix A to this report.

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<sup>14</sup> Spreadsheets containing the assumptions and calculations for equipment under consideration were posted on the DOE website at: [http://www.eren.doe.gov/buildings/codes\\_standards/notices/notc0044/index.html](http://www.eren.doe.gov/buildings/codes_standards/notices/notc0044/index.html).

## 2 General Comments on the Prioritization Process

### 2.1 General Comments on the DOE Program

Several commentators voiced support for some type of DOE action in general, while others broadly opposed DOE action.<sup>15</sup> The Edison Electric Institute (EEI) supports DOE action to update test procedures, and Shaver supports an expansion of the energy conservation program. Energy Market & Policy Analysis, Inc. (EMPA) also supports efforts to update test procedures, but it is opposed to expansion of the energy conservation program. Similarly, the Electronic Consumers Alliance (ECA) and Competitive Enterprise Institute (CEI) provided comments opposed to the energy conservation program in general.

EEI commented that “the Department should concentrate on expanding the program where it is cost-effective for the maximum number of consumers, technically feasible, economically justified on a national basis, and saves a significant amount of energy, both at the end-user level and at the national level” (EEI, No. 33<sup>16</sup>). EEI further commented that the Department should focus its effort on updating test procedures (EEI, No. 33).

In full support of expanding the energy conservation program to include additional consumer products (i.e., computers, monitors, printers, microwave ovens, incandescent light bulbs, and compact fluorescent light (CFL) bulbs), Shaver commented that such inclusion “is necessary in order to provide an effective and significant counter to the trend (of growing electricity consumption) which threatens the ability of the ... electricity generation and distribution system to meet consumer and industry demands” (Shaver, No. 7). Shaver further commented that “inclusion in the Program would provide consumers with more economical products, provide consumers with tools to make energy-smart purchases, and provide companies with an incentive to produce more energy efficient products” (Shaver, No. 7).

The California Energy Commission (CEC) commented that upgrading of standards for consumer products as mandated by NAECA should be given priority. CEC also supports completion of January 2001 rulemaking activity for the identified products that required further study to assess adoption of several standards contained in ASHRAE 90.1-1999. On the other hand, CEC asserted that the Department is not in a position to expand the scope of the appliance standards program at this time, and that in most cases it lacks legal authority to do so (CEC, No. 38).

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<sup>15</sup> This section does not address comments provided with respect to specific products.

<sup>16</sup> Dominion Virginia Power commented that it is “in full support of the detailed comments submitted by the Edison Electric Institute” (DVP, No. 31). Instead of noting this comment in conjunction with each and every EEI comment, it appears once in this footnote.

The American Council for an Energy Efficient Economy (ACEEE) commented that it believes DOE should be able to undertake five rulemakings at this time, in addition to a few test procedure rules, because the rulemakings now being considered are unlikely to be as controversial as many of the recent rulemakings. ACEEE added that, therefore, there is room to start two to three new rulemakings, as there are currently only three or four other major rulemakings. ACEEE recommend that the department choose incandescent reflector lamps, unit heaters, and external power supplies/battery chargers (which did not make the final list of potential products for consideration) as subjects for new rulemakings, as new ENERGY STAR<sup>®</sup> programs have recently started for ceiling fans, set-top boxes, and commercial refrigerators. Furthermore, ACEEE recommended that the Department monitor efficiency trends of products for which the U.S. Congress is likely to adopt new standards without DOE action (i.e., torchieres) and products for which an ENERGY STAR<sup>®</sup> program is making progress in capturing energy savings (e.g., computers/monitors and TVs/VCRs/audio equipment) (ACEEE, No. 39).

EMPA is in support of updating test procedures; however, it is opposed to the addition of new products to the existing appliances standards program (EMPA, No. 3 and 25). EMPA commented that the U.S economy is already much less energy intensive than in the past due to three key factors, which do not include mandated efficiency standards: relatively high energy prices in the 1970s and early 1980s, new technologies that have permitted increased productivity and required less energy, and a shift in the U.S. economy to less energy-intensive manufacturing and services (EMPA, No. 25).

ECA and CEI generally opposed further DOE action. ECA commented that “mandated reduced energy consumption will result in conservation; however, it is an incomplete premise upon which to base policy, in the same way as it would be to increase energy prices” (ECA, No. 23). On a different note, CEI commented that “most energy-using home appliances (including heating and air conditioning systems, refrigerators, water heaters, cooking products, clothes washers and dryers)” have already been regulated, and the new products under consideration are only “minor energy users” (CEI, No. 8 and 24). CEI further commented that “the Department is statutorily precluded from promulgating any standard that does not save a significant amount of energy and that is not economically justified” (CEI, No. 24).

## **2.2 Effects on Consumers**

CEI, ECA, Women Involved in Farm Economics (WIFE), National Association of Farmer Elected Committees (NAFEC), Small Business Survival Committee (SBSC), First Company, EMPA, and the American Corn Growers Association (ACGA) provided comments regarding energy efficiency standards and the interests of consumers. These commentators, in general, asserted that standards would have the effect of increased consumer prices and would likely be adverse to the interests of consumers. Furthermore, commentators discussed NAECA’s consumer protections for rulemakings,

including impact on purchase price, life cycle cost, maintenance and service agreements, as well as product choice, utility, features, and performance (CEI, No. 24; ECA, No. 23, WIFE, No. 19; NAFEC, No. 22; SBSC, No. 27; FC, No. 26; EMPA, No. 3 and 25; ACGA, No. 35).

Due to impact on consumers, WIFE, NAFEC, SBSC, and ACGA commented that the Department should not expand the list of consumer products under energy efficiency regulation. ECA opposes expanding the scope of energy efficiency regulation without further empirical consideration of the relative costs and benefits for residential and small business consumers (ECA, No. 23). CEI and ECA commented that DOE should only promulgate standards that are in the best interest of consumers or that would benefit consumers positively (CEI, No. 8 and 24; ECA, No. 23).

WIFE, NAFEC, and ACGA are concerned about rural area impact, commenting that expansion of the standards program would primarily impact affordability and access to basic household appliances and electronics in rural America. (WIFE, No. 19; NAFEC, No. 22; ACGA, No. 35). SBSC commented that consumers will bear the burden for costs incurred by industry, making some essential products unaffordable for “many Americans” (SBSC, No. 27).

EMPA commented that the Department could account for the interests of real consumers by specifically contracting with one or more organizations that would be charged explicitly with such a task. This would include analyzing existing and proposed energy efficiency standards, evaluating data used by the Department and its contractors, and defending consumers’ economic and choice freedoms (EMPA, No. 15). EMPA further commented that DOE currently provides funding to energy efficiency advocacy groups, including National Laboratories (AES), ACEEE, The Alliance to Save Energy, (AES) and State energy offices (EMPA, No. 3 and 25).

### **2.3 Ranking and Prioritization**

Southern Company, EEI, the Association of Home Appliance Manufacturers (AHAM) and ACEEE provided comments commending the ranking and prioritization criteria. Specifically, EEI commended the additional criteria of innovation and fuel neutrality (EEI, No. 5 and 16), and AHAM commended the consideration of cumulative regulatory burden (AHAM, No. 10). ACEEE commented that it would add “reduction in peak electrical demand” to the list, which the Department did, as shown in Table 1-4 (ACEEE, No. 39).

EEI questioned the relationship between the one-quad cutoff criteria and economic justification. EEI commented that if the technology that provides one-quad of cumulative energy savings is the highest efficiency (and technically feasible) product, it is not likely to be economically justified (EEI, No. 5 and 16). Several other

organizations made similar comments about the appropriateness of “best available” products as a potential energy efficiency level, primarily in the context of consumer electronics and office equipment. Specifically, the Consumer Electronics Association (CEA) noted that many products that can achieve the ‘best available’ energy efficiency may be a ‘de-featured’ product, likely to have very limited market appeal (CEA, No. 28). In addition, CEI commented that “NAECA contains provisions to protect consumers from conservation standards that may diminish product choice, features” (CEI, No. 8 and 24). The Department acknowledges that consideration of technical energy savings potential alone would be inappropriate. The one Quad criterion was a preliminary sorting threshold and the list of priority products will include consideration of economic and other factors.

First Company suggested that three more factors be considered for prioritization criteria: status as a niche product, dual function products, and effect on consumer choice (FC, No. 26). First Company stated that in many cases niche products are manufactured by small independent companies, and their share of the market is small. For ‘dual function products,’ First Company commented that “a product cannot, by definition, have two ‘primary’ functions, and the Department’s legal authority is limited to developing energy efficiency standards based on the primary function of an appliance” (FC, No. 26). In past rulemakings the Department has considered the unique consumer utility niche products provide by establishing separate product classes for these products. Also, the Department has evaluated separately - and considered - the burdens placed on niche manufacturers. For the purposes of the priority setting, the Department did not evaluate dual function products.

ACEEE commented that energy savings estimates should not be included for technologies that are unlikely to meet NAECA’s criteria of “technically feasible” and “economically justified.” For example, since heat pump and microwave clothes dryers are unlikely to be cost-effective to consumers, they should not be included in the energy-saving analysis. ACEEE further commented that other factors listed in NAECA under economic justification are generally more difficult to screen; thus, these other factors should be generally left to the rulemaking process as opposed to the screening process (ACEEE, No. 39). In the initial screening process, DOE identifies technically feasible options for energy savings estimates, albeit some that are not yet commercially available. Then, the Department reviews the list of design options based on the factors and policies specifically listed in the Process Rule. Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products, 61 FR 36974 (July 15, 1996).

ACEEE also commented that one major problem with the analysis is that many related products were examined separately, with the result that energy savings appear small. Where products have enough similarity that they can be combined into a single

rulemaking (e.g., commercial reach-in refrigerators, freezers and refrigerator-freezers), they should be examined together and not separately (ACEEE, No. 39).

The Department has determined that the following sets of products should be combined into a single rulemaking:

- Gas Unit Heaters and Gas Duct Furnaces
- Reach-In Freezers and Reach-In Refrigerators
- Vending Machines and Beverage Merchandisers
- RACK/Component Audio and Compact Audio

## **2.4 Overall Process and Methodology**

While few comments were raised regarding the overall process and methodology, several general points of interest were brought to DOE's attention. First, for products selected for further rulemaking consideration, the National Electrical Manufacturers Association (NEMA) and EMPA presumed that significantly more detailed analysis of potential energy savings and economic benefits will be undertaken (NEMA, No. 20; EMPA, No. 3). In the TSD accompanying this report, the Department is providing a more detailed analysis of the energy savings potential and where possible, a description of the consumer economic impacts. For any products ultimately selected for standards actions, the Department will undertake a rigorous economic analysis.

Southern Company commented that it generally agrees with the methodology (SC, No. 17). However, EMPA commented that the period of time in lifecycle cost analyses should be changed to reflect the period of time that the initial purchaser owns the appliance<sup>17</sup> (EMPA, No. 15). DOE maintains that the correct definition of time period to be considered is the entire life of the product, as useful energy and cost savings are realized throughout the product's entire life. Regarding the compiled list of potential products, EEI commented that the list came only from a selected group of stakeholders and the additional suggestions made in October 2001, by other stakeholders should be considered (EEI, No. 16). As suggested by EEI the Department expanded the products under consideration in response to comments received during and following the public meetings.

Southern Company and AHAM recommend reestablishing the Advisory Committee on Appliance Energy Efficiency so that a forum exists to discuss and communicate issues of a general nature (S.C., No. 6; AHAM, No. 10). On the other hand, EMPA does not recommend that the Department reestablish the Committee, asserting that the former Committee resulted in communication limited to a preferred group. However, EMPA further commented that if the Committee is reestablished, it should assure that all

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<sup>17</sup> EMPA commented that authority for this is given under 42 USC 6295 (o) (EMPA, No. 15).

legitimate interests are represented, including “real consumers” (EMPA, No. 15). At this point, DOE does not plan to re-establish the Advisory Committee on Appliance Energy Efficiency; instead, it will continue to hold public meetings and encourages participation of a broad range of stakeholders in the prioritization process.

## **2.5 Technology Changeover, Product Convergence, and Innovation**

Bose, EEI, CEI, EMPA, and the Information Technology Industry Council (ITI) commented that technology changeover, product convergence, and innovation affect consideration of standards for new products, specifically consumer electronic products and office equipment (i.e., VCRs, Component and RACK Audio, Compact Audio, Monitors, Desktop PCs, Televisions, and Set-top Boxes). The three specific characteristics of consumer electronics products postulated as precluding energy conservation standards are: (1) short product life-cycles relative to the rulemaking cycle, (2) rapid evolution of product features, including multi-functionality; and (3) the possibility that energy consumption caps might result in products that cannot support the otherwise desired breadth of features (i.e., de-featured products). Detailed discussion of each of these issues and the specific comments is given in Section 4.5.

## **2.6 Voluntary or Other Programs**

W.C. Wood, Southern Company, Controlled Energy Corporation, Sony, SBSC, CEA, CEI, and ITI provided comments in support of voluntary and/or energy-use labeling programs. W.C. Wood, Sony, CEA, CEI, and ITI provided comments in favor of increasing the number of products covered by, and increasing the support to, the ENERGY STAR<sup>®</sup> Program, and Southern Company supported efforts to extend the energy-use labeling program to new products (W.C. Wood, No. 4; Controlled Energy Corp., No. 14; Sony, No. 21; CEA, No. 28; Bose, No. 32; CEI, No. 8 and 24; ITI, No. 30; SC, No. 6 and 17). Sony recommended that the Department consider building on the ENERGY STAR<sup>®</sup> program to avoid potentially difficult and non-productive regulation (Sony, No. 21). CEI commented that the success of non-regulatory approaches reduces the need for additional standards (CEI, No. 8 and 24). ITI commented that “a number of factors have contributed to ENERGY STAR’s<sup>®</sup> success...perhaps the most important is the program’s reliance on voluntary rather than ‘command-and-control’ compliance mechanisms” (ITI, No. 30). As noted in Section 1, the Department strongly supports the development of voluntary programs (such as ENERGY STAR<sup>®</sup>) that promote energy efficiency for products, as appropriate.

## **2.7 Setting Standards at ASHRAE Levels**

EEI commented that DOE should accept ASHRAE standards for products already covered by ASHRAE (EEI, No. 5); however, First Company commented that ASHRAE standards should not be a substitute for the Department’s own rulemaking processes and protections (FC, No. 26). EEI believes that Department resources should be saved for

other activities (EEI, No. 5). On the other hand, First Company commented that it should not be assumed that standards developed by ‘standards-setting’ organizations such as ASHRAE are truly ‘consensus’ standards that meet Department criteria (FC, No. 26).

DOE responds that its role in mandating equipment efficiency is separate from the role of ASHRAE and building codes. Specifically, the Department, for products over which it has authority to regulate, is tasked with setting standards in accordance with criteria set forth in EPCA, and the ASHRAE 90.1 standards may not satisfy these criteria.

