DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

10 CFR Part 430

[Docket Number EE–RM–97–500]

RIN 1904–AA75

Energy Conservation Program for Consumer Products: Fluorescent Lamp Ballasts Energy Conservation Standards

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

ACTION: Notice of proposed rulemaking and public hearing.

SUMMARY: The Energy Policy and Conservation Act, as amended, prescribes energy conservation standards for certain major household appliances, and requires the Department of Energy (DOE, Department, or we) to administer an energy conservation program for these products. The National Appliance Energy Conservation Amendments of 1988 require DOE to consider amending the energy conservation standards for fluorescent lamp ballasts. The Department conducted several analyses regarding the energy savings, benefits and burdens of amended energy conservation standards for fluorescent lamp ballasts and has shared the results of these analyses with all stakeholders. Based on these analyses, several of the major stakeholders, including manufacturers and energy efficiency advocates, submitted to the Department a joint proposal for the highest standard level which they believe to be technically feasible and economically justified. Based on our review of this proposal and our analyses, we believe the standards they proposed are technically feasible and economically justified. Therefore, today we propose to amend the energy conservation standard for fluorescent lamp ballasts for commercial and industrial applications as recommended in the joint proposal and announce a public hearing.

DATES: Comments must be received on or before May 29, 2000. The Department requests 10 copies of the written comments and, if possible, a computer disk. Oral views, data, and arguments may be presented at the public hearing to be held in Washington, D.C., beginning at 9:00 a.m. on April 18, 2000.

Requests to speak at the hearing must be received by the Department no later than 4:00 p.m., April 3, 2000. Copies of statements to be given at the public hearing must be received by the Department no later than 4:00 p.m., April 6, 2000. The DOE panel will read the statements in advance of the hearing and would appreciate the oral presentations to be limited to a summary of the statement. The length of each oral presentation is limited to 15 minutes.

ADDRESSES: The hearing will be held at the U.S. Department of Energy, Forrestal Building, Room 1E–245, 1000 Independence Avenue, SW, Washington, DC. Written comments, oral statements, and requests to speak at the hearing are to be submitted to Brenda Edwards-Jones, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Energy Conservation Program for Consumer Products: Fluorescent Lamp Ballasts, Docket No. EE–RM–97–500, 1000 Independence Avenue, S.W., Washington, D.C. 20585–0121.

Copies of the public comments received, the Technical Support Document (TSD) and the transcript of the public hearing 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–41, 1000 Independence Avenue, SW, Washington, DC 20585. (202) 586–9127. Copies of the analysis can also be found on the Codes and Standards Internet site at: http://www.eren.doe.gov/buildings/codes__standards/applbrf/ballast.html.

For more information concerning public participation in this rulemaking proceeding see Section VII, ''Public Comment Procedures,'' of this Notice.

FOR FURTHER INFORMATION CONTACT: Carl Adams, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, EE–41, 1000 Independence Avenue, SW, Washington, DC 20585–0121, (202) 586–9127, or Eugene Margolis, U.S. Department of Energy, Office of General Counsel, GC–72, 1000 Independence Avenue, SW, Washington, DC 20585, (202) 586–9507.

SUPPLEMENTARY INFORMATION:

I. Introduction

a. Authority

Part B of Title III of the Energy Policy and Conservation Act, Public Law 94–163, as amended by the National Energy Conservation Policy Act, Public Law

95–619, by the National Appliance Energy Conservation Act, Public Law 100–12, by the National Appliance Energy Conservation Amendments of 1988, Public Law 100–357, and the Energy Policy Act of 1992, Public Law 102–486 [1] created the Energy Conservation Program for Consumer Products other than Automobiles. The consumer products subject to this program (often referred to hereafter as ''covered products'') include fluorescent lamp ballasts.

Under the Act, the program consists essentially of three parts: Testing, labeling, and Federal energy conservation standards. The Department, in consultation with the National Institute of Standards and Technology, amends or establishes new test procedures for each of the covered products. Section 323. The test procedures measure the energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use. They must not be unduly burdensome to conduct. Section 323 (b)(3). A test procedure is not required if DOE determines by rule that one cannot be developed. Section 323(d)(1). Test procedures appear at 10 CFR part 430, subpart B.

