

# **ENERGY STAR Refrigerator/Freezer Program Expansion Rationale**

**The combination of interest from industry and the potential for additional national energy savings prompted the Department to consider expanding the ENERGY STAR criteria for refrigerators, refrigerator-freezers, and freezers.**

**The process to date for considering the expansion of this program has included:**

- **Ongoing partner feedback prior to 2002;**
- **Informal audits of partners about proposed expansions in the first half of 2002;**
- **Research and analysis of proposed criteria expansion in May, June and July 2002;**
- **A formal stakeholder letter and request for comments on June 7, 2002;**
- **A public stakeholder meeting on July 18, 2002;**
- **Additional research and analysis, and publication of same, in July 2002, per stakeholder request;**
- **Request for final stakeholder comments by August 30, 2002, with an expected announcement of final Department decisions in early Q4 2002**

**The proposed ENERGY STAR criteria expansion (see below and attached) includes all sizes and configurations of residential refrigerators, refrigerator-freezers, and freezers meeting specific efficiency levels. The primary areas of contention in the proceedings have included concerns about the cost-effectiveness and value of extending the ENERGY STAR label to compact units, and to the efficiency levels for the new proposed categories. The proposed criteria reflect both stakeholder feedback and the Department's ENERGY STAR program objectives. Information and reports on this process can be found at <http://www.energystar.gov/opie/meetings/old/reffre71802/index.html>.**

## **Program Objectives**

**The Department was directed in Section 127 of the Energy Policy Act of 1992 to promote the development and commercialization of energy-efficient appliances. It was directed to establish voluntary programs to promote products more efficient than required by State or Federal codes. In 2001, the National Energy Policy Development Group recommended the Department extend the ENERGY STAR labeling program to additional products, appliances, and services. During the past decade, the ENERGY STAR program has achieved significant gains.**

**The Department needed to consider whether expanding the ENERGY STAR criteria to include additional sizes and configurations of residential refrigerators, refrigerator-freezers, and freezers would help the objectives of the ENERGY STAR Program. If so, what criteria should be established and when?**

**The proposed expansions are designed to extend ENERGY STAR criteria to all types of refrigerators and freezers regardless of size or defrost type. This will help streamline the management of the ENERGY STAR program for the Department, address recurring**

**stakeholder requests for expansion of ENERGY STAR, as well as increase the annual national energy savings attributed to this program.**

**The Department held a public meeting on July 18, 2002, which provided a formal venue for discussion of the relevant issues related to the proposed criteria expansions. This meeting, combined with the additional process events noted above, provided the Department with the necessary context to propose specific ENERGY STAR criteria levels for the new categories that meet the Department's program objectives.**

**Extending the 10% level below the National Appliance Energy Conservation Act (NAECA) to freezers and previously ineligible refrigerators (excluding compacts) has been broadly supported by industry. Contrastingly, the suggested 20% below the NAECA level for compact refrigerators resulted in debate. Some manufacturers claim the 20% level is too strict, while others view the 20% level as an opportunity to push the market toward more efficient products. Because of the discussion on compacts, as well as the demand for explanatory information on other areas of the proposed specification, a few items were outlined for further research. A summary of the research and resulting decisions are below.**

## **Specification Options**

### **Freezers (Residential): Standard-Size**

**Since no manufacturers were making equipment better than the NAECA level at the time of the initial analysis, no data was available to evaluate various schemes of performance. An estimate was generated using the weighted average volumes of freezers and estimates of energy savings for the proposed 10% level.**

**The analysis below forecasts an aggregate annual energy savings of 13.6 GWh/year. These savings are a good contribution to the current aggregate energy savings for the entire refrigerator program. The original report is available at <http://www.energystar.gov/opie/meetings/old/reffre71802/index.html>.**

## Freezers Energy Consumption

	Type of Freezer			Weighted Averages/ Totals
	Upright w/manual defrost	Upright w/automatic defrost	Chest	
<b>Current federal maximum annual energy consumption (10 CFR 430C1997, kWh/yr)*</b>	<b>417</b>	<b>587</b>	<b>351</b>	<b>472</b>
<b>ENERGY STAR Proposed maximum, annual energy Consumption (kWh/yr, 10% &lt; current federal maximum)*</b>	<b>375</b>	<b>528</b>	<b>316</b>	<b>406</b>
<b>Estimated Annual ENERGY STAR labeled Freezer Shipments, 10% market penetration</b>	<b>117,800</b>	<b>42,700</b>	<b>46,300</b>	<b>206,800</b>
<b>Aggregate Annual National Energy Savings with ENERGY STAR labeled Freezers (GWh/yr)</b>	<b>4.9</b>	<b>2.5</b>	<b>1.6</b>	<b>13.6</b>

\*The freezer chart compares units that have an adjusted volume of 21 cubic feet.