## **2.8 One Watt Standby Level**

Southern Company commented that it recommends setting a different standby power standard for each product rather than a universal one-watt (1 W) standby power maximum (SC, No. 17). The Department will consider standby power standards that vary from product-to-product. A universal one-watt standby power level may not be appropriate for all applicable products. The Department intends to incorporate standby power consumption on a product by product basis in the course of revising test procedures. Furthermore, the July 2001 Executive Order, which specifies that the Federal government should purchase products which consume one watt or less in standby mode, will create an incentive for manufacturers to produce devices meeting the one-watt threshold where feasible.

## **2.9 NAECA’s 100 kWh Annual Energy Usage Requirement**

EEI and CEI commented that the Department may not be allowed to legally issue rulemakings for products using less than 100 kWh per year on average (EEI, No. 5; CEI, No. 24). For several product classifications (e.g., desktop personal computers, monitors, and laser printers), some participants in the meetings on priorities questioned the distinction between household and commercial energy consumption for purposes of applying NAECA’s requirement of a 100 kWh minimum annual energy consumption (per household). For example, they questioned DOE’s authority to promulgate energy efficiency regulations for desktop PCs, as the average desktop PC consumes ~297 kWh/year in commercial applications but only ~56 kWh/year in residential applications. CEI noted this discrepancy between residential and commercial usage and asserted that desktop PCs, as well as monitors, cannot legally be subjected to rulemakings (CEI, No. 24). To further clarify application of the NAECA requirement for some products (e.g., halogen torchieres and compact audio systems which may only be used with batteries), EEI suggested that detailed studies may be needed to determine the average or median energy usage (EEI, No. 5).

In the context of an expansion of the appliance program as contemplated by the National Energy Policy, this report seeks to identify which products could have the potential to

save energy from regulatory or other actions. Once the Department has identified those products, the Department's consideration of further action must take into account its authority under EPCA.

### 3 Comments on the Products under Existing Regulation: Product- specific Feedback Received and DOE Response

This (and the following) section of the report addresses product-specific issues for those products identified by stakeholders as most promising for future standards. Each product sub-section includes concise background information about the subject product, a summary of comments received, DOE’s responses to these comments, and the Department’s proposed action for that product. This section considers products under *existing* regulation, and the next section covers the same topics for potential *new* products that might be included in the program. Section 5 addresses these same topics for products not selected for further consideration at this time.

In all of the recommendations, specific data for energy savings potential estimates represent the cumulative quads of energy saved in the period 2008-2030. To give perspective on the relative energy savings potential of different products for the purpose of this report only, the energy saving potentials have received categorization as “high,” “moderate,” or “low,” based on the thresholds shown in Table 3-1.

**Table 3-1: Categorization of Energy Savings Potential (for 2008-2030 Period)**

Classification	Energy Savings Potential (quads)
High	>1.0
Moderate	0.5 to 1.0
Low	<0.5

#### 3.1 Dishwashers

Dishwashers, with an installed base of 53.8 million units, consume 0.24 quads of energy annually. The current minimum efficiency standard is an energy factor (EF) of 0.46. The identified technologies considered for revised energy efficiency standards are: (1) the best available unit as listed in ENERGY STAR<sup>®</sup> (1.05 EF) and (2) the current minimum standard ENERGY STAR<sup>®</sup> for a dishwasher (0.58 EF). Using the efficiency of these two products as standards, the potential cumulative (2008-2030) energy savings are 1.4 quads and 0.40 quads, respectively.<sup>18</sup>

Currently, the primary issue concerning energy savings for dishwashers is the need for a test procedure that properly reflects energy consumption for new, readily available adaptive control technologies. The existing test procedure specifies testing with clean dishes only; therefore it cannot properly reflect actual energy consumption of dishwasher models that alter cycle times and functions based on the level of cleanliness of the dishes. In support of this, ACEEE commented that the dishwasher test procedure needs to be corrected (ACEEE, No. 39). Similarly, EEI contended that energy savings values based on the requirement that consumers use an appliance in one particular way

<sup>18</sup> Source: Appendix A, Technical Support Document (TSD).

(e.g. requiring pre-rinsing) are not likely to be obtained (EEI, No. 16). Industry supports a test procedure revision for more accurate testing of new adaptive control models. Upon finalization of a new test procedure, ACEEE recommended that dishwashers be subject to a new rulemaking, as many presently-available dishwashers exceed the current standard by 25 percent or more (ACEEE, No. 39).

To address new technology (e.g., adaptive controls, dirt sensors), the Department is in the process of updating the test procedure. The new procedure will use dirty test-dishes to encompass the variety of sensor techniques now in the market. As the next step, the Department plans to evaluate the energy performance of dishwashers under the new test procedures. This will allow the Department to determine the relative performance of the products and evaluate their energy savings potential.

The Department considers the development of new dishwasher test procedures a high priority. Furthermore, given the relatively high energy savings potential of new standards, the Department proposes to move dishwashers from low to medium priority for rulemaking.

### **3.2 Fluorescent Lamps**

Fluorescent lamps consumed 3.0 quads of energy in 2001. Energy efficiency levels considered for possible future standards are: (1) best available Federal Energy Management Program (FEMP) procurement recommendation levels (4-foot, 8-foot, and U-tube lamps), and (2) recommended FEMP procurement recommendation levels (4-foot, 8-foot, and U-tube lamps). Estimates for cumulative (2008-2030) energy savings at these levels are 3.54 and 1.84 quads, respectively. When taking into account market trends towards the use of electronic ballasts, the energy savings estimates due to the best available and recommended FEMP levels become 0.47 and 0.14 quads, respectively. These lower estimates are more likely as ballast standards mandating the use of electronic ballasts for new fluorescent lamp installations will become effective in the year 2005.

Fluorescent lamps are subjects of EPACT, the ENERGY STAR<sup>®</sup> program, the ASHRAE 90.1 building energy efficiency code, the FEMP Federal Relighting Initiative, and some utility demand side management (DSM) programs. Furthermore, although not specific to lamps, a recent Federal rule (2000) established electronic ballasts as the baseline for fluorescent lamps/ballast systems. NEMA commented that no further action is necessary because of the 2000 Federal fluorescent lamp ballast energy conservation standards (NEMA, No. 20). EEI commented that these ballast standards, which go into effect in 2005, will shift the lamp technology to T8 lamps (EEI, No. 16). In clarification, DOE acknowledges that the ballast standards will essentially require electronic ballasts, as opposed to magnetic ballasts. Furthermore, the most common lamp/ballast system sold in the U.S. today is a T8 lamp running on an electronic ballast,

so a shift to T8 lamps is already occurring. In addition, the updated ASHRAE 90.1-1999 building code lighting provisions essentially require T8 lamps in new non-residential buildings.<sup>19</sup> As of October 2001, seven states had already adopted the updated 1999 standard. ACEEE commented that lighting power density standards in building codes (i.e., ASHRAE 90.1-1999) are a more flexible and preferable option than new lamp standards and thus recommended that fluorescent lamps should remain a low priority for a new rulemaking (ACEEE, No. 39).

Due to the low to moderate energy savings potential of the two FEMP scenarios<sup>20</sup> (0.14-0.47 quads, based on a more likely characterization of the future ballast market), the Department will not conduct further energy savings and economic analysis of new standards for fluorescent lamps, and this product will have low priority status.

### **3.3 High Intensity Discharge Lamps**

High Intensity Discharge (HID) lamps, with an installed base of 167 million units, consume 1.4 quads of energy annually. If all HID lamps rated at 100 W or higher had an efficacy of at least 50 lumens per watt, which would result from the substitution of metal halide and high-pressure sodium lamps for mercury vapor lamps, the potential cumulative (2008-2030) energy saving would equal 1.4 quads.

Southern Company, EEI, NEMA, and ACEEE commented on the cumulative potential energy savings estimate (with the opinion that it was too high). They noted that inefficient mercury vapor lamps are already being replaced by more efficient choices and that HID lighting (in general) is already used in applications where it produces the most light for the least electricity (SC, No. 17; EEI, No. 16; NEMA, No. 20; ACEEE, No. 39). NEMA commented that even if all mercury vapor lamps were eliminated, potential energy savings may not even meet the 1.0 quad threshold. If the rulemaking occurs, NEMA commented that HID standards should be tailored to eliminate mercury vapor lamps, an already declining market, over a time period that allows users to make an orderly transition (NEMA, No. 20).

Market-driven replacement of inefficient mercury vapor lamps with metal halide and high-pressure sodium lamps is occurring but it is uncertain whether it will continue into the future. Data reported in the companion TSD shows that the annual sales of mercury vapor lamps decreased by more than 75 percent from 1993 to 2001. But there are markets (e.g., the southern U.S.) and fixture types (e.g., dawn-to-dusk fixture) that continue to use mercury vapor lamps due to their extremely low cost. Although life cycle costs clearly favor the change from mercury vapor to either metal halide or high-

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<sup>19</sup> ASHRAE 90.1-1999 contains lighting power density (LPD) allowances in Watts/sq. ft for various building and space types. Where a fluorescent light is typically used, the LPDs were calculated based on T8 fluorescent lamp efficacies.

<sup>20</sup> Another scenario considered, with a technology shift from T12 to T8 lamps offers too low of an energy savings potential to warrant consideration for rulemaking. It is assumed that this shift will take place as a side-effect of the upcoming fluorescent ballast standards, which will result in a shift to electronic ballasts. Therefore, since the large majority of these electronic ballasts will be used with T8 lamps, the additional savings from mandating the present T8 technology would be small.

pressure sodium lamps for most applications, it is possible that core markets will continue to utilize low first cost mercury vapor lamps.<sup>21</sup>

The drop-off in mercury vapor HID lamp sales over the past decade suggests a strong market-based move to more efficient HID technologies. The Department will conduct additional analysis to determine if this trend is likely to continue at the current rate or “bottom out” at a specific level.

Due to the potential, yet uncertain, energy savings for HID lamps, the Department will conduct a standards determination to accurately assess the viability of minimum energy efficiency standards. Market trends will receive particular attention in the determination analysis.

### **3.4 Residential Clothes Dryers**

Residential clothes dryers can be divided into gas and electric subcategories. At an installed base of 18 million units, gas residential clothes dryers consume 0.064 quads of energy annually. Electric residential clothes dryers, at an installed base of 60.5 million units, consume 0.6 quads of energy annually. The identified technologies considered for energy efficiency standards are: (1) heat pump electric dryer with modulation (5.5 EF); (2) heat pump electric dryer (5.2 EF<sup>22</sup>); (3) microwave electric dryer (3.4 EF); and (4) modulating gas dryer (2.8 EF). Using these products as standards, the potential cumulative (2008-2030) energy savings are 3.8, 3.5, 1.2, and 0.06 quads, respectively.

EI and ACEEE questioned the economic and technical feasibility of heat pump and microwave clothes dryers. EI is not aware of any working model or prototype of heat pump electric clothes dryers. EI also commented that Edison Power Research Institute (EPRI) research found little success when applying microwave clothes dryers to full size applications (EI, No. 16). ACEEE commented that heat pump and microwave clothes dryers are unlikely to be cost-effective; thus energy savings from a new standard are likely to be modest (ACEEE, No. 39).

The primary issue as to the energy savings potential of clothes dryers is that mechanical extraction of moisture in clothes washers is 20 times more efficient than an incremental gain in clothes dryer efficiency.<sup>23</sup> The move to a modified energy factor (MEF) for washer performance has led to more washer designs that strive to reduce the remaining moisture content (RMC) of clothes, in turn reducing the energy consumed by dryers (by approximately 15 percent). Consequently, the potential energy savings for residential clothes dryers would decrease by approximately 15 percent.

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<sup>21</sup> Actual payback for conversion from mercury vapor to high pressure sodium or metal halide varies depending on three factors: actual wattage reduction, electricity rate structures of the region, and the number of hours electric lighting is used in the location.

<sup>22</sup> For dryers, the Energy Factor (EF) equals the number of pounds of moisture removed from a specified set of test cloths per kW h of energy consumed by the dryer.

<sup>23</sup> Source: Appendix A, TSD.

Furthermore, numerous changes to the clothes dryer test procedure are required prior to a standards rulemaking for this product, such as accounting for sensor systems (i.e., humidity sensors). Also, a new product class needs to be defined for condenser dryers and currently there is one test procedure waiver in effect.

The Department considers residential clothes dryers to be a low priority product and will not consider further actions at this time due to three factors: (1) energy savings for the task of drying clothes is effectively realized in clothes washers as opposed to clothes dryers; (2) the products with large potential energy savings (i.e., heat pump and microwave electric dryers) are not yet available in the market; and (3) the energy savings potential of the remaining options are low.

### **3.5 Incandescent General Service Lamps**

Incandescent general service lamps (A-type) consume 2.5 quads of energy annually (2001). The identified energy efficiency levels considered for standards are: (1) a 1.5 percent efficacy increase over products currently sold; (2) a three percent efficacy increase; and (3) a technology shift to incandescent halogen lamps (17 percent efficacy increase). Estimates for cumulative (2008-2030) energy savings at these levels are 0.80, 1.57, and 8.52 quads, respectively.<sup>24</sup>

ENERGY STAR<sup>®</sup>, ASHRAE 90.1, the FEMP Federal Relighting Initiative, and some utility DSM programs address efficient alternatives to present incandescent general service lamps. NEMA recommended that the Department pursue increased use of ENERGY STAR<sup>®</sup> compliant compact fluorescent lamps as the method to improve the efficiency of residential lighting (NEMA, No. 20). NEMA further commented that to support this effort and maintain the quality and efficiency of CFLs, the Department should consider minimum efficiency standards for CFLs similar to the current 2001 ENERGY STAR<sup>®</sup> specifications (NEMA, No. 20). Shaver commented that both incandescent general service lamps and CFL lamps should be included in the standards program as the annual average per-household energy consumption meets NAECA's threshold (Shaver, No. 7).

EI and NEMA provided comments in opposition of the potential shift to halogen lamp technology. EI commented that a shift to compact fluorescent technology may be more desirable (EI, No. 16). NEMA commented that the expected market price of "A" lamps cannot support the cost of internal halogen capsules with infrared (IR) coatings, nor would they be sufficiently robust for household use (NEMA, No. 20). ACEEE commented that the economics of halogen IR technology has not yet been demonstrated. Likewise, halogen lamps are generally not as cost-effective as CFLs. In summary, ACEEE commented that economically justified standards will not result in substantial

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<sup>24</sup> Source: Appendix A, TSD.

energy savings at this point in time and thus recommended that DOE focus only on R&D efforts for halogen IR technology at this time (ACEEE, No. 39).

Regarding the proposed potential standards in general, EEI commented that an efficacy<sup>25</sup> increase does not guarantee energy savings, as manufacturers may still make the same wattage bulbs, with the effect being the production of more light (EEI, No. 16). NEMA commented that residential users perceive value in longer life, not in greater efficiency, citing increased acceptance of screw based halogen non-IR lamps (NEMA, No. 20). NEMA also commented that the Federal Trade Commission (FTC) regulates labeling of these lamps (NEMA, No. 20).