The Federal Trade Commission (FTC) prescribes rules governing the labeling of covered products after DOE publishes test procedures. Section 324(a). The FTC labels indicate the annual operating cost for the particular model and the range of estimated annual operating costs for other models of that product. Section 324(c)(1). Disclosure of estimated operating cost is not required if the FTC determines that such disclosure is not likely to assist consumers in making purchasing decisions, or is not economically feasible. In such a case, the FTC must require a different useful measure of energy consumption. Section 324(c). At the present time, there are Federal Trade Commission rules requiring labels for the following products: Room air conditioners, furnaces, clothes washers, dishwashers, water heaters, refrigerators, refrigerator-freezers and freezers, central air conditioners and central air conditioning heat pumps, and fluorescent lamp ballasts.

The National Appliance Energy Conservation Amendments of 1988 prescribed Federal energy conservation standards for ballasts. Section 325(g). The Act specifies that the standards are to be reviewed by the Department no later than January 1, 1992. Section 325(g)(7)(A).

Any new or amended standard must be designed so as to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. Section 325(o)(2)(A).

Section 325(o)(2)(B)(i) provides that before DOE determines whether a standard is economically justified, it must first solicit comments on a proposed standard. After reviewing comments on the proposal, DOE must then determine that the benefits of the standard exceed its burdens, based, to the greatest extent practicable, on a weighing of the following seven factors:

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

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

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

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

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

(VI) The need for national energy conservation; and

(VII) Other factors the Secretary considers relevant.

In addition, section 325(o)(2)(B)(iii) establishes a rebuttable presumption of economic justification in instances where the Secretary determines that ''the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy * * * savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure * * *'' The rebuttable presumption test is an alternative path to establishing economic justification.

Section 327 of the Act addresses the effect of Federal rules on State laws or regulations concerning testing, labeling, and standards. Generally, all such State laws or regulations are superseded by the Act. Section 327(a)–(c). Exemptions to this general rule include: (1) State standards prescribed or enacted before January 8, 1987, and applicable to appliances produced before January 3, 1988 (section 327(b)(1)); (2) State procurement standards which are more stringent than the applicable Federal standard (Section 327(b)(3) and (f)(1)–(4)); (3) State regulations banning constant burning pilot lights in pool heaters (Section 327(b)(4)); and (4) State standards for television sets effective on or after January 1, 1992, may remain in effect in the absence of a Federal standard for such product (Section 327(b)(6) and 327(c)).

b. Background

The National Energy Conservation Policy Act,[2] which amended the Energy Policy and Conservation Act, required DOE to establish mandatory energy efficiency standards for each of the 13 covered products. These standards were to be designed to achieve the maximum improvement in energy efficiency that was technologically feasible and economically justified.

The National Energy Conservation Policy Act provided, however, that no standard for a product be established if there were no test procedure for the product, or if DOE determined by rule either that a standard would not result in significant conservation of energy, or that a standard was not technologically feasible or economically justified. In determining whether a standard was economically justified, the Department was directed to determine whether the benefits of the standard exceeded its burdens by weighing the seven factors discussed above.

The National Appliance Energy Conservation Act, which became law on March 17, 1987, amended the Energy Policy and Conservation Act in part by: Redefining ''covered products'' (specifically, refrigerators, refrigerator-freezers, and freezers were combined into one product type from two; humidifiers and dehumidifiers were deleted; and pool heaters were added); establishing Federal energy conservation standards for 11 of the 12 covered products; and creating a schedule, according to which each standard is to be reviewed to determine

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

[2] The consumer products covered by the National Energy Conservation Policy Act included: Refrigerators and refrigerator-freezers; freezers; dishwashers; clothes dryers; water heaters; room air conditioners; home heating equipment not including furnaces; television sets; kitchen ranges and ovens; clothes washers; humidifiers and dehumidifiers; central air conditioners; and furnaces.

if an amended standard is required. It also established the rebuttable presumption test of economic justification.

