federal register

Wednesday
September 24, 1997

Part III

Department of Energy

Office of Energy Efficiency and Renewable Energy

10 CFR Part 430

Energy Conservation Program for Consumer Products; Conservation Standards for Room Air Conditioners; Final Rule

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

10 CFR Part 430

[Docket Numbers EE–RM–90–201 and EE–RM–93–801–RAC]

RIN 1904–AA38

Energy Conservation Program for Consumer Products: Final Rule Regarding Energy Conservation Standards for Room Air Conditioners

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy (DOE).

ACTION: Final Rule.

SUMMARY: The Department of Energy (DOE or Department) has determined that revised energy conservation standards for room air conditioners will result in a significant conservation of energy, are technologically feasible, and are economically justified. On this basis, the Department is today amending the existing energy conservation standards for room air conditioners. The Department projects the standards to save 0.64 quad of energy through 2030, which is likely to result in a cumulative reduction of emissions of approximately 95,000 tons of nitrogen dioxide and 54 million tons of carbon dioxide.

EFFECTIVE DATE: The effective date of the standards is October 1, 2000.

ADDRESSES: A copy of the Technical Support Document (TSD) for this product may be read at the DOE Freedom of Information Reading Room, U.S. Department of Energy, Forrestal Building, Room 1E–190, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586–3142, between the hours of 9:00 a.m. and 4:00 p.m., Monday through Friday, except Federal holidays. Copies of the TSD may be obtained from: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrestal Building, Mail Station EE–43, 1000 Independence Avenue, SW., Washington, DC 20585. (202) 586–9127.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION:

I. Introduction

a. Authority

Part B of Title III of the Energy Policy and Conservation Act, Pub. L. 94–163, as amended by the National Energy Conservation Policy Act (NECPA), Pub. L. 95–619, the National Appliance Energy Conservation Act (NAECA), Pub. L. 100–12, the National Appliance Energy Conservation Amendments of 1988 (NAECA 1988), Pub. L. 100–357, and the Energy Policy Act of 1992 (EPAct), Pub. L. 102–486,[1] created the Energy Conservation Program for Consumer Products other than Automobiles. The consumer products subject to this program are called ''covered products.'' The covered products specified by statute include room air conditioners. EPCA, section 322, 42 U.S.C. 6292.

For room air conditioners, EPCA prescribes an initial Federal energy conservation standard effective in 1990 and specifies that the Department shall publish a final rule no later than January 1, 1992, to determine if the 1990 standards should be amended. A second review must be completed within five years after publication of this final rule. EPCA, section 325(c), 42 U.S.C. 6295(c). Any new or amended standard is required to be designed so as to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. EPCA, 325(o)(2)(A), 42 U.S.C. 6295(o)(2)(A). The Secretary may not prescribe any amended standard which increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. EPCA, section 325(o)(1), 42 U.S.C. 6295(o)(1).

Section 325(o)(2)(B) provides that DOE, in determining whether a standard is economically justified, must determine whether the benefits of the standard exceed its burdens, based, to the greatest extent practicable, on a weighing of the following seven factors:

(1) The economic impact of the standard on the manufacturers and on the consumers of the products subject to such standard;

(2) 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, in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard;

(3) The total projected amount of energy savings likely to result directly from the imposition of the standard;

(4) Any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;

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

(6) The need for national energy conservation; and

(7) Other factors the Secretary considers relevant.

In addition, section 325(o)(2)(B)(iii) establishes a rebuttable presumption of economic justification in instances where the Secretary determines that

[1] The Energy Policy and Conservation Act, as amended by the National Energy Conservation Policy Act, the National Appliance Energy Conservation Act, the National Appliance Energy Conservation Amendments of 1988, and the Energy Policy Act of 1992, is referred to in this notice as the ''EPCA.'' Part B of Title III is codified at 42 U.S.C. 6291 *et seq.*

''the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure.''

b. Background

The purpose of this rulemaking is to review the energy conservation standards for room air conditioners. In 1990, DOE published an advance notice of proposed rulemaking with regard to standards for nine covered products, including room air conditioners. 55 FR 39624 (September 28, 1990) (hereinafter referred to as the September 1990 advance notice). The September 1990 advance notice presented the product classes that DOE planned to analyze and provided a detailed discussion of the analytical methodology and models that the Department expected to use.

On March 4, 1994, DOE published a notice of proposed rulemaking (NOPR) concerning eight products, including room air conditioners. 59 FR 10464 (March 4, 1994) (hereinafter referred to as the Proposed Rule). The standards the Department proposed for room air conditioners are shown in the following table:

TABLE 1–1.—PROPOSED STANDARDS LEVELS FOR ROOM AIR CONDITIONERS

Product class	Energy efficiency ratio	
	Current standards (effective January 1, 1990)	Standards proposed in 1994 Proposed Rule
1. Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	8.0	11.1
2. Without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	8.5	10.3
3. Without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	9.0	11.0
4. Without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	8.8	11.1
5. Without reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.2	9.6
6. Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	8.0	10.7
7. Without reverse cycle, without louvered sides, and 6,000 to 7,999 Btu/h	8.5	9.9
8. Without reverse cycle, without louvered sides, and 8,000 to 13,999 Btu/h	8.5	10.7
9. Without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	8.5	10.8
10. Without reverse cycle, without louvered sides, and 20,000 Btu/h or more	8.2	9.3
11. With reverse cycle and with louvered sides	8.5	10.8
12. With reverse cycle and without louvered sides	8.0	10.4

DOE received over 8,000 comments during the comment period on the 1994 Proposed Rule and from participants at public hearings held in Washington, DC on April 5–7 and June 7–8, 1994. Most of the comments related to other products; twelve of the comments dealt specifically with room air conditioners.

After reviewing the comments on the proposed standards for room air conditioners, the Department concluded that a number of significant issues were raised which required additional analysis. In 1995, the Department revised the analyses regarding room air conditioners to account for the comments and data received during the public comment period. (This revised analysis became the basis for the 1996 Draft Report.)

A moratorium was placed on publication of proposed or final rules for appliance efficiency standards as part of the FY 1996 appropriations legislation. Pub. L. 104–134. That moratorium expired on September 30, 1996.

In 1995 and 1996, the Department conducted a review of its process for developing appliance energy efficiency standards. This review resulted in the publication of a final rule, entitled ''Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products'' (hereinafter referred to as the Process Rule). 61 FR 36973 (July 15, 1996). Although the new procedures in the Process Rule do not apply to this rulemaking, 61 FR at 36980, DOE has employed an approach consistent with the new procedures in completing work on this rule. In keeping with the new process, and based on comments received in response to the Proposed Rule, DOE distributed for comment a Draft Report on the Potential Impact of Alternative Energy Efficiency Levels for Room Air Conditioners (hereinafter referred to as Draft Report). The Draft Report contained DOE's revised analysis, begun in 1995, examining five alternative efficiency levels. The Draft Report was distributed to a mailing list that included all of the commenters on the proposed rule on room air conditioners on May 5, 1996. (EE–RM–93–801–RAC[2] No. 1 and No. 2.) The letter invited comment on the Draft Report by no later than July 1, 1996.

Between the beginning of June and the end of November 1996, DOE received six comments on the Draft Report and related issues. DOE officials also held meetings on September 26 with representatives of the Association of Home Appliance Manufacturers (AHAM) and interested manufacturers and on September 27 with the American Council For an Energy Efficient Economy (ACEEE), the Alliance to Save Energy, the Natural Resources Defense Council (NRDC), and State energy officials from California, Florida, and Oregon. (EE–RM–93–801–RAC No. 11 and No. 12.)

On the basis of these comments, DOE prepared a TSD which comprises the Draft Report and a supplemental analysis conducted on a candidate standard level not included in the Draft Report. The supplemental analysis focused on a set of efficiency levels for the same 9 classes analyzed in the proposed rule. (EE–RM–93–801–RAC No. 13.)

In a **Federal Register** (FR) Notice dated January 29, 1997, the Department reopened the comment period for room air conditioners for 15 days. This notice announced the availability of the supplemental analysis and gave indication of the standard levels the Department was inclined to promulgate in the final rule. The Department received 4 comments in response to this notice.

II. Summary of Final Rule

The standards set forth in today's rule are projected to save approximately 0.64 quad of energy through 2030. Although

[2] EE–RM–90–201 refers to the docket for the September 1990 advance notice and the 1994 Proposed Rule. Docket No. EE–RM–93–801–RAC contains the 1996 Draft Report, comments to the 1996 Draft Report, comments to the 1997 reopening notice, and the supplemental analysis.

the standards in the Proposed Rule were projected to save 2.2 quads, DOE has concluded, based on public comment and further analysis, that the proposed standards are not economically justified. The standard levels set forth in today's rule are significantly less costly than those standards in the proposed rule.

The following table presents the standards established in today's rule:

Product class	Energy efficiency ratio, effective as of	
	January 1, 1990	October 1, 2000
1. Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	8.0	9.7
2. Without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	8.5	9.7
3. Without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	9.0	9.8
4. Without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	8.8	9.7
5. Without reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.2	8.5
6. Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	8.0	9.0
7. Without reverse cycle, without louvered sides, and 6,000 to 7,999 Btu/h	8.5	9.0
8. Without reverse cycle, without louvered sides, and 8,000 to 13,999 Btu/h	8.5	8.5
9. Without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	8.5	8.5
10. Without reverse cycle, without louvered sides, and 20,000 Btu/h or more	8.2	8.5
11. With reverse cycle, with louvered sides, and less than 20,000 Btu/h	8.5	9.0
12. With reverse cycle, without louvered sides, and less than 14,000 Btu/h	8.0	8.5
13. With reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.5	8.5
14. With reverse cycle, without louvered sides, and 14,000 Btu/h or more	8.0	8.0
15. Casement-Only	([1])	8.7
16. Casement-Slider	([1])	9.5

[1] Casement-only and casement-slider room air conditioners are not separate product classes under standards effective January 1, 1990. These units are subject to the applicable standards in classes 1 through 14 based on unit capacity and the presence or absence of louvered sides and a reverse cycle.

III. Discussion of Comments

a. Room Air Conditioner Comments.

This section addresses comments to the 1994 Proposed Rule, the 1996 Draft Report, and the 1997 reopening notice. The ''RAC'' notation signifies that the following comment is from Docket No. EE–RM–93–801–RAC which contains comments to the 1996 Draft Report and the 1997 reopening notice. All other comments are from Docket No. EE–RM–90–201 which contains comments from the 1994 Proposed Rule. Note that the Draft Report addressed many of the comments to the 1994 Proposed Rule.

1. Classes

In the 1994 Proposed Rule, the Department proposed fourteen classes of room air conditioners. These product classes consisted of five categories; units with side louvers, units without side louvers, units with reversing valve and with side louvers, units with reversing valve and without side louvers, and casement-type units. There were five class divisions by capacity within each of the two categories without reversing valves. Casement-type units were divided into the following two classes: casement only units and casement-slider units.

Units with louvered sides and without reversing valves. The California Energy Commission (CEC) proposed a reduction in product classes from twelve to four, eliminating the class divisions based on capacity. They stated that the profusion of classes makes comparison of models difficult since the label-reading consumer does not compare all the models available. In addition, disincentives could be created that discourage manufacturers from making efficiency improvements to models near capacity breakpoints because design changes can push the capacity into the next category which has a higher or lower standard level. (CEC, No. 539 at 2–3.) Fedders Corporation (Fedders) proposed that the three smallest capacity classes for units with side louvers and without reversing valve be consolidated into a single class. It called for this consolidation due to the disparity in cost and dehumidifying capability that would arise from having significantly different efficiency standards promulgated for these three classes. (Fedders, April 7, 1994, Transcript at 120–122.) AHAM proposed that the Department retain the current five capacity class divisions for units with side louvers and without reversing valves. (AHAM, No. 1 at 2.)

In the 1994 Proposed Rule, DOE explained that performance and installation constraints necessitate class divisions by capacity. Manufacturers limit their production of cabinets to three or four sizes. Units of similar capacity tend to be designed for the same cabinet size. The space and configuration limitations imposed by the cabinet tend to produce units with similar efficiencies. Because efficiency is essentially a function of cabinet size, and thus capacity, class divisions by capacity are warranted. In the Final Rule, the minimum efficiency standards for each of the four classes with louvered sides and capacities less than 20,000 Btu/h all have nearly the same efficiency value (efficiencies range from 9.7 to 9.8 EER), reducing the concern about inappropriate incentives to change product capacity to take advantage of capacity based standards. The Department agrees with AHAM that the current 5 capacity-based classes should be retained.

Units without louvered sides and without reversing valves. AHAM, Frigidaire Company (Frigidaire), and Sanyo Electric Company (Sanyo) proposed that classes without louvered sides and without reversing valve be consolidated into two classes: units with capacities of less than 8,000 Btu/h and units with capacities greater than or equal to 8000 Btu/h. (AHAM, No. 1 at 2; Frigidaire, No. 544 at 5; Sanyo, No. 771 at 3.) AHAM states that the capacity classes established for units with side louvers and without reverse cycle are not particularly applicable to the other types of classes. (AHAM, RAC No. 4 at 1.) In support of making this recommendation, AHAM stated that since the 1990 minimum efficiency standards became effective, models without louvered sides have been produced only in the 6,000 to 7,999 Btu/h capacity class or the 8,000 to 13,999 Btu/h class. The sizes of existing sleeves and the efficiency standards have constrained capacities to these two classes. (AHAM, No. 1 at 20.) In its comments to the 1996 Draft report, AHAM again urged the Department to reduce the number of classes from five to two for these units. (AHAM, RAC No. 4 at Attachment 1 pg. 1.)

As discussed with respect to classes with louvered sides and without reversing valves, class divisions by capacity are warranted for units without louvered sides because of the effect that economic and installation constraints have on capacity and efficiency. Although manufacturers currently do not produce units in two of the existing five capacity classes, the Department has decided not to consolidate these classes into those units with capacities less than and greater than 8,000 Btu/h. However, the new standards for the two classes of units less than 8,000 Btu/h are the same (9.0 EER) and the new standards for the three classes of units with capacities of 8,000 Btu/h or more are the same (8.5 EER.) In the future, manufacturers might produce units in classes where none are currently being produced. For example, models are now being produced in the less than 6000 Btu/h class where models were not being manufactured previously. Therefore, the Department will retain all five of the existing classes for units without louvers and without reverse cycle.

Units with reversing valves. AHAM and Sanyo proposed that units with reversing valves be consolidated into a single class if the efficiency standard specified for them is a single fixed EER difference below all other cooling-only classes (i.e., classes without reversing valve.) A fixed EER difference of 0.5 EER was proposed. (AHAM, No. 1 at 2; Sanyo, No. 771 at 3.) This recommendation essentially creates as many classes for units with reversing valves as there are for units without reversing valves. Both Whirlpool Corporation (Whirlpool) and Fedders agreed with this recommendation. (Whirlpool, April 7, 1994, Transcript at 106; Fedders, April 7, 1994, Transcript at 136.) In a April 23, 1996 joint letter to AHAM, ACEEE and NRDC agreed with the fixed 0.5 EER difference between reverse-cycle classes and their corresponding ''cool-only'' classes. (ACEEE/NRDC, RAC No. 3 at 4.) In addition, during a meeting with ACEEE, Alliance to Save Energy, California Energy Commission, Florida Energy Office, Oregon Department of Energy, and NRDC, a recommendation was made to refer to reverse cycle products as ''heat pump air conditioners'' in the future. (RAC No. 10 at 2.) AHAM responded that these systems are not designed to be sophisticated heat pumps but rather to modify a room air conditioner by adding a reverse cycle to ''make it function as a heat pump within the confines of a relatively small enclosure.'' (AHAM, RAC No. 6 at 3.)

The Department has determined its current class structure for units without reversing valves (two product classes: one for units with louvered sides and another for units without louvered sides) is not adequate. Therefore, the Department is adding two classes for units with reverse cycle to accommodate the concerns expressed in public comments. The two additional classes are class 13—units with reverse cycle, with louvers, and with a capacity of 20,000 Btu/h or more—and class 14—units with reverse cycle, without louvers, and capacity of 14,000 Btu/h or more.

Casement-Type Units. In the 1994 Proposed Rule, the Department proposed additional classes for casement-slider and casement-only room air conditioners because of the unique utility they offer to the consumer. Casement-type units offer a performance-related feature (fitting into casement windows) which other room air conditioners cannot provide. AHAM and Frigidaire supported the Department's proposal to establish separate classes for casement only and casement/slider units. In addition, AHAM stated that because of the limited number of models available and the narrow range of capacities, class divisions by capacity are not necessary for these unit types. (AHAM, No. 1 at 21–22; Frigidaire, No. 544 at 6.) In their comments to the Draft Report, ACEEE and NRDC recommended that casement-only units be combined in the same category as casement-slider units due to the fact that there is only one casement-only unit on the market. ACEEE and NRDC are also concerned that a loophole may be created because lower-priced casement units may be used in applications that do not require the special dimensions required by casement-only units. They commented that adjustable side panels can be used to enclose the space created when a window is wider than the air conditioner. (ACEEE/NRDC, RAC No. 5 at 4.)

The Department believes that the size limitations imposed on casement-type units are more significant than those faced by typical units which are designed for double-hung windows. Since this performance-related feature justifies a lower efficiency standard, separate classes will be established for casement-slider and casement-only units. The Department agrees with AHAM that class divisions by capacity are not necessary because of the narrow range of capacities in which models are currently available. According to AHAM's Directory of Certified Room Air Conditioners, casement-slider units range in capacity from 5,000 to 11,000 Btu/h, while there is currently only one casement-only unit, which has a capacity of 6,200 Btu/h. The Department believes that there is utility added by having a casement-only as well as a casement-slider class. In addition, the Department believes that the dimensions of casement units are restrictive enough to prevent a loophole.

Ductless Split Systems. Fedders proposed that ductless split system air conditioners be regulated under room air conditioner efficiency standards as it believes that they are directly competing against room air conditioners for market share. (Fedders, April 7, 1994, Transcript at 123.) The NRDC agreed with the Fedders recommendation. (NRDC, No. 55 at 28)

The Department's efficiency standards for split system-type central air conditioners also apply to ductless split systems. The Department makes no distinction between split systems which deliver conditioned air with or without ducts. Thus, because split systems are covered under standards for central air conditioners, ductless split system air conditioners will not be established as an additional class for room air conditioners.

2. Design Options

Commenters provided detailed comments on several of the design options that were analyzed by the Department for the proposed rulemaking.

Rotary compressors. Compressor efficiency was the design option that drew the greatest amount of comment. AHAM, Amana Refrigeration, Inc. (Amana), Frigidaire, Fedders, Sanyo, Matsushita Electric Corporation (Matsushita), Whirlpool, and Tecumseh Corporation (Tecumseh) all provided comments stating that rotary compressors cannot attain the 11.5 to 12.0 EER efficiency levels assumed in the Department's analysis. They stated that the maximum efficiency of currently available rotary compressors falls in the 10.7 to 10.9 EER range. Compressor manufacturers stated that only minor efficiency improvements are expected within the next three to five years. The combined effect of these efficiency improvements would yield only a 11.1 to 11.3 EER rotary compressor. And although efficiency increases of this magnitude may be theoretically achievable, they would require the development of high-efficiency motors which are currently not available, use of higher-grade materials in the rotary compressor mechanism, and new compressor production methods and equipment. Both AHAM and Amana additionally commented that physical samples of new compressors need to be available to room air conditioner manufacturers at least 36 months prior to the effective date of the standards to provide adequate time for development, reliability and field testing. (AHAM, No. 1 at 7; Amana, Inc., No. 347 at 1; Frigidaire, No. 544 at 2; Fedders, April 7, 1994, Transcript at 121–122; Sanyo, No. 771 at 7–9; Matsushita, April 7, 1994, Transcript at 88–90; Tecumseh, April 7,1994, Transcript at 97–99; Whirlpool, April 7, 1994, Transcript at 102–103.) ACEEE commented that compressor efficiencies have been improving in recent years and are still below the theoretical limit. It stated that according to trade press articles, rotary and reciprocating compressors with efficiencies exceeding 11.0 EER are already available and further increases in efficiency are being developed. It argues that if 11.5 to 12.0 EER compressors are not realized, other technologies could be used to attain the Department's proposed efficiency levels. (ACEEE, No. 557 at 21.) ACEEE and NRDC commented that slightly more efficient compressors which are likely to become available soon should be used in the analyses in future rulemakings. (ACEEE/NRDC, RAC No. 5 at 1.)