At this time, DOE considers development of new standards for incandescent general service lamps a low priority because the more efficient technologies do not appear to be economically viable for this very mature technology. But due to the large amount of energy savings possible from shifting to halogen lamp technology, support for voluntary programs encouraging CFL or halogen substitution will continue and the Department will explore research opportunities to reduce the cost of halogen alternatives

### **3.6 Incandescent Reflector Lamps**

Two classes of incandescent reflector lamps were analyzed: lamps regulated under EPACT (essentially PAR lamps) and unregulated incandescent reflector lamps (BR and ER lamps and exempt Parabola Aluminized Reflector (PAR) and reflectors (R) lamps)

PAR reflector lamps consumed 0.29 quads of energy in 2001. The identified potential energy efficiency standards are: 1) a 1.5 percent efficacy increase over current product sold; 2) a 3 percent efficacy increase over current product sold; and 3) a technology shift to halogen infrared reflector lamps (30 percent efficacy increase). Estimates for cumulative (2008-2030) energy savings at these levels are 0.09, 0.18, and 1.44 quads, respectively.

Unregulated reflector lamps consumed 0.30 quads of energy in 2001. The identified potential energy efficiency standards are: (1) a 1.5 percent efficacy increase over current product sold; (2) a switch to halogen lamps (18 percent efficacy increase); and (3) a technology shift to halogen infrared reflector lamps (54 percent efficacy increase). Estimates for cumulative (2008-2030) energy savings at these levels are 0.1, 1.0, and 2.26 quads, respectively.<sup>26</sup>

The Energy Policy Act of 1992 established minimum average lamp efficacy standards (LPW) for many other incandescent reflector lamps, although BR, ER and some PAR

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<sup>25</sup> Efficacy is a measurement of lighting efficiency, recording a device's ability to convert watts of power into lumens of light. Stated in units of lumens per watt (LPW), efficacy is a primary metric by which light sources are compared. Increased efficacy of a light source results in either a) decreased wattage for a given lumen level or b) increased lumens for a given wattage.

<sup>26</sup> Source: Appendix A, TSD.

and R lamps remain exempt. In addition, ENERGY STAR<sup>®</sup>, ASHRAE 90.1, FEMP programs, and some utility DSM programs address efficient alternatives to incandescent reflector lamps.

EEI, ACEEE and NEMA provided two general comments. EEI commented that for incandescent reflector lamps, a shift to halogen technology has already occurred in the commercial sector (EEI, No. 16). Similarly, ACEEE commented that because halogen lamps are fairly standard at present and because IR reflecting lamps are widely available, a new rulemaking on these products is appropriate (ACEEE, No. 39). NEMA commented that incandescent reflector lamps are already regulated for efficiency and test method by the Department and labeling by the FTC (NEMA, No. 20).

Furthermore, NEMA provided comments addressing each of the three classes of incandescent reflector lamps:

- Halogen PAR - already covered by EPACT standards;
- Halogen PAR-IR - technology is not yet sufficiently mature for the general market. Furthermore, the technology can only be applied to a small inner capsule, and it is therefore not a candidate for manufacturing a more efficient BR lamp; and
- BR lamps – the efficiency of BR lamps is already considerably greater than the lower cost alternatives (“A” or “K” lamps). Subjecting BR lamps to efficiency standards would only restrict the general availability of the lamps, resulting in increased usage of the higher wattage alternatives. The Department could consider elimination of the BR rough service exemption and include lamps of BR31 and higher in the BR40 limit of 120 watts. Currently the “one-piece” PAR (BR38) is exempt and generally available at 150 watts (NEMA, No. 20).

Regarding BR lamps, ACEEE added that a rulemaking should include BR lamps as these lamps are a major “loophole” in the current EPACT standard (ACEEE, No. 39).

In response, DOE acknowledges that most PAR lamps are covered by EPACT, but notes that a number of products, notably BR and ER lamps, are currently exempt. Moreover, the energy savings potentials of one option for the regulated category and two of the three energy savings options are high. Since the Department believes it would be best to consider all incandescent reflector lamps together, as a first step DOE will assess whether to classify currently exempt incandescent reflector lamps as covered.

#### **4 Comments on the New Products under Consideration for Regulation: Product-specific Feedback Received and DOE Response**

Whereas Section 3 discusses products currently part of the appliance standards program, Section 4 describes new products, which if included, would expand the scope of the appliance standard program. This section brings together knowledge about the products, summarizes stakeholder comments, and articulates the Department's proposed actions.

Note that energy savings potential of a product category depends to large extent on which products are aggregated in the category. We have made considerable effort to base product categories on rational groupings of products, taking into account function, test procedure, similarity of energy consuming technology and characteristics, etc. For example, reach-in freezers and refrigerators are grouped together because they share the same basic test procedure; only the operating temperatures differ. On the other hand, commercial refrigeration is not considered a single overarching product category due to the wide variety among individual products, including their test procedures (e.g., vending machines versus reach-in freezers).

##### **4.1 Torchieres**

With an installed base of 40 million units (1998) and annual shipments of about 14 million units (1999), torchieres consumed approximately 0.19 quads of energy in 1997. The identified technologies considered for energy efficiency standard levels are: (1) wattage limit set at 190 W, and (2) wattage limit set at 70 W. These levels have potential cumulative energy savings (2008-2030) of 0.83 quads and 1.7 quads, respectively.<sup>27</sup>

DOE has not adopted a test procedure for torchiere lamps. However, there is an ENERGY STAR<sup>®</sup> test procedure that references various ANSI, Illumination Engineering Society of North America (IESNA), and Underwriters Laboratories (UL) test procedures, which include the performance characteristics of input power and light output. The inclusion of these two key energy efficiency metrics means that the test procedure accurately represents energy consumption and the potential savings. Furthermore, the test procedure and metric of energy input correlate highly with the peak output of torchiere lamps.

EEI and ACEEE provided comments regarding the energy savings analysis. EEI believes that the analysis overstates the total annual primary energy usage and that peak demand correlation is likely low (EEI, No. 16). Second, EEI suggested using import and export shipment data to provide information on market growth (EEI, No. 16). Finally, EEI noted that if CFL torchieres cannot be dimmed, then the potential for

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<sup>27</sup> Source: Appendix A, TSD.

energy savings is reduced (EEI, No. 16). ACEEE commented that DOE's assumptions are inconsistent and lead to an overly conservative estimate of energy savings. Specifically, ACEEE estimates sales of nine million incandescent and halogen torchiere units per year and a 10 year average life, resulting in an installed base of 90 million units, much higher than DOE's estimate of 40 million units. ACEEE recommended that the Department review and revise its figures, which it believes will likely lead to a higher savings estimate (ACEEE, No. 39).

The Department agrees with EEI and ACEEE that the energy savings calculations are uncertain. In the TSD, DOE highlights two major counteracting uncertainties; the size of the installed base and, a market shift to lower-wattage lamps due to safety concerns. Even considering the uncertainties the Department believes the energy savings potential of higher efficiency torchieres is such that they warrant further consideration.

The Department will give further consideration to the possible development of efficiency standards for torchieres, given their moderate to high-energy savings potential (0.83-1.7 quads). Since EPCA currently prescribes no efficiency requirements for torchieres, DOE will first assess whether to classify them as "covered products" under Section 322 of the statute.

## 4.2 Ceiling Fans

Ceiling fans have an installed base of 158 million units and annual shipments of 16.5 million units (2000); approximately 95 percent of ceiling fans incorporate a lighting fixture in addition to the fan. The fan apparatus (air-moving) and lighting involve distinct energy use issues, and the 2000 energy consumption levels equaled 0.14 quads for motors and 0.36 quads for the associated lighting. The identified technologies considered for energy efficiency standards are: (1) the ENERGY STAR<sup>®</sup>-compliant air-moving efficacy level (75 cfm/W<sup>28</sup>); (2) the best available aerodynamic fan blade performance (130 cfm/W); (3) aerodynamic fan blade combined with improved motor technology (260 cfm/W); and (4) ENERGY STAR<sup>®</sup> compliant lighting (pin-based CFL). Using these levels as baseline standards, the potential cumulative (2008-2030) energy savings equal 0.47, 1.1, 1.6, and 3.7 quads, respectively.<sup>29</sup>

EEI and AHAM provided several comments regarding the energy savings analysis. First, EEI questioned the assumptions of (1) lighting always "on" when the fan is operating, and (2) no use of dimming switches. Second, EEI commented that the metric of cfm/W for ceiling fan systems has no impact on annual energy usage or peak demand savings, as total watts consumed is the metric necessary for energy consumption (EEI, No. 16). AHAM commented that data needs to be gathered to determine the number of hours of use, the number of fans per home, usage patterns, climatic differences,

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<sup>28</sup> Cfm/W (cubic feet per minute/wall) quantifies the amount of air moved per motor power draw, where fan speed is characterized as the number of cfm of air flow. The levels cited are for the highest-speed setting.

<sup>29</sup> Source: Appendix A, TSD.

saturation and energy usage versus savings potential. AHAM added that the use of a fan (as opposed to an air conditioner) actually provides energy savings during warm weather, because fan usage allows thermostats to be raised to avoid or reduce the use of central or room air conditioners (AHAM, No. 10).

Our estimate of the lighting energy consumption reflects a lighting usage pattern independent of the fan usage. In addition, the Department recognizes that to achieve the goal of energy conservation, any efficiency standard must address watts consumed and that the efficacy metric of cfm/W does so. This metric values and compares the energy efficiency of the air-moving characteristics of the motor and blade technologies under consideration. Also, the Department recognizes that additional analyses are needed to address the issues raised by AHAM.

Significant issues concerning regulation of ceiling fans are the variety of air-flow capacities of fans and the common inclusion of lighting as an integral component of ceiling fans. Approximately 95 percent of ceiling fans are shipped with lighting and lighting typically consumes more energy than the fan motor; therefore, ceiling fan/lighting combinations may warrant consideration as a potential new product for rulemaking.<sup>30</sup> EEI commented that efficiency of the fan and efficiency of the lighting system should be addressed separately (EEI, No. 16). DOE has – and will continue to – analyze the lighting and fan motor components of ceiling fan energy consumption separately.

A DOE test procedure does not exist for ceiling fan air moving efficacy; however, one does exist under ENERGY STAR<sup>®</sup>. The ENERGY STAR<sup>®</sup> test procedure is based on the industry developed Hunter Method, which measures the efficiency of a fan's ability to move air (cfm/W). Tier I ENERGY STAR<sup>®</sup> requirements, which took effect on January 1, 2002, also govern controls, lighting, warranty, and provide consumer information. Tier II levels take effect on October 1, 2003, and include amendments that cover most of the above categories and additional noise regulations. Controls may also increase energy savings (e.g., the Gossamer Wind fan includes motion-sensing controls to insure that the fan does not operate when people are not present in the room).

The Department will give further consideration to the possible development of efficiency standards for ceiling fans, given their moderate to high-energy savings potential (0.47 –5.3 quads). Since EPCA currently prescribes no efficiency requirements for ceiling fans, DOE will first assess whether to classify them as “covered products” under Section 322 of the statute. Also, the Department will continue to support the ENERGY STAR<sup>®</sup> program for ceiling fans.

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<sup>30</sup> Source: Appendix A, TSD.

### 4.3 Gas Unit Heaters and Gas Duct Furnaces

Gas unit heaters have an installed base of approximately 3.2 million units (1995) and annual shipments of 0.14 million units (1995). Annual energy consumption is 0.5 quads (1998). Gas duct furnaces, at an installed base of 0.24 million units (1997) and annual shipments of 0.11 million units (1995), consume approximately 0.1 quads of energy annually. The identified technologies considered for energy efficiency standards are: (1) power vent ( $E_t$ <sup>31</sup> = 82 percent); (2) pulse combustion ( $E_t$  = 90 percent); and (3) condensing ( $E_t$  = 93 percent). Using these levels as standards, the potential cumulative energy savings (2008-2030) for gas unit heaters are 0.59, 0.72, and 1.3 quads, respectively, and 0.13, 0.16, and 0.3 quads for gas duct furnaces, respectively.<sup>32</sup>

Efficiency levels for both products are set forth in ASHRAE 90.1-1999. EEI commented that the Department should work with ASHRAE to change the efficiency levels of gas unit heaters and gas duct furnaces (EEI, No. 16). EEI believes that products that are already covered by ASHRAE 90.1 standards should not have separate standards set by the Department (EEI, No. 16).

The existing ANSI test procedure measures thermal (or combustion) efficiency for unit heaters and duct furnaces operating under full-load and steady-state conditions. However, thermal efficiency measured under these conditions does not fully indicate the actual annual energy consumption of this equipment. First, the fans and other types of air movers that are built into unit heaters and duct furnaces consume electricity but are not covered under the current testing procedure. Second, the test procedure only measures full-load steady-state efficiency and does not indicate how well the heater or furnace performs during “warm-up” and “cool-down” operation, or during part-load operation (when the dampers are partially closed or the fan operates at partial speeds). A seasonal measure, such as annual fuel utilization efficiency (AFUE), would better model these effects. ACEEE commented that the Department should base its analysis on seasonal efficiency (e.g., AFUE), as the biggest opportunity for savings is by reducing off-cycle losses, which are not accounted for in thermal efficiency measurements (ACEEE, No. 39).

Despite the moderate to high energy savings potential of gas unit heaters (0.59-1.3 quads), and the additional energy savings potential of the technologically similar gas duct furnaces (0.13-0.30 quads), these products are not currently covered under EPCA, and the Department plans no further action at this time.

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<sup>31</sup> The thermal efficiency,  $E_t$ , equals 100 percent minus the energy that escapes via the flue.

<sup>32</sup> Source: Appendix A, TSD.

## 4.4 Commercial Refrigeration

Several commentators addressed commercial refrigeration products in general. EEI raised the concern that DOE had under-estimated the payback periods for all commercial refrigeration products because the average cost of electricity it used was too high (EEI, No. 16). The analysis, which was performed in 1996, used an electricity price based on geographic locations with medium energy costs of 7.82 cents per kWh (1996).<sup>33</sup> EEI commented that, according to the Energy Information Administration Statistical Yearbook 2000, the average commercial cost of electricity was 7.26 cents per kWh in 1999 and had been declining since the early 1990's. In response, DOE notes that using the most recent (1999) cost of electricity prices represents an approximate seven percent increase in the estimated simple payback periods and that this does not have a substantial impact upon the economic analysis. For example, the 1999 cost of electricity would increase a 2-year payback period to about 2.15 years.