The National Appliance Energy Conservation Amendments of 1988, which became law on June 28, 1988, established Federal energy conservation standards for fluorescent lamp ballasts. These amendments also created a review schedule for DOE to determine if any amended standard for fluorescent lamp ballasts is required.

The Energy Policy Act of 1992, which became law on October 24, 1992, addressed various commercial appliances and equipment.

As directed by the Act, DOE published an advance notice of proposed rulemaking for fluorescent lamp ballasts, as well as a variety of other consumer products. (55 FR 39624, September 28, 1990). The advance notice presented the product classes that DOE planned to analyze, and provided a detailed discussion of the analytical methodology and analytical models that the Department expected to use in performing the analysis to support this rulemaking.

Pursuant to section 325 of the Act, DOE proposed to revise the energy conservation standards applicable to fluorescent lamp ballasts, as well as a variety of other consumer products. 59 FR 10464 (March 4, 1994). On January 31, 1995, the Department published a Rulemaking Determination that, based on comments received, it would issue a revised notice of proposed rulemaking for fluorescent lamp ballasts. 60 FR 5880 (January 31, 1995).

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.

On July 15, 1996, the Department published a Process Improvement Rule establishing procedures, interpretations and policies to guide the Department in the consideration of new or revised appliance efficiency standards (Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products). 61 FR 36974.

The Department conducted numerous meetings, workshops and discussions regarding energy efficiency standards for fluorescent lamp ballasts resulting in the publication of a Draft Report on Potential Impact of Possible Energy Efficiency Levels for Fluorescent Lamp Ballasts, July, 1997; a Summary of Inputs for the Technical Support Document: Energy Efficiency Standards for Fluorescent Lamp Ballasts, April 20, 1998; and a Ballast Manufacturer Impact Analysis Analytical Approach, April 10, 1998. 62 FR 38222 (July 17, 1997) and 63 FR 16706 (April 6, 1998). A workshop was conducted on these analyses and documents on April 28, 1998. 63 FR 16706 (April 6, 1998). Based on comments and the growing popularity of electronic ballasts with T8 lamps, the Department solicited further comments specifically on the issue of whether market shifts (*e.g.,* from T12 to T8 lamps) should be considered in determining the impact of an energy conservation standard on commercial and industrial consumers, manufacturers and the nation. 63 FR 58330 (October 30, 1998). Further comments on the above analyses, and modifications resulting from those comments, culminated in publishing a revised analysis on the Codes and Standards Internet site (http://www.eren.doe.gov/buildings/codes__standards/applbrf/ballast.html) in April of 1999. We also conducted a workshop reviewing this analysis on June 1, 1999. 64 FR 24634 (May 7, 1999). On the basis of comments received on these documents, DOE reviewed its analysis and prepared a TSD.

On October 12 and 13, 1999, the National Electrical Manufacturers Association convened a meeting where its members negotiated with representatives of the American Council for an Energy Efficient Economy, the Natural Resources Defense Council, the Alliance to Save Energy and the Oregon Energy Office to produce a joint comment proposal for amended fluorescent lamp ballast standards. (Hereafter referred to as the Joint Comment.) We have evaluated the impacts of the joint comment proposal and those results are presented in Appendix E of the TSD.

II. General Discussion

a. Test Procedures

The Act provides that no standard for a product be established if there is no test procedure for the product. The Amendments of 1988 set forth test procedures and energy conservation standards for fluorescent lamp ballasts. Based upon the Amendments of 1988, the Department established Federal test procedures for fluorescent lamp ballasts. 56 FR 18682 (April 24, 1991). As of the effective date of the energy conservation standards (ballasts manufactured on or after January 1, 1990; sold by the manufacturer on or after April 1, 1990; or incorporated into a luminaire by a luminaire manufacturer on or after April 1, 1991), all ballasts, be they energy efficient magnetic, cathode cutout or electronic, for use in connection with F40T12, F96T12 or F96T12HO lamps, are required to meet a ballast efficacy factor as measured by the Federal test procedures. No one has petitioned DOE indicating the Department's test procedures were inadequate for testing fluorescent lamp ballasts using the above technologies. Since these are the same technologies considered in today's proposed rule, the Department considers the current Federal test procedures applicable and appropriate for today's proposed rule. Furthermore, stakeholders commenting in the Joint Comments stated that they consider the current Federal test procedures applicable and appropriate for the new recommended ballast standards. (Joint Comment, No. 91 at 6).

b. Technological Feasibility

1. General

There are lamp ballasts in the market at all of the efficiency levels analyzed in today's notice. The Department, therefore, believes all of the efficiency levels discussed in today's notice are technologically feasible.