The Department rejects AHAM's suggestion that design options must be available 36 months prior to the effective date of the standards. However, the prediction in the 1994 Proposed Rule that 11.5 to 12.0 EER compressors would be available by the year new efficiency standards would become effective was based on development plans of a compressor manufacturer to produce 11.6 to 12.0 EER compressors. Subsequently, those development plans were canceled. Because rotary compressor manufacturers state that they cannot produce compressors with efficiency levels approaching the 11.5 to 12.0 EER range, the Department, in the Draft Report, analyzed only rotary compressors which are currently on the market. Depending on their capacity, the most efficient rotary compressors range in efficiency from 10.7 to 11.1 EER. In its comments to the 1996 Draft Report, AHAM stated that the revised report addressed its concerns. (AHAM, RAC No. 4 at Attachment 1, pg 2.)

Scroll compressors. Only AHAM provided comments regarding scroll compressors. It stated that scroll compressors are currently not available in capacities less than 18,000 Btu/h and that efficiencies are either no more or slightly more efficient than rotary compressors. In addition, scroll compressor application heights are typically three to five inches greater than comparable rotary compressors, therefore requiring a larger chassis. Copeland Corporation (Copeland), a scroll compressor manufacturer, was cited by AHAM as having announced plans to develop a new, smaller scroll design optimized in the 14,000 to 24,000 Btu/h capacity range. AHAM stated this design could be expanded effectively into room air conditioner applications with more reasonable cost premiums and with efficiencies possibly in the 11.5 to 12.0 EER range, but because it is not possible to make these compressors available to manufacturers 36 months prior to the effective date of new standards, they should not be considered by the Department for this rulemaking. (AHAM, No. 1 at 8.) Again, ACEEE and NRDC in their joint comments to the Draft Report stated that slightly more efficient compressors which are likely to become available soon should be used in the analyses in future rulemakings. (ACEEE/NRDC, RAC No. 5 at 1.)

Again, the Department rejects AHAM's suggestion that design options must be available 36 months prior to the effective date of the standards. Although Copeland Corporation is currently investigating this more efficient compressor technology in the 14,000 to 24,000 Btu/h capacity range, they could not commit to produce it. Because there was not sufficient evidence this technology would be available by the effective date of the standards, only Scroll compressors which are currently on the market were considered for the Department's Final Rule analysis. For compressors which would be suitable for room air conditioner applications, Copeland's scroll compressors currently range in efficiency from 10.8 to 11.1 EER. The lowest capacity scroll compressor offered by Copeland is 16,500 Btu/h. Thus, scroll compressors were only considered for room air conditioners with capacities of at least 16,000 Btu/h. The information DOE received from compressor manufacturers showed that scroll compressor heights are only 1–2 inches greater than comparable rotary compressors. Moreover, because this design option was not contained in any of the standard levels the Department found to be economically justified, the Department does not consider this height differential to be an issue. AHAM commented that it was satisfied with the treatment of this issue in the Draft Report. (AHAM, RAC No. 4 at Attachment 1 pg. 2.)

Reciprocating compressors. The Department's analysis of an advanced reciprocating compressor design called the inertia compressor received comments by AHAM, Frigidaire, and Bristol Compressors (Bristol.) All three commented that inertia compressors with efficiencies in the range of 11.5 to 12.0 EER are expected to be available within the next couple of years but only in capacities exceeding 18,000 Btu/h. Inertia compressors are significantly heavier, larger, and noisier than the rotary compressors that are currently used in room air conditioner applications. Larger chassis sizes would be required to accommodate the increased weight and size of the inertia compressor. In addition, sound blankets would be necessary to muffle the increased noise levels. Thus, cost premiums and the accompanying application costs make inertia compressors difficult to cost justify for room air conditioners. (AHAM, No. 1 at 8–9; Frigidaire, No. 544 at 2; Bristol, June 7, 1994, Transcript at 355–362.)

Although the Department recognizes that advanced reciprocating compressors are heavier and larger than existing rotary compressors, no information was provided as to how great the application costs for enlarging and bracing the chassis would be for incorporating them into room air conditioner units. Thus, only the cost of the compressor itself, with its accompanying sound blanket, was explicitly included in the Department's Final Rule analysis. For those instances where the advanced reciprocating compressor exceeded the weight of the rotary compressor by a significant amount (over 30 percent), an increase in chassis size was assumed to be necessary for incorporating the larger and heavier compressor. Therefore, a design option which resulted in a chassis size increase (i.e., increased evaporator and condenser face areas) always preceded the incorporation of an advanced reciprocating compressor. The added costs for increasing the chassis were assumed to cover the expense of incorporating the reciprocating compressor. For compressors which would be suitable for room air conditioner applications, Bristol's inertia compressors currently range in efficiency from 11.2 to 11.8 EER. The lowest capacity inertia compressor offered by Bristol is 18,000 Btu/h. Thus, inertia compressors were considered only for room air conditioners with capacities of at least 18,000 Btu/h. In its comments to the 1996 Draft Report, AHAM indicated that this approach addressed its concerns. (AHAM, RAC No. 4 at Attachment 1 pg 2.)

Fan motor efficiency. Only AHAM provided comments with regard to improvements in fan motor efficiency. It stated that permanent split capacitor (PSC) fan motors are already used in 98 percent of room air conditioners. The efficiency of PSC fan motors fall in the range of 50 percent to 70 percent with larger motors being more efficient. AHAM admitted that some modest gains may be achieved with PSC fan motors in specific applications. With regard to electronically commutated motors (ECM), otherwise known as brushless permanent magnet motors (BPM), AHAM stated that they cost 2.5 to 3 times more than standard PSC motors. In addition, they weigh approximately twice that of a standard PSC motor. ECM efficiencies range from 68 percent to 78 percent. ECMs are currently not available with the double ended shaft required for room air conditioner applications because controls block one end of the motor. AHAM believes that ECMs with double ended shafts are not likely to be made available in the foreseeable future. Even if ECMs were manufactured with double ended shafts, AHAM claimed that manufacturers would need physical samples 24 months before the effective date of standards. (AHAM, No. 1 at 10 and RAC No. 4 at 5.)

The Department recognizes that most room air conditioner designs already incorporate permanent split capacitor fan motors. But for two of the product classes analyzed, the representative baseline units used inefficient shaded pole motors. Thus, for these two classes, significant efficiency gains were achieved by replacing the shaded pole motors with more efficient permanent split capacitor motors. For all other classes, the representative baseline units already incorporate permanent split capacitor motors. Further fan motor efficiency increases were assumed to be achieved only through the use of ECMs. Although current ECM controls are situated at one end of the motor, the Department believes that there is no reason why they cannot be moved to another location on the motor. Thus, it is assumed that ECMs can be manufactured with double ended shafts. Although the Department recognizes that ECMs weigh approximately twice as much as standard permanent split capacitor motors, no information was provided about the application costs for bracing the chassis to incorporate them into room air conditioner units. Thus, only the cost of the ECM itself was explicitly taken into account in the Department's Final Rule analysis. However, because the analysis showed that ECMs were not an advantageous design option, any cost increases due to increased ECM weight need not be considered further. In its comments to the 1996 Draft Report, AHAM indicated that the analysis, which assumes a fan motor efficiency of 30 percent for shaded pole and 50 percent for permanent split capacitor (PSC) when changing from a shaded pole to a PSC, addresses its concern. (AHAM, RAC No. 4 at Attachment 1, pg. 2.)

Variable speed compressors. AHAM stated that variable speed compressors are not currently used in room air conditioner applications and should not be considered a technically viable design option. AHAM commented that the cost premium is 30 percent to 50 percent above comparable single-speed compressors. Although variable speed compressors are available off-shore in capacities and sizes suitable for use in room air conditioners, improvements in efficiency cannot be measured with the Department's current test procedure. AHAM commented that the Department's current single condition test procedure adequately matches consumer usage patterns for room air conditioners. (AHAM, No. 1 at 12.) AHAM does not believe variable speed compressors are ''capable of being assembled into room air conditioners by the effective date'' and should not be considered a viable design option. (AHAM, RAC No. 4 at 5.)

Although the Department recognizes that the current test procedure is not adequate for determining the benefits due to variable speed compressors, they are still analyzed as a design option for room air conditioners. As done for the Proposed Rule's analysis, efficiency gains are established based on estimates from central air conditioning applications. The efficiency improvement, because it is primarily a result of reduced cycling (i.e., reduced on and off operation), is reported in terms of the seasonal energy efficiency ratio (SEER). A minimum efficiency standard cannot be based on its inclusion because the current test procedure does not recognize a SEER rating as an appropriate measure of efficiency. In addition, variable speed compressors were not included in any of the efficiency levels DOE determined to be economically justified.

Heat exchanger design options. A number of comments were received regarding design changes to improve heat exchanger (evaporator and condenser) performance. These improvements can be put into two categories: designs for increasing the heat exchanger surface area and designs for increasing the heat transfer coefficients. The heat transfer surface area can be increased by any of the following methods: increasing the frontal area of the coil by increasing the height or width; adding a subcooler to the condenser coil; increasing the depth of the coil by adding vertical tube rows; or increasing the fin density. The heat transfer coefficients can be increased by using an enhanced fin design or grooved (rifled) refrigerant tubing.

With regard to heat exchanger improvements, manufacturers expressed great concern over design options that would require an increase in chassis size, namely, increases in heat exchanger size. AHAM claimed that tooling for a new chassis size can range in cost from $1.5 to $5.0 million per manufacturer. In addition, it stated that there are limits to the efficiency that can be achieved through increases in coil size without causing problems with latent cooling capacity (i.e., dehumidification.) It also stated that if standards require larger chassis sizes, there will be loss of utility in terms of portability and availability of larger capacities that can fit into smaller windows. In addition, availability of very large capacities would be reduced. (AHAM, No. 1 at 11–12.) AHAM also stated that an increase in coil size could affect compressor reliability. It stated that if room air conditioner efficiency is increased by enlarging the coil, the compressor capacity must be reduced to maintain the capacity of the system. But because the unit now has more refrigerant as a result of enlarging the coil, it is more likely that the smaller compressor's maximum charge limitation would be reached. The closer the refrigerant charge comes to the compressor's charge limit, the more likely that compressor failure would occur. (AHAM, Transcript, April 7, 1994, at 66.) Amana stated that its current coil designs are already optimized. (Amana, Inc., No. 347 at 1.) Sanyo stated that increasing the condenser surface area is not feasible as the chassis enclosure is already too crowded. (Sanyo, No. 771 at 9.)

AHAM and several manufacturers commented that the Department's proposed efficiency standards would require increases in chassis size for all room air conditioner product classes because some design options that the Department assumed would be available, primarily 11.5 to 12.0 EER compressors, would not exist by the time the proposed standards became effective. AHAM stated that even a small increase in the efficiency standard will cause some models to move to a larger chassis size. According to AHAM, 92 percent of total production would need to move to a larger chassis size to meet the standards proposed in the 1994 Proposed Rule. AHAM further commented that because chassis sizes vary widely among manufacturers, new standards will have significant competitive effects. (AHAM, No. 1 at 1, 14–18.) Amana, Whirlpool and Frigidaire all provided comments reinforcing AHAM's comments. Amana stated that to meet the Department's proposed standards it would need to redesign nine of thirteen basic models into a larger chassis. These manufacturers further commented that the higher prices resulting from chassis size increases place an unfair burden on low income consumers. (Amana, No. 347 at 1; Whirlpool, No. 391A. at 1; Frigidaire, No. 544. at 3.)

AHAM provided the Department with a graph which shows the percentage of production which would be required to change chassis size at each EER. (AHAM No. 1 at 14.) In its comments to the Draft Report, AHAM states that ''more stringent standards [than the standards proposed by AHAM] will cause a significant number of chassis size changes with step function-like cost implications to manufacturers and raise utility, marketing and competitive issues.'' (AHAM, RAC No. 6 at 1.) AHAM stated the baseline model method of analysis does not realistically represent the impact on cost of increasing the chassis size. AHAM believes the Department should weight the cost of a larger chassis by the proportion of models needing a larger chassis to achieve specific efficiency levels. (AHAM, RAC No. 4 at 3.) In their most recent comments, ACEEE and NRDC state this approach is reasonable, but they believe the life cycle cost minimums, resulting when costs of chassis size increases are prorated, should be used to select standards. Referring to the graph provided by AHAM, ACEEE and NRDC state that the proportion of models requiring a larger chassis size at 9.8 EER is ''scarcely different'' than the proportion required by 9.5 EER and that only at EER levels above 9.8 EER do a significant proportion of models need a larger chassis. Furthermore, they state ''to consider chassis size as an independent decision-making factor would overemphasize chassis size in making a final decision.'' (ACEEE/NRDC, RAC No. 5 at 2.)

The impact of increased heat exchanger size on dehumidification was assessed with the engineering computer simulation model. The simulation model not only estimates the efficiency increase that results from adding more coil area but also its effect on latent heat removal. For all the room air conditioners which were modeled, the heat exchanger increases which were analyzed resulted in latent heat ratios of at least 25 percent. The latent heat ratio is the latent heat rate removal of the air conditioner divided by its total cooling capacity. AHAM considers 25 percent to be the minimum acceptable latent heat ratio. With regard to the issue of compressor reliability, although the Department recognizes that an increase in coil size coupled with a decrease in compressor capacity could affect the reliability of the compressor, manufacturer data were not provided as to the maximum charge limit of room air conditioner compressors. The Department's analysis of larger coil sizes assumed that the compressor capacity would not have to be reduced when analyzing larger coil sizes. Thus, with regard to how the Department conducted its analysis, it is unlikely that compressor reliability would be negatively impacted. Moreover, increasing evaporator/condenser coil area was not contained in any of the standard levels DOE found to be economically justified.

With regard to the issue that some manufacturers may be competitively disadvantaged by being required to increase chassis size, the Department carefully considered the information provided by AHAM which indicates that the proposed standards in the 1994 Proposed Rule would require 92 percent of manufacturers to increase chassis size. Both the Department and AHAM recognize that any change in efficiency standard will require some manufacturers to increase chassis size. The Department has attempted to reduce the number of chassis size changes as much as possible while still achieving the goal of promulgating standards which maximize energy efficiency consistent with economic justification. The standards set forth would require an increased chassis size for a substantially smaller subset—approximately 25 percent—of products.

The Department considered AHAM's recalculations of life-cycle cost minimums which prorated the cost of chassis size increases. (AHAM, RAC No. 9 at Attachment 3A.) DOE has selected standard levels corresponding to the minimum life cycle costs when chassis size cost is prorated for the classes for which AHAM provided this information (i.e., classes 1 through 5).

AHAM commented that manufacturers will make adjustments to the number of tube rows and the density of fins in order to optimize heat exchanger performance. Because heat exchangers are, in general, already optimized, however, adjusting either the tube rows or the fin density is not a significant factor in increasing system efficiency. (AHAM, No. 1 at 9.) Sanyo stated that adding tube rows or fin material causes increased air flow restrictions and requires design changes to fan and fan motors. If motor speeds are increased to obtain high airflow, unacceptable noise levels result. (Sanyo, No. 771 at 9.)

The Department agrees with AHAM and Sanyo that the number of tube rows and the fin density are already optimized to yield the greatest heat exchanger performance. In using the engineering computer simulation model, increases in either tube row density or fin density provided negligible increases in system performance. In its comments to the 1996 Draft Report, AHAM indicated that because the simulation model shows negligible increases in system performance by increasing the fin density and number of tube rows, AHAM is no longer concerned about this matter. (AHAM, RAC No. 4 at Attachment 1 pg. 2.)

AHAM stated that enhanced fins are already used in 64 percent of the evaporators produced by manufacturers and 99 percent of the condensers. AHAM also commented that good projections for the efficiency improvement due to enhanced fins are not available. AHAM further commented that the increased use of enhanced fins in evaporators is likely to be limited because in some cases condensate drainage is a limiting factor. AHAM believes that additional significant improvements in fin design are not expected in the foreseeable future. (AHAM, No. 1 at 10.) Sanyo stated that many models already employ enhanced fins. (Sanyo, No. 771 at 9.)

The Department recognizes that most room air conditioner designs incorporate enhanced fins. Consequently, most of the representative baseline units for the product classes analyzed by the Department already include enhanced (i.e., slit-type) fins. For those baseline units where enhanced fins could be added, efficiency improvements were based on information provided by room air conditioner and heat exchanger manufacturers. Publicly available research information was used to check the reasonableness of the data supplied by manufacturers. The manufacturer information also included data on how densely enhanced fins could be packed until condensate drainage became a problem. In accordance with this manufacturer data, the Department's analysis limited enhanced fin densities before condensate drainage became a problem. In its comments to the 1996 Draft Report, AHAM indicated that this approach addressed its concerns. (AHAM, RAC No. 4 at Attachment 1 pg. 2.)

AHAM stated that grooved refrigerant tubes are already used in 97 percent of the evaporators produced by manufacturers and 86 percent of the condensers. AHAM also commented that good projections for the efficiency improvement due to grooved tubes are not available. AHAM does not expect additional significant improvements in tube design in the foreseeable future. (AHAM, No. 1 at 10.) Sanyo stated that many models already employ grooved tubes. (Sanyo, No. 771 at 9.)

As with enhanced fins, the Department recognizes that most room air conditioner designs already incorporate grooved refrigerant tubing. However, for many of the representative baseline units that were selected (with consultation from AHAM) for the Proposed Rule's analysis, grooved tubing was not incorporated into the design. For the Department's Proposed Rule analysis, manufacturer test data was used to determine the efficiency improvements due to grooved tubing. However, publicly available research data indicated the manufacturer test data overstated the possible improvement. In addition, the analysis conducted for the Proposed Rule did not account for the increase in refrigerant-side pressure drop due to the grooved tubing. Thus, for the Department's analysis for the Final Rule, efficiency and pressure drop estimates were based on research data published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE.) In its comments to the 1996 Draft Report, AHAM commented that this approach addressed its concern. (AHAM, RAC No. 4 at Attachment 1 pg. 2.)

In their comments to the Draft Report, ACEEE and NRDC state that the report seems to ignore a new heat exchanger technology by Modine Technology that can achieve ''at least a 0.75 increase in EER'' without changing chassis size. (ACEEE/NRDC, RAC No. 5 at 1.) The advocates recommend that new technologies such as this one be considered in future rulemakings. The Oregon Department of Energy also stated its belief that most manufacturers were in contact with Modine Technology. (RAC No. 10 at 2.)

The efficiency improvement made possible by the new heat exchanger technology to which the energy efficiency advocates referred is based on theoretical calculations. Modine Technology's new heat exchanger has shown improvements in central air conditioners; however, it has not been tested in room air conditioners. The Department does intend to analyze this technology in future rulemakings.

AHAM, Amana, Frigidaire, Fedders, and Sanyo all provided comments with regard to subcoolers. Test data was provided indicating that the efficiency improvement due to subcoolers is significantly lower than that estimated by the Department in the 1994 Proposed Rule. AHAM presented data indicating that, on average, the actual efficiency and capacity improvements are 44 percent and 67 percent, respectively, of that projected by the Department's simulation model. Also, according to the AHAM, four out of seven room air conditioner manufacturers do not currently use subcoolers and five of the seven manufacturers would need to make major tooling changes on all or some of their chassis. (AHAM, No. 1 at 6–7; Amana, No. 347 at 2; Frigidaire, No. 544 at 2–3; Fedders, No. 693 at 2–6; Sanyo, No. 771 at 9.)