The Air-Conditioning and Refrigeration Institute (ARI) raised concerns about grouping diverse commercial refrigeration products into "broadly defined categories" (ARI, No. 36). ARI further commented that it is only by aggregating all commercial refrigeration products into one category that the one quad criterion for consideration for rulemaking is met. On the other hand, ACEEE commented that commercial reach-in refrigerators, freezers, refrigerator-freezers, and beverage merchandisers should be part of the same rulemaking. ACEEE reasoned that because residential refrigerators, freezers, and refrigerator-freezers have been covered by a single rulemaking, the same should hold true for commercial products. ACEEE also suggested that refrigerator vending machines could be part of such a rulemaking, as they are essentially refrigerators with coin vending features (ACEEE, No. 39). Finally, ARI commented that DOE must first establish standardized test procedures for each product line and product class before it can consider regulation for commercial refrigeration products (ARI, No. 36). The Department's response and proposed action for each product category of commercial refrigeration equipment is discussed individually in the following sub-sections.

### 4.4.1 Walk-in Coolers, Freezers, and Combinations

Walk-in coolers, freezers, and combinations thereof, are estimated to have an installed base of 0.54, 0.28, and 0.065 million units, respectively. It is estimated that walk-in coolers consumed 0.095 quads of energy in 1995, walk-in freezers 0.064 quads, and combination units 0.022 quads. The identified technology considered for energy efficiency standards is a combination of energy savings options,<sup>34</sup> which result in potential cumulative energy savings (2008-2030) of 0.37 and 0.35 quads for walk-in coolers, and freezers and cooler-freezers, respectively.<sup>35</sup>

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<sup>33</sup> Source: Appendix A, TSD.

<sup>34</sup> Includes Floating Head Pressure, Ambient Subcooling, Evaporator Fan Shutdown, Brushless DC Evaporator and Condenser Fan Motors.

<sup>35</sup> Source: Appendix C, Data Sheets for New Products.

Two factors complicate the application of energy standards to walk-in refrigeration equipment: (1) the wide range of combinations of insulated boxes and condensing units actually used in the field, and (2) the importance of field installation to overall energy consumption. Moreover, a test procedure for a complete walk-in refrigeration system does not exist. However, various test procedures exist for compressors and condensing units, which are major components of walk-in refrigeration systems. Due to the wide variety of walk-in refrigeration systems as a whole (size, operating temperatures, etc.), we believe any energy test procedure should focus on individual components, such as the condensing unit and/or the insulated box.

EEI commented that the Department should work with ARI or ASHRAE to set standards for commercial refrigeration (EEI, No. 16).

Based on the low energy savings potential (0.35 – 0.37 quads), the large diversity of systems in this product category (and consequent complexity in promulgation of standards), as well as the fact that many systems are assembled on site, the Department does not plan to take any actions for these products at this time.

#### **4.4.2 Supermarket Refrigeration Systems**

Supermarket refrigeration systems, with an installed base of 0.03 million units and annual shipments of 0.055 million units, consumed 0.33 quads of energy in 1995. The identified technologies to be considered for energy efficiency standards are: (1) a brushless direct connect evaporator, and (2) a combination of other energy savings measures with less than a 5-year payback period.<sup>36</sup> Using these two levels as standards, the potential cumulative (2008-2030) energy savings are 0.44 quads and 0.39 quads, respectively.<sup>37</sup>

EEI provided two comments regarding supermarket refrigeration systems. First, EEI suggested a review of EPRI research on supermarket refrigeration electric load profiles (EEI, No. 16). Second, EEI believes that voluntary and information programs, rather than standards, are the best way to advance energy efficiency due to the nature of this equipment (EEI, No. 16).

The Department believes that the very wide range of system architectures used in supermarket refrigeration systems makes application of energy standards extremely complicated. At this time, no suitable efficiency definitions have been established for supermarket refrigeration systems, since they are complex systems composed of many components, serving site-specific loads. Moreover, almost all supermarket refrigeration

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<sup>36</sup> Includes Hot Gas Defrost, Antisweat Heater Control, Defrost Control, Liquid-Suction Heat Exchangers for Low Temperature applications, Evaporative Condenser, Floating Head Pressure, Heat Reclaim, and Mechanical Subcooling.

<sup>37</sup> Source: Appendix C, Data Sheets for New Products.

systems are assembled on site. Energy test procedures might focus on individual components, such as display cases or condensing units.

Given the low energy savings potential (0.39-0.44 quads), combined with the great range and complexity of supermarket refrigeration systems, the Department does not plan to take any actions for these products at this time.

#### **4.4.3 Water Coolers**

Water coolers, with an installed base of 6.03 million units (1992) and annual shipments of 1.0 million units (1998), consume approximately 0.044 quads of energy annually (1992). The identified technology to be considered for energy efficiency standards is a combination of energy savings options,<sup>38</sup> which would result in potential cumulative (2008-2030) energy savings of 0.26 quads.<sup>39</sup> The ENERGY STAR<sup>®</sup> performance level would realize 0.24 quads of energy savings in the same period.

The baseline energy studies are 10 years old (1992), and EEI commented that a more accurate baseline of energy usage is needed and suggested conducting field studies (EEI, No. 16). EEI also commented that daily energy use may vary significantly by season (EEI, No. 16).

A DOE test procedure does not exist for water coolers. However, ASHRAE and ENERGY STAR<sup>®</sup> both have test procedures for the measurement of water cooler energy consumption: (1) ASHRAE 18-1987 (R1997) and (2) the ENERGY STAR<sup>®</sup> test procedure (based on ASHRAE 18). It is unlikely that alternative test procedures will be developed; if an alternative procedure were developed, it would likely be based on the ASHRAE procedure. The ENERGY STAR<sup>®</sup> test procedure's emphasis on standby energy use probably captures most of the energy use associated with water coolers. Also, the ambient temperature of 75° F used in the ENERGY STAR<sup>®</sup> test is appropriate for most applications. EEI commented that the minimum hot water temperature in the ENERGY STAR<sup>®</sup> test procedure of 165° F raises concerns regarding scalding (EEI, No. 16). We expect this safety issue to be addressed by the ENERGY STAR<sup>®</sup> program.

The wide range of water cooler types (e.g., ARI categorizes water coolers as: bottle-type, pressure-type, compartment-type, hot and cold-type, and remote-type) complicates the promulgation of standards. Given the diversity of this product and the low energy savings potential (0.24-0.26 quads), the Department does not plan to take any action for the product at this time.

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<sup>38</sup> Includes High Insulation Value, Energy Efficient Compressors, Better Thermal Bond between coil and evaporator, Improved motor efficiencies, and Storage Coil Redesign.

<sup>39</sup> Source: Appendix C, Data Sheets for New Products.

#### 4.4.4 Ice Machines

Ice machines, with an installed base of 1.2 million units (1995) and annual shipments of 0.30 million units (1998), consumed an estimated 0.10 quads of energy in 1995. The identified technologies to be considered for energy efficiency standards are: (1) a combination of energy savings technologies,<sup>40</sup> (2) the Canadian standards; (3) FEMP recommended levels; and (4) FEMP best available levels. Using these four levels as standards, the potential cumulative (2008-2030) energy savings are 0.18, 0.0, 0.16, and 0.31 quads, respectively.<sup>41</sup>

Application of energy standards to ice machines is complicated due to the significant variety of products involved. AHAM commented that this product is undefined in the Department document, and that therefore it is unclear if the Department is considering icemakers contained in other types of products, and residential icemakers and/or commercial products (AHAM, No. 10). EEI commented that DOE should differentiate product categories by cooling type (air or water) and daily ice production capacity (pounds per day) (EEI, No. 16). DOE clarifies that the product category of “ice machines” that we analyzed, which are classified under “commercial refrigeration,” refers to stand alone, commercial ice machines. The energy consumption and savings evaluations in our analysis take into account energy consumed to make and refrigerate ice.

Although a DOE test procedure for ice machines does not exist, an industry accepted test procedure exists under ASHRAE Standard 29. However, because the ASHRAE test procedure was initially developed primarily for manufacturers to evaluate ice machine capacity, as opposed to ice-machine energy efficiency, it does not incorporate typical ambient and supply water temperatures. In addition, the ASHRAE test is performed at a machine’s full ice-making capacity, which overestimates the duty cycle of machines used in many applications. To better measure and represent actual energy use, a new test procedure that specifies more typical ambient and water supply temperatures, as well as a range of representative capacities, is needed.

The current ASHRAE test procedure involves high ambient air and water temperatures and 100 percent duty cycle and correlates well with peak load impact. EEI commented that peak load impact for beverage merchandisers and ice machines depends on the location of the equipment (indoor vs. outdoor) and the time of usage ( e.g., whether ice production is in the daytime or at night ) (EEI, No. 16).

ARI commented that since ice machines do not meet the DOE one-quad criteria for standards consideration, regulatory action is not warranted. The Department does not

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<sup>40</sup> Includes High-Efficiency Compressor and Brushless DC Evaporator Fan Motor.

<sup>41</sup> Source: Appendix A, TSD.

plan further actions for ice machines at this time, given the low energy savings potential (0.0-0.31 quads).

#### 4.4.5 Reach-in Freezers and Reach-in Refrigerators

Reach-in freezers, with an installed base of 0.8 million units and annual shipments of 0.08 million units, consumed 0.065 quads of energy in 1995. The identified technologies considered for energy efficiency standards are: (1) a combination of energy savings options (35 percent energy reduction);<sup>42</sup> (2) California regulations Tier I; (3) California regulations Tier II; and (4) ENERGY STAR<sup>®</sup> minimum levels. Using these levels as standards, the potential cumulative (2008-2030) energy savings are 0.40, 0.09, 0.15, and 0.23 quads, respectively.<sup>43</sup>

Reach-in refrigerators, with an installed base of 1.3 million units and annual shipments of 0.12 million units, consumed 0.054 quads of energy in 1995. The identified technologies considered for energy efficiency standards are: (1) three combinations of energy savings options (44 and 67 percent energy reductions);<sup>44</sup> (2) California regulations Tier I; (3) California regulations Tier II; and (4) ENERGY STAR<sup>®</sup> requirements. Using these levels as standards, the potential cumulative (2008-2030) energy savings are 0.42, 0.64, 0.76; 0.0, 0.09, and 0.28 quads, respectively.<sup>45</sup>

The primary issues as to reach-in freezers and refrigerators are significant product variety and repeatability of the door-opening tests in the ASHRAE 117 test procedure, as a DOE test procedure does not exist. On the issue of product variety, ARI commented that the design and intended use of reach-in products varies greatly. Some “reach-in” products have sliding doors, some have standard hinged doors, and some of these doors are transparent while others are solid (ARI, No. 36). ARI believes that assigning uniform minimum efficiency standards for all “reach-in” products is impractical since they are very different products that, as a result of their design and use, have significantly different energy use requirements (ARI, No. 36). Regarding the test procedure’s door-opening issue, the expense of the test means that not all models made by a manufacturer are tested; instead, the manufacturer tests selected models and extrapolates the results to estimate the energy consumption of other models. Test procedures involving no internal load and no automatic door openings would be significantly easier to carry out and would have greater repeatability of results; however, the automatic door-openings provide a reasonable representation of typical reach-in use.

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<sup>42</sup> Includes Hot Gas Antisweat, High Efficiency Compressor, Brushless DC Evaporator and Condenser Fan Motors..

<sup>43</sup> Source: Appendix A, TSD.

<sup>44</sup> Includes Hot Gas Antisweat, High Efficiency Compressor, Brushless DC Evaporator and Condenser Fan Motors, (44% Energy Reduction); Includes Improved Face Frame Design, Improved Gasket, Reduced Antisweat Heater Wattage, Condensate Line Trap, Brushless DC Evaporator Fan Motor, PSC Condenser Fan Motor, Evaporator Fan Shutdown, Refrigeration System Optimization (67% Reduction.); Includes Improved Face Frame Design, Improved Gasket, Reduced Antisweat Heat Input, Condensate Line Trap, Brushless DC Evaporator and Condenser Fan Motors, Variable-Speed Refrigeration System, Hot Gas Antisweat Heating (80% Reduction).

<sup>45</sup> Source: Appendix A, TSD.

Nevertheless, ASHRAE Standard 117 is already being used to determine the energy use of reach-in refrigeration products. Canada, California, and ENERGY STAR® have all adopted this test standard. Correlation of peak load impact with the ASHRAE 117 test procedure is fair, since the test procedure's ambient temperature is relatively low. However, the ambient temperature condition is somewhat low compared to temperatures often seen in commercial kitchens employing the equipment. EEI does not agree with the determination that peak load impact is "high," as they believe that this equipment has a relatively flat electric load profile with a high load factor (EEI, No. 16).

EEI also provided several comments regarding the energy savings analysis. First, EEI commented that the analysis does not show how technologies may interact to increase or reduce payback periods (EEI, No. 16). Second, EEI commented that the best available efficiency of 5 kWh per day for reach-in freezers appears to be based on a product that does not yet exist. EEI does not believe that standards should be based on "rough estimates" for equipment that does not exist in the marketplace (EEI, No. 16).

ACEEE commented that DOE uses a model developed by the Delfield Company to represent the base case energy consumption of commercial refrigerators and freezers. Based on its research, ACEEE believes that Delfield tends to make some of the most efficient units presently on the market and thus does not represent a good average baseline. ACEEE recommends that DOE examine the California Energy Commission database for these products to determine a more appropriate baseline (ACEEE, No. 39).

Due to the potentially high potential energy savings (0.09 - 1.16) of reach-in freezers and reach-in refrigerators, the Department plans to conduct further analysis for these products. Currently EPCA prescribes no efficiency requirements for these products. Hence, DOE will first examine covering them under provisions of the statute that concern commercial products. If DOE classifies them as covered under the statute, we would then review and decide what if any action to take with respect to adoption of test procedures, labeling requirements, and energy conservation standards.

#### **4.4.6 Vending Machines and Beverage Merchandisers**

Vending machines, with an installed base of 4.1 million units and annual shipments of 0.4 million units, consumed 0.13 quads of energy in 1995. The identified technology considered for energy efficiency standards is a high-efficiency compressor combined with a brushless direct current (DC) evaporator fan motor (28 percent energy use reduction) and Royal Vendors' *Econo-cool* unit (47 percent energy use reduction). These technologies have cumulative energy savings potentials (2008-2030) of 0.67 and 1.13 quads.<sup>46</sup>

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<sup>46</sup> Source: Appendix A, TSD.

Beverage merchandisers, with an installed base of 0.8 million units and annual shipments of 0.6 to 0.12 million units, consumed 0.05 quads of energy in 1995. The identified technology considered for energy efficiency standards is also a high-efficiency compressor combined with a brushless DC fan motor. Using this technology as a possible standard, the potential cumulative energy savings equals 0.33 quads.<sup>47</sup>

Significant product variety is the primary issue for promulgation of energy efficiency standards for vending machines. For both products, EEI commented that separate standards and test procedures should be created for indoor and outdoor vending machines and beverage merchandisers to account for the significantly different ambient conditions. EEI believes that the suggested efficiency metrics may be feasible for indoor units, but are not feasible for outdoor units. Furthermore, EEI commented that DOE should clarify how it defines these two equipment types (EEI, No. 16).