2. Maximum Technologically Feasible Levels

The Act requires the Department, in considering any new or amended standards, to consider those that ''shall be designed to achieve the maximum improvement in energy efficiency * * * which the Secretary determines is technologically feasible and economically justified.'' (Section 325 (o)(2)(A)). Accordingly, for each class of product under consideration in this rulemaking, a maximum technologically feasible (max tech) design option was identified.

Ballast efficiency is expressed as a ballast efficacy factor, BEF. It is equal to BF/W, where BF is the ballast factor expressed as a percentage (*e.g.,* 90, not 0.90) and W is the input power to the ballast in ANSI (American National Standards Institute) C82.2–1984 in Watts. The most efficient technology presently available is a high frequency electronic ballast; this is considered the maximum technologically feasible (MTF) design for this analysis. The operation at high frequency (20 Kilohertz (kHz) or more) increases the lamp efficacy and also allows for lower ballast losses.

For each product class and technology that we analyzed, there is a range of efficiencies in the marketplace. In consideration of this range, we used a different approach to selecting BEF level for the purposes of today's analysis than for the setting of the trial standard levels. The analysis represents the probable average savings from a movement from the base case to the MTF option (electronic ballast), which itself has a range of BEFs. In contrast, the proposed trial standards set BEF levels that allow the large majority of electronic ballasts to meet the standard. The following paragraph explains the two approaches in more detail.

For the analysis of electronic ballasts, we chose the median (50 percentile) BEF as the value to use from the electronic ballast product data supplied by the National Electrical Manufacturers Association (NEMA). These data are found in Appendix A of the TSD. For each product class, about half of the ballasts on the market have efficiencies greater and half lower than the level chosen for the analysis. Therefore, the unit energy consumption calculated for a ballast at the median efficiency will result in an energy use close to the average for that product class. The Department believes this median approach properly reflects the energy savings impact from using electronic ballasts rather than magnetic ballasts.

For the purpose of setting efficiency standards, the Department chose not to differentiate within a technology (such as electronic high frequency ballasts) and decided to choose BEF levels that the vast majority of models would be able to meet. Therefore, for electronic ballasts in each product class, we chose the 10 percentile BEF level of efficiency. This means that 90 percent of the existing electronic ballast models can meet the standard being considered. In order to clearly show the differences in these BEFs, we report in the table below both the proposed standard level BEF (10th percentile) and the corresponding analysis level BEF (50th percentile) for each product class analyzed.

ELECTRONIC FLUORESCENT LAMP BALLAST EFFICACY FACTORS [3]

Application for operation of	Analysis BEF (50th percentile)	Standards BEF (10th percentile)
One F40 T12/40-watt lamp	2.34	2.29
Two F40 T12/40-watt lamps	1.19	1.17
Three F40 T12/40-watt lamps	0.78	0.76
Two F96 T12/40-watt lamps	0.65	0.63
Two F96 T12HO/40-watt lamps	0.43	0.39

Another consideration in choosing MTF levels is that experience shows that there is some variation in the BEFs of ''identically'' manufactured electronic ballasts of any product class. As indicated in Table A.3, Appendix A of the TSD, there is sometimes only a small spread between the 10 and 50 percentile BEFs. By choosing the standard level at the 10th percentile rather than the 50 percentile level, the Department is allowing manufacturing tolerance to the ballast manufacturers.

c. Energy Savings

1. Determination of Savings

The Department forecasted energy savings through the use of a national energy savings (NES) spreadsheet, which forecasted energy savings over the period of analysis for candidate standards relative to the base case. The Department quantified the energy savings that would be attributable to a standard as the difference in energy consumption between the candidate standards case and the base case. The base case represents the forecast of energy consumption in the absence of amended mandatory efficiency standards.