Based on comments, the Department used manufacturer test data to calibrate the subcooler efficiency increases that were estimated by the simulation model. For each room air conditioner model simulated, the temperature of the condensate into which the subcooler is immersed was adjusted until the simulated efficiency increase matched that indicated by the manufacturer test data. Depending on the capacity of the unit, the manufacturer test data demonstrates unit efficiency increases of between 1.4 percent to 3.0 percent, as compared to approximately 6 percent increases found in the analysis for the Proposed Rule. The simulation model was adjusted based on this test data. AHAM indicated that this approach addressed its earlier concern. (AHAM, RAC No. 4 at Attachment 1 pg. 2.) In addition, DOE used manufacturer cost information provided by AHAM to calculate the economic impact of incorporating a subcooler as one of the room air conditioner design options.

Design options already in use. Many manufacturers claimed that they already use many of the design options that are being considered by the Department for increasing energy efficiency. (AHAM, April 7, 1994, Transcript at 51–52; Amana, No. 347 at 1; Frigidaire, No. 544 at 4; Fedders, No. 693 at 1; Sanyo, No. 771 at 8.) Both Amana and Frigidaire stated that they already use high efficiency rotary compressors, grooved tubes, enhanced fins and permanent capacitor fan motors. Amana stated that the only design options available for increasing efficiency are more efficient compressors, larger coil sizes, larger chassis sizes, and the addition of a liquid line subcooler. (Amana, No. 347 at 1; Frigidaire, No. 544 at 4.)

The design options which are considered in the analysis are based on the characteristics of the representative baseline units. The baseline models used in this analysis were selected through consultation with AHAM. If a baseline unit does not include particular design options, then those options are analyzed as measures to improve the efficiency of the unit. Although some of these design options are already commonly used, they may not all be used simultaneously. For example, some of the baseline units used more efficient compressors to achieve a certain efficiency rating, while many of the units on the market used less efficient compressors but improved heat exchanger design options to achieve the same level of efficiency.

3. Engineering Simulation Model

The Department received several comments regarding the engineering computer simulation model that it used in its analysis of efficiency improvements for room air conditioners. Comments were provided primarily by AHAM and can be categorized into three areas: (1) the accuracy of the simulation model; (2) the method in which the modeling analysis was conducted; and (3) the selection of baseline models for room air conditioners without louvered sides.

In comparing simulation results from the Department's computer simulation model to test data gathered from four room air conditioner models, AHAM demonstrated that there is a marked tendency for the simulation model to overestimate system efficiency. It concluded that the simulation model has the potential for making errors of 5 percent or more, especially when extended well beyond the point where actual correlative test data exists. (AHAM, No. 1 at 3.) Frigidaire and Sanyo reinforced the AHAM's comments when they presented data demonstrating that the simulation model estimated higher benefits for design options than are realized in practice. (Frigidaire, No. 544 at 4; Sanyo, No. 771 at 10–12.)

The simulation model was extensively reviewed by the room air conditioner industry. For the 1994 Proposed Rule, simulation results were calibrated to manufacturer test data for all of the representative baseline units modeled. The Department recognizes that when simulation results are calibrated to a single manufacturer's test data, it is possible that the model will yield errors of 5 percent or more when used to simulate the performance of other manufacturers' units. Where test data is not available, the Department expects to continue to use the simulation model to estimate the efficiency increases resulting from the incorporation of design options. When manufacturer test data is provided, as in the case of subcoolers, the Department will use it to adjust the simulation model.

AHAM commented that several errors were made in the simulation modeling. The first pertains to compressor modeling and the fact that actual compressor performance data was used only in the modeling of baseline equipment. The Department derived performance data for more efficient compressors by multiplying the motor input values from the baseline compressor data by the ratio of the baseline and high-efficiency compressor nominal energy efficiency ratios (EER.) This type of analysis shows overall room air conditioner efficiency improvement equal to 89 percent of the nominal compressor EER improvement. Limited test data shows that the overall room air conditioner efficiency increase is about 75 percent of the nominal compressor EER improvement. AHAM advocated using actual compressor performance data for the analysis of more efficient compressors but to limit maximum system efficiency improvements to 75 percent of the nominal compressor EER increase. It also stated that when deriving compressor coefficients for input to the simulation model, the Department must use compressor performance data that spans the entire range of evaporating and condensing temperatures under which the compressor might operate. Otherwise, incorrect input coefficients could be generated. (AHAM, No. 1 at 3–6 and AHAM, RAC No. 4 at Attachment 1 pg 1.)

The Department agrees with AHAM that actual compressor performance data should be used to model the performance of compressors. Nominal compressor performance is based on ratings at standardized temperature conditions, and actual compressor performance may be significantly different at actual room air conditioner operating conditions. Using the nominal efficiency to compare the performance between two compressors only provides the efficiency difference at the standardized conditions. Using actual compressor performance data to model compressor operation captures the effect that different operating conditions have on room air conditioner performance. Thus, actual compressor performance data, spanning the entire range of evaporating and condensing temperatures in which the compressor might operate, was used to model the performance of all the compressors analyzed for the Final Rule. The Department disagrees with AHAM that system efficiency improvements should be limited to 75 percent of the nominal compressor EER increase. The basis for using compressor performance data is to more accurately assess the system improvement due to more efficient compressors. Placing a ceiling on the efficiency improvement eliminates the possibility of gaining system EER increases due to more favorable compressor operating conditions. As it turned out, most of the compressors modeled as design options in the Final Rule analysis yielded system efficiency increases that were equal to or less than 75 percent of the nominal compressor EER increase. Only one of the compressors analyzed yielded a system efficiency increase significantly above the AHAM's suggested 75 percent ceiling. This compressor was used at standard level 5, which was found to be not economically justified.

According to AHAM, another error in the simulation modeling concerns the use of superheat. It noted that the Department incorrectly specified the input for superheat from manufacturer test data by using the difference between the mid-evaporator temperature and a temperature on the suction line. It claimed that the Department should have adjusted the superheat input to the simulation model until the difference between the averages of the simulated evaporator inlet and outlet temperatures and the simulated suction line inlet and outlet temperatures were equal to the test value. (AHAM, No. 1 at 5.)

The Department's method for specifying the superheat was in accordance with recommendations made by AHAM in 1990. These recommendations included making modifications to the simulation model in order to account for the presence of an accumulator. The modifications were based on treating the inlet to the accumulator as the inlet to the compressor shell for rotary compressors. In order to account for superheating occurring within the accumulator, the simulation model was modified to include provisions to account for the temperature and pressure increases that occur within the accumulator. The location on the suction line where the temperature was measured was at the accumulator inlet (i.e., the suction line outlet). The superheat in the simulation model is defined as the difference between the compressor shell inlet's refrigerant and saturation temperatures; therefore, knowing that the suction line temperature was measured at the accumulator inlet provided confidence in using it to specify the superheat. Because the test data did not provide the accumulator inlet's saturation temperature, the mid-evaporator temperature was used as a close approximation of the evaporator saturation temperature, which is also a close approximation for the compressor shell inlet saturation temperature. Therefore, the Department believes it appropriate to use the difference between the mid-evaporator and accumulator inlet temperatures to specify the superheat. AHAM indicated in its comments to the Draft Report that this method addresses its concerns. (AHAM, RAC No. 4 at Attachment 1, pg. 1.)

In estimating room air conditioner efficiency increases resulting from more efficient fan motors, AHAM commented that it was inappropriate to use combined fan and fan motor efficiencies as input to the simulation model. Rather than using efficiencies, it advocated using fan motor power as an input as it asserts that room air conditioner efficiencies will be overestimated by using fan and fan motor efficiencies. (AHAM, No. 1 at 5.)

The simulation model was originally developed to model the performance of central air conditioners. Manufacturers generally agreed to this approach. However, some adjustments had to be made to model a different air delivery system. For room air conditioners, the evaporator and condenser fans are both driven by a single fan motor, as opposed to central air conditioners, in which each fan is driven by its own fan motor. For the room air conditioner model, the Department decided to describe the air delivery system with combined fan and fan motor efficiencies in order to account for the impact of evaporator and condenser air-side pressure drop on fan motor power use. This modeling scheme also assumed that the evaporator fan accounted for 40 percent of the total fan motor power while the condenser fan accounted for the remaining 60 percent. AHAM was in agreement with modeling the room air conditioner's air delivery system by using a ''40/60 split'' on the fan motor power. But due to this modeling scheme, only 60 percent of the fan motor heat loss was added to the condenser air stream. All of the heat loss from the fan motor should be added to the condenser air stream as the motor resides in the outdoor section of the room air conditioner. The Department decided to change the simulation model in order to account for the fan motor's full heat loss. In the Department's analysis for the 1994 Proposed Rule, simulation results were calibrated to test data for all the baseline models. Because accounting for the full heat loss slightly lowers the system efficiency, minor adjustments had to be made to the power and capacity correction factors contained in the input files in order to recalibrate the simulation results to the baseline model test data. In AHAM's comments to the 1996 Draft Report, AHAM indicated that this method addressed its concerns. (AHAM, RAC No. 4 at Attachment 1, pg 1.)

AHAM claimed the simulation modeling analysis used incorrect power consumption penalties to account for reversing valves and for no louvers. With regard to reversing valves, AHAM noted that the TSD for the 1994 Proposed Rule reports two different power consumption penalties: 3 percent and 4 percent. AHAM noted that the Department's simulation analysis actually calculates a power reduction value of 2.5 percent. AHAM recommended using a penalty of five percent when modeling reverse cycle units with the simulation model. With regard to the power consumption penalty used for units without louvered sides, AHAM claimed that the value of 4 percent used in the Department's simulation analysis does not account for the reduced airflow across the condenser coil due to the non-louvered sides. Although it proposed no alternative power penalty to account for non-louvered sides, it stated that the condenser face area being modeled should be decreased because outdoor air is drawn through the back of the unit rather than through louvered sides, and thus less condenser area is available for heat exchange. (AHAM, April 7, 1994, Transcript at 62–65.)

For the 1994 Proposed Rule, power consumption penalties to account for reversing valves and to account for no louvers were applied only to the compressor's power consumption. Because the power penalty is assessed only to the compressor, the overall power increase for the entire room air conditioner is always slightly smaller than the reported power penalty value. The TSD for the Proposed Rule did mistakenly report two different penalties for reversing valves. The value that was actually used was 3 percent. The power penalty used to account for non-louvered sides was 4 percent. A 5 percent power penalty was used for the Final Rule to account for products with a reversing valve. Because an alternative power penalty value was not proposed for non-louvered sides, the Department retained the use of a 4 percent power penalty. This 4 percent power penalty was assumed to account for any degradation in performance due to drawing outdoor air directly through the condenser coil. Thus, the modeled condenser face area was not reduced.

In its comments to the 1996 Draft Report, AHAM states that although the Draft Report indicates that power consumption penalties were used in the simulation model, it appears (referencing Table 1.6 of the Draft Report) that baseline data for actual models were used, and that these results are not consistent with actual practice. (AHAM, RAC No. 4 at 2.) The Department did use the power consumption penalties in the simulation model for the Draft Report. Table 1.6 of the Draft Report is intended to show that the results produced by the simulation model are close to the actual test data.

Both AHAM and Sanyo asserted that the Department selected baseline models for ''through-the-wall'' units (units without louvered sides) with efficiencies that were not representative of the class. They both stated that baseline models were derived from models with louvered sides, and thus, the analysis conducted for these products is meaningless. Sanyo stressed that the largest capacity size within the smallest enclosure for the particular product class of interest should be selected as a representative baseline model. (AHAM, No. 1 at 19; Sanyo, No. 771 at 6–10.)

In the analysis for the 1994 Proposed Rule, representative baseline models for non-louvered and reversing valve classes were derived from the baseline models that were selected for louvered classes. The Department agrees with AHAM and Sanyo in that actual baseline units should be used to represent the non-louvered and reversing valve classes. Thus, the Department based its analysis of non-louvered and reversing valve classes on modeling of actual baseline units. With regard to non-louvered classes, manufacturer data were available only for two of the existing five capacity classes; 6,000 to 7,999 Btu/h and 8,000 to 13,999 Btu/h. Thus, analyses were conducted only for the two classes where manufacturer data were available. Manufacturer data were also available for selecting representative baseline units for reversing valve classes, with and without louvered sides, and engineering analyses were conducted for both these classes.

Based on its recommended changes for improving the performance of the engineering simulation model, AHAM re-ran the model for the five capacity classes with louvered sides and without a reversing valve. For all five classes, the efficiency levels determined by AHAM's simulation analysis were significantly lower than the Department's proposed efficiency standards. (AHAM, No. 1 at 26.) Using the version of the simulation model that the Department used for its Proposed Rule analysis, Sanyo conducted a simulation analysis for classes without louvered sides. With its analysis, it also concluded that efficiency gains were significantly below those that the Department demonstrated were possible for classes without louvered sides. (Sanyo, No. 771.) Like AHAM, Fedders also performed an efficiency analysis for the five capacity classes with louvered sides and without a reversing valve. But instead of using the Department's simulation model, it used test data (and interpolated estimates based on test data) to project efficiency increases. Fedders' results were similar to AHAM's in that the efficiency levels that were calculated were significantly lower than the Department's proposed standards for all five classes. (Fedders, No. 693 at Sec. 1, 1–6.)

Based on the comments received, DOE made a number of adjustments to the simulation model, as described above, and changed the method in which certain design options were analyzed. After these adjustments, the Department's simulation results were close to those reported by AHAM. For the five capacity classes being compared, these were the only two classes for which DOE and AHAM had efficiency results that differed by greater than 1 percent—the 6,000 to 7,999 Btu/h class and the 14,000 to 19,999 Btu/h class.

In the case of the 6000 to 7999 Btu/h class, the discrepancy (approximately 3 percent) between AHAM's simulation results and the Department's simulation results for the Final Rule can be attributed to an error in the earlier simulation model. This error, which was present in the simulation model that AHAM used and that the Department used in its analysis for the Proposed Rule, was corrected for the Department's Final Rule analysis. Thus, correcting this error in the version of the simulation model used by the AHAM would yield a predicted efficiency that would be closer to that estimated by the Department for the Final Rule. The error related acceptable difference between the calculated condenser exiting temperatures from the two subroutines—because the acceptable difference was too low, the model converged at solutions that produced condenser heat transfer coefficients which were too small.

In the case of the 14,000 to 19,999 Btu/h class, the discrepancy (approximately 3.5 percent) was primarily attributable to AHAM's method of estimating efficiency improvements due to an additional design option (condenser grooved tubes) that was analyzed by the Department but not by AHAM. If the Department had not considered this design option, the discrepancy would only be 0.6 percent.

In AHAM's comments to the 1996 Draft Report, AHAM stated that it was ''satisfied with the efficiency analyses of models with side louvers and without reverse cycle up to the application of the BPM fan motor and the variable speed compressor'' and that after correcting for the errors described in the preceding paragraphs, ''the correlations would all be within an acceptable 1%''. (AHAM, RAC No. 4 at 2.)

With regard to Fedders' estimates, the Department's revised efficiency estimates were still significantly different: discrepancies, on average, were over 3.5 percent. Unfortunately, Fedders did not provide detailed information on how it arrived at its estimates. Given the close agreement with the results reported by AHAM, the Department is comfortable with its revised simulation results.

In its comments to the Draft Report, AHAM stated that the ''fine tuning of the simulation model has led to reasonably good correlations'' for models with side louvers and with a reverse cycle. However, AHAM stated that although the simulation model was calibrated to baseline data for actual models without louvers and actual models with a reverse cycle, ''the simulated effect of the applied design options is not consistent with actual practice.'' AHAM also stated that considerable time and effort would be required to ''get the same level of correlation that was achieved for models with louvers and without a reverse cycle.'' AHAM also states that the wide variability of results when comparing simulation model efficiency results to AHAM's results shows that there is a ''significant problem'' in simulating models with reverse cycle. (AHAM, RAC No. 4 at 2–4.) In addition, with regard to units with a reverse cycle, AHAM stated that ''poor correlation with these units is most likely due to the unusual restrictions in the refrigeration circuit due to the reversing valve and compromises made to balance both the heating and the cooling of the unit.'' (AHAM, RAC No. 4 at 4.) ACEEE and NRDC recommended in their joint comments that ''problems with the simulation models can be dealt with by examining the efficiencies of units now on the market, in order to sanity check the simulation model results.'' (ACEEE/NRDC, RAC No. 5 at 3.)

The Department agrees that its computer model may not accurately simulate actual performance for models without louvers (classes 6–10) or models with a reverse cycle (classes 11 and 12). Consequently, the Department has relied more heavily on the comments in selecting standards levels. For classes with a reverse cycle, the Department chose standard levels which took into consideration the comments by both the manufacturers and energy efficiency advocates. With regard to the recommendation made by ACEEE and NRDC, the Department consulted the AHAM directory when making decisions on the efficiency standards to set forth in this rule.

4. Proposed Efficiency Standards

Support for proposed standards. Southern California Edison Company (SCEC), ACEEE, Central Hudson Gas & Electric Corporation (CHGEC), and Alabama Power Company (APC) all generally supported the Department's proposed standards. ACEEE stated that the standards proposed in the 1994 Proposed Rule are supported due to the availability of products with high efficiency levels in the marketplace. ACEEE stated that according to AHAM's 1993 and 1994 directories, units with louvered sides and without a reversing valve are available with efficiencies exceeding 11.0 EER in the 6000 to 7999 Btu/h and 8000 to 13,999 Btu/h product classes. In the 14,000–19,999 Btu/h product class, models are available with efficiencies of 10.5 EER. The ACEEE asserted that even if the Department underestimated the extra first cost of the proposed standards by a factor of two, they would still be cost effective. (ACEEE, No. 557 at 20–22.) CHGEC stated that for its service area, the proposed standards would save approximately 103 kWh per unit for a typical 8000 Btu/h size. (CHGEC, No. 601 at 1.) SCEC and APC generally supported the rulemaking proposals. (SCEC, No. 14 at 1; APC, No. 696 at 20.)

Although the Department recognizes the comments supporting the proposed standards, lower efficiency standards are being promulgated in this Final Rule. Revisions made to both the engineering simulation model and the method in which certain design options were analyzed, based on public comment, resulted in lower efficiency standards being selected for all product classes.

Proposed standard level 6. In addition to receiving comments in support of the proposed standards, the NRDC commented that the Department did not provide justifiable reasons for rejecting even the higher efficiency standards in the 1994 Proposed Rule. NRDC's argument included: (1) the Department's rejection of the higher standards (described as standard level six in the 1994 Proposed Rule) based on the standard level's long payback is legally unacceptable; (2) though short-term return on equity is reduced by standard level six, the long-term return is not significantly reduced; and (3) manufacturer cost impacts are premised on the continuation of current practices for utility rate design under which residential peak kilowatt-hours do not carry a price premium. (NRDC, April 5, 1994, Transcript at 115–116.)

There are significant differences between the candidate standard levels selected for the proposed rule and those levels selected for the final rule. These differences are a result of revisions made to the engineering analysis.

In response to NRDC's specific comments, the Department recognizes that in determining whether a standard is economically justified, the Secretary cannot consider the failure to meet the rebuttable presumption criterion. EPCA, section 325(o)(2)(B)(iii), 42 U.S.C. 6295(o)(2)(B)(iii). However, the Department does consider energy cost savings relative to incremental first cost. EPCA, section 325(o)(2)(B)(I)(II), 42 U.S.C. 6295(o)(2)(B)(I)(II). The Department also considers both short run and long run return on equity as important factors in determining the rule's impact on manufacturers. In addition, the Department strives to fairly assess consumer cost impacts, including sensitivity analysis of high and low State energy prices.

Adverse effects of standards. The Department received several comments regarding the adverse affects of promulgating the proposed standards. The greatest concern of manufacturers, that heat exchanger coils and cabinets would need to be expanded, at significant expense, in order to meet the Department's proposed standards, was discussed previously under comments pertaining to design options requiring increased chassis sizes. Other manufacturer concerns included: (1) The disparity in the proposed efficiency levels for class 1 (less than 6,000 Btu/h, with louvers and without a reversing valve) and class 2 (6,000–7,999 Btu/h, with louvers and without a reversing valve); (2) the effect of higher efficiency standards on the replacement market for ''through-the-wall'' units (i.e., units without louvered sides) ; (3) the effect higher standards would have on sales of units with reversing valves; (4) the impact on the dehumidification capability of low capacity units; and (5) the impact on low-income consumers.