### Refrigerators, Refrigerator-Freezers and Freezers (Residential): Compact

The California Energy Commission (CEC) database was used since it is the most extensive electronic database of eligible models. The Association of Home Appliance Manufacturers (AHAM) collects model information from their members, but most compact manufacturers are not AHAM members. The Federal Trade Commission (FTC) collects the energy data from all models sold in the United States, but that information is not available electronically. The CEC database currently contains 228 refrigerator and refrigerator-freezers models having a volume less than 7.75 cubic feet and would therefore be considered compacts.

Assuming expansion to a criterion of 20% more efficient than NAECA, 10 models would currently qualify for the ENERGY STAR label. This provides counterweight to the argument that the technology to achieve a 20% savings over the Federal standard is not readily available. These 10 models are all refrigerator-only models, with six being manual defrost and four being automatic defrost. At a 15% level, 33 models would qualify. If the

criteria were set at a 10% level, 47 units would qualify. At the lower levels, there is less opportunity for differentiation. More importantly, the aggregate energy savings are less compelling at any level less than 20%, and energy savings was another concern of those criticizing the expansion of the ENERGY STAR criteria to cover compacts.

Below is a table showing the potential energy savings of the proposed 20% better than standard efficiency level for the ENERGY STAR compact refrigerator program.

<b>Compacts Energy Consumption</b>			
	<b>Type of Refrigerator/Refrigerator-Freezer</b>		<b>Weighted Averages/Totals</b>
	<b>Manual Defrost</b>	<b>Automatic Defrost</b>	
<b>Current federal maximum annual energy consumption (10 CFR 430C1997, kWh/yr)*</b>	<b>351</b>	<b>416</b>	<b>358</b>
<b>ENERGY STAR Proposed maximum, annual energy Consumption (kWh/yr, 20% &lt; current federal maximum)*</b>	<b>281</b>	<b>333</b>	<b>286</b>
<b>Estimated Annual ENERGY STAR labeled Compact Shipments, 10% market penetration</b>	<b>216,900</b>	<b>24,100</b>	<b>241,000</b>
<b>Aggregate Annual National Energy Savings with ENERGY STAR labeled Freezers (GWh/yr)</b>	<b>15.2</b>	<b>2.0</b>	<b>17.4</b>

\*The compact chart compares refrigerators that have a fresh volume of 4.0 cubic feet, a freezer volume of 0.5 cubic feet for an adjusted volume of 4.815 cubic feet.

#### **Additional Refrigerators, Refrigerator-Freezers, and Freezers: Standard-Size**

The Department found shipment data for these categories of refrigerators are available to the public in aggregate form only, and a breakdown of shipment data by size and configuration was not available without significant cost or, alternatively, voluntary disclosure of data by manufacturers. Therefore, a good estimate of the aggregate energy savings and shipment numbers for the standard-size refrigerators not currently covered by ENERGY STAR (i.e. 7.75-12.5 ft<sup>3</sup> top freezer; 7.75-18.5 ft<sup>3</sup> bottom freezer & side by side) was difficult.

**Industry sources including AHAM, NPD, and Lawrence Berkeley National Laboratory, all provided information in aggregate, but did not have shipment data segmented by size and configuration. For that reason, an estimate of 1.9 million units of mid-size refrigerator shipments was used for energy savings analysis. This estimate is based on an extrapolation of some limited shipment data from AHAM and the manufacturers. Using this shipment number, expanding the ENERGY STAR label to include the all standard-size refrigerators, refrigerator-freezers, and freezers was determined to provide about 8.7 GWh/year.**