The NES spreadsheet model is described in section III.b of this notice, *infra,* and also in Appendix B of the TSD. One of the very important inputs to the model is the forecast of magnetic ballast shipments in the absence of amended mandatory standards. Two shipments scenarios (shipments of magnetic ballasts decline until 2015 and shipments decline until 2027) were examined to attempt to cover the range of possibilities for market shares of electronic and magnetic ballasts (see Chapter 5 of the TSD). Additionally, in evaluating the joint comment proposal, the Department used a third shipment scenario (flat magnetic ballast shipment forecast) as the upper bound as described in Appendix E of the TSD.

The NES spreadsheet model first calculates the energy savings in site energy or kilowatt-hours (kWh). Site energy is the energy directly consumed at building sites by the lamp/ballast systems of interest. The energy savings to the nation is expressed in quads, that is, quadrillions of British thermal units (Btus). This is the source energy needed to generate and transmit the electricity consumed. A time series of conversion factors is used to convert site energy (kWh) to source energy (Btu). Chapter 5 of the TSD contains a table of these conversion factors, which are derived from DOE/EIA's Annual Energy Outlook 1999.

2. Significance of Savings

Under section 325(o)(3)(B) of the Act, the Department is prohibited from adopting a standard for a product if that standard would not result in ''significant'' energy savings. While the term ''significant'' has never been defined in the Act, the U.S. Court of Appeals, in *Natural Resources Defense Council* v. *Herrington,* 768 F.2d 1355, 1373 (D.C. Cir. 1985), concluded that Congressional intent in using the word ''significant'' was to mean ''non-trivial.''

d. Rebuttable Presumption

The National Appliance Energy Conservation Act established new criteria for determining whether a standard level is economically justified. Section 325(o)(2)(B)(iii) states:

> If the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy * * * savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure, there shall be a rebuttable presumption that such standard level is economically justified. A determination by the Secretary that such criterion is not met shall not be taken into consideration in the Secretary's determination of whether a standard is economically justified.

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 we presume that such standard is economically justified.[4] This

[3] It should be noted the analyses were performed assuming energy saver lamps and the values in the table below are for full-wattage T12 lamps. Table 3.5 in the TSD contains both watts and BEF values for various ballast types operating T12 energy saver lamps.

[4] For this calculation, the Department calculated cost-of-operation based on the DOE test procedures with assumed usage shown in Table 3.5 of the TSD. Commercial and industrial consumers that use the ballasts less hours will experience a longer payback

Continued

presumption of economic justification can be rebutted upon a proper showing.

e. Economic Justification

As noted earlier, Section 325(o)(2)(B)(i) of the Act provides seven factors to be evaluated in determining whether a conservation standard is economically justified.

1. Economic Impact on Manufacturers and Consumers

The July 1996 Process Improvement Rule established procedures, interpretations and policies to guide the Department in the consideration of new or revised appliance efficiency standards (Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer products). 61 FR 36974 (July 15, 1996). Key objectives of the rule have direct bearing on the implementation of manufacturer impact analyses. First, the Department will utilize an annual cash flow approach in determining the quantitative impacts on manufacturers. This includes a short-term assessment based on the cost and capital requirements during the period between the announcement of a regulation and the time when the regulation comes into effect, and a long-term assessment. Impacts analyzed include industry net present value, cash flows by year, changes in revenue and income, and other measures of impact, as appropriate. Secondly, the Department will analyze and report the impacts on different types of manufacturers, with particular attention to impacts on small manufacturers. Thirdly, the Department will consider the impact of standards on domestic manufacturer employment, manufacturing capacity, plant closures and loss of capital investment. Finally, the Department will take into account cumulative impacts of different DOE regulations on manufacturers.