The proposed standard of 11.1 EER for class 1 units was significantly greater than the proposed standard of 10.3 EER for class 2 units. Both AHAM and Frigidaire claimed that this disparity in the efficiency levels will result in significantly higher consumer costs for class 1 units. They asserted that this disparity will eventually eliminate class 1 units from the marketplace because consumers would purchase less expensive class 2 units. They stated that eliminating low cost class 1 units would adversely effect low income consumers. With regard to energy consumption, for applications where class 1 units are more suitable, they stated that class 2 units might run less to provide the same amount of cooling, but their overall power consumption would be higher because they would operate at a lower efficiency. For units of equal efficiency providing cooling to environments with the same sensible and latent loads, limited manufacturer test data indicated that a class 2 unit (6,000 Btu/h capacity) consumes 6 percent more power than a class 1 unit (5,000 Btu/h capacity.) In addition, both AHAM and Frigidaire claimed that to offset humidity effects, class 2 units would probably be run with a lower thermostat setting resulting in increased run times and increased energy use. Both commenters urged the Department to set standard levels for class 1 units that are no greater than the standards that are set for class 2 units. (AHAM, No. 1 at 18–19; Frigidaire, No. 544 at 6–9.)

ACEEE also noted the disparity in the proposed efficiency levels for class 1 and class 2 units. It noted that class 3 units (8,000 to 13,999 Btu/h) have a significantly higher efficiency standard than class 2 units. ACEEE commented that promulgating a significantly lower standard for class 2 units would likely result in manufacturers concentrating a greater fraction of shipments in this size range, leading to lower than expected energy savings from the proposed standards. The ACEEE urged the Department to raise the standard for class 2 units to 11.0 or 11.1 EER. ACEEE claimed this level is ''technically feasible according to the Department's analysis,'' citing that the top-rated model in the market in this capacity range has an 11.0 EER. ACEEE believed that because the DOE life-cycle cost analysis showed only a slight increase in life-cycle cost going from an EER of 10.25 to 10.74 for this capacity range, a ''small additional step to an EER of 11.0—11.1 should not have much of an impact on LCC either.'' It also urged the Department to raise the standard for the 6000 to 7999 Btu/h product class without side louvers to the same levels being proposed for the less than 6000 Btu/h and 8000 to 13,999 Btu/h product classes. (ACEEE, No. 557 at 22.)

The Department disagrees that ACEEE's extrapolation of the life-cycle cost analysis of the 1994 Proposed rule indicates that an increase to 11.0—11.1 EER should have little impact on life-cycle cost. Moreover, the reanalysis provided in the Draft Report resulted in efficiency levels for classes 1 and 2 being approximately the same. AHAM indicated in its comments to the Draft Report that these results addressed its concerns. (AHAM, RAC No. 4 at Attachment 1, pg 3.) In addition, for the final rule, the Department has selected standards for class 1 and class 2 that are equal. ACEEE and NRDC also support these standard levels. (ACEEE/NRDC, RAC No. 14 at 3.)

AHAM, manufacturers, and real estate organizations commented that the proposed efficiency standards would obsolete the replacement market for ''through-the-wall'' units (i.e., units without louvered sides.) Because of the unavailability of 11.5 to 12.0 EER compressors, chassis sizes would need to be increased to meet the proposed efficiency standards. But because of the overall size restrictions due to ''through-the-wall'' sleeves already in service, chassis sizes cannot be increased without obsoleting the existing sleeves. If existing wall openings are expanded to accommodate larger units, retrofit costs are estimated to be between $250 and $500. These commenters argue that the proposed standards would force the discontinuation of higher capacity systems as only smaller capacity units would be able to fit into existing sleeve openings. (AHAM, No. 1 at 19; Given & Spindler Companies (G&S), No. 302 at 1–2; Frigidaire, No. 544. at 5; Institute of Real Estate Management (IREM), No. 553 at 7; Sanyo, No. 771 at 3–6; Friedrich Air Conditioning Co. (Friedrich), April 7, 1994, Transcript at 77–80.) Both IREM and G&S requested that the Department exempt ''through-the-wall'' units because of the undue burden upon owners who will be forced to make retrofit changes without any financial compensation. (G&S, No. 302 at 1–2; IREM, No. 553 at 7.) Sanyo stated that the efficiency levels proposed in the 1994 Proposed Rule would force higher capacity units to be discontinued. (Sanyo, No. 771 at 3.) The AHAM presented data demonstrating that existing models meeting the current efficiency standards already employ all available design options. The AHAM stated that any increase in efficiency can only be accomplished by increasing chassis size or by further decreasing cooling capacity. (AHAM, No. 1 at 20.) Frigidaire stated that above 8,000 Btu/h, any increase in the current standard ''will result in a lower BTUH capacity, thus reducing the utility of this product category.'' Frigidaire notes that in order ''to comply with the 1990 Energy Standards, we were forced to reduce the capacity in this product class from 13,500 BTU to 10,700 BTU.'' (Frigidaire, No. 544 at 5.) In its comments to the 1996 Draft Report, AHAM reiterated the industry's struggle to achieve the current standards in the largest capacity models which has resulted in the reduction of the maximum capacity available. (AHAM, RAC No. 4 at 4.) Both the National Apartment Association (NAA) and the National Multi Housing Council (NMHC) requested that the Department adopt an efficiency standard for units without louvered sides that takes into consideration the adverse impact upon the multi-family housing industry. (G&S, No. 302 at 2; IREM, No. 553 at 7.) Because the multi-family housing industry predominantly uses air conditioner units without louvered sides, NAA and NMHC are concerned about the impact of increased cabinet size (due to higher efficiency standards) on these ''through-the-wall'' units.

The ACEEE opposed exempting ''through-the-wall'' units from more stringent standards. It stated that such an exemption would create a loophole that could result in a significant reduction in energy savings. It believed that manufacturers should be able to produce these units using the same or similar components used in louvered-type units. Through gains in economy of scale, costs with maintaining different product lines for models with and without side louvers could be avoided. (ACEEE, No. 557 at 23.) ACEEE and NRDC are particularly concerned about loopholes if standards are not increased for units below 14,000 Btu/h. (ACEEE/NRDC, RAC No. 5 at 3.) In February 1997, ACEEE and NRDC urged the Department to raise the standard for class 8 (units without louvers, without a reverse cycle, and 8,000—13,999 Btu/h) to 8.7 EER in an effort to reduce the likelihood of a loophole. In addition, they stated that according to the data provided by AHAM (AHAM, RAC No. 9 at Attachment 1), the 1994 sales weighted average for this class is 8.73

EER. (ACEEE/NRDC, RAC No. 14 at 3.) AHAM stated that these concerns are based ''on the incorrect view that these products are essentially the same except for the presence of side louvers.'' AHAM states that the elimination of side louvers causes extensive changes that result in ''a significant loss of efficiency for the same capacity.'' (AHAM, RAC No. 6 at 2.) Furthermore, AHAM stated that increasing the standard for class 8 would eliminate higher capacity units, causing harm to building owners and consumers, and would ''violate NAECA's safe harbor rule in Section 325(n)(4).'' (AHAM, RAC No. 16 at 4.)

In its comments to the 1994 Proposed Rule NRDC was concerned that the practice of using small sleeves may amount to a permanent constraint on how far energy efficiency can be increased. It suggested that the Department analyze what fraction of the market cannot accept design options that increase sleeve size. Then the Department should determine the economic impact of replacing design options that do require increased size with other less cost-effective options for that fraction of the market that cannot adapt. NRDC also suggested that the Department consider adopting a second tier of efficiency standards which would be available for states to adopt voluntarily through building codes. This way, room air conditioners could be designed to the optimum level for the new construction market without imposing unreasonable costs on the replacement market. (NRDC, No. 55 at 27.)

The Department agrees with manufacturers and real estate organizations that added retrofit costs would be necessary for units which require larger sleeves and, as a result, larger wall openings. Thus, for units without louvered sides, an additional installation cost of $375 is assumed for design options which require a larger chassis (i.e., for increased evaporator and condenser face areas.) The Department was not provided with the necessary information to determine the percentage of existing sleeves which could not accept larger chassis sizes. Thus, the added retrofit cost of $375 was assumed to apply to all units requiring a chassis size change. In addition, since the percentage of units being used in new construction is believed to be small, all units were assumed to incur the added retrofit cost, regardless of application. The Department examined the 1997 AHAM Directory. It indicates that for higher capacity models (9,000 Btu/h or more), only one manufacturer currently produces units which could meet the advocates recommendation of 8.7 EER, despite the fact that this value is the 1994 shipment weighted average for this class. The Department agrees that there is reason to believe that increasing standards for units without louvers and without reverse cycle may result in eliminating higher capacity units from the market. Thus, the Department will not increase standards for ''through-the-wall'' units of 8,000 Btu/h capacity or more in today's rule. These standard levels minimize or eliminate the need to increase chassis size. Consequently, the Department does not believe the multifamily housing industry will be negatively impacted.

As for the advocates concern over possible loopholes, the Department intends to monitor market trends for these classes and will consider these trends during its next review of room air conditioner standards. Regarding NRDC's suggestion that the Department adopt a second tier standard for states to adopt voluntarily through building codes, in accordance with the legislation, a recommendation for a second tier standard for adoption through voluntary building codes must be done separately from manufacturing standards. However, because the ''through-the-wall'' units account for only about one-tenth of air conditioner energy use and because only a fraction of these units are in new construction, the Department does not believe this measure is warranted.

In their comments to the 1994 Proposed Rule, AHAM and Whirlpool also expressed that, as a result of setting standards too high for units with a reversing valve, more electric resistance heat models will be sold because of their significantly lower cost. They stated that this will result in an overall increase in energy consumption. (AHAM, No. 1 at 21; Whirlpool, April 7, 1994, Transcript at 103–105.) The standards for units with a reverse cycle set forth in today's rule are significantly lower than those standards proposed in the 1994 Proposed Rule, so this concern should be mitigated.

Fedders claimed that energy consumption due to reduced dehumidification is adversely affected by the standard levels proposed in the 1994 Proposed Rule for class 1 through class 3. Fedders presented calculations demonstrating that units meeting the proposed standard levels will consume more energy than units meeting existing efficiency standards. Fedders stated that units meeting the proposed standard levels will need to operate longer in order to dehumidify as effectively as units meeting the existing standards. (Fedders, No. 693 at 1–5, Sec. 2.)

Fedders' claims of longer run times for more efficient units are based on its estimates of the dehumidification capability of existing minimum efficiency units and those which comply with the Proposed Rule's proposed efficiency standards. Fedders' dehumidification data for units at the proposed efficiency levels were based on historical test data which were extrapolated to the proposed levels. The Department's engineering simulation model indicated that the proposed efficiency standards did not significantly reduce the dehumidification capability of the units which were modeled. The Department has questions about Fedders' assumptions used to calculate room air conditioner run times. For example, although Fedders acknowledges that sizing recommendations for room air conditioners are dependent on such things as building construction, window types and insulation levels, its cooling load calculations are based on a single room size and a single set of initial indoor room conditions. Most importantly, because the standards promulgated in this final rule are significantly lower than those proposed in the 1994 Proposed Rule, the dehumidification capabilities should no longer be in question.

One of the country's largest retailers, the Sears, Roebuck and Company (Sears), asserted that the standards proposed in the 1994 Proposed Rule impose disproportionate hardships on low income consumers as most room air conditioner consumers have lower than average incomes. Whirlpool substantiates this claim by presenting data on the income distribution of typical room air conditioner purchasers. (Sears, April 7, 1994, Transcript at 115; Whirlpool, No. 391A at 1–2.)

The standards set forth in the final rule will have substantially less impact on purchase price than those standards proposed in the 1994 Proposed Rule and will have shorter payback periods. For example, class 1 has an approximate first cost increase of $10, and a payback period of approximately 2 years, satisfying the rebuttable presumption criteria for economical justification. The Department does not believe the standards set forth today will have a substantial negative impact on low income consumers.

Efficiency Standards Recommendations. Several commenters concerned about adverse effects of promulgating the efficiency standards proposed in the 1994 Proposed Rule recommended to DOE alternative levels at which to set the standards for room air conditioners. For classes with louvered sides and without a reversing valve, Frigidaire recommended the following efficiency standards: 9.0 EER for the less than 6000 Btu/h class, 9.5 EER for the 6000 to 7999 Btu/h class, 9.5 EER for the 8000 to 13,999 Btu/h class, 9.5 EER for the 14,000 to 19,999 Btu/h class, and 8.5 EER for the greater than 20,000 Btu/h class. (Frigidaire, No. 544 at 10.) In its comments to the 1994 Proposed Rule, Fedders called for consolidating the three smallest capacity classes into a single class and setting the efficiency standard at 10.0 EER. For the two largest capacity classes, Fedders agreed with the Department's proposed standards (11.1 and 9.8 EER). (Fedders, April 7, 1994, Transcript at 120–122.) The CEC recommended a single efficiency standard for all classes with louvered sides and without a reversing valve. It recommended setting the efficiency standard based on the level which the Department proposed (11.0) for the most popular class (i.e., the 8000 to 13,999 Btu/h class.) (CEC, No. 539 at 2,3.)

For classes without louvered sides and without a reversing valve, AHAM, Frigidaire, and Sanyo recommended that the current five capacity classes be consolidated into two classes: units less than 8000 Btu/h and units greater than or equal to 8000 Btu/h. For the less than 8000 Btu/h class, AHAM, Frigidaire, and Sanyo all recommended setting the efficiency standard at 9.0 EER. For the greater than or equal to 8000 Btu/h class, they all recommended setting the standard at 8.5 EER. AHAM presented data demonstrating that existing models meeting the current efficiency standards already employ all available design options. They stated that any increase in efficiency can only be accomplished by increasing chassis size or by further decreasing cooling capacity. (AHAM, No. 1 at 20; AHAM RAC No. 4 at 1–2; Frigidaire, No. 544 at 5; Sanyo, No. 771 at 3.) Friedrich recommended that units without louvered sides be exempt from efficiency regulation. (Friedrich, April 7, 1994, Transcript at 84.) The CEC recommended a single efficiency standard for all classes without louvered sides and without a reversing valve. The Commission recommended setting the efficiency standard based on the level which the Department proposed (10.7 EER) for the most popular class (i.e., the 8000 to 13,999 Btu/h class). (CEC, No. 539 at 2,3.)

For classes with a reversing valve, AHAM stated that the efficiency of a reverse cycle unit in the cooling mode is theoretically less than the efficiency for a cooling-only model due to the additional pressure drop caused by the reversing valve and inefficiencies created by the refrigerant charge being adjusted for an acceptable balance between cooling and heating performance. AHAM presented data demonstrating that the average reduction in efficiency due to a reversing valve is 0.42 EER. In order to cover the majority of reverse cycle units, AHAM recommended setting a standard for reverse cycle units which is 0.5 EER less than the standard for a comparable cool-only model with or without louvered sides. (AHAM, No. 1 at 20, 21.) Both Sanyo and Whirlpool also recommended setting the same type of standard. (Sanyo, No. 771 at 3; Whirlpool, April 7, 1994, Transcript at 103–105.) The CEC proposed maintaining the current classification for units with a reversing valve; one class for units with louvered sides and another class for units without louvered sides. The CEC agreed the efficiency levels proposed by the Department for reverse cycle units. (CEC, No. 539 at 2,3.)

On April 23, 1996, ACEEE and NRDC sent a letter to AHAM with the following table of proposed standard levels (ACEEE/NRDC, RAC No. 3 at 3.):

Class	Standard level
Units without reverse cycle and with louvered sides:	
Capacity less than 20,000 Btu/h	10.0 EER.
Capacity 20,000 Btu/h and more	9.0 EER.
Units without reverse cycle and without louvered sides	9.0 EER.
Slider/casement and casement-only units	9.0 EER.
Units with reverse cycle, all capacities	0.5 EER less than the standard for comparable cool-only model.

In its comments to the 1996 Draft report, AHAM proposed the following standards (AHAM, RAC No. 6 at 2):

Class	Standard level
Units without reverse cycle and with louvered sides:	
Capacity less than 20,000 Btu/h	9.5 EER.
Capacity 20,000 Btu/h and more	8.5 EER.
Units without reverse cycle and without louvered sides:	
Capacity less than 8,000 Btu/h	9.0 EER.
Capacity 8,000 Btu/h or more	8.5 EER.
Units with reverse cycle, with louvers	8.5 EER.***
Units with reverse cycle, without louvers	8.0 ERR.***
Casement-only	8.7 EER.
Casement-slider	9.5 EER.

*** AHAM would prefer to set the standard for reverse cycle units 0.5 EER less than the standard for its ''cool-only'' counterpart. This recommendation results in ten classes for reverse cycle units. Because DOE did not support ten classes for reverse cycle units, AHAM stated that the standard should be set in reference to the highest capacity class. For example, if the standard for models without reverse cycle, without louvers, 20,000 Btu/h or more were set at 8.5 EER, then the standard for units with reverse cycle, without louvers, 20,000 Btu/h or more should be set at 8.0 EER. (AHAM, RAC No. 6 at 2–3.)

Following the meetings in late September 1996, ACEEE modified its recommendation to the following standards (ACEEE/NRDC, RAC No. 5 at 4–5)

Class	Standard
Without reverse cycle and with louvered sides less than 6,000 Btu/h	9.7 EER.
Without reverse cycle and with louvered sides 6,000 to 7,999 Btu/h	9.7 EER.
Without reverse cycle and with louvered sides 8,000 to 13,999 Btu/h	9.8 EER.
Without reverse cycle and with louvered sides 14,000 to 19,999 Btu/h	9.7 EER.
Without reverse cycle and with louvered sides 20,000 or more Btu/h	8.5 EER.
Without reverse cycle and without louvered sides less than 14,000 Btu/h	9.0 EER.
Without reverse cycle and without louvered sides 14,000 or more Btu/h	8.5 EER.
With reverse cycle and with louvered sides	9.0 EER.
With reverse cycle, without louvered sides	8.5 EER.
Casement (Casement-only and Casement-slider)	9.5 EER.

For classes without louvered sides, ACEEE and NRDC stated in their November 1996 comments that they were willing to accept 8.5 EER for capacities of 14,000 Btu/h or more. However, ACEEE and NRDC emphasized their recommendation of 9.0 EER for the 8,000—13,999 Btu/h capacity class, stating that: this EER is the minimum life cycle cost point according to the Draft Report; the 1994 sales weighted average of 8.73 EER approaches this recommendation; and 20 percent of 1996 models in this class meet or exceed this level according to the March 1996 AHAM Directory. They were concerned that AHAM's 8.5 EER recommendation could ''create a loophole in that units without louvered sides at 8.5 EER would cost manufacturers less than units with louvered sides at 9.5 EER ($240 vs. $263 according to the DOE draft analysis).'' (ACEEE/NRDC, RAC No. 5 at 3.) In its comments to the Draft Report, AHAM states that there is a significant cost and energy efficiency differential between models with and without side louvers. (AHAM, RAC No. 6 at 2.) In February 1997, ACEEE and NRDC urged the Department to raise the standard for class 8 to at least 8.7 EER. (ACEEE/NRDC, RAC No. 14 at 3.)

As discussed earlier, although manufacturers currently do not produce units in two of the existing five capacity classes, the Department has retained the five capacity-based classes. The Department conducted analyses only for the two classes for which manufacturer data were available (the 6,000 to 7,999 Btu/h and the 8,000 to 13,999 Btu/h classes.) In this Final Rule, the Department has applied the same efficiency standard (9.0 EER) to the 6,000 to 7,999 Btu/h class and the less than 6,000 Btu/h class. The efficiency standard for the 8,000 to 13,999 Btu/h class (8.5 EER) is also applied to the 14,000 to 19,999 Btu/h class and the 20,000 Btu/h or more class. According to 1997 AHAM Directory, the highest capacity ''through-the-wall'' unit currently manufactured has a capacity of 12,500 Btu/h, and only one manufacturer currently makes units at a capacity of 9,000 Btu/h or higher which meet the 8.7 EER standard proposed by ACEEE/NRDC. On this basis, the Department has determined that raising this standard is likely to result in higher capacity models being withdrawn from the market to the disbenefit of consumers.