For refrigerated vending machines, ACEEE commented that Royal Vendor, one of the largest manufacturers of refrigerated vending machines, just announced a new model that cuts energy use by about 50 percent, indicating that DOE's estimate of savings (which used a 28 percent energy reduction) can be nearly doubled (ACEEE, No. 39). As noted above, the Department has added the Royal Vendors unit performance level as a technology option and included it in the companion TSD.

For beverage merchandisers, the main issue is the importance of energy use during pull down mode versus steady state. Furthermore, a test procedure specific to beverage merchandisers does not exist. California treats Glass-Door Beverage Merchandisers as Glass-Door Reach-Ins, for which ASHRAE Standard 117 is the established test, and Coca Cola has proprietary test procedures which include evaluation of energy use. However, a test procedure could be developed which is more suited than ASHRAE 117 to the operation of beverage merchandisers. Although the ASHRAE 117 ambient temperature of 75° F is appropriate for typical temperatures for beverage merchandisers in most applications, the test procedure does not have a component which evaluates the energy required to pull down the temperature of warm beverages loaded into the machine. EEI commented that the Department should work cooperatively with ASHRAE to create energy efficiency standards for beverage merchandisers (EEI, No. 16). DOE agrees that the energy savings estimate should include the recovery condition (versus steady state) and differentiate between indoor and outdoor product performance, and sees the need for test procedures that reflect these scenarios.

The Department believes that vending machines and beverage merchandisers energy have moderate to high energy savings potential (1.0 – 1.43 quads). Currently, EPCA prescribes no efficiency requirements for these products. Hence DOE intends to examine covering them under provisions of the statute that concern commercial products. If they are classified as covered under the statute, DOE will review and

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<sup>47</sup> Source: Appendix A, TSD.

decide what if any action to take with respect to adoption of test procedures, labeling requirements, and energy conservation standards.<sup>48</sup>

#### **4.5 General Comments on Consumer Electronics**

Three issues are significant to energy efficiency standards for consumer electronics products:<sup>49</sup> (1) short product life-cycles relative to the rulemaking cycle; (2) rapid evolution of product features, including multi-functionality; and (3) the possibility that energy consumption caps might result in products that cannot support the otherwise desired breadth of features (i.e., de-featured products). The distinct possibility exists that an efficiency standard for one of these products could be obsolete by the time of its promulgation because the typical consumer electronic product is manufactured for a period significantly shorter than the typical rulemaking cycle. Furthermore, the variety and rapid evolution of features for these products complicate rulemaking. For instance, emerging digital TV technology may account for a large portion of the new TVs sold by 2006 and their power consumption characteristics may change significantly relative to today's analog TVs. Finally, concern exists over the possibility that an "energy budget" for electronics products would limit the ability to add energy consuming features desired in the marketplace, resulting in decreased product utility.

Bose, EEI, CEI, EMPA, and ITI provided comments regarding technology changeover, product convergence, and innovation with respect to consideration of standards for new products. EEI and ITI noted that given the rate of evolution for these products, new regulations would most likely lag far behind product development and potentially be obsolete before finalization (Boss, No. 32; EEI, No. 5; ITI, No. 30). EEI specifically cited desktop PCs, computer monitors, compact audio systems, RACK audio systems, VCRs, and the convergence of any of these technologies with other products (e.g., Web TV and TV/VCR combinations) (EEI, No. 5). CEI added that most previously regulated appliances had been on the market for several decades before being regulated, and hence incorporated mature technologies that manufacturers had had sufficient time to develop (CEI, No. 8 and 24).

Commentators also asserted that expansion of a standards program would have the effect of increased consumer prices and/or a decrease in product utility. CEI, ECA, WIFE, NAFEC, SBSC, First Company, EMPA, and ACGA all provided comments with regard to this issue and the interests of consumers. Additionally, WIFE, NAFEC, and ACGA commented that rural Americans would feel the greatest impact of higher prices and/or less useful consumer electronics, especially in efforts to overcome the digital divide (WIFE, No. 19; NAFEC, No. 22; ACGA, No. 35). First Company, SBSC, and

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<sup>48</sup> Proposed legislation pending in the Congress would amend EPCA to authorize the Department to treat commercial products as "covered products" under Section 322 of EPCA, and to specifically include commercial unit heaters and certain commercial refrigeration equipment among the products covered by the statute. If such legislation is adopted, we would re-assess what action to take concerning these products.

<sup>49</sup> VCRs, Component and RACK Audio, Compact Audio, Monitors, Desktop PCs, Televisions, and Set-top Boxes

EMPA extended this defense to affordability for all Americans (FC, No. 26; SBSC, No. 27, EMPA, No. 38 and 25). With respect to specific products, CEA commented that DOE should withdraw computers, monitors, set top boxes, and televisions from consideration (CEA, No. 28), and ITI commented that computers, monitors, servers, printers, copiers, fax machines and multifunctional devices should not be considered for future rulemakings (ITI, No. 30). In summary, CEI commented that “NAECA contains provisions to protect consumers from conservation standards that may diminish product choice, features, and performance<sup>50</sup>” (CEI, No. 8 and 24).

CEA and ITI commented about the success of ENERGY STAR<sup>®</sup> for consumer electronics products. CEA asserted that “by voluntarily supporting the ENERGY STAR<sup>®</sup> program, the electronics industry has increased consumers’ awareness and use of energy efficient products; such industry involvement has been vital to the past success of ENERGY STAR<sup>®</sup> and will be important to the evolution of the program” (CEA, No. 28). Furthermore, CEA commented that it is important for reasons of product convergence that electronic product specifications remain voluntary and market-driven (CEA, No. 28). ITI commented that, given the substantial success of ENERGY STAR<sup>®</sup> in the U.S., and growing international support for the program as is, it would be “unduly burdensome” for the Department to create redundant energy efficiency regulations and labeling programs for information technology products (ITI, No. 30).

ACEEE provided suggestions regarding grouping of similar product classes for the purpose of rulemaking. ACEEE recommended, for the reasons stated, that the following groups of products each be considered as a general group for rulemaking:

- Televisions, VCRs, DVDs, and audio equipment – opportunities for reducing their standby energy use are similar;
- Set-top boxes – digital, analog, and wireless may be considered as separate product classes but should be considered together for rulemaking; these could also be included as part of a TV/VCR rulemaking; and
- Desktop PCs and monitors – these devices are used in tandem (ACEEE, No. 39).

The following subsections address product-specific comments and issues.

#### **4.5.1 RACK/Component Audio**

RACK/Component Audio systems, with an installed base of 74 million units and annual shipments of 10.6 million units, systems consumed 0.11 quads of energy in 1998. The identified technologies considered for energy efficiency standards are: (1) the current ENERGY STAR<sup>®</sup> level (2 watt standby); (2) the ENERGY STAR<sup>®</sup> 2003 level (1 W standby); and (3) the best available level (0.26 W standby). Using these levels as

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<sup>50</sup> 42 U.S.C. § 6295(o)(2)(B)(i)(IV) and (42 U.S.C. § 6295(o)(4) as taken from (CEI, No. 8 and 24).

standards, the potential cumulative (2008-2030) energy savings are 0.10, 0.20, and 0.27 quads, respectively.<sup>51</sup>

Presently, more than 25 RACK/Component audio models draw one W or less in standby mode. Further evidence of market-driven or voluntary approaches is evident in ENERGY STAR<sup>®</sup>'s target market penetration rate of 54 percent (2000). However, standby mode only accounts for about 10 percent of RACK/Component audio energy consumption.

EI commented that the analysis should not focus on standby mode energy use as the potential impact of such use on annual energy usage and peak demand will be minimal (EI, No. 5). The only existing test procedure is the guideline for measurement of standby power in the "ENERGY STAR<sup>®</sup> Program Requirements." Given that the standby mode only accounts for about 10 percent of RACK/Component audio energy consumption, results from applying the existing test procedure are likely to provide a poor indication of actual energy consumption. Furthermore, the test procedure likely does not accurately evaluate peak load conditions, as many units are in "active" mode during peak load time periods.

Bose raised several questions regarding power budgets, product convergence, and technology changeover for RACK/Component audio and compact audio products. Bose suggested that the power 'budget' should be specified by function rather than by product category. For example, if a product were to consist of a receiver, digital video device (DVD) player, powered speaker, and video display all with separate line cords, each should get its own energy budget. Furthermore, Bose commented that many of its products contain components traditionally thought of as 'computers,' including hard drives, video displays, and mother boards, which raises the issue of product convergence and allowed power consumption. Bose suggested that products currently on the market at the time of promulgation should be allowed to live out their normal product lives (i.e., more than eight years), as it would be impractical to redesign all products in less than seven or eight years in order to comply with a new rulemaking. Furthermore, Bose commented that the DOE should consider the negative effect of energy conservation regulations on innovation in the high end of the industry, which is U.S.-based and in which there is a high technology turnover (Bose, No. 32).

Bose also provided comments clarifying the degree to which RACK/component audio manufacturers are already subject to electromagnetic regulations and power factor regulations in many of the countries to which it exports. Bose suggested that to mitigate the impact of regulatory burden, DOE could ensure that testing and certification are permitted by existing agencies (Bose, No. 32). DOE considers overall regulatory burden as one criteria in its rulemaking process.

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<sup>51</sup> Source: Appendix A, TSD.

Given the low energy savings potential (0.10 – 0.27 quads), DOE does not plan to take actions for RACK/Component audio products other than support for ENERGY STAR<sup>®</sup> levels that include standby energy.

#### **4.5.2 Compact Audio**

Compact audio products, with an installed base of 47 million units (1998) and annual shipments of 11.8 million units (2000), consumed 0.057 quads of energy in 1998. The identified technologies considered for energy efficiency standards are: (1) the current ENERGY STAR<sup>®</sup> level (2 watt standby); (2) the ENERGY STAR<sup>®</sup> 2003 level (1 W standby); and (3) the best available level (0.25 W standby). Using these levels as standards, the potential cumulative (2008-2030) energy savings are 0.49, 0.55, and 0.60 quads, respectively.<sup>52</sup>

Presently, at least 50 compact audio models draw one watt or less in standby mode. Further evidence of market-driven or voluntary approaches is evident in ENERGY STAR<sup>®</sup>'s target market penetration rate of 54 percent (2000).

The only existing test procedure is the guideline for measurement of standby power in the “ENERGY STAR<sup>®</sup> Program Requirements.” Standby energy consumption accounts for about 50 percent of compact audio energy consumption, and therefore, the existing test procedure correlates somewhat with actual energy consumption. The test procedure likely fails, however, to evaluate peak load conditions, as many units are in “operation” mode during peak load times. EEI and Bose made the same comments for compact audio as for RACK/Component audio regarding inappropriate focus on standby mode and technology evolution (EEI, No 15; Bode, No. 32).

Given the low to moderate energy savings potential (0.49 – 0.60 quads), DOE does not plan to take actions for compact audio products other than support for ENERGY STAR<sup>®</sup> levels that include standby energy.

#### **4.5.3 Monitors**

Monitors, with an installed base of 60 million commercial units and 51 million residential units, consumed 0.22 and 0.05 (commercial and residential sectors respectively) quads of energy in 2000. The identified technologies considered for energy efficiency standards are: (1) the current minimum ENERGY STAR<sup>®</sup> standard (at its current enabling rate) and maximum 1 W sleep level (and 17-inch cultivate ray tube (CRT) screen); (2) the current minimum ENERGY STAR<sup>®</sup> standard, 100 percent enabled (and 17-inch CRT screen); and (3) the current ENERGY STAR<sup>®</sup> rate with liquid crystal display (LCD) screen (15-inch screen). Using these three technologies as standards, the potential cumulative (2008-2030) energy savings are 0.44, 2.6, and 3.6

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<sup>52</sup> Source: Appendix A, TSD.

quads respectively in the commercial sector, and 0.32, 0.1, and 0.84 quads in the residential sector.<sup>53</sup> Note that the ranking of the energy savings potential for the three options differs between the two sectors.

The energy savings potential for monitors depends in large part upon increasing the ENERGY STAR<sup>®</sup> enabled rate – a software option. Although ENERGY STAR<sup>®</sup> is prevalent in new monitor sales, the user often disables the power management feature, leading to 60 percent and 59 percent ENERGY STAR<sup>®</sup>-enabled rates for the commercial and residential monitor stocks, respectively. Increasing the ENERGY STAR<sup>®</sup> enabled rate may require software modification (e.g., permanent enabling of power-down features).<sup>54</sup>

Although LCD monitors offer a large energy savings potential, they have a cost premium of about 85 percent relative to CRT technology. This translates to a payback period for commercial use for a 15-inch LCD of 11 years, and 33 years for residential use, both relative to a 17-inch CRT.<sup>55</sup> Both far exceed the average monitor lifetime of three years. It should be noted that the market share of LCD monitors is growing. Although LCDs represented less than three percent of the total monitor stock as of 2000, their sales doubled from 1999 to 2000.

EI commented that computer monitors for the residential sector may not be subject to standards according to NAECA because the unit energy consumption is less than the criteria of 100 kWh per year. EI also commented that the focus should not be on standby energy usage and that the most efficient available products may be “de-featured” products (EI, No. 16).

In response to these issues and comments, DOE plans to pursue activities to increase the enabling rate of ENERGY STAR<sup>®</sup> power management features (and other ENERGY STAR<sup>®</sup> initiatives) but will not give further consideration to other actions at this time.

#### **4.5.4 Desktop Personal Computers**

Desktop Personal Computer (PC) energy conservation standards are considered separately for the commercial and residential sectors. For the commercial sector, with an installed base of 59 million units, desktop PCs consumed 0.21 quads of energy in 2000. For the residential sector, with an installed base of 51 million units, they consumed 0.03 quads of energy in 2000. Total annual shipments are 44 million units (2000).

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<sup>53</sup> Source: Appendix A, TSD.

<sup>54</sup> Source: Appendix A, TSD.

<sup>55</sup> In practice, a 15-inch LCD screen effectively replaces a 17-inch CRT screen due to the LCD's more efficient use of screen space for viewing and higher display resolution.

The identified technologies considered for energy efficiency standards are: (1) 1 W sleep (current ENERGY STAR<sup>®</sup> enabled rate) with standard microprocessor; (2) 50 percent ENERGY STAR<sup>®</sup>-enabled; (3) 100 percent ENERGY STAR<sup>®</sup>-enabled, standard central processing units (CPU); (4) laptop computer; and (5) low-power CPU design. The five technologies have cumulative energy savings potentials (2008-2030) of 0.16, 0.89, 1.9, 3.8, and 3.6 quads, respectively,<sup>56</sup> for the commercial sector and 0.11, 0.03, 0.08, 0.35, and 0.48 quads, respectively for residential desktop PCs.