**The California Energy Commission (CEC) database contains 61 models that are not compacts but are not included in current ENERGY STAR refrigerator categories. Of these, 36 would qualify for the 10% ENERGY STAR level. These 36 models include 14 single door refrigerators, 7 partial automatic refrigerator freezers, 5 internal freezer models, 8 top-freezer models between 7.75 cubic feet and 12.5 cubic feet, and 2 bottom-mount freezer models under 18.5 cubic feet. Only 7 of these would meet the 2004 ENERGY STAR level of 15% more efficient.**

### **Refrigerators, Refrigerator-Freezers, Freezers: Manual and Partial-Automatic Defrost**

**Again, the Department found shipment data for these categories of refrigerators are available to the public in aggregate form only, and a breakdown of shipment data by size and configuration was not available without significant cost or, alternatively, voluntary disclosure of data by manufacturers. Therefore, a good estimate of the aggregate energy savings and shipment numbers for the standard-size refrigerators that are not currently covered by ENERGY STAR (manual and partial-automatic defrost) was difficult. Anecdotal information indicates these categories are very unpopular in the United States giving them limited market share. Their contribution to the overall aggregate energy savings of the 10% less than federal maximum levels will be minimal.**

## **Decision and Rationale**

### **Freezers (Residential): Standard-Size**

**The proposed ENERGY STAR criteria includes all freezer categories ranging from products with a total volume greater than or equal to 7.75 ft<sup>3</sup> and products with a total volume less than or equal to 30 ft<sup>3</sup>, that exceed the NAECA minimum energy efficiency standards by 10%.**

**The 10% level is consistent with the current refrigerator specification, and although there were no eligible models as recently as a few months ago, freezer manufacturers have jointly confirmed that the proposed 10% level is reasonable. Moreover, freezer manufacturers have demonstrated an eagerness to begin making more efficient equipment for the marketplace. At the time of this report, manufacturers had already begun listing freezers at the proposed ENERGY STAR level of 10% below the NAECA maximum.**

**This expansion would increase the aggregate national energy savings attributed to the Department's ENERGY STAR program. It would also encourage industry to produce and differentiate new products based on energy-efficiency, utilizing ENERGY STAR to do so. It would also help consumers make decisions based on the ENERGY STAR label.**

**Based on manufacturer feedback and energy savings estimates from current shipments and anticipated efficiencies, a level of 10% below the current NAECA maximum was chosen. This efficiency level makes a good contribution to the current refrigerator specification's resultant savings, is consistent with the current ENERGY STAR refrigerator specification, and is a reasonable level to which to manufacture. With a 10% savings, the a qualifying ENERGY STAR freezer would save the average consumer 66 kWh/year or \$6 per year compared to a new non-qualifying model. For comparison, the ENERGY STAR refrigerator specification saves the average consumer 56 kWh/year or \$5.**

### **Refrigerators, Refrigerator-Freezers and Freezers (Residential): Compact**

**The proposed ENERGY STAR criteria includes all compact refrigerators, refrigerator-freezers, and freezers of total volume less than 7.75 ft<sup>3</sup> and 36 inches or less in height that exceed the NAECA minimum energy efficiency standards by 20%.**

**The specification for compacts was proposed at 20% more efficient (instead of 10%) for several reasons. The first reason is there are already efficient products on the market meeting the 20% level. This demonstrates the technology exists to meet this level and the market supports these products. Second, the majority of manufacturers agree this level will provide reasonable differentiation within the product category. Finally, per unit savings of a compact unit at 20% more efficient than the federal standard are equivalent to the savings of a full-size unit at 10% more efficient.**

**The compact category is the most controversial of the proposed new criteria categories. Larger refrigerator manufacturers claim the energy savings attributable to compacts are too insignificant to label and labeling compacts degrades the value of ENERGY STAR. Most compact manufacturers support the expansion to include compacts and favor the 20% level but some claim that the level is too restrictive. The 20% level creates the best balance. At this level, the compact refrigerator savings are actually greater than the standard refrigerator savings at 10%. Existing compacts meet the proposed 20% level and manufacturers have shown a willingness to produce them.**

**This expansion would increase the aggregate national energy savings attributed to the Department's ENERGY STAR program. It would also allow industry to differentiate existing products based on higher levels of energy-efficiency and encourage competitors to meet this new level of efficiency. It would also help consumers, including institutions such as universities, make decisions based on the ENERGY STAR label. With a 20% savings, the a qualifying ENERGY STAR freezer would save the average consumer 72 kWh/year or \$6 per year compared to a new non-qualifying model. Again for comparison, the ENERGY STAR refrigerator specification saves the average consumer 56 kWh/year or \$5.**