With regard to the comment that units without louvered sides at 8.5 EER would cost manufacturers less than units with louvered sides at 9.5 EER, ACEEE and NRDC appear to refer to the values found in tables 1.12 and 1.16 in the Draft Report. The two units being compared have different capacities; therefore a direct cost comparison is not appropriate. However, the Department shares the general concern about the possibility that differences in standard levels for different classes may cause shifts in product use and sales, and as stated previously, the Department intends to monitor market trends for these classes. If it appears that products without louvers are used in lieu of units with louvers because of differences in energy efficiency standards, the Department will consider the need to set comparable standards during its next review of room air conditioner standards.

In their comments to the Draft Report, ACEEE and NRDC recommend a 9.0 EER for reverse cycle units with louvers and an 8.5 EER for reverse cycle units without louvers. They stated that these levels are well below the minimum life-cycle cost point of the Draft Report. Furthermore, they state that a third of the 1996 reverse cycle units with louvers and 80 percent of the 1996 reverse cycle units without louvers meet these levels. The advocates also note that the only reverse cycle unit in the 1996 AHAM directory above 20,000 Btu/h has a 9.0 EER. (ACEEE/NRDC, RAC No. 5 at 3.) In addition, they are concerned about ''loopholes'' which may result if the standards are not raised. (RAC, No. 12 at 1.) AHAM counters that a loophole would not be created because the cost of building a unit with a reverse valve is ''quite significant.'' (AHAM, RAC No. 6 at 3.) The energy advocates also state that the Department's analysis appears to only evaluate cooling energy savings and not heating energy savings. (ACEEE/NRDC, RAC No. 5 at 2.)

In response to comments, DOE has split classes 11 and 12. AHAM, NRDC, and ACEEE all recommended setting the standards for reverse cycle units at 0.5 EER less than their cool-only counterparts. (ACEEE/NRDC, RAC No. 3 and AHAM, No. 1 at 21.) For units with reverse cycle and louvered sides, the energy efficiency advocates believe an EER of 9.0 is acceptable. (ACEEE/NRDC, RAC No. 5 at 5.) AHAM also finds this level to be acceptable for units with capacities less than 20,000 Btu/h. However, for units at 20,000 Btu/h or more, AHAM argues that the standard should not be higher than the standard for its ''cool-only'' counterpart. (AHAM, RAC No. 6 at 3.) The Department agrees. By splitting class 11 at 20,000 Btu/h, the Department can raise the standard for most of the units with reverse cycle and with louvers to 9.0 EER, without raising the standard for units of capacities of 20,000 Btu/h or more above the 8.5 EER of its cool-only counterpart.

Similarly, the Department has split class 12 and set the standard for units less than 14,000 Btu/h at 8.5 EER while keeping the standard for units of 14,000 Btu/h or more at 8.0 EER. This split is largely consistent with the recommendations of ACEEE, NRDC, and AHAM for a 0.5 EER differential between reverse cycle units and their ''cool-only'' counterparts for units without louvers, with the exception of units in the 8,000–13,999 Btu/h capacity range for which there is no differential. According to the 1997 AHAM directory, only one model with reverse cycle and without louvers in this capacity range does not meet an 8.5 EER. In response to the advocates question as to why the Department's analysis only evaluates cooling energy savings and not heating energy savings, the Department does not evaluate heating savings because the test procedure is unable to account for the heating energy savings.

In their February 1997 comments to the notice reopening the comment period, ACEEE/NRDC stated that establishing separate classes with weaker standards for higher capacity units with a reverse cycle is unnecessary because all currently existing models at these capacity levels meet their recommended standards, without splitting the classes. (ACEEE/NRDC. RAC No. 14 at 3.) Although all currently existing models with louvers and with a reverse cycle at 20,000 Btu/h or more meet a 9.0 EER, the Department does not believe new models entering the market should be required to meet a standard higher than the standard for a unit without a reverse cycle. In addition, the Department recognizes that no models currently exist with a reverse cycle and without louvers at 14,000 Btu/h or more; however, the Department believes that it should allow manufacturers the opportunity to design units without louvers and with a reverse cycle at higher capacities, and the evidence indicates that manufacturers could not meet a standard greater than 8.0 EER at capacities of 14,000 Btu/h or more. Furthermore, in April 1996, the advocates supported AHAM's recommendation to make the standard for reverse cycle units 0.5 EER less than the standard for its cool-only counterpart. (ACEEE/NRDC, RAC No. 3 at 3.) This recommendation would create 10 classes for reverse cycle room air conditioners. Thus, the Department questions why the advocates suggest that promoting only four classes for reverse cycle units is superfluous.

AHAM stated that casement-type units are already using all available design options and are limited in size because of their applications. (AHAM, No. 1 at 22.) In its comments to the Draft Report, AHAM recommended efficiency standards of 9.5 EER for slider/casement units and 8.7 EER for casement-only units. (AHAM, RAC No. 6 at 2.) In its comments to the 1994 Proposed Rule, Frigidaire recommended a standard of 9.0 EER for slider/casement units. (Frigidaire, No. 544 at 6.) Because the 1994 Proposed Rule did not propose standards for casement-type units, ACEEE, CEC, NRDC, and the New York State Energy Office (NYSEO) urged the Department to collect the necessary data in order to perform an analysis and set efficiency standards for these units. ACEEE and NRDC stated that if data is not available to perform an analysis, standards should be set for casement-type units that are equivalent to those for typical room air conditioners. NRDC added that the Department is prohibited under NAECA from reducing the stringency of energy efficiency standards. The CEC asked the Department to clarify whether States may adopt efficiency standards for casement-type classes without preemption or whether another standard level applies to these products until the Department adopts a separate level. (ACEEE, No. 557 at 23; CEC, No. 539 at 3; NRDC, April 5, 1994, Transcript at 116–117; NYSEO, June 8, 1994, Transcript at 18–19.) The Department considers casement-type units to be air conditioners. Therefore, these units are subject to the currently applicable standards based on unit capacity and the presence or absence of louvered sides and a reverse cycle.

In their February 1997 comments, ACEEE and NRDC stated that a special class set aside for one casement-only model in existence is not necessary. They are concerned that a casement-only unit at an 8.7 EER will be less expensive to produce than a ''standard'' unit at 9.7 EER. They believe this cost disparity would cause manufacturers to capitalize on this niche class. (ACEEE/NRDC, RAC No. 14 at 2.) AHAM counters that casement units are expensive relative to their capacity and that there would be no economic incentive to exploit this class. Furthermore, casement-only units add a unique utility not provided by casement-slider units. (AHAM, RAC No. 16 at 3.) In addition, in February 1997, Friedrich provided information regarding the relative costs of casement room air conditioners as compared to ''standard'' models with side louvers and without a reverse valve. This information shows that casement-only and casement-slider room air conditioners are significantly more expensive than units that do not meet the size constraints of casement room air conditioners. (RAC No. 18.) Therefore, the Department has found no economical advantage to using casement-type units at lower energy efficiency ratings for standard room air conditioner applications. Thus, the Department has selected separate classes for casement room air conditioners. DOE has selected the efficiency standard recommended by AHAM, ACEEE, and NRDC for casement-slider units (9.5 EER) (AHAM, RAC No. 6 at 2 and ACEEE/NRDC, RAC No. 5 at 5) and the standard recommended by AHAM for casement-only units (8.7 EER). (AHAM, RAC No. 6 at 2.) However, due to the energy efficiency advocates' concern about the possibility of ''loopholes,'' the Department will monitor market trends for these classes. If it appears that casement units are used in lieu of ''standard'' units because of differences in energy efficiency standards, the Department will consider the need to set comparable standards during its next review of room air conditioner standards.

AHAM stated that its recommended standards would result in meaningful energy savings but would alleviate the economic burden on manufacturers. AHAM states that in light of the economic burden of chassis size increases, the cumulative burden of other rulemakings, and the relatively modest energy use of room air conditioners that ''more stringent standards than that proposed by industry would be unreasonable and unjustified.'' (AHAM, RAC No. 6 at 1.)

The standards established in today's rule are similar to the standards recommended by AHAM. The Department selected slightly higher standards for the first four classes. AHAM's primary concern was the cost of increasing chassis size. Because the standard levels the Department has selected for the first five classes are based on the life cycle cost minimums when the cost of increasing chassis size is prorated, the Department believes the cost impact is reduced.

5. Other Comments

Effective date of standards. Commenting on the 1994 Proposed Rule, Fedders proposed accelerating the effective date from January 1st to August 1st. It claimed this would prevent manufacturers from producing large quantities of less efficient units during the months of August through December. (Fedders, April 7, 1994, Transcript at 123–124.)

AHAM urged the Department to set an effective date of October 1, 2000, in order to coordinate with manufacturing cycles. AHAM stated that production begins in August or September and runs through June or July. AHAM stated that an arbitrary effective date of 3 years from the date of the rule, and likely in the middle of a manufacturing season, would cause severe economic hardships on manufacturers which are not accounted for in the manufacturing impact analysis. (AHAM, RAC No. 16 at 3.)

The Department agrees, due to the unique seasonal nature of room air conditioners, the effective date should be coordinated with manufacturing cycles. Thus, this rule will take effect on October 1,2000.

Units consuming less than 500 watts. Commenting on the 1994 Proposed Rule, Fedders recommended that room air conditioners consuming less than 500 watts be exempted from regulation. In support of this recommendation, it stated that a 3000 Btu/h capacity unit at an efficiency of 8.0 EER consumes 375 watts compared to a 5000 Btu/h capacity unit at 11.1 EER that consumes 450 watts. Fedders argued that this exemption would encourage development of units that are smaller and consume less energy and resources. (Fedders, April 7, 1994, Transcript at 122–123.) AHAM, Frigidaire, NRDC, and the ACEEE all opposed the Fedders' recommendation. AHAM disagreed with Fedders' claim that as many as two-thirds of the rooms in which 5000 Btu/h capacity units are installed could be adequately cooled with units as small as 3000 Btu/h. AHAM saw no reason that smaller units should be given an advantage by being exempted from a standard and ''strenuously disagreed with Fedders' proposed exemption for models of less than 500 watts.'' (AHAM, No. 1 at 23 and AHAM, RAC No. 4 at Attachment 1, pg 4.) Frigidaire stated that the recommendation by Fedders is counterproductive to saving energy as, under it, low capacity units of low efficiency will be introduced into the marketplace. (Frigidaire, No. 544 at 11.) The NRDC agreed with the motivation behind Fedders' suggestion but did not agree with the specifics of the recommendation as it would allow the creation of a new market driven entirely by low first cost. NRDC suggested that the Department consider a lower standard for a product class below 4000 Btu/h in capacity based on comparable criteria to the standard set for the below 6000 Btu/h class. (NRDC, No. 55 at 28.) The ACEEE opposed the Fedders' recommendation as it believes it could lead to widespread use of inefficient smaller capacity units. (ACEEE, No. 557 at 22.)

The Department agrees with both AHAM and ACEEE that room air conditioners which consume less than 500 watts should not be exempt from efficiency regulation. The Department recognizes that small capacity units may draw less power than larger capacity systems. But the Department does not agree with Fedders' claims that, for units in the less than 6000 Btu/h class, small capacity units will consume less energy than more efficient, larger capacity systems. In creating a separate product class for units with capacities below 6000 Btu/h, the Department has recognized that small capacity units are used differently than units in larger capacity classes. Applications for small capacity units tend to be for small rooms where the cooling load is relatively low. To further differentiate the less than 6000 Btu/h class by capacity would require field tests demonstrating that there are applications which are suitable specifically for units with extremely small capacities. Such field data has not been presented.

Phase out of HCFC–22. With concern that the phase out [4] of HCFC–22 (the refrigerant used by all room air conditioners) might be accelerated, AHAM recommended, in its comments to the 1994 Proposed Rule, that the Department promulgate a second tier of standard levels for HCFC-free room air conditioners. AHAM stated that some replacement refrigerants show a drop in efficiency of 10 percent. AHAM proposed that the second tier be set initially at 10 percent less than the efficiency standards for room air conditioners using HCFC–22. AHAM proposed that second tier of standards would be effective upon the phase-out date of HCFC–22 and would not be available if the HCFC–22 phase out date is not accelerated. (AHAM, No. 1 at 22,23.) Because compressor testing indicates that alternative refrigerant blends will decrease efficiency, Matsushita commented that any efficiency standards promulgated for room air conditioners should apply only to units charged with HCFC–22. (Matsushita, April 7, 1994, Transcript at 91–92.) Frigidaire urged the Department to consider possible energy penalties for HCFC–22 alternative refrigerants. (Frigidaire, No. 544 at 11.) NRDC did not support creating less stringent standards for room air conditioners using alternative refrigerants. NRDC believed that units with new refrigerant alternatives can attain the same efficiency level as units using HCFC–22. NRDC suggested that the Department collaborate with the Environmental Protection Agency on decisions regarding the phase out of HCFCs. Because the Department must promulgate another rulemaking before a phaseout would occur, NRDC stated that the phase out date of HCFC–22 is not within the period of applicability for room air conditioner efficiency standards. It urged that the Department should not plan around a phase out requirement that does not exist. (NRDC, No. 55 at 27,28.) ACEEE stated that alternative refrigerants, such as AZ–20, have been demonstrated to increase room air conditioner efficiency as compared to HCFC–22. (ACEEE, No. 557 at 21.)

In 1996, Fedders stated it has concern over replacement refrigerants. Fedders commented that the Montreal Protocol may require phase-out sooner than the current phaseout date of 2010. Fedders stated that the industry will be required to do extensive retooling if the new standards cannot be met with replacement refrigerants. Furthermore, Fedders stated that the U.S. is ''dangerously close to the legal caps of HCFC chemicals.'' Fedders was concerned ''the EPA will impose restrictions on production, thereby necessitating implementation of replacement refrigerants quickly.'' Therefore, Fedders recommended maintaining the current energy efficiency regulations until the issues related to refrigerant charges are ''resolved and implemented into commerce.'' (Fedders, RAC No. 7 and RAC No. 8.)

In its comments to the 1996 Draft Report, AHAM stated that the issue of replacement refrigerants is a far more serious problem than the Department acknowledges. It states that because of the size restrictions of room air conditioners and because the compressor and condenser are located in a window, the potential adverse effects of high pressure refrigerants are higher, and low pressure alternates demonstrate efficiency penalties. (AHAM, RAC No. 4 at 5.) In February 1997, AHAM requested that the Department make a provision for compliance problems which may result from the transition to HCFC-free refrigerants.

In their comments to the Draft Report, ACEEE and NRDC stated that because the standard set forth in today's rule will cover the 2000–2005 time period, alternative refrigerants will likely be an issue for the next statutorily required standard review but not this review. In addition, the advocates state that it is unlikely for replacement refrigerants to result in an energy penalty and may result in a slight energy efficiency increase. (ACEEE/NRDC, RAC No. At 3.)

The Department agrees that the phase out date of 2010 for HCFC–22 is far enough in the future that no adjustment to these standards is necessary. Replacements for HCFC–22 are being developed. Concerned over the impact that the phase out of HCFC–22 would have on the unitary air conditioner and heat pump industry, the Air Conditioning and Refrigeration Institute initiated the Alternative Refrigerant

[4] The EPA's final rule accelerating the phaseout of ozone-depleting substances bans the production and consumption of virgin HCFC–22 unless it is used as feedstock or in equipment manufactured before January 1, 2010. The final rule also bans the production and consumption of HCFC–22 on January 1, 2020, except for limited exemptions specified by statute. 60 FR 24970 (Wednesday May 10, 1995).

Evaluation Program (AREP). AREP has identified several HCFC–22 alternatives. Two of the more promising replacements include a low-glide ternary blend consisting of HFC–32, HFC–125 and HFC–134a refrigerants, and an azeotrope consisting of H.C.-32 and H.C.-125 refrigerants. A detailed discussion of replacement refrigerants can be found on page 1.18 of the TSD.

Although two of the more promising alternatives demonstrate slight disadvantages compared to R–22, the Department expects that the performance characteristics of the available alternative refrigerant blends will improve as more experience is gained with their use in different formulations. The Department does not anticipate a problem with degradation of performance of refrigerants related to the HCFC–22 phaseout. The EPA states that it does not intend to accelerate the HCFC–22 phaseout. (RAC No. 19.) The Department recognizes the possibility that the phaseout date could be accelerated or the availability of HCFC–22 could diminish. DOE will continue to monitor the situation and take appropriate actions.

Based on this information, the Department declines to establish a two tier system that takes into account a possible degradation in system performance using replacement refrigerants.

Exemption of refrigerant-gas free units. Fedders stated that in order to promote the research and development of alternative air conditioning systems, the Department should exempt refrigerant-gas free room air conditioners from efficiency regulation. (Fedders, April 7, 1994, Transcript at 123.)

The Department will not exempt refrigerant-gas free room air conditioners from efficiency regulation because the energy conservation policies underlying the EPCA do not support such an exemption.

Installation Costs. A few commenters opposed the proposed standard because of increased installation costs. (G&S No. 302 at 2; Amana, No. 347 at 2; Southwestern Public Service Co No. 495 at 5; Whirlpool, No. 391A at 4; CHGEC, No. 601 at 1; and AHAM No. 1 for some classes.)

The Department analyzed the net consumer benefit from the imposition of the standards, estimating costs, including installation costs, and benefits to the utility customer, and concluded that the benefits outweighed the increased costs.

6. Other comments regarding FR Notice of January 29, 1997

Southern Company Services, Inc. stated that these standards appear reasonable and economically justified. (Southern Gas, RAC No. 15 at 1.) ACEEE and NRDC stated that the standards the Department indicated it was inclined to select for the final rule were generally reasonable, and they strongly supported those standards for the first five classes. For the remaining classes, they suggested a few changes which were addressed under ''Efficiency Standards Recommendations.'' (ACEEE/NRDC, RAC No. 14 at 3.) AHAM stated that under two critical conditions, the majority of their members accepted the standard levels the Department indicated it was inclined to select in the January 29 notice. These conditions concerned non-HCFC refrigerants and the effective date of the standards, discussed in the previous section. (AHAM, RAC No. 16 at 1) Glenn Schleede of Energy Market & Policy Analysis, Inc. (EM&PA) stated that the economic analysis is based on outdated and invalid assumptions about potential energy costs. Mr. Schleede's comments dealt specifically with: overestimating national energy cost savings; using total residential electricity cost per kilowatt-hour to calculate national and consumer energy savings; the utility impact model; and the variables and assumptions used in the model. Mr. Schleede believes all calculations of life cycle costs, payback periods, and consumer energy cost savings in the TSD are based on unrealistically high estimates of future energy (particularly electricity) prices. He also believes the Department has not ''taken into account the interests of real consumers.'' (EM&PA, RAC No. 17.)

In the analyses for the Draft Report, the Department utilized EIA forecasts that have not yet addressed the possible price effects of the electric utility regulatory reforms and industry restructuring that are anticipated. Due to this and other uncertainties in electricity price forecasts, the Department conducts sensitivity analyses to bound the possible ranges of impacts. The Department intends to increase the use of sensitivity analyses and scenario analyses in future rulemakings. 61 FR at 36987 (to be codified at 10 CFR Part 430, Subpart C, Appendix A, section 11(e)(1)). The Department will continue to examine how to better account for these changes in the future.

Various cases of Net Present Value (NPV) and life-cycle cost sensitivity to changes in energy price and equipment price were analyzed. These sensitivity analyses are discussed in section IV.c.2., ''Life-cycle Cost and Net Present Value,'' of today's rule. These sensitivity analyses included the effect of using the lowest state energy prices on life-cycle cost and the use of energy price projections provided by the Gas Research Institute to calculate NPV and energy savings.