Like all consumer electronics, issues are raised concerning focus on standby energy consumption, use of de-featured products, technology convergence, and innovation. The energy savings analysis found that the laptop computer and a low-power computer options yielded the largest energy-savings potentials. However, EEI commented that using a laptop computer as the “best available” unit energy consumption is not logical because laptop computers may have less features when compared to standard desktop computers. EEI further commented that laptop and desktop computers should be analyzed separately (EEI, No. 16). DOE acknowledges (and mentioned in the data sheets presented at the meetings) that many of the low-power strategies used in commercially-available laptop computers (e.g., low-power CPUs) often command a price premium.

The DOE data sheet also stated that the low-power design desktop computer is not commercially available, but it is technically feasible to design and build. Such a model takes advantage of low power elements and components found in a laptop but avoids the high costs of tight packaging and liquid-crystal displays. A hurdle, in addition to the lack of implemented low-power desktop designs, is the cost premium of these chips.

However, several commentators raised different views regarding the low power design option. CEA and ITI commented that, contrary to the DOE data sheet, a low-power or power-aware desktop computer is commercially available (CEA, No. 28; ITI, No. 30). Both commentators also believe that the correlation of a computer’s power consumption with a microprocessor significantly over-simplifies the analysis for this product. ITI also commented that correlation of low-power design with only one manufacturer (e.g., Transmeta) is misleading as other manufacturers have developed and market low power processors for laptop PCs and certain desktop PCs, including some which cost less than the \$50 quoted for the Transmeta processor (ITI, No. 30).

As noted previously, uncertainty regarding the authority of DOE to promulgate of standards for desktop PCs based on NAECA’s 100 kWh annual household energy consumption threshold were raised by several commentators. EEI commented that desktop computers for the residential sector may not be subject to standards according to NAECA because the unit energy consumption is less than the criteria of 100 kWh per year (EEI, No. 16). On the other hand, Shaver commented that computers and computer

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<sup>56</sup> Source: Appendix A, TSD.

peripherals should be included in the standards program because the energy consumption of a household computer system (including a monitor, printer, and computer) meet NAECA's threshold (Shaver, No. 7). Given the NAECA threshold, it might well be necessary to declare a household computer system as a product in order to legally regulate these products.

The energy savings potential for desktop PCs, like monitors, depends in large part upon increasing the rate at which ENERGY STAR<sup>®</sup> power management software is enabled. For example, although more than 90 percent of desktop PCs sold in 2000 were ENERGY STAR<sup>®</sup>-compliant, only 25 percent of desktops in stock are ENERGY STAR<sup>®</sup>-enabled. Due to the very rapid evolution of PCs and their functionality, the Department does not plan to take any actions for this product at this time other than support ENERGY STAR<sup>®</sup> initiatives.

#### **4.5.5 Televisions**

Televisions, with an installed base of 212 million units (1998) and annual shipments of 31.4 million units (2000), consumed 0.348 quads of energy in 1998. The identified technologies considered for energy efficiency standards are: (1) future ENERGY STAR<sup>®</sup> (1 W standby); (2) the best available model (0.1 W standby); and (3) LCD screens. Using these three levels as standards, the potential cumulative (2008-2030) energy savings are 1.4, 1.7, and 1.1 quads, respectively.<sup>57</sup>

The present focus on standby instead of active mode energy consumption is the primary issue for the energy conservation potential of televisions. The "active" mode dominates TV energy consumption (89 percent<sup>58</sup>), and the DOE test procedure measures both active and standby power draws. On the other hand, the ENERGY STAR<sup>®</sup> test procedure measures only standby power and will not measure potential energy savings from approaches that decrease the active power draw of TVs (such as LCD). CEC commented that the current mandatory federal test method is not accepted or used by industry, and that, it is therefore a hindrance to other organizations that want to take energy efficiency action either by mandatory standards or by incentive programs. CEC recommends that the Department withdraw the current test method, thus giving the opportunity for others to develop a new test method without the threat of Federal preemption (CEC, 38). EEI commented that the energy savings analysis should focus on the active mode and that peak demand impact should consider that the average home likely has more than one television (EEI, No. 16). The TSD reflects these views.

Several other issues complicate the establishment of effective energy standards for televisions. First, digital TV will probably have a major impact on the future of the television. A federal mandate to convert all television programming to digital signals by

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<sup>57</sup> Source: Appendix A, TSD.

<sup>58</sup> Source: Appendix A, TSD.

2007 will require either the purchase of new TVs with a built-in digital receiver box or deployment of digital receivers (set-top boxes) to enable digital signals to function with existing analog TVs. Either adaptation will strongly impact television energy consumption. Second, high-definition TVs (HDTV), which offer much higher resolution than conventional analog TVs, exist in the marketplace and are expected to capture a significant market share in the future. HDTV will likely impact the active (and possibly the standby) power draw of TVs. Third, the quantity of multi-function TVs (TV/VCR, TV/DVD, TV/Monitor, electronic programming guide functions, etc.) could increase in the future, impacting overall device unit energy consumption (UEC).

Due to the rapid evolution that will likely occur to televisions, the Department does not plan to take any actions for this product at this time other than to support ENERGY STAR<sup>®</sup> initiatives.

#### **4.5.6 Set-top Boxes**

We have considered set-top box energy conservation standards separately for cable and wireless product classes. Currently, analog and digital cable set-top boxes, with installed bases of 45 million and 3.8 million units (1999), consume 0.047 and 0.008 quads annually respectively. The 13 million wireless set-top boxes installed in 1999 consumed an additional 0.02 quads, for a total of 0.075 quads for all set-top boxes. However, because of the Federal government's mandate that all television broadcasting transition to digital signals by 2007, digital set-top boxes are expected to displace all analog cable set-top boxes before 2008. Consequently, all subsequent analysis of cable set-top boxes assumes that the entire 1999 population of cable set-top boxes will become digital devices in the 2008-2030 period.

The identified technologies considered for energy efficiency standards are: (1) current ENERGY STAR<sup>®</sup> minimum level (15 watt standby); (2) ENERGY STAR<sup>®</sup> 2004 minimum level (7 W standby); and (3) best available (1 W standby). Using these three levels as standards, the potential cumulative (2008-2030) energy savings for digital set-top boxes are 0.45, 0.95, and 1.3 quads, respectively. For wireless set-top boxes, the potential cumulative (2008-2030) energy savings are 0.02, 0.15, and 0.25 quads, respectively.<sup>59</sup>

The ENERGY STAR<sup>®</sup> program addresses set-top boxes; however, only two products for digital cable TV meet the ENERGY STAR<sup>®</sup> power draw requirement of 15 W or less. In addition, the feasibility of a one-watt standby level for a set-top box is unclear. With respect to the use of potential standard levels that are not necessarily feasible, CEA commented that only "real-world" feasibility should be used to estimate energy savings potential (CEA, No. 28).

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<sup>59</sup> Source: Appendix A, TSD.

The ENERGY STAR<sup>®</sup> test procedure, which calls for measurement of standby power only, sufficiently accounts for current set-top box energy consumption, as analog and digital boxes consume more than three times more energy annually in standby mode than in active mode. In addition, the boxes consume little additional energy in active mode (relative to standby): analog boxes require an average of 1.4 W (13 percent) more to operate in the active mode, digital boxes 0.7 W (three percent).<sup>60</sup> EEI commented that a more proper way to define the energy usage modes of set-top boxes would be “processing” mode and “processing plus transmission” mode. According to EEI, set-top boxes are never in “standby” mode as they are constantly downloading and processing hundreds of channels of information (EEI, No. 16).

Two issues complicate the establishment of an energy standard for set-top boxes. First, although presently consisting of cable and wireless boxes, the set-top box category may grow in the future to include a wide range of products, including digital TV, personal VCF, video game consoles, Internet access devices, videophone, and multifunction devices. Second, the functionality of future set-top boxes may expand to encompass several different tasks, e.g., receiving and recording TV content, computer network access, telephony, etc. All product evolutions will impact the feasibility of different standards levels. As a result, the Department does not plan to take any actions for this product at this time other than to support ENERGY STAR<sup>®</sup> initiatives.

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<sup>60</sup> Source: Appendix A, TSD.

## 5 Products Not Considered

This section summarizes comments received on products which DOE did not select for further analysis or give explicit consideration.

### 5.1 General Comments

CEC provided several comments that addressed a group of products under existing energy efficiency programs. First, as a priority, CEC commented that the Department should publish final rules on the following commercial products for which rulemaking workshops have already taken place:

- Central air conditioners and heat pumps;
- Packaged terminal air conditioners and heat pumps;
- Central furnaces;
- Packaged boilers;
- Water heaters; and
- Hot water storage tanks.

As another priority, CEC commented that the Department should take action concerning test procedures for these products as well as for water heaters that are consumer products. CEC stated that the scope of the energy efficiency provisions for water heaters is very clear, but that the test method, which was developed before NAECA became law, has a much more limited scope and has resulted in confusion over Federal preemption of State standards (CEC, No. 38).

### 5.2 Packaged Terminal Air Conditioners and Heat Pumps

The estimated cumulative (2008-2030) energy savings potential of packaged terminal air conditioners and heat pumps (PTACs) is 0.03-0.56 quads.<sup>61</sup> EEI and ARI provided comments in favor of adopting ASHRAE standards for PTAC and heat pumps. ACEEE commented that ASHRAE 90.1-1999 is not the maximum level of energy efficiency that is technically feasible and economically justified and therefore should not be adopted by DOE. ACEEE recommends that the Department conduct a rulemaking for PTACs once higher priority rulemakings are completed. EEI and ARI commented that the Department should adopt the ASHRAE 90.1 (1999 or 2001) energy efficiency standards for packaged terminal conditioners and heat pumps (EEI, No. 16; ARI, No. 36). They further commented that any other Department action may result in less energy savings

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<sup>61</sup> Source: Appendix B, Data Sheets for Existing Products.

due to the delay in standards implementation. EEI further commented that the Department should then work with ASHRAE to update the standards (EEI, No. 16).

PTACs were classified high priority products for rulemaking during the 2001 priority setting. The Department plans to maintain the high priority and reassess the energy savings potential. The Department will also reconsider adopting the ASHRAE 90.1 – 1999 standard levels.

### **5.3 Ground Source Heat Pumps**

Southern Company commented that given that most ground-coupled heat pumps are significantly more efficient than air-source heat pumps, it would be counterproductive to set standards for ground-coupled heat pumps (SC No. 6). Southern Company further commented that setting standards for ground-coupled heat pumps would likely increase their cost, thus encouraging consumers to purchase the less efficient and less expensive air-source heat pump equipment (SC No. 6).

The Department decided not to consider ground source heat pumps (GSHPs) due to the low energy savings potential that could be expected from minimum efficiency requirements.

### **5.4 Cooking Products**

The estimated cumulative (2008-2030) energy savings potential for cooking products is 0.1-0.2 quads for gas cooktops and 0.2-0.4 quads for gas ovens.<sup>62</sup> This product category was not selected for further consideration, primarily because of its low to medium energy savings potential. Comments received regarding these products are summarized in the following paragraphs.

Southern Company commented that changes in efficiency levels for competing products with different fuel types should be implemented at the same time to reduce effects on competition. Southern Company further commented that, therefore, standards for gas-cooking products should be issued as soon as possible since new standards for electric-cooking products (only) were issued in 1998 (SC, No. 6 and 17). Furthermore, EEI commented that it is concerned that gas cooking products were demoted to low priority in 2001 from high priority in the previous year (EEI, No. 5).

EEI commented that microwave ovens are shown as a NAECA covered product under “cooking products” in the 2002 priority setting document dated August 31, 2001. EEI asked whether or not the Department wants to define microwave ovens as a separate product category (EEI, No. 5). Shaver commented that microwave ovens should be

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<sup>62</sup> Source: Appendix B. Data Sheets for Existing Products

included in the energy efficiency program, because the annual average per-household energy consumption meets NAECA's threshold (Shaver, No. 7). AHAM commented that it opposes any new rulemaking on microwave ovens, which were subject to a final no-standard determination in 1995 (AHAM, No. 10). AHAM further commented that microwave ovens are relatively efficient cooking products and there are serious technical and economical issues in significantly improving their efficiency (AHAM, No. 10).

AHAM commented that coffeemakers should not be the subject of regulation, as their energy savings potential is small (AHAM, No. 10). AHAM further commented that the California Energy Commission agrees with this view in its pending rulemaking (AHAM, No. 10).

Given their low potential energy savings the Department is not considering further analysis for microwave ovens or coffeemakers. (The Department notes that, as indicated by AHAM's comments, microwave ovens are already a covered product and DOE has place them in a separate product category.)

## **5.5 Residential Central Air Conditioners and Heat Pumps**

A final rule was issued on May 23, 2002 for these product categories establishing a 12 SEER standard for most products. Comments received regarding these products are summarized below.<sup>63</sup>

CEC commented that the Department's highest priority should be the completion of its rulemaking for residential air-cooled air conditioners and residential air source heat pumps. Furthermore, CEC commented that the Department should maintain the original seasonal energy efficiency rating (SEER) 13 standard and its effective date (CEC, No. 38). EEI and ARI commented that the Department should not consider this equipment until 2011 because the new, higher efficiency standards are scheduled to go into effect in 2006 (EEI, No. 5; ARI, No. 36).

ACEEE commented that it supports revisions to the test procedure and recommended that a key part of a rulemaking be to look at the accuracy of the test procedure relative to field conditions. In particular, ACEEE commented that the current test procedure underestimates fan energy use and does not fully adjust for the benefits of thermal expansion valves in the field (ACEEE, No. 39).

EMPA provided comments regarding the energy savings analysis. EMPA commented that there are limitations to the data used to make estimates about air conditioners and heat pumps (EMPA, No. 3). EMPA also commented that the time period for the payback calculation should be the amount of time that the appliance remains in the

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<sup>63</sup> Source: Appendix B, Data Sheets for Existing Product.

ownership and use of the initial purchaser, as opposed to the entire useful lifetime of the product (EMPA, No. 3).

## **5.6 Residential Refrigerators and Freezers**

The estimated cumulative (2008-2030) energy savings potential for refrigerators, refrigerators/freezers, and freezers is 1.4 quads.<sup>64</sup> A final rule for this product category was issued on April 28, 1997, and became effective July 1, 2001. Thus, these products were not selected for further consideration for new energy efficiency standards at this time.

W.C. Wood commented that household freezers (and other classes/sizes of refrigerators) are a logical extension of the ENERGY STAR<sup>®</sup> Program. W.C. Wood also recommended that in addition to “automatic defrost” type freezers, “manual defrost chest” freezers and “manual defrost upright” freezers should be included in a proposed rulemaking. W.C. Wood further commented that in some models and sizes, the electrical savings of manual defrost type freezers are equal to or greater than those available from the automatic defrost type freezers (W.C. Wood, No. 4).