## **Additional Refrigerators and Refrigerator-Freezers (Residential): Standard-Size**

**The proposed ENERGY STAR criteria includes refrigerators and refrigerator-freezers of total volume greater than or equal to 7.75 ft<sup>3</sup> and total volume less than or equal to 39 ft<sup>3</sup> that exceed the NAECA minimum energy efficiency standards by 10%. The affected products would be all refrigerators between 7.75 ft<sup>3</sup> and 12.5 ft<sup>3</sup> (the current cut-off for top-mount freezer models); bottom-mount and side-by-side freezer models between 12.5 and 18.5 ft<sup>3</sup>; and single-door refrigerators and internal freezer models.**

**There is no compelling reason for these refrigerator types to not be included. They were not in the original specification only because the number of them was limited. The Department has since received requests from several manufacturers to add the missing products.**

**This market was difficult to characterize since manufacturers and their representative trade associations are reluctant to release shipment information based on size and configuration. Using estimates based on anecdotal shipment data, the energy savings contribution was determined to be beneficial to the ENERGY STAR refrigerator program and the manufacturers had no objection to adding these various, small categories. The energy level of 10% below the current NAECA maximums was determined to produce a good contribution of energy savings. It is also consistent with the current ENERGY STAR Refrigerator specification.**

**This expansion would increase the aggregate national energy savings attributed to the Department's ENERGY STAR program. It would allow all manufacturers of standard-size units in this product category to differentiate existing products based on higher levels of energy-efficiency. It would allow consumers to make decisions based on the ENERGY STAR label, while accommodating additional preference related to product size and configuration. In addition, it would streamline the management of this ENERGY STAR product category by applying one standard to all standard-size residential units. The savings for the new ENERGY STAR categories would depend on the size. For the smallest sized newly qualifying model the savings would only be 35 kWh/year or \$3, but for the largest sized newly qualifying model the savings would be 97 kWh/year or \$8 which is greater than the savings of all but two of the current ENERGY STAR refrigerators.**

## **Refrigerators, Refrigerator-Freezers, Freezers: Manual and Partial-Automatic Defrost**

**The proposed ENERGY STAR criteria include manual and partial-automatic defrost refrigerators, refrigerator-freezers, and freezers under the ENERGY STAR criteria for the respective product categories.**

**Manual and partial automatic defrost were originally not included because of limited supply and because a consumer who does not regularly defrost their refrigerator may not realize the same efficiency levels. However, manufacturers have asserted the efficiency change for a refrigerator with a frost build up is not significant, and the ENERGY STAR label has not considered consumer behavior post-purchase in previous decisions and should not apply**

**this criterion to this decision. Manufacturers stress the program is designed to encourage partners to make and sell more efficient product. They argue this can be achieved in the manual and partial automatic defrost category.**

**This expansion would primarily streamline the management of related ENERGY STAR product categories by applying one criterion to all residential units. It would increase the aggregate national energy savings attributed to the Department's ENERGY STAR program. It would allow all manufacturers of standard-size units in this product category to differentiate existing products based on higher levels of energy-efficiency. It would allow consumers to make decisions based on the ENERGY STAR label, while accommodating additional preference related to product size and configuration.**

## **Summary**

**The numbers shown in the table below demonstrate the relative savings of the various ENERGY STAR labeled appliances. Refrigerators are the leader among appliances. The addition of mid-size, compacts, and freezers will increase this number by about 7% or an estimated 40 GWh/year if the anticipated 10% market penetration is achieved. This additional 40 GWh/yr projected savings per year could supply electricity to 3,700 homes for a year or power 5,400 passenger cars for a year.**

**Energy Savings of ENERGY STAR Appliances**

<b>ENERGY STAR Labeled Appliances</b>	<b>Energy Saved (GWh/year)</b>
<b>Refrigerators</b>	<b>615</b>
<b>Clothes Washer<sup>1</sup></b>	<b>415</b>
<b>Room Air Conditioners</b>	<b>215</b>
<b>Dishwashers<sup>1</sup></b>	<b>127</b>

<sup>1</sup> electrical savings only, gas not included