As a complement to energy price sensitivities, the Department calculated the cost of conserved energy (CCE) for its appliance energy-efficiency standards under consideration. The CCE is the increase in purchase price amortized over the lifetime of the appliance. The advantage of the CCE approach is that it does not require assumptions about future energy prices, because it uses only the purchase expense of the efficiency measure and the expected energy savings. The consumer will benefit whenever the cost of conserved energy is less than the energy price paid by the consumer for that end use. The CCE's calculated for the standards set forth in today's rule are all less than the energy prices projected by either the EIA or GRI. See Supplemental tables 4.10–4.18 in the TSD.

For consumer impacts such as payback and changes in life cycle cost, which are measured at the effective date of the standard, the Department believes both fixed and variable costs should be included because these costs are currently reflected in consumer utility bills based on cost-of-service rates. It is not anticipated that the reductions in energy demand resulting from energy efficiency standards for room air conditioners are likely to have any significant effect on consumer electricity rates (or prices).

In estimating the national net present value of the cost savings resulting from more stringent efficiency standards, it may be appropriate to distinguish between the expected cost impacts on individual consumers and the cost impacts on the nation as a whole. To determine whether there is a significant difference between consumer and national cost impacts, it would be necessary to distinguish between the long run fixed and variable costs of serving residential electricity demand. For example, if electricity demand is reduced, utilities will be able to cut back immediately on the fuel used to generate electricity and, over the long run, should also be able to reduce their power generating, transmission and possibly even their distribution capacity. However, reduced demand is unlikely to affect the cost to a utility of billing and servicing individual customers. Furthermore, because virtually all consumer electricity rates are still based on average costs and do not reflect the variations in these costs that occur hourly, it is also possible that improving the efficiency of particular appliances will result in significant reductions in the high costs of meeting peak demand or, in other cases, may simply reduce utility base loads (resulting in much lower cost savings). Unfortunately, the Department does not have adequate information upon which to distinguish accurately between consumer cost savings and the cost reductions likely to be experienced by utilities or the nation as a whole. In the absence of such information, the Department believes that its use of retail prices as the basis for calculating the net present value of projected cost savings to the nation (national benefits) is a reasonable approach.

In addition to the impact of energy savings in today's world, there is much speculation as to the impact of electric utility restructuring on future electric rates. However, with federal and state regulations being very undefined, the Department believes it would be pointless to attempt to reflect unknown future electric rate structures in today's analyses. In future rulemakings, the Department will consider such impacts as they become evident. The Department concludes from the information set forth above that it is properly calculating consumer energy cost savings and national net present value.

With regard to the variables and assumptions used in the models, the assumptions regarding discount rates have been discussed extensively, and DOE used the discount rates it determined to be most appropriate. For future rulemakings, the Department always seeks and welcomes the most current information regarding its models and will continue to improve them.

b. General Analytical Comments

This section discusses the general analytical issues raised by the comments to the 1994 Proposed Rule.

The Engineering Analysis identified design options for improvements in efficiency along with the associated costs to manufacturers for each class of product. For each design option, these costs constitute the increased per-unit cost to manufacturers to achieve the indicated energy efficiency levels. Manufacturer, wholesaler, and retailer markups will result in a consumer purchase price higher than the manufacturer cost.

In the analysis which supported the Draft Report, the Department used a computer model that simulates a hypothetical company to assess the likely impacts of standards on manufacturers and to determine the effects of standards on the industry at large. This model, the Manufacturer Analysis Model (MAM), is described in the TSD. (See TSD, Appendix C.) It provides a broad array of outputs, including shipments, price, revenue, net income, and short- and long-run returns on equity. An ''Output Table'' lists values for all these outputs for the base case and for each of the five standard levels analyzed. It also gives a range for each of these estimates. The base case represents the forecasts of outputs with a range of energy efficiencies which are expected if there are no new or amended standards. A ''Sensitivity Chart'' (TSD, Appendix C) shows how returns on equity would be affected by a change in any one of the nine control variables of the model. The Manufacturer Analysis Model consists of 13 modules. The module which estimates the impact of standards on total industry net present value is version 1.2 of the Government Regulatory Impact Model (GRIM), dated March 1, 1993, which was developed by the Arthur D. Little Consulting Company (ADL) under contract to AHAM, the Gas Appliance Manufacturers Association (GAMA), and the Air-Conditioning and Refrigeration Institute (ARI). (See TSD, Appendix C for more details.)

Arthur D. Little, Inc. (ADL) submitted comments on the 1994 Proposed Rule on behalf of AHAM, the Air-Conditioning and Refrigeration Institute (ARI), and the Gas Appliance Manufacturers Association (GAMA.) ADL and others criticized the methodology and analytical models used to assess standards. These comments raised concerns about the determination of the impact of standards on manufacturers, particularly the way the Department used the GRIM developed by industry, and the failure to consider the impact of multiple DOE and other agency regulations. Other analytical issues raised included the determination of consumer paybacks from energy savings, expected life of the product, economic assumptions, the use of prototypical firms, and other assumptions and variables used in the simulation model. (ADL, No. 665 at 1, 8–10, 14-19; AHAM, Transcript April 7, 1994, at 173.) Amana commented that historical models are difficult to construct and that prices fluctuate, and therefore, the Department should not ''place too much stock in computer models.'' Basing its statement on the consumer price index (CPI), producer price index (PPI), and average energy use trends, Amana also stated that there is no evidence to suggest that capital cost increases due to efficiency improvements are passed on to the consumer. (Amana, No. 347 at 2–3.)

In implementing the Process Rule, the Department is now undertaking a review of the manufacturing impact analysis model and methodologies. In developing its new methodology, the Department will take into account the comments received concerning its methodology. However, while DOE is committed to working with the interested public to improve these analytical tools, DOE believes the analytical approach used in conjunction with the Draft Report is a reasonable basis for assessing manufacturer impact.

The Department recognizes that the manufacturers disagreed with the analytical method used in the 1994 Proposed Rule and the Draft Report regarding impacts on manufacturers. However, the Department assumes that the standards recommended by AHAM would not have adverse impacts on the industry or the individual manufacturers. The standards the Department sets forth in today's rule are quite similar to those recommended by AHAM. The Department has selected slightly higher (0.2–0.3 EER) standards than those standards proposed by AHAM for the classes 1 through 4. AHAM's primary concern was the impact of the cost of chassis size increases on manufacturers. The Department took into consideration a graph provided by AHAM which shows the percent of production requiring a chassis size change at each EER level. In selecting the standard levels for classes 1 through 4, the Department, in an effort to mitigate the identified cost impact on manufacturers, was careful to avoid any significant increase in the percentage of production requiring a chassis size change.

ACEEE recommended that DOE compile the best available data on two key variables: markup from manufacturer to the consumer and changes in purchase patterns in response to efficiency-induced price increases. This data should be used for the current analysis in both the Government Regulatory Impact Model (GRIM) and the Manufacturer Impact Model (MIM.) Over the long term, ACEEE suggested that DOE work with industry to co-fund a study on consumer purchase behavior in response to efficiency-induced price increases that would help improve the usefulness of both GRIM and MIM. (ACEEE, No. 557 at 5.)

DOE has decided to integrate the GRIM with the MIM which has resulted in the development of a new model entitled the Lawrence Berkeley Laboratory Manufacturer Analysis Model (LBL–MAM.) The Department will continue in its efforts to collect the best available data on markups to use in its analytical tools. With regard to consumer response to efficiency-induced price increases, the Department's consumer analysis contains, for each covered product, values that represent the likely response. These values were originally estimated by analyses of data concerning product purchases during the 1970's and have been updated. The Department continues attempting to update its assumptions where updates are warranted and welcomes ACEEE's suggestions. DOE will explore the feasibility of a cooperative study on empirically-verifiable updates on price elasticity.

IV. Analysis of Room Air Conditioner Standards

Revised standards for room air conditioners shall be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. These and related statutory criteria are addressed below.

a. Efficiency Levels Analyzed

The Department examined a range of standard levels for room air conditioners. Table 4–1 presents the five efficiency levels selected for analysis in the Draft Report, as well as the supplemental efficiency level. Level 5 corresponds to the highest efficiency level, max tech, considered in the engineering analysis. The Final TSD contains the information analyzed in the Draft Report and the supplemental analysis.

After analyzing the comments received concerning the Draft Report, the Department decided to analyze an additional standard level, defined as the supplemental level. The Department calculated the energy savings, net present value, life-cycle cost, life-cycle cost sensitivity to energy prices, payback period, and environmental emissions reduction for this supplemental standard level. These tables can be found in the Supplemental section of the TSD.

TABLE 4–1.—STANDARD LEVELS ANALYZED FOR ROOM AIR CONDITIONERS

Product class	Level 1	Level 2	Suppl. level	Level 3	Level 4	Level 5
Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	9.32	9.71	9.7	10.00	10.38	11.74
Without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	9.38	9.66	9.7	9.91	10.33	11.67
Without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	9.71	9.85	9.8	10.11	10.97	12.39
Without louvered sides, with reverse cycle, and 14,000 to 19,999 Btu/h	9.70	9.98	9.7	10.15	10.15	12.77
Without reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.39	8.39	8.5	8.51	8.88	11.14
Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	9.10	9.10	9.0	9.23	9.23	11.52
Without reverse cycle, without louvered sides, and 6,000 to 7,999 Btu/h	9.10	9.10	9.0	9.23	9.23	11.52
Without reverse cycle, without louvered sides, and 8,000 to 13,999 Btu/h	8.80	9.05	8.5	9.12	9.12	11.08
Without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	8.80	9.05	8.5	9.12	9.12	11.08
Without reverse cycle, without louvered sides, and 20,000 Btu/h or more	8.80	9.05	8.5	9.12	9.12	11.08
With reverse cycle and with louvered sides	9.05	9.05	9.0	9.27	9.27	11.16
With reverse cycle and without louvered sides	8.72	8.72	8.5	8.86	8.86	10.87

Rather than presenting the results for all classes of room air conditioners in today's rule, the Department selected a class of room air conditioners as being representative, or typical, of the product and is presenting the results only for that class. The results for the other classes can be found in the TSD in the same sections as those referenced for the representative class. The representative class for room air conditioners is units with side louvers, without a reverse cycle, and with a capacity of 8,000–13,999 Btu per hour. This class of room air conditioners has the largest sales volume. For this representative class, trial standard level 1 accomplishes efficiency improvements from the baseline by increasing the compressor EER to 10.8; level 2 adds a subcooler; level 3 adds evaporator and condenser grooved tubing; level 4 increases the evaporator and condenser coil area; and level 5 adds a variable-speed compressor and brushless permanent magnet fan motor. Similar design options are used to achieve the above efficiencies for the other classes and are found tabulated in Section 1.5 of the TSD. The supplemental level was not based on any specific configuration of design options, but rather it resulted from consideration of the comments DOE received regarding the Draft Report. The analysis used in the Draft Report became the basis for the TSD. Consequently, calculations in the TSD and today's rule are based on those energy price forecasts from the 1995 Annual Energy Outlook (AEO) of the Energy Information Administration (EIA) , the current forecast at the time of the analysis, unless otherwise noted. (DOE/EIA–0383(95)). Supplemental calculations were performed where the Department determined it would be appropriate to reflect the most current prices.

The Department believes that all the standard levels it examined are technologically feasible. The only questions which were raised by commenters about technological feasibility pertained to Brushless Permanent Magnetic (BPM) fan motors and variable speed compressors. These design options were only considered at the most stringent standard levels.

b. Significance of Savings

Under section 325(o)(3)(B) of EPCA, the Department is prohibited from adopting a standard for a product if that standard would not result in ''significant'' energy savings. The Department forecasted energy consumption by the use of the LBL–REM. (See Appendix B of the TSD.) To estimate the energy savings by the year 2030 due to revised standards, the energy consumption of new room air conditioners under the base case is compared to the energy consumption of those sold under the candidate standard levels. For the candidate energy conservation standards, the Lawrence Berkeley Laboratory-Residential Energy Model projects that over the period 1999–2030, the following energy savings would result for all classes of the product:

Level 1—0.36 Quad
Level 2—0.52 Quad
Supplemental Level—0.49 Quad
Level 3—0.69 Quad
Level 4—0.96 Quad
Level 5—0.72 Quad

The preceding values of energy savings use AEO 1995 energy price forecasts; however, calculating the energy savings for the supplemental level using AEO 1997 produces an energy savings of 0.64 Quad.[5]

While the term ''significant'' is not defined in EPCA, the U.S. Court of Appeals for the District of Columbia Circuit concluded that Congress intended the word ''significant'' to mean ''non-trivial.'' *Natural Resources Defense Council* v. *Herrington*. 768 F.2d 1355, 1373 (D.C.Cir. 1985). Thus, for this rulemaking, DOE concludes that each standard level considered results in significant energy savings.

c. Economic Justification

Section 325(o)(2)(B) of EPCA provides seven factors to be evaluated, to the greatest extent practicable, in determining whether a conservation standard is economically justified.

1. Economic Impact on Manufacturers and Consumers

The engineering analysis identified improvements in efficiency along with the associated costs to manufacturers for each efficiency level for each class of product. For each design option, these associated costs constitute the increased per-unit cost to manufacturers to achieve the indicated energy efficiency levels. Manufacturer, wholesaler, and retailer markups will result in a consumer purchase price higher than the manufacturer cost.

To assess the likely impacts of standards on manufacturers and to determine the effects of standards on different-sized firms, the Department used a computer model that simulates hypothetical firms in the industry under consideration. This model, the Manufacturer Analysis Model (MAM), is explained in the TSD. (See TSD, Appendix C.)

For consumers, measures of economic impact are the changes in purchase price, annual energy expense, and installation costs. The purchase price, installation cost, and cumulative annual energy expense, i.e., life-cycle cost, of each standard level are presented in Chapter 3 of the TSD. Under section 325 of the EPCA, the life-cycle cost analysis is a separate factor to be considered in determining economic justification.

The per unit increased costs to manufacturers to meet the efficiency of levels 1–5 for the representative class are $6.11, $8.37, $13.17, $47.09, and $242.52, respectively. The increased per unit cost for the supplemental level falls within the range of $6–$9 for the representative class. See Tables 1.10–1.18 in the TSD.

The consumer price increases for the representative class are estimated to be $11, $15, $23, $82, and $434 for standard levels 1–5, respectively. The consumer price increase for the supplemental level is estimated to be $13. See Tables 4.1–4.9 and Supplemental Tables 4.1–4.9 in the TSD.

The per-unit reduction in annual costs of operation (i.e., energy expense) for the representative class are $2, $3, $4, $8, and $13 for standard levels 1–5, respectively, and $2.5 for the supplemental level. See Tables 4.1–4.9 and Supplemental Tables 4.1–4.9 in the TSD.

The Lawrence Berkeley Laboratory-Manufacturer Impact Model results for all classes of room air conditioners show that revised standards could cause a prototypical manufacturer to have some reductions in short-run return on equity from the 10.9 percent return in the base case. Standard levels 1 through 5 are projected to produce short-run returns on equity of 10.7 percent, 10.6 percent, 10.5 percent, 8.8 percent, and 0.13 percent, respectively. The short-run return on equity for the supplemental level is projected to be in the range of 10.5–10.7 percent. Revised standards have little or no effect on the prototypical manufacturer's long-run return on equity. Standard levels 1 through 5 are projected to produce long-run returns on equity of 10.8 percent, 10.8 percent, 10.8 percent, 10.3 percent, and 7.2 percent, respectively. For the supplemental level the long-run return on equity would also be approximately 10.8 percent. See Tables 5.1 and 5.3 in the TSD.

2. Life-cycle Cost and Net Present Value

One measure of the effect of proposed standards on consumers is the change in life-cycle costs, including recurring operating expenses, the purchase price, and the installation costs resulting from the new standards. The change in life-cycle cost is quantified by the difference in the life-cycle costs between the base case and candidate standard case for each of the product classes analyzed. The life-cycle cost is the sum of the purchase price and the cumulative operating expense, including installation and maintenance expenditures, discounted over the lifetime of the appliance. The life-cycle cost was calculated for the range of efficiencies analyzed in the ''Engineering Analysis'' section of the TSD, for each class, in the year standards are imposed, using real consumer discount rates of six percent.

For the representative class, life-cycle costs at standard levels 1–3 as well as the supplemental level are less than the baseline unit. Standard level 1 would reduce life-cycle costs for the average affected consumer of $6.76 for the representative class of room air conditioner; standard level 2 would reduce average life-cycle costs by $6.67, standard level 3 by $8.48, and the supplemental level by $6.59; for standard levels 4 and 5, the life-cycle costs are projected to increase $19.4 and $328, respectively, compared to the base case. Of the five candidate standard levels, a unit meeting standard level 3 would have the lowest consumer life-cycle cost for the representative class. See Figures 4.4, Tables 4.1–4.18, and Supplemental Tables 4.1–4.18 in the TSD.

The Department's baseline method of analysis[6] calculated costs of increasing

[5] AEO 1995 projected higher energy prices in the future as compared to AEO 1997. Consequently, using AEO 1995 projections, a larger percentage of consumers are projected to purchase higher efficiency room air conditioners in the absence of standards (in the base case), as compared to the base case using AEO 1997 projections. This relative difference results in a larger projected energy savings between the base case and the standards case using AEO 1997 projections as compared to AEO 1995 projections.

[6] The engineering analysis is conducted on the basis of selecting a representative ''baseline'' unit for each room air conditioner product class. The selected ''baseline'' unit is an actual room air conditioner model that has an EER close to the existing minimum efficiency standard and a cooling capacity that is representative of most units in the product class. The physical characteristics of the

chassis size at the standard level at which the baseline required a chassis size change. This analysis produced the preceding values for life-cycle cost. In addition, AHAM provided analysis in which the cost of increasing chassis size was prorated at each standard level. Using this method and the data provided by AHAM (AHAM, RAC No. 9 at Attachment 3A), for classes 1–5, which make up 85 percent of the shipments, the supplemental standard level has the lowest life-cycle cost when prorating chassis size cost.

The Department examined the effect of different discount rates (2, 6, and 15 percent) on the life-cycle cost curves and generally found little impact. See Figures 4.1–4.9 in the TSD. Life-cycle cost sensitivity to changes in energy price and equipment price were analyzed. See Figure 4.10, Table 4.19, and Supplemental Table 4.19 in the TSD. This analysis shows that the life-cycle cost minimums remain unchanged at high energy prices. For low State energy prices, any increase in standard above the baseline, shows a life-cycle cost increase; however, through standard level 3, this increase is less than $3 (and approximately $1 for the standards in today's rule).

As previously addressed under Discussion of Comments, the Department also calculated life cycle costs and paybacks using energy prices calculated by the Gas Research Institute (GRI). (See the Supplemental Sensitivity Analysis subsection of the TSD.) The life-cycle minimums resulting from the GRI projections remain unchanged from the analysis using the AEO price forecasts. The payback periods increase slightly, using the GRI forecasts, but remain well within the expected lifetime of the product.

The Net Present Value analysis, a measure of the net savings to society, indicates that for all classes of room air conditioners, standard level 1 would produce an NPV of $0.40 billion to consumers. The corresponding net present values for standard levels 2–5 are $0.54 billion, $0.59 billion, $−0.26 billion, and $−10.9 billion, respectively (based on AEO 1995 energy price projections). See Table 3.6 in the TSD. The NPV for the supplemental level is $0.51 billion using AEO 1995, for basis of comparison. Using AEO 1997 data, the NPV of the supplemental level is calculated to be $0.45 billion. See the Supplemental Sensitivity Analysis subsection of the TSD.

A sensitivity analysis was also conducted for energy savings and Net Present Value (NPV), using GRI forecasts for the following cases: the GRI fuel price projection, low equipment price, high equipment price, and high efficiency trend. (See the Supplemental Sensitivity Analysis subsection of the TSD.) The results of this analysis show that although the NPV and energy savings change in each scenario, both the NPV and the energy savings remain positive, indicating an overall benefit to the consumer and the nation.

3. Energy Savings

EPCA requires DOE to consider the total projected energy savings that result from revised standards. The Department forecasted energy consumption through the use of the LBL–REM. (See Appendix B of the TSD for a detailed discussion of the LBL–REM.) The projected savings using AEO 1997 is 0.64 Quad for the supplemental level. See Supplemental Table 3.97 in the TSD. Also, see section IV.c. in today's rule for the energy savings of the other efficiency levels.