ACEEE commented that a 20-30 percent increase in residential refrigerator efficiency is possible, as opposed to the 10 percent improvement used in DOE’s analysis, and would result in savings of 2.8-4.2 quads. Thus, ACEEE recommended that DOE pursue a new rulemaking on residential refrigerators in the next few years (ACEEE, No. 39).

## **5.7 Residential Furnaces and Boilers**

The estimated cumulative (2008-2030) energy savings potential for residential furnaces and boilers is 1.8-15.1 quads.<sup>65</sup> A rulemaking for these products was initiated in 2001. ACEEE commented that it supports the current rulemaking on residential furnaces. ACEEE further commented that the DOE analysis should include improved efficiency of furnace fans. ACEEE estimates that the use of high-efficiency variable speed motors in furnace blowers can save 2.8 quads of energy (ACEEE, No. 39). The Department notes that in the course of the residential furnaces and boilers rulemaking analysis it will assess the impact of design options on electricity use as well as AFUE, and will seek comment on whether to regulate electricity use.

## **5.8 Commercial Boilers**

ACEEE recommended that DOE adopt the ASHRAE 90.1-1999 standard for steam boilers but that nothing be done for hot water boilers at this time. ACEEE commented that the ASHRAE standard represents a three percent efficiency increase for steam

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<sup>64</sup> Source: Appendix B, Data Sheets for Existing Products.

<sup>65</sup> Source: Appendix B, Data Sheets for Existing Products.

boilers over the current EPart standard. For hot water boilers, the ASHRAE standard represents little change from the current EPart standard. ACEEE further commented that if DOE were to adopt the ASHRAE standard, it would not be able to act again unless and until ASHRAE develops another set of new efficiency standards, an undertaking ASHRAE has shown little interest in (ACEEE, No. 39).

The Department proposes to move commercial oil and gas-fired packaged boilers, from medium to high priority for a standards rulemaking. The Department will also reassess the energy savings potential and reconsider adoption of ASHRAE 90.1-1999.

## **5.9 Commercial Laundry**

The estimated cumulative (2008-2030) energy savings potentials for commercial clothes dryers (gas) and commercial clothes washers are 0.40-0.81 quads and 0.26-0.72 quads respectively.<sup>66</sup> These products were not selected for further consideration for regulatory activity, primarily because they did not meet the one-quad criterion. However, Alliance Laundry Systems (ALS), AHAM, and the Multi-Housing Laundry Association (MLA) provided comments regarding commercial washers and dryers. Their comments are summarized in the following sections.

MLA commented that washers and dryers in common-area laundry rooms in residential buildings (i.e., coin-operated laundry) should be included in the existing program for residential laundry machines and that “nationwide uniformity” should be added to the list of criteria for including new products in an energy efficiency program (MLA, No. 29). MLA commented that coin-operated laundry machines generally fall within the definition applied to residential clothes washers and dryers and that these machines are used directly by consumers, not businesses. MLA suggested that only an interpretive ruling stating that the existing standard applies to coin-operated laundry machines is needed (MLA, No. 29).

MLA further commented that manufactures and suppliers at present face the prospect of having to comply with State regulations that are different from any Federal standard (i.e., Texas and California). According to MLA, machines in common-area laundry rooms are approximately three percent of all 7.5 million washers and dryers manufactured each year. MLA commented that manufactures would find it either very inefficient economically or in practice unfeasible to produce one set of machines for the residential market and then several thousand other machines to meet any one State’s energy efficiency standard (MLA, No. 29).

ALS and Maytag commented that they support expansion of the Energy Conservation Program to include commercial clothes washers (ALS, No. 9 and 37; Maytag, No. 18). ALS commented that a Federal energy efficiency standard for commercial clothes

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<sup>66</sup> Source: Appendix C, Data Sheets for New Products.

washers is needed to preempt State regulations that have been adopted (i.e., California, February 6, 2002) or are being considered (i.e., Maryland, with legislation introduced into its Senate on February 1, 2002) (ALS, No. 9 and 37).

Maytag, AHAM, and ALS commented that the existing definition of clothes washers in NAECA should be interpreted to include “commercial” units (Maytag, No. 18; AHAM, No. 10; ALS, No. 9). AHAM noted that commercial/residential-style clothes washers are products that are essentially the same as residential clothes washers, and therefore DOE should use its discretion to extend coverage of NAECA to these commercial products. Maytag added that commercial clothes washers should be included under the existing energy efficiency standards required for residential clothes washers since commercial clothes washers are “distributed in commerce for personal use or consumption by individuals” (42 U.S.C. 6291. Sec. 321(1)(B), (Maytag, No. 18). Maytag noted that, earlier in the year, DOE recognized the similarities between residential and commercial clothes washers by allowing commercial units to carry the ENERGY STAR<sup>®</sup> label.(Maytag, No. 18).

While supporting the inclusion of commercial washers into the standards program, ALS commented that any proposed commercial clothes washer standard must be set at  $MEF=1.15 \text{ ft}^3/\text{kWh}/\text{cycle}$ , and not at the consumer home-style washer standard of  $MEF = 1.26$  ” (ALS, No. 9).

EI and Maytag provided comments regarding the test procedure for commercial clothes washers. EI commented that there are too many issues with test procedures and baseline efficiency parameters to warrant setting a standard for commercial clothes washers (EI, No. 16). On the other hand, Maytag commented that the same test procedure that is used for residential units could also be used for commercial units (Maytag, No. 18).

ALS and AHAM commented that the Department should not add commercial clothes dryers to the Energy Conservation Program (ALS, No. 9; AHAM, No. 10). ALS further commented that it bases its recommendation on the recognition in previous Department rulemakings that more substantial impact on the energy from laundering can be made through increasing spin extraction speeds of the clothes washer (ALS, No. 9). AHAM similarly commented, adding that since residential dryers are not subject to new standards, it will provide very little energy benefit to apply existing standards to commercial clothes dryers (AHAM, No. 10). ALS further commented that no states have initiated any energy efficiency rulemakings for commercial clothes dryers at this time (ALS, No. 9).

The Department intends to investigate, in a context other than this priority setting activity, the possibility of covering residential-style commercial clothes washers under existing requirements for residential washing machines.

## 5.10 Oil Unit Heaters

The estimated cumulative (2008-2030) energy savings potential for oil unit heaters is 0.01 quads.<sup>67</sup> Oil unit heaters were not selected for further consideration primarily because of their low energy savings potential.

Similar to its comments for gas unit heaters and gas duct furnaces, EEI commented that the Department should not set standards for oil unit heaters because they fall under ASHRAE 90.1-1999 standards. EEI believes that the Department should work with ASHRAE to change the efficiency levels of this equipment (EEI, No. 16). EEI also commented that peak load impact should refer to natural gas/petroleum peak demand, not electricity (EEI, No. 16).

## 5.11 Exit Signs

The estimated cumulative (2008-2030) energy savings potential for exit signs is 0.06-0.41 quads.<sup>68</sup> This product category was not selected for further consideration, primarily because of its low energy savings potential. Comments received regarding this product are summarized in the following paragraph.

EEI commented that the best available technology, in terms of energy efficiency, should be an (LED) exit sign that meets all applicable codes. EEI commented that the Department should not use electro luminescent or photo luminescent exit signs, as they do not meet current fire and safety codes, especially with regards to visibility (citing January 1994 National Lighting Product Information Program (NLPPI) Specifier Report) (EEI, No. 16).

## 5.12 Traffic Signals

The estimated cumulative (2008-2030) energy savings potential for traffic signals is 0.3-0.6 quads.<sup>69</sup> This product category was not selected for further consideration primarily because of its low to moderate energy savings potential and the strong market-based demand for (more efficient) LED traffic signals.

EEI provided two comments regarding the energy savings estimates for traffic signals (EEI, No. 16):

1. Variations in the physical size of traffic lights lead to variations in wattage of the lighting system (e.g., 9-inch disc versus 12-inch disc).
2. Ambient temperature impacts the energy usage of LED traffic lights. The

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<sup>67</sup> Source: Appendix C, Data Sheets for New Products.

<sup>68</sup> Source: Appendix C, Data Sheets for New Products.

<sup>69</sup> Source: Appendix C, Data Sheets for New Products.

California Energy Commission’s proposed standard sets different levels for 25°C and 74°C.

EEI also commented that the peak load impact estimates should be reevaluated. EEI added that the CEC uses a 34 percent coincident demand factor (EEI, No. 16).

### **5.13 Dehumidifiers**

The estimated cumulative (2008-2030) energy savings potential for dehumidifiers is 0.19-0.53 quads.<sup>70</sup> This product category was not selected for further consideration primarily because of its low to moderate energy savings potential.

AHAM commented that the ENERGY STAR<sup>®</sup> Program for dehumidifiers should be sufficient for dehumidifiers considering their modest energy use (AHAM, No. 10). EEI commented that seasonal usage patterns should be taken into account for determining impact on peak demand. High correlation may occur in summer, but little or no correlation occurs in the winter (EEI, No. 16).

### **5.14 Copy Machines**

The estimated cumulative (2008-2030) energy savings potential for copy machines equals 0.1-0.7 quads in the commercial sector and 0.08-0.11 quads in the residential sector.<sup>71</sup> This product category was not selected for further, primarily because of its low energy savings potential.

EEI commented that the analysis for copiers should focus on the “active” mode. EEI does not agree that energy savings depends on the technical abilities to lower “sleep power” as it likely constitutes only 10.5 percent of the total energy usage (EEI, No. 16). Regarding the test procedure, EEI commented that the procedure should measure energy usage in all modes (e.g., active, standby, sleep and off) with appropriate weighting factors for each (EEI, No. 16). Finally, EEI agreed with using total annual energy usage as the metric rather than watts for particular modes (EEI, No. 16).

### **5.15 Fax Machines**

The estimated cumulative (2008-2030) energy savings potential for fax machines is 0.12-0.24 quads in the commercial sector and 0.04-0.07 quads in the residential sector.<sup>72</sup> This product category was not selected for further consideration primarily because of its low energy savings potential.

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<sup>70</sup> Source: Appendix C, Data Sheets for New Products.

<sup>71</sup> Source: Appendix C, Data Sheets for New Products.

<sup>72</sup> Source: Appendix C, Data Sheets for New Products.

EEI commented that fax machines may not meet NAECA's 100 kWh per year annual energy consumption criterion (EEI, No. 16). Furthermore, EEI commented that if fax machines are becoming an obsolete technology, it does not make sense for the Department to create standards (EEI, No. 16). Similar to its comments for desktop computers, EEI stated that there is an incorrect focus on standby energy usage and that best available products may be "de-featured" products (EEI, No. 16).

### **5.16 Laser Printers**

The estimated cumulative (2008-2030) energy savings potential for laser printers is 0.2-0.5 quads in the commercial sector and 0.0 quads in the residential sector.<sup>73</sup> This product category was not selected for further consideration, primarily because of its low energy savings potential.

EEI commented that laser printers for the residential sector may not be subject to standards according to NAECA because the unit energy consumption is less than the criteria of 100 kWh per year. EEI further commented that only laser printers in the commercial sector use more than 100 kWh per year (EEI, No. 16). EEI also commented that the analysis of commercial laser printers should account for the different usage patterns between a desktop and networked printer (EEI, No. 16). Finally, EEI commented that, like copiers, laser printers are likely to have multiple "standby" modes (EEI, No. 16).

### **5.17 Low-End Servers, Commercial**

The estimated cumulative (2008-2030) energy savings potential for low-end commercial servers equals 0.19 to 0.92 quads.<sup>74</sup> This product category was not selected for further consideration primarily because of its low energy savings potential and the rapid evolution of low-end server products. Comments received regarding this product are summarized in the following paragraph.

EEI commented that the amount of time in "sleep" mode for low-end commercial servers is probably very small. Therefore, the 90 percent energy savings shown for the best available unit may be overstated (EEI, No. 16). EEI further commented that if power management systems affect server performance, they will not likely be accepted in the marketplace (EEI, No. 16).

### **5.18 Wine Chillers**

Although wine chillers were not on the list of potential new products under consideration, one comment was received regarding this product. CEC commented that

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<sup>73</sup> Source: Appendix C, Data Sheets for New Products.

<sup>74</sup> Source: Appendix C, Data Sheets for New Products.

the Department should publish the proposed rule that would change the wording of the Code of Federal Regulations to make it clear that wine chillers are exempt products under federal regulation. CEC commented that this ruling is needed to clear the question of federal preemption of state standards for wine chillers (CEC, 38).

### **5.19 Power Supplies and Battery Chargers**

The product categories of external power supplies and battery chargers were not on the list of potential new products for consideration for regulation but were raised for consideration at the November 26, 2001, meeting. ACEEE, EEI, and Southern Company thereafter provided comments on these products.

ACEEE commented that DOE should add external power supplies and battery chargers to its analysis. ACEEE commented that both have relatively high standby energy use and thus provide opportunities for significant energy savings. ACEEE estimates that the average household has 3-5 of these devices and that standards can reduce the standby power of these products by at least 3 watts (from an average of about 4.5 watts to an average of 1-1.5 watts), resulting in 1.6-2.8 quads of cumulative energy savings. In summary, ACEEE recommended that the Department conduct rulemaking activity on external power supplies and battery chargers as a priority at this time (ACEEE, No. 39).

On the other hand, Southern Company commented that the Department does not have authority to regulate power supplies and battery chargers because they do not meet the NAECA criterion of unit energy consumption of 100 kWh per year, and EEI asserted that stand alone battery chargers likely fail to meet this criterion (EEI, No. 16; SC, No. 17). The 100 kWh criterion, however, does not apply to energy consumption by a unit of a product per household, but rather applies to consumption by a product per household (i.e., by all units in a household). Southern Company added that it seems incorrect to interpret the law to lump these products into one group that would meet the 100 kWh criterion (SC, No. 17). EEI commented that external power supplies and many battery chargers are appliance components, and that energy efficiency standards should not be set for such products without regard for the appliance system of which they are part, as this could result in increased energy usage by the system (EEI, No. 16).

### **5.20 Video Cassette Recorders**

VCRs, with an installed base of 129 million units (1998) and annual shipments of 24 million units (2000), consumed 0.10 quads of energy in 1998. The identified technologies considered for energy efficiency standards are: (1) the new ENERGY STAR<sup>®</sup> compliant level (2 W standby) and (2) a 1 W standby level (proposed 2003

ENERGY STAR<sup>®</sup> level). Using these two levels as standards, the potential cumulative (2008-2030) energy savings are 0.25 quads and 0.38 quads, respectively.<sup>75</sup>

Currently, 45 VCRs in the market meet ENERGY STAR<sup>®</sup> standards (i.e., the ENERGY STAR<sup>®</sup> website lists 45 models by eight different manufacturers, available as of September 1, 2001). A test procedure does not exist for VCRs, but future revisions of the “ENERGY STAR<sup>®</sup> Program Requirements” will include test procedures that call for the use of a power meter to measure VCR power draw in standby mode. However, this test procedure would have a low correlation with VCR energy consumption as standby mode accounts for only about 35 percent of VCR annual energy consumption. Accordingly, EEI commented that the energy conservation impact of reducing “standby” energy usage would be minimal and may prevent important innovations (EEI, No. 16). EEI added that the “best available” products (i.e., low standby power) might not have the features necessary for market appeal (EEI, No. 16). As for product peak load impact, the degree of correlation for VCRs is unknown because it depends upon the distribution of VCR operational mode during peak power demand periods which cannot be readily determined.