For consumers, measures of economic impact are the changes in purchase price and annual energy expense. The purchase price and annual energy expense, *i.e.,* life-cycle cost, of each standard level are presented in Chapter 4 of the Technical Support Document (TSD). Under section 325 of the Act, the life-cycle cost analysis is a separate factor to be considered in determining economic justification. Additionally, the Department has decided to consider, under factor seven, ''other factors the Secretary considers relevant,'' the life-cycle cost impacts on those subgroups of commercial and industrial consumers who, if forced by standards to purchase electronic ballasts, would choose to switch from T12 to T8 lighting systems.

2. Life-Cycle Costs

One measure of the effect of proposed standards on consumers is the change in operating expense as compared to the change in purchase price, both resulting from standards. This is quantified by the difference in the life-cycle costs between the baseline and the more efficient technologies for the lamp/ballast combinations analyzed. The life-cycle cost is the sum of the purchase price and the operating expense, including installation and maintenance expenditures, discounted over the lifetime of the appliance.

For each lamp/ballast combination, we calculated the life-cycle costs for three technologies: energy efficient magnetic, cathode cutout and electronic ballasts. We used real discount rates of 4, 8 and 15 percent for the calculations. The assumption is that the consumer purchases the ballast in 2003. Price forecasts are taken from the 1999 *Annual Energy Outlook* of the Energy Information Administration (DOE/EIA–0383). For the probability-based life-cycle cost analysis, we used a distribution of marginal electricity prices for a data base of commercial buildings (see Chapter 4 and Appendix B of the TSD). The life-cycle cost calculations include ballast and lamp costs (purchase prices and installation costs for both and replacement costs for lamps only) and annual electricity costs of the lamp/ballast system operation over the lifetime of the ballast. Chapter 4 of the TSD contains the details of the life-cycle cost calculations including those considered under factor seven below, *infra.*

3. Energy Savings

While significant conservation of energy is a separate statutory requirement for imposing an energy conservation standard, the Act requires DOE, in determining the economic justification of a standard, to consider the total projected energy savings that are expected to result directly from revised standards. The Department used the NES spreadsheet results, discussed earlier, in its consideration of total projected savings. The savings are provided in Section V of this notice.

4. Lessening of Utility or Performance of Products

This factor cannot be quantified. In establishing classes of products and design options and by providing exemptions, the Department tried to eliminate any degradation of utility or performance in the products under consideration in this rulemaking.

An issue of utility that was considered was the possibility of interference with certain equipment, such as medical monitoring equipment, caused by the high frequency of electronic ballasts. To prevent any interference that cannot be solved by electronic ballast designers, the Department is not establishing a standard for T8 ballasts, thereby allowing magnetic T8 ballasts for such applications.

5. Impact of Lessening of Competition

It is important to note that this factor has two parts; on the one hand, it assumes that there could be some lessening of competition as a result of standards; and on the other hand, it directs the Attorney General to gauge the impact, if any, of that effect.

In order to assist the Attorney General in making such a determination, the Department has provided the Attorney General with copies of this notice and the Technical Support Document for review.

6. Need of the Nation To Conserve Energy

We report the environmental effects from each standard level for each product under this factor in Section V of this notice.

7. Other Factors

This provision allows the Secretary of Energy, in determining whether a standard is economically justified, to consider any other factors that the Secretary deems to be relevant. Under this factor, the Secretary has decided to consider the life-cycle cost impacts on those subgroups of consumers who, if forced by standards to purchase electronic ballasts, would choose to switch from T12 to T8 lighting systems. This analysis is part of the Department's continuing effort to study the economic impact of standards on consumers. While the Department does not believe it can set standard levels based on consumer purchasing behavior given the findings of the court in *Natural Resources Defense Council* v. *Herrington,* 768 F. 2d 1355, 1406–07 (D.C. Cir. 1985), where the court stated that ''the entire point of a mandatory program was to change consumer behavior'' and ''the fact that consumers demand short payback periods was itself a major cause of the market failure that Congress hoped to correct,'' the Department will consider and evaluate the impact of likely consumer actions.

The Secretary has also decided to consider the Joint Comment. This

while those that use them more will have a shorter payback.

proposal segments the ballast market by defining replacement ballasts and proposes extended