4. Lessening of Utility or Performance of Products

In establishing classes of products and design options, the Department tried to eliminate consideration of any design option that would result in degradation of utility or performance. Thus, a separate class with a different efficiency standard was created for a product where the record indicated that the product included a utility or performance-related feature that affected energy efficiency. For example, the Department added classes for casement-only and casement-slider room air conditioners. These room air conditioners offer the unique utility of fitting into slider and casement windows. In this way, the Department attempted to minimize the impact of amended standards on the utility and performance of room air conditioners.

5. Impact of Lessening of Competition

The Energy Policy and Conservation Act directs the Department to consider the impact of any lessening of competition that is likely to result from the standards, as determined by the Attorney General.

In a letter dated September 16, 1994, the Department of Justice (DOJ) expressed concern about the effects the standards proposed in the 1994 Proposed Rule might have on industry. DOJ stated that there was evidence that some of the design options suggested in the 1994 Proposed Rule were less effective and more costly than the TSD indicated and that manufacturers may, among other things, need to redesign the chassis of some classes to comply with the standard. DOJ concluded that such redesigns could add to unit installation costs, make units larger and more cumbersome to install, and otherwise depress demand. Furthermore, DOJ noted evidence that at least one product, the five thousand Btu/h unit, may cease to be manufactured if the standard proposed in 1994 were adopted. DOJ was also concerned about the availability and efficacy of some design options suggested in the TSD for the Proposed Rule. DOJ concluded that the proposed standard could have a substantial negative impact on demand and rates of return, and could cause one or more firms to cease the manufacture and sale of some of these products, thus lessening competition. (DOJ, No. 840 at 5.) The September 16, 1994, letter is printed at the end of today's rule.

The Department of Justice comments were based on the standards proposed in the 1994 Proposed Rule. The revised analysis contained in the 1996 Draft Report and the supplemental analysis, and commented upon by the public, addressed many of the concerns raised by DOJ. The standards promulgated in today's final rule have been adjusted from the proposed standards in order to mitigate the types of concerns raised by DOJ. For example, the Final Rule sets the same standard level for class 1 as for class 2, addressing the concern that class 1 units would be eliminated from the marketplace as a result of the revised standards. The Department's revised analysis addressed concerns about the installation costs and chassis size increases, and the standards in the Final Rule reflect this revised analysis. The manufacturing impact analysis shows no significant shifts in manufacturer rates of return under the supplemental standards level. Thus, the Department of Energy concludes that the concerns raised by the DOJ have been addressed, and DOE does not expect competition to be negatively impacted by this final rule.

6. Need of the Nation to Save Energy

Enhanced energy efficiency improves the Nation's energy security, strengthens the economy, and reduces the environmental impacts of energy production. In 1997, 3.4 percent of residential sector electricity consumption (corresponding to 0.38

''baseline'' unit (e.g., compressor efficiency and heat exchanger design) dictate which design options can be considered to improve its efficiency and at what rate the manufacturer cost will be increased. The selected ''baseline'' unit's physical make-up is known not to be representative of all minimum efficiency equipment in its product classes. But because its EER and capacity are representative, it is assumed that the design options that are added to improve its efficiency will yield a manufacturer cost vs. efficiency relationship that is representative of all ''baseline'' units in the product class, irrespective of physical design.

quad source energy) was accounted for on a national basis by room air conditioners. The Department estimates that over 30 years the revised standards will save approximately 0.64 quads of primary energy.

7. Other Factors

Decreasing future electricity demand by means of standards will decrease air pollution. Standards will result in a decrease in nitrogen dioxide (NO_x) emissions. For standard levels 1–5, over the years 2000 to 2030, the total estimated NO_x emission reduction would be 55,000 tons; 80,000 tons; 104,000 tons; 141,000 tons; and 60,000 tons, respectively. For the supplemental level the reduction is estimated at 74,000 tons using the AEO 1995 energy prices and 95,000 tons using AEO 1997 energy prices. See Tables 7.1–7.5 and Supplemental Tables 7.6 and 7.7 in the TSD.

d. Payback Period

Another consequence of the standards will be the reduction of carbon dioxide (CO_2) emissions. For standard level 1, over the years 2000 to 2030, the total estimated CO_2 emission reduction would be 30 million tons. For standard levels 2–5, the reductions would be 44 million tons; 57 million tons; 79 million tons; and 55 million tons, respectively. For the supplemental level the reduction is estimated at 41 million tons using AEO 1995 energy prices and 54 million tons using AEO 1997. See Tables 7.1—7.5 and Supplemental Tables 7.6 and 7.7 in the TSD.

Energy associated with these standards would also reduce the costs associated with SO_2 compliance.[7] See Tables 7.1—7.5 and Supplemental Tables 7.6 and 7.7 in the TSD.

[7] Decreases in SO_2 emissions will not occur because the Clean Air Act places a ceiling on SO_2 emissions that will be met under any regulatory regime. In the case of SO_2 therefore, the emissions reductions should be interpreted as reduced costs to electricity generators for controlling SO_2. For all classes of room air conditioners, over the years 2000 to 2030, the estimated need to control SO_2 is estimated to be reduced by 59,000 tons; 86,000 tons; 111,000 tons; 149,000 tons; and 43,000 tons, for levels 1–5, respectively. For the supplemental level the reduction is estimated at 79,000 tons. However, using AEO 1997, the reduction is estimated at 100,000 tons. This reduced need to control emissions will be reflected in lower costs of pollution control at utilities or lower price allowances.

If the increase in initial price of an appliance due to a conservation standard would repay itself to the consumer in energy savings in less than three years, then it is presumed that such standard is economically justified.[8] EPCA, Section 325(o)(2)(B)(iii), 42 U.S.C. 6295(o)(2)(B)(iii). This presumption of economic justification can be rebutted upon a proper showing. Failure to qualify for this presumption shall not be taken into consideration in determining whether a standard is economically justified. *Id.*

[8] For this calculation, the Department calculated cost-of-operation based on the DOE test procedures. Therefore, the consumer is assumed to be an ''average'' consumer as defined by the DOE test procedures. Consumers who use the products less than the test procedure assumes will experience a longer payback while those who use them more than the test procedure assumes will have a shorter payback.

Table 4.2 presents the payback periods[9] for the efficiency levels analyzed for the representative class of the product. For this representative class, none of the standard levels satisfy the rebuttable presumption test. Standard level 4 meets the rebuttable presumption criteria for classes 4 and 12. Standard level 3 meets the rebuttable presumption criteria for classes 1, 4 and 12. The standards set forth in today's rule meet the rebuttable presumption criteria for classes 1, 2, 4, 8–10, and 12. Payback periods for all classes of room air conditioners may be found in Tables 4.10—4.18 and Supplemental Tables 4.10—4.18 in the TSD.

[9] These payback periods are weighted averages. They compare the portion of the projected distributions of designs in the base case that are less efficient than the standard level to the design at the standard level. Designs with energy consumption at or below the standard level are not affected by the standard and are excluded from the calculation of impacts.

TABLE 4–2.—PAYBACK PERIODS OF DESIGN OPTIONS (YEARS) FOR THE REPRESENTATIVE CLASS OF ROOM AIR CONDITIONERS

Standard level	Payback period
1	3.8
2	3.9
Supplemental	3.8
3	4.2
4	8.3
5	27.2

e. Conclusion

1. *Additional Product Classes.* The Department has added four new product classes. First, the Department is adding two classes for casement-type units because of the unique utility they offer the consumer. The size limitations imposed on casement-type units are more significant than the limitations of typical units designed for double-hung windows, and the performance-related feature (fitting into casement windows) justifies a lower efficiency standard. The two additional product classes for casement units are casement-only units and casement-slider units. In today's rule, definitions for these terms are being added to Section 430.2 Subpart A of 42 U.S.C. 6291–6309. For today's rule, the Department has selected the efficiency standard recommended by AHAM, ACEEE, and NRDC for casement-slider units (9.5 EER) (AHAM, RAC No. 6 at 2 and ACEEE/NRDC, RAC No. 5 at 5) and the standard recommended by AHAM for casement-only units (8.7 EER). (AHAM, RAC No. 6 at 2.)

Second, the Department is splitting each of two classes for reverse cycle units into two classes. Splitting of these two classes accommodates the concerns expressed in public comments. The class of units with a reverse cycle and louvered sides is split between capacities of less than 20,000 Btu/h (class 11) and 20,000 Btu/h or more (new class 13). The class of units with reverse cycle and without louvered sides is split between capacities of less than 14,000 Btu/h (class 12) and capacities of 14,000 Btu/h or more (new class 14).

2. *Standards.* Section 325(o)(2)(A) of the Act specifies that the Department must establish standards that ''achieve the maximum improvement in energy efficiency which the Secretary determines is technologically feasible and economically justified.'' EPCA, section 325(o)(2)(A). Technologically feasible design options are ''technologies which can be incorporated in commercial products or in working prototypes.'' 10 CFR part 430, Appendix A to Subpart C, 4(a)(4)(I).

[10] This value was calculated using AEO 1997 and factoring in the offset from the increased use of central air conditioners and heat pumps.

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A standard level is economically justified if the benefits exceed the burdens. EPCA, section 325(o)(2)(B)(I).

A maximum technologically feasible (max tech) design option was identified for each class of room air conditioners. The max tech levels were derived by adding energy-conserving engineering design options to the baseline units for each of the respective classes in order of decreasing consumer payback. The max tech level includes higher efficiency fan motors, which were added as one of the first design options, and variable speed compressors, which were added as one of the last design options because of their slower payback. A complete discussion of each max tech level, and the design options included in each, is found in the *Engineering Analysis* in the TSD, Chapter 3.

Table 5–1 presents the max tech performance levels for all classes of the subject product:

TABLE 5–1.—MAXIMUM TECHNOLOGICALLY FEASIBLE STANDARD LEVELS FOR ROOM AIR CONDITIONERS EXPRESSED IN ENERGY EFFICIENCY RATIO

Product class	Energy efficiency ratio
Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	11.7
Without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	11.7
Without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	12.4
Without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	12.8
Without reverse cycle, with louvered sides, and 20,000 Btu/h or more	11.1
Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	11.5
Without reverse cycle, without louvered sides, and 6,000 to 7,999 Btu/h	11.5
Without reverse cycle, without louvered sides, and 8,000 to 13,999 Btu/h	11.1
Without reverse cycle, without louvered sides, and 14,000 to 19,000 Btu/h	11.1
Without reverse cycle, without louvered sides, and 20,000 Btu/h or more	11.1
With reverse cycle and with louvered sides	11.2
With reverse cycle and without louvered sides	10.9

Accordingly, the Department first considered the max tech level of efficiency, i.e., standard level 5. Of the standard levels analyzed, level 5 would save the most energy (4.1 quads between 1999 and 2030.) However, because many consumers would not purchase room air conditioners due to the high first cost associated with this standard level, purchases of central air conditioners and heat pumps will increase, resulting in a reduction of savings for room air conditioners. After accounting for this offset, the net savings is 0.72 quad. Also, in order to meet this standard, the Department assumes that all room air conditioners would incorporate larger and improved heat transfer devices in addition to high efficiency, variable-speed fan motors and compressors. However, at this standard level, the payback period of 27 years for the representative class, and up to 107 years for other classes, exceeds the 12.5-year life of the product. The life-cycle cost increases are $328 for the representative class and up to $911 for other classes. This level also drives the short-run manufacturer return on equity from 10.9 percent to 0.13 percent. The Department therefore concludes that the burdens of standard level 5 for room air conditioners outweigh the benefits and that this standard level is not economically justified, and thus the Department rejects the standard level.

The next most stringent standard level is standard level 4. This standard level is projected to save 1.34 quads of energy. However, many consumers would not purchase room air conditioners due to the high first cost associated with this standard level, resulting in increased purchases of central air conditioners and heat pumps and a reduction of savings for room air conditioners. After accounting for this offset, the savings are 0.96 quad. For the representative class this level produces a life-cycle cost increase of $19 compared to the base case. Classes 4 and 12 meet the rebuttable presumption criteria. However, the payback period for the representative class is 8.3 years, with payback periods of up to 10.6 years for the other classes (80 percent of the average product lifetime of 12.5 years). This level also reduces manufacturer short-run return on equity from 10.9 percent to 8.8 percent, a reduction of nearly 20 percent. The Department therefore, concludes that the burdens of standard level 4 for room air conditioners outweigh the benefits and that this standard level is not economically justified, and thus the Department rejects the standard level.

The next most stringent standard level is standard level 3. Standard level 3 is projected to save 0.79 quad of energy. After accounting for the increased use of central air conditioners and heat pumps, the savings become 0.69 quad. For the representative class, the analysis shows this level produces a life-cycle cost decrease of $8.5 compared to the base case and a payback of 4.2 years. This standard level meets the rebuttable presumption criteria for classes 1, 4 and 12. The manufacturer impact analysis for this level shows a manufacturer short-run return on equity reduction from 10.9 percent to 10.5 percent. Although the feedback generated from the LBL-MAM indicated acceptable manufacturer impact, the comments received from manufacturers on the 1996 Draft Report indicated burdens to manufacturers which were not identified by the model. The Department believes these impacts must be considered. A class-specific approach was taken to consider these impacts.

For classes 1 through 5, the manufacturers disagreed with the Department's baseline method of analysis wherein, for each class, a specific model was simulated for improvement up to and including a chassis size change, when necessary for that model. AHAM commented that this method does not adequately account for the cost of increasing chassis size. AHAM believes the cost of increasing chassis size should be prorated for each efficiency level analyzed, because at each efficiency improvement, some models within each class would need to undergo a chassis size change, even though the specific model being analyzed did not necessarily need a chassis size change. AHAM provided the Department with a graph depicting the percent of production required to change chassis size at each standard level for each of the first five classes. (AHAM, No, 1 at 14.) AHAM calculates that efficiency level 3 would require 39 percent of production to move to a larger chassis size. However, because the baseline method of analysis does not prorate the cost at each level, the impact of 39 percent of production requiring a larger chassis is not considered by the model. (AHAM, No. 4 at 3.)

For classes 6 through 12, AHAM argues that because the engineering simulation model was designed using units with louvered sides and without a reversing valve, the simulation does not provide a good simulation for units without louvers or units with a reversing valve. AHAM commented that this inaccuracy understates the extreme differences between the air flow patterns on the condenser side of units with and without louvers, as well as the refrigeration circuit restrictions caused by the reversing valve and concessions made to balance both cooling and heating in one unit. As addressed in section III, ''Discussion of Comments,'' manufacturers emphasize that increasing the standards could eliminate higher capacity models from the market due to the impracticality of increasing the chassis size for these units. (AHAM, RAC No. 4 at 3–4.)

For these reasons, the Department concludes the burdens of standard level 3 outweigh the benefits and that the standard level is not economically justified, and thus, the Department rejects this standard level.

Based on the comments received regarding the 1996 Draft Report, the Department next considered a supplemental efficiency level. The comments the Department received in response to its 1996 Draft Report contained recommended standards from AHAM and from ACEEE and NRDC. These recommended standards fell in the range between efficiency levels 1, 2 and 3, depending on the product class.

For classes with louvered sides and without a reversing valve, ACEEE and NRDC recommended 10.0 EER for the first four classes, while AHAM recommended 9.5 EER for the first four classes. For class 5, all three organizations supported an 8.5 EER. AHAM calculated the life cycle costs when prorating the cost of increasing the chassis size for each of the efficiency levels. The life cycle cost minimums fell in the 9.7–9.8 range for the first four classes and 8.5 EER for class 5. The Department concluded that these life-cycle cost minimums should be considered in the supplemental efficiency level.

For classes without louvered sides and without a reverse cycle, the Department also received comments and recommendations for efficiency standards. For most of these classes, both AHAM and the efficiency advocates agreed upon standard levels. Consequently, these levels were selected for the Department's supplemental efficiency level. For class 8, upon which AHAM and the efficiency advocates had differing recommendations, the Department concluded, after analyzing the AHAM Directory, that there is evidence that increasing standards for units without louvers and without reverse cycle may result in eliminating higher capacity units from the market. Thus, the Department chose 8.5 EER for this class.

For classes with a reverse cycle, the Department again took the comments and recommendations it received into consideration in adding and establishing efficiency levels to examine as part of the supplemental efficiency level. In response to public comment, the Department split the two classes for reverse cycle units in order to address the concerns of AHAM, ACEEE, and NRDC.

After carefully considering the analysis, the Department is amending the existing statutory standard for room air conditioners with the supplemental standard level for room air conditioners. The Department concludes that the supplemental standard level for room air conditioners saves a significant amount of energy and is designed to be technologically feasible and economically justified.

This level of efficiency will result in significant energy savings. During the period 2000—2030, these savings are calculated to be 0.64 quad[10] of primary energy. In addition, the standard is expected to have a positive effect on the environment by reducing the emissions of NO_X and CO_2 by 95,000 tons and 54 million tons, respectively.

The technologies that are necessary to meet this standard are presently available. The Department finds this level to be economically justified. The consumer payback of this standard level is 3.8 years for the representative class and no more than 5 years for any class. This standard is at or close to the lowest life-cycle cost for all classes and is expected to result in a reduction in life-cycle cost of approximately $6.6 for the representative class and up to $23 for the other classes. Additionally, the standard is expected to have a small impact on the prototypical manufacturer's short run return on equity and no impact on their long run return on equity, as calculated by the Department. Furthermore, the efficiency levels are reasonably close to the standards recommended by AHAM, which presumably reflect acceptable manufacturer impacts. Although stakeholder consensus was not reached, the public comments converged following the reanalysis, meetings with stakeholders, and the notice reopening the comment period. The efficiency levels selected for today's rule fall within the small range of difference between the stakeholder recommendations. These efficiency levels address the concerns raised by the Department of Justice with regard to the standards in the 1994 Proposed Rule. In addition, since this standard does not involve substantial redesign or retooling, the Department expects that it will not have negative impacts on smaller competitors. Moreover, for classes 1, 2, 4, 8–10, and 12 there is a payback period of less than 3 years and thus a presumption of economic justification. For these reasons, DOE concludes that these standard levels are economically justified and thus promulgates them as revisions to the existing standards.

V. Procedural Issues and Regulatory Review

a. Review Under the National Environmental Policy Act

In issuing the proposed rule, the Department prepared an Environmental Assessment (EA) (DOE/EA–0819) that was published within the Technical Support Document for the Proposed Rule. (DOE/EE–0009, November 1993.) The environmental effects associated with various standard levels were not found to be significant, and a Finding of No Significant Impact (FONSI) was published. 59 FR 15868 (April 5, 1994).

In conducting the analysis for the final rule, the Department evaluated several design options suggested in comments on the proposed rule. As a result, the energy savings estimates and resulting environmental effects in the final rule differ somewhat from those presented in the proposed rule. For example, by the year 2030, the reductions in nitrogen dioxide (NO_2) and carbon dioxide (CO_2) emissions from the standard on room air conditioners are expected to be 95,000 tons and 54,000,000 tons respectively. The environmental effects expected from the final rule fall within ranges of environmental impacts that DOE found in the FONSI not to be significant.

b. Review Under Executive Order 12866, ''Regulatory Planning and Review''

Today's regulatory action has been determined to be an ''economically significant regulatory action'' under Executive Order 12866, ''Regulatory Planning and Review.'' 58 FR 51735 (October 4, 1993.) Accordingly, today's action was subject to review under the

[10] This value was calculated using AEO 1997 and factoring in the offset from the increased use of central air conditioners and heat pumps.

Executive Order by the Office of Information and Regulatory Affairs (OIRA).