Given the low energy savings potential (0.25 – 0.38 quads) and the general issues of product life-time relative to the rulemaking cycle, rapid evolution of features, and the potential for a “de-featured” product, DOE does not plan to take actions for VCRs at this time other than support for ENERGY STAR<sup>®</sup> levels that include standby energy.

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<sup>75</sup> Source: Appendix A, TSD.

## 6 Summary of Proposed Actions

A summary of the proposed actions for each currently regulated product considered is given in Table 6-1.

For each product under consideration the Department is proposing one or more of the following future actions:

- Changing the priority of standards and test procedures;
- Conducting additional analysis;
- Supporting ENERGY STAR<sup>®76</sup> and other voluntary efforts;
- Exploring research opportunities

**Table 6-1: Summary of Proposed Actions for Currently Regulated Products under Consideration**

Product	Energy Savings (Quads)	Proposed Action
Dishwashers	0.40 – 1.4	<ul style="list-style-type: none"> <li>• High priority test procedure</li> <li>• Move from low to medium rulemaking priority for standards</li> </ul>
Fluorescent Lamps	0.14 – 0.47	<ul style="list-style-type: none"> <li>• Maintain low priority for standards</li> <li>• Conduct additional analysis                             <ul style="list-style-type: none"> <li>• Explore research opportunities</li> </ul> </li> </ul>
High Intensity Discharge Lamps	1.4	<ul style="list-style-type: none"> <li>• High priority for standards determination</li> </ul>
Residential Clothes Dryers	0.06 – 3.8	<ul style="list-style-type: none"> <li>• Low priority for standards</li> </ul>
Incandescent General Service Lamps	0.8 – 8.52	<ul style="list-style-type: none"> <li>• Low priority for standards</li> <li>• Support voluntary efforts encouraging CFL and Halogen</li> <li>• Explore research opportunities</li> </ul>
Incandescent Reflector Lamps	0.19 – 3.7	<ul style="list-style-type: none"> <li>• Assess possibility of classifying as a “covered product” for 2 currently exempt lamps (e.g., BR and ER)</li> </ul>

*Dishwashers:* The Department estimates the potential cumulative (2008-2030) energy savings from new dishwasher standards between 0.40 and 1.4 quads. Before these savings can be obtained, however, a revised test procedure is needed to properly reflect the energy consumption of products that use adaptive control technologies. Consequently, the Department considers the development of new dishwashers test procedures a high priority. Furthermore, given the relatively high-energy savings

<sup>76</sup> DOE and EPA jointly administer the ENERGY STAR<sup>®</sup> program, and the DOE supports all products in the program. The “Support ENERGY STAR<sup>®</sup>” comment is intended to signify products for which the ENERGY STAR<sup>®</sup> program offers greater energy savings potential; its absence is not intended to signify exclusion of certain products

potential of new standards, the Department proposes to move dishwashers from low to medium priority for standards.

*Fluorescent lamps* are subjects of numerous mandatory and voluntary initiatives including the ENERGY STAR<sup>®</sup> program, ASHRAE 90.1 building energy efficiency standards, the FEMP Federal Relighting Initiative, and utility DSM programs. Furthermore, new ballast standards, which go into effect in 2005, are expected to accelerate to market shift to T8 lamp technology. Given the rapidly changing lamp market, the Department proposes to maintain fluorescent lamps in the low priority category for standards development. However, given the large energy savings potential resulting from even a small efficiency improvement, the Department will conduct additional analysis.

*High Intensity Discharge Lamps:* Due to the potential, yet uncertain, energy savings, for this product, the Department considers HID lamps a high priority (determination) product.

*Residential Clothes Dryers:* The Department's analysis indicates that the Clothes Dryer design options with large potential energy savings (i.e., heat pump and microwave electric dryers) are not yet commercially viable. Also limiting the potential benefits of a new standard is the expectation that the new descriptor for clothes washer efficiency, (Modified Energy Factor or MEF), will lead to more washer designs that strive to reduce the remaining moisture content of clothes. In conclusion, given the low energy savings potential identified DOE considers residential clothes dryers a low priority product for both standards and test procedures and is not considering further actions at this time.

*Incandescent General Service Lamps (A-type):* At this time, DOE considers development of new standards for incandescent general service lamps a low priority because the more efficient technologies do not appear to be economically viable for this very mature technology. Support for voluntary programs encouraging CFL or halogen substitution will continue and the Department will explore research opportunities to reduce the cost of halogen alternatives (e.g., IR coatings).

*Incandescent Reflector Lamps:* The Energy Policy Act of 1992 established minimum average lamp efficacy standards (lumens per watt) for many incandescent reflector lamps, although BR, ER and some PAR and R lamps remain exempt. The Department estimates that the potential energy savings from both regulated and unregulated lamps are large. The Department will assess whether to classify currently exempt incandescent reflector lamps as covered products under EPCA. If these lamps become covered products then the Department will consider moving all incandescent reflector lamps from low to high priority for standards.

Incorporating the proposed actions just described for new products, Table 6.2 presents the appliance standards programs' revised priorities for standards and determinations.

**Table 6-2: Revised Priorities-Standards and Determination**

High	Medium
Residential Central AC/HP	Dishwashers
Distribution Transformers	Central AC/HP, three-phase <65 kBtu
Residential Furnaces and Boilers	
HID (Determination) #	
Small Electric Motors (Determination)	
Central AC/HP, 65-240kBtu	
Oil- and Gas-Fired Commercial Packaged Boilers #	
Tankless Gas-Fired Instantaneous Water Heaters#	
Packaged Terminal AC/HP	

#Indicates change in priority status compared to 2001 priority

Comparing table 6-2 with table 1-6 illustrates the change in priorities since the 2001 priority setting. The Small Electric Motors determination process is continuing and remains a high priority.

The test procedure priorities are shown in table 6-3. These are unchanged from the 2002 priorities shown in table 1-17.

**Table 6-3: Revised Priorities – Test Procedures**

High	Medium
Dishwashers	Compact Refrigerators
Residential Central AC/HP	Ductless Split Central AC/HP
Commercial A/C and Heat Pumps	
Commercial Furnaces	
Commercial Water Heaters	

A summary of the recommended actions for each new product considered is given in Table 6-4.

**Table 6-4: Summary of Proposed Actions for New Products under Consideration**

	<b>Product</b>	<b>Energy Savings (Quads)</b>	<b>Recommended Actions</b>
<b>Consumer Products</b>	Torchieres	(0.83 – 1.7)	<ul style="list-style-type: none"> <li>Assess possibility of classifying as “covered product”</li> <li>Support ENERGY STAR®</li> </ul>
	Ceiling Fans (excluding lighting) (including lighting)	(0.47 – 1.6) (4.17 – 5.3)	<ul style="list-style-type: none"> <li>Assess possibility of classifying as “covered product”</li> <li>Support ENERGY STAR®</li> </ul>
<b>Commercial Heating</b>	Gas Unit Heaters and Gas Duct Furnances	(0.72 – 1.6)	<ul style="list-style-type: none"> <li>No further action at this time”</li> </ul>
<b>Commercial Refrigeration</b>	Walk-in Coolers, Freezers, and Combinations	(0.35 – 0.37)	<ul style="list-style-type: none"> <li>No further actions at this time</li> </ul>
	Supermarket Refrigeration Systems	(0.39– 0.44)	
	Water Coolers	(0.24 – 0.26)	
	Ice Machines	(0.0 – 0.31)	
	Reach-in Freezers and Reach-in Refrigerators	(0.09 – 1.16)	<ul style="list-style-type: none"> <li>Assess possibility of classifying as “covered product”</li> </ul>
	Vending Machines and Beverage Merchandisers	(1.0 – 1.43)	<ul style="list-style-type: none"> <li>Assess possibility of classifying as “covered product”</li> </ul>
<b>Consumer Electronics</b>	RACK / Component Stereo Audio	(0.10 – 0.27)	<ul style="list-style-type: none"> <li>Support ENERGY STAR®</li> </ul>
	Compact Audio	(0.49 – 0.60)	
	Monitors	(.76 – 4.44)	
	Desktop PC	(0.27 – 4.15)	
	Televisions	(1.1 – 1.7)	
	Set-Top Boxes	(0.47 – 1.55)	

*Torchieres:* The Department found that substantial energy savings could be achieved through wider use of torchieres that are more energy efficient than those which now predominate in the marketplace. EPCA currently prescribes no efficiency requirements for torchieres, and therefore DOE intends to assess whether to classify them as “covered products” under Section 322 of the statute. If they are classified as covered products, the Department will then review and decide what if any action to take with respect to adoption of test procedures and energy conservation standards. DOE plans to support energy efficiency for torchieres through ENERGY STAR<sup>®</sup> initiatives.

*Ceiling Fans:* Based on the potential for high energy savings from use of more efficient ceiling fans, DOE plans to consider the development of efficiency requirements for this product. Since EPCA currently prescribes no efficiency requirements for ceiling fans, as with torchieres, DOE intends to assess whether to classify them as “covered products” under Section 322 of the statute. If they are classified as covered products, the Department will then review and decide what if any further action to take DOE plans to support energy efficiency for torchieres through ENERGY STAR<sup>®</sup> initiatives.

*Gas Unit Heaters and Gas Duct Furnace:* The Department believes that substantial energy savings could be achieved through wider use of gas unit heaters and duct furnaces that are more energy efficient than those which now predominate in the marketplace. Also, it might be beneficial to develop a test procedure for these products that take into account seasonal efficiency. Since EPCA prescribes no efficiency requirements for these products, DOE does not plan to take any further action for these products at this time.<sup>77</sup>

*Walk-in Coolers, Freezers, and Combinations; Supermarket Refrigeration Systems; Water Coolers; and Ice Machines:* The Department analyzed and received comments on several additional types of commercial refrigeration equipment. Given their low energy savings potential, the Department does not plan to take any further actions for these products at this time.

*Reach-in Refrigerators and Reach-in Freezers; Vending Machines and Beverage Merchandisers:* The Department believes that substantial energy savings could be achieved through wider use of more efficient commercial refrigeration equipment of these types. Since EPCA prescribes no efficiency requirements for these products, DOE intends to examine covering them under the statute. If they are classified as covered, DOE would then review and decide what if any further action to take.

*Consumer Electronics:* Most consumer products present significant issues such as their product life-time relative to the rulemaking cycle and rapid evolution of features. Given

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<sup>77</sup> Proposed legislation pending in the Congress would amend EPCA to authorize the Department to treat commercial products as “covered products” under Section 322 of EPCA, and to specifically include commercial unit heaters and certain commercial refrigeration equipment among the products covered by the statute. If such legislation is adopted, we would re-assess what action to take concerning these products.

consideration of these concerns, the Department does not plan to take any further action for these products at this time. Instead, DOE plans to support energy efficiency for consumer electronics products through ENERGY STAR<sup>®</sup> initiatives. This includes pursuing development actions to support more user-friendly ENERGY STAR<sup>®</sup> power management interfaces for office equipment. ENERGY STAR<sup>®</sup> already has consensus-based efficiency levels tailored to each consumer electronics product, as well as widespread industry participation for most products.

## References

The commentators are listed in order of receipt by the Department and as numerically labeled by the Department. Numbers (1,2, 11, 12, and 13) were not assigned to a comment. Number (34) was the same as number (14).

Energy Market & Policy Analysis, Inc. (EMPA, No. 3). Glenn R. Schleede. September 11, 2001.

W.C. Wood Company Limited (W.C. Wood, No. 4) . David M. Scheach. September 14, 2001.

Edison Electric Institute (EEI, No. 5). Steve Rosenstock, P.E. October 9, 2001.

Southern Company (SC, No. 6). Donald M. Brundage, P.E. October 10, 2001.

Gary Shaver (Shaver, No. 7). October 11, 2001.

Competitive Enterprise Institute (CEI, No. 8). Ben Lieberman. October 11, 2001.

Alliance Laundry Systems LLC (ALL, No. 9). Phil Manthei. October 15, 2001.

Association of Home Appliance Manufacturers (AHAM, No. 10). Charles A. Samuels. October 29, 2001.

Controlled Energy Corporation (California Energy Commission, No. 14). Mary Moffroid. November 12, 2001.

Energy Market & Policy Analysis, Inc. (EMPA, No. 15). Glenn R. Schleede. November 20, 2001.

Edison Electric Institute (EEI, No. 16). Steve Rosenstock, P.E. November 30, 2001.

Southern Company (SC, No. 17). Donald M. Brundage, P.E. December 4, 2001.

Maytag Corporation (Maytag, No. 18). Ron Fey. December 5, 2001.

Women Involved in Farm Economics (WIFE, No. 19). Sheila Massey. December 5, 2001.

National Electrical Manufacturers Association (NEMA, No. 20). Edward Gray. December 5, 2001.

Sony Electronics Incorporated (Sony, No. 21). David L. Traver. December 5, 2001.

National Association of Farmer Elected Committees (NAFEC, No. 22). Paul Clark. December 4, 2001.

Electric Consumers Alliance (ECA, No. 23). Robert K. Johnson. December 5, 2001.

Competitive Enterprise Institute (CEI, No. 24). Ben Lieberman. December 5, 2001.

Energy Market & Policy Analysis, Inc. (EMPA, No. 25). Glenn R. Schleede. December 6, 2001.

First Company (FC, No. 26). James H. Nation. December 6, 2001.

Small Business Survival Committee (SBSC, No. 27). Karen Kerrigan. December 5, 2001.

Consumer Electronics Association (CEA, No. 28). Douglas Johnson. December 6, 2001.

Multi-Housing Laundry Association (MLA, No. 29). David Field. December 7, 2001.

Information Technology Industry Council (ITI, No. 30). Ken J. Salaets. December 6, 2001.

Dominion Virginia Power (DVP, No. 31). Harold Crowder. December 6, 2001.

Bose Corporation (Bose, No. 32). Joseph L. Veranth. December 5, 2001.

Edison Electric Institute (EEI, No. 33). Steve Rosenstock, P.E. December 19, 2001.

American Corn Growers Association (ACGA, No. 35). Larry Mitchell. December 4, 2001.

Air-Conditioning & Refrigeration Institute (ARI, No. 36). Deborah E. Miller. January 22, 2002.

Alliance Laundry Systems LLC (ALL, No. 37). Phil Manthei. February 15, 2002.

California Energy Commission (CEC, No. 38). R. Michael Martin. October 16, 2001.

American Council for an Energy-Efficiency Economy (ACEEE, No. 39). Steven Nadel. November 30, 2001.