Pursuant to E.O. 12866, DOE prepared a draft regulatory analysis. Six major alternatives were identified by DOE as representing feasible policy alternatives for achieving consumer product energy efficiency. Each alternative was evaluated in terms of its ability to achieve significant energy savings at reasonable costs and has been compared to the effectiveness of the rule. 59 FR 10464, 10525–6 (March 4, 1994.) No new data has been received concerning this review, and no substantive changes have been made to this action since the review of the draft by OIRA. The non-regulatory alternatives analyzed in the draft Regulatory Analysis were evaluated for the eight products in aggregate. None of the alternatives analyzed saved as much energy as the standards in the Proposed Rule. The Department believes that the non-regulatory alternatives for each product would have energy savings proportional to the savings for all eight products. Therefore, the Department concludes that non-regulatory alternatives are not likely to meet or exceed the energy savings expected from the standards set forth in today's rule.

c. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act, 5 U.S.C. 601 *et seq.*, requires an assessment of the impact of regulations on small businesses unless an agency certifies that the rule will not have a significant economic impact on a substantial number of small businesses and other small entities. To be considered a small business, a manufacturer of room air-conditioners and its affiliates may employ a maximum of 750 employees. (Small Business Administration size standards, 61 FR 3280.) In the notice of proposed rulemaking, DOE certified pursuant to section 605(b) of the Regulatory Flexibility Act that the proposed action would not have a ''significant economic impact on a substantial number of small entities,'' and, thus, a regulatory flexibility analysis was not prepared.

The Department has not identified any firms that both manufacture room air conditioners covered by EPCA, and have, together with their affiliates, 750 or fewer employees. The Department estimates there are approximately nine domestic firms and six foreign firms that manufacture room air conditioners covered under EPCA, with three domestic companies holding approximately 70 percent of U.S. room air conditioner sales. Many room air conditioner manufacturers are affiliated with larger U.S. or foreign firms which manufacture full product lines of home appliances.

DOE's notice of proposed rulemaking elicited no public comments on the economic impact of the proposed rule on small businesses. One commenter did criticize the Manufacturer Impact Model (MIM) and claimed that the model is inadequate for estimating the impact of standards on small firms. The comment was not supported by any data to cause the Department to conclude that this final rule would have a significant impact on small businesses subject to the regulation.

Today's final rule contains less stringent room air conditioner energy efficiency standards than the proposed rule. The final rule establishes standards in a range from 8.0 to 9.8 EER, and it would add four new product classes to accommodate room air conditioners with and without side louvers and reverse cycle as well as casement room air conditioners. These changes in the final rule will significantly reduce any potential economic impact of the rule on small businesses. Therefore, DOE certifies that this final rule will not have a significant economic impact on a substantial number of small entities.

d. Review Under the Paperwork Reduction Act

No new information or record keeping requirements are imposed by this rulemaking. Accordingly, no Office of Management and Budget clearance is required under the Paperwork Reduction Act. 44 U.S.C. 3501 *et seq.*

e. Review Under Executive Order 12988, ''Civil Justice Reform''

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

f. ''Takings'' Assessment Review

It has been determined pursuant to Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 52 FR 8859 (March 18, 1988) that this regulation would not result in any takings which might require compensation under the Fifth Amendment to the United States Constitution.

g. Federalism Review

Executive Order 12612, ''Federalism,'' 52 FR 41685 (October 30, 1987) requires that regulations, rules, legislation, and any other policy actions be reviewed for any substantial direct effect on States, on the relationship between the Federal Government and the States, or on the distribution of power and responsibilities among various levels of government. If there are substantial direct effects, then Executive Order 12612 requires preparation of a federalism assessment to be used in all decisions involved in promulgating and implementing a regulation or a rule.

The Department finds that this final rule will not have a substantial direct effect on State governments. State regulations that may have existed on the products that are the subject of today's rule were preempted by the Federal standards established in EPCA. States can petition the Department for exemption from such preemption based on criteria set forth in EPCA. None has done so. Accordingly, the Department finds that the preparation of a federalism assessment for this rulemaking is not warranted.

h. Review Under the Unfunded Mandates Reform Act

With respect to a proposed regulatory action that may result in the expenditure by the private sector of $100 million or more (adjusted annually for inflation), section 202 of the

Unfunded Mandates Reform Act of 1995 (UMRA) requires a Federal agency to publish estimates of the resulting costs, benefits and other effects on the national economy. 2 U.S.C. 1532(a), (b). Section 202 of UMRA authorizes an agency to respond to the content requirements of UMRA in any other statement or analysis that accompanies the proposed rule. 2 U.S.C. 1532(c).

The content requirements of section 202(b) of UMRA relevant to a private sector mandate substantially overlap the economic analysis requirements that apply under section 325(o) of EPCA and Executive Order 12866. The Supplementary Information section of the notice of proposed rulemaking and ''Regulatory Impact Analysis'' section of the TSD for the 1994 Proposed Rule responded to those requirements.

Under section 205 of UMRA, the Department is obligated to identify and consider a reasonable number of regulatory alternatives before promulgating a rule for which a written statement under section 202 is required. DOE is required to select from those alternatives the most cost-effective and least burdensome alternative that achieves the objectives of the rule unless DOE publishes an explanation for doing otherwise or the selection of such an alternative is inconsistent with law. As required by section 325(o) of the Energy Policy and Conservation Act (42 U.S.C. 6295(o)), this final rule establishes energy conservation standards for room air conditioners that are designed to achieve the maximum improvement in energy efficiency which DOE has determined to be both technologically feasible and economically justified. A full discussion of the alternatives considered by DOE is presented in the ''Regulatory Impact Analysis'' section of the TSD for the 1994 Proposed Rule.

i. Review Under the Small Business Regulatory Enforcement Fairness Act of 1996

Consistent with Subtitle E of the Small Business Regulatory Enforcement Fairness Act of 1996, 5 U.S.C. 801–808, DOE will submit to Congress a report regarding the issuance of today's final rule before the effective date set forth at the outset of this notice.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Energy conservation, Household appliances.

Issued in Washington, D.C., on September 12, 1997.

Joseph J. Romm,

Acting Assistant Secretary, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble Part 430 of Chapter II of Title 10, Code of Federal Regulations, is amended as set forth below.

Part 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

1. The authority citation for Part 430 continues to read as follows:

Authority: 42 U.S.C. 6291–6309.

2. Section 430.2 of Subpart A is amended by adding new definitions for ''Casement-only room air conditioner'' and ''Casement-slider room air conditioner'' in alphabetical order, to read as follows:

Subpart A—General Provisions

§ 430.2 Definitions.

* * * * *

Casement-only means a room air conditioner designed for mounting in a casement window with an encased assembly with a width of 14.8 inches or less and a height of 11.2 inches or less.

Casement-slider means a room air conditioner with an encased assembly designed for mounting in a sliding or casement window with a width of 15.5 inches or less.

* * * * *

3. Section 430.32 is amended by revising paragraph (b) to read as follows:

§ 430.32 Energy conservation standards and effective dates.

* * * * *

(b) *Room air conditioners.*

Product class	Energy efficiency ratio, effective as of	
	Jan. 1, 1990	Oct. 1, 2000
1. Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	8.0	9.7
2. Without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	8.5	9.7
3. Without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	9.0	9.8
4. Without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	8.8	9.7
5. Without reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.2	8.5
6. Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	8.0	9.0
7. Without reverse cycle, without louvered sides, and 6,000 to 7,999 Btu/h	8.5	9.0
8. Without reverse cycle, without louvered sides, and 8,000 to 13,999 Btu/h	8.5	8.5
9. Without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	8.5	8.5
10. Without reverse cycle, without louvered sides, and 20,000 Btu/h or more	8.2	8.5
11. With reverse cycle, with louvered sides, and less than 20,000 Btu/h	8.5	9.0
12. With reverse cycle, without louvered sides, and less than 14,000 Btu/h	8.0	8.5
13. With reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.5	8.5
14. With reverse cycle, without louvered sides, and 14,000 Btu/h or more	8.0	8.0
15. Casement-Only	*	8.7
16. Casement-Slider	*	9.5

* Casement-only and casement-slider room air conditioners are not separate product classes under standards effective January 1, 1990. These units are subject to the applicable standards in classes 1 through 14 based on unit capacity and the presence or absence of louvered sides and a reverse cycle.

* * * * *

Note: The following letter will not appear in the Code of Federal Regulations.

September 16, 1994

Honorable Christine A. Ervin
Assistant Secretary for Energy Efficiency and Renewable Energy
United States Department of Energy, Forrestal Building, 1000 Independence Ave., S. W., Washington, D.C. 20585

Dear Ms. Ervin:

By letter dated March 14, 1994, the Department of Energy (''DOE'') transmitted to the Attorney General a Notice of Proposed Rulemaking (59 FR 10464) addressing energy standards for eight classes of household appliances. Those classes are: room air conditioners, water heaters, direct heating equipment, mobile home furnaces, kitchen ranges and ovens, pool heaters, fluorescent lamp ballasts and television sets. Section 325 of the Energy Policy and Conservation Act, as amended in 1992 (42 U.S.C. 6295) (''the Act''), requires the Attorney General to determine the impact, if any, of any lessening of competition likely to result from the proposed standards. This letter contains the competitive impact determination of the Department of Justice (''Department'').

Summary

The evidence available to the Department does not indicate that any significant lessening of competition is likely to result from the imposition of the proposed standards for mobile home furnaces and pool heaters contained in the Notice. For television sets, fluorescent lamp ballasts and professional-style or high-end kitchen ranges it is the Department's judgement based on the available evidence that significant anticompetitive effects are likely to occur. For electric water heaters the evidence indicates that a significant anticompetitive effect could take place if sufficient time is not permitted firms to develop, produce and market products complying with the new standard. For microwave ovens, oil-fired water heaters, room air conditioners, and direct heating equipment the evidence indicates that anticompetitive effects could result; the Department is unable on the basis of the available evidence to determine whether such effects are likely. Finally, the evidence indicates that the cumulative effects of these and other regulatory standards could be to lessen competition in certain markets for household appliances.

In preparing these comments the Department has considered the Notice, the Technical Support Document (TSD) prepared by Lawrence Berkeley Laboratory, written comments and oral comments collected by the department in the time allowed and without the benefit of compulsory process.

Discussion

Adoption of standards requiring greater energy efficiency in household appliances could affect competition in a number of ways. First, by raising the cost of appliances and reducing design and feature choices, standards may lower demand. If standards impose costs on manufacturers that can not be passed to consumers they can lower manufacturers' rates of return. Either one or both of these effects could cause manufacturers to exit the market with the effect of lessening competition and raising prices. Second, imposition of standards may lessen or discourage competition in the design and development of new product features or technologies; such competition benefits consumers and the economy.

The record in this proceeding raises many factual issues relating, among other things, to the technical feasibility of certain standards, their economic impact on manufacturers and consumers and consumer reaction to the changes in products that they might require. In numerous instances, industry representatives and technical consultants retained by them have challenged assumptions and conclusions in the Notice and TSD. The Department is not in a position to resolve many of these contested issues on the basis of the available record. Accordingly, in some instances, the Department is unable to reach a conclusion about the impact of the proposed standards on competition.

Fluorescent Lamp Ballasts

One technical issue that has been raised is whether the proposed standards for fluorescent lamp ballasts are attainable with currently available technology. Numerous ballast manufacturers assert that in many instances they are not. The Department concludes that the doubts raised about the technical feasibility of the standards are serious and affect a substantial number of ballast classes. Thus, if the proposed standards were adopted some or all manufacturers would likely have to cease the production of many products and competition in the sale of those products would cease or diminish.

Television Sets and Related Technologies

1. The weight of available evidence is that adoption of the proposed standard for television sets could force all or many manufacturers to revise their products to lessen the number and quality of their features. Many in the industry contend that the only way to produce products that will comply with the standard would be to reduce or eliminate features that consume electricity such as brighter pictures, remote control, picture-in-picture, improved sound and in-set program guides and other features presently being developed. Development and marketing of product improvements and new features has been an important factor driving competition in the market for television sets. Reducing or retarding the development of such features could substantially reduce demand for sets, retard development and refinement of technology, and reduce utility of the product.

Manufacturers might attempt to circumvent the proposed standard by letting features ''migrate''—incorporating them in units to be sold separately or packaged with television sets. It is claimed that disaggregating features in this manner will decrease overall television energy efficiency. There is evidence that it could also lessen competition because the development and marketing of features in such attached units could be costly and cumbersome, among other things encountering receivers that receive cable signals.

There is evidence that the proposed standard for television sets could affect competition in other markets. Representatives of the television industry assert that as the ''Information Highway'' develops television manufacturers intend to expand the capabilities of their products to include new features to enable them to serve as in-home devices for data transmission and communication. They argue that the TV receiver, already located in virtually every American home, could be a uniquely efficient vehicle for the introduction of new data-processing and communication devices. The Department does not make final judgement on this contention but does conclude that, given the apparent difficulties in the marketing of new features as part of attached units, the standard is likely to retard the development of technology and inhibit the ability of television manufacturers to compete with computer manufacturers and others in the development of new technologies and features for the Information Highway.

Professional-Style and Standard Ranges

The Notice proposes a single set of standards for gas ovens and cooking tops in household ranges. There is substantial evidence that one category of home range cannot be manufactured to meet these proposed standards without losing so much of its distinct characteristics that it is no longer marketable. Professional-style or high-end ranges are products designed to provide some of the performance characteristics of professional or restaurant ranges for home kitchens. Some of these characteristics which differentiate them from standard kitchen ranges, such as high performance burners and ovens, involve considerably more energy consumption than do standard ranges; the special uses and appeal of these products, and their premium in price, depends in good measure on these features. Representatives of the range industry assert that high-end ranges cannot be modified to comply with the proposed standards without giving up so much of the special features of the product that they are no longer marketable. The Department concludes that it is likely that competition in the manufacture and sale of these products will be eliminated if the proposed standards are adopted.

While not as strong as the evidence relating to professional style ranges there is evidence challenging the conclusions in the TSD that the proposed standards for standard gas and electric range ovens and cooking tops will not require significant retooling or redesign and will have not more than minimal impact on manufacturers' long run rates of return on equity. The Association of Home Appliance Manufacturers contends that the standard could have a destructive impact on the range industry. It and various range manufacturers claim that design options suggested in the TSD are not effective and that compliance would require substantial investment in redesign and retooling. The Association also insists that suppliers of equipment and technology necessary to comply may not be able to respond simultaneously and evenly to range manufacturers, a problem that could impose a competitive handicap on some range manufacturers.

A range manufacturer has commented that compliance with the standard could seriously weaken it and its ability to compete. There is also evidence that the cumulative costs of compliance with this standard and with other and future appliance standards could induce or force ''full line'' appliance manufacturers to exit one or more of the markets that they serve. The range market is concentrated and, while there is conflicting evidence, the Department concludes that there is a possibility that this proposed standard could force one or more firms out of the manufacture of standard ranges thus lessening competition.

Microwave Ovens

The Notice and the TSD conclude that the proposed standard for microwave ovens will not involve any substantial redesign or retooling by manufacturers and will have little impact on their long run returns on equity. Representatives of the industry strongly challenge these conclusions. For example, a representative of MCD Corporation has testified that compliance with the standard would require that her company, a manufacturer of microwaves, make large investments in retooling, and would threaten its viability. The Association of Home Appliance Manufacturers contends that the standard will in all likelihood eliminate all U.S. Production of microwaves and concentrate U.S. sales in the hands of one or two companies. The Department is not in a position to resolve all of the contested technical and financial issues but concludes that this proposed standard could force some significant producers from this concentrated market and substantially lessen competition in it.

Room Air Conditioners

The Notice and TSD conclude that this proposed standard will not involve substantial redesign or retooling and, while it may produce some reductions in the short run, will have little or no effect on manufacturers' long run returns on equity. This conclusion has been challenged by firms in the industry. There is evidence that some of the design options suggested in the Notice are less effective and more costly than the TSD assumes and that manufacturers may, among other things, need to redesign the chassis of some classes to comply with the standard. Such redesigns could add to unit installation costs, make units larger and more cumbersome to install, and otherwise depress demand. There is evidence that at least one product, the five thousand BTU unit, may cease to be manufactured if the standard is adopted. There are also unresolved issues about such matters as the availability and efficacy of some design options suggested in the TSD. The Department is not able to resolve these issues but concludes that the standard could have a substantial negative impact on demand and rates of return, and cause one or more firms to cease the manufacture and sale of some of these products, thus lessening competition.

Direct Heating Equipment

Manufacturers of direct heating equipment contend that this standard will seriously depress demand for their product and likely force some, perhaps all, manufacturers out of this business. Among other things, they contend that the TSD substantially underestimates the added costs of manufacture, and also the added installation costs for venting and wiring, that will be required. They insist that consumer cost increases will seriously depress demand for their product and that their profit margins will suffer because it will be impossible to pass on much of the increased manufacturing costs to consumers. The Department cannot resolve many of these issues but concludes that there is a possibility that several of the five companies that account for most of the production of these products might exit the market if the standard is adopted thus substantially lessening competition.

Water Heaters

Manufacturers of oil-fired heaters contend that the proposed standard for their product class would threaten the survival of the product, likely forcing all or most producers out of this business. Some claim that it may not be possible with presently available technology to design and manufacture a product that would comply. Manufacturers assert that the added costs of producing a product in compliance with the standard would, in any event, be considerably higher than the TSD indicates and that increases in price would very seriously depress consumer demand for this product. Five firms, two of them Canadian producers, account for most of the sales of this product in the U.S. The Department is not able to resolve all the questions raised regarding this standard; it concludes that there is at least a possibility that the standard might force one or more of these competitors to exitthe U.S. market. Another firm has been taking steps to enter the oil-fired water heater market; adoption of the standard may deter it from doing so. The loss of one such firm could result in a substantial lessening of competition.

DOE's proposed standard for electric water heaters would, in effect, require that such products have an integral heat pump. DOE concedes that this would involve major changes and might cause one or more existing firms to cease the marketing of electric water heaters but believes that other firms such as air conditioner manufacturers may begin producing electric water heaters as a result of the standard. There are complex and unresolved issues as to what would happen to demand for electric water heaters if consumers were required to purchase heat pumps with them. It seems clear that the price of such units will be considerably higher than that of the electric resistance heaters that the standard would remove from the market, but the range of future prices, costs of installation and maintenance and degree of consumer acceptance of a product that has not been widely accepted until now are very difficult to predict. Heat pump water heaters may be useful and economically attractive to many consumers but serious issues have been raised in this proceeding as to whether certain kinds of consumers, such as households with relatively little demand for hot water, will derive a benefit from the product.

Even if the heat pump water heater is eventually widely accepted in the market the Department has concluded that it is likely that competition will be adversely affected for some period of time if adequate time is not permitted for the phasing in of the standard. Three million units or more of electric resistance units are now sold annually in the U.S. Only a few thousand heat pump units are now produced annually in this country, by two firms. It could take a considerable time for other firms to design new product lines and being substantial ne production capacity on line. There is also evidence from those with experience with the product that heat pump water heaters require special maintenance and servicing. Considerable time may be required for firms to develop and train adequate distribution and service networks if they are to compete effectively. If adequate time for phasing in the standard is not allowed, for a considerable period of time there could be fewer companies competing effectively in the electric water heater business than there are now, and competition in this concentrated market could be substantially lessened.

Cumulative Effects of Regulation

Many of the manufacturers of appliances subject to the proposed standards manufacture several different types of appliance, each subject to those standards or to others authorized by the Act. As indicated above, there is evidence that compliance with some of these standards may require manufacturers to make considerable investments. It is anticipated that future standards for other appliances could require manufacturers to make similar investments. Full-line manufacturers such as General Electric, Whirlpool, Frigidaire, Amana and Maytag could thus be required to make changes in several product lines.

As the TSD recognizes, it is difficult for manufacturers to pass redesign and retooling costs on to consumers. And the impact of a single product redesign may fall more heavily on firms with small shares of the market since they must write off their costs against less sales volume. There is some evidence that firms, particularly the smaller ones, facing the prospect of repeated redesigns involving several different products, may be induced to cease manufacturing one or more of such product lines. Thus to a degree that we cannot fully assess there is a possibility that the cumulative effect of these and future energy efficiency standards could be to lessen competition in one or more home appliance markets.

Sincerely yours,

Anne K. Bingaman,

Assistant Attorney General.

[FR Doc. 97–24978 Filed 9–23–97; 8:45 am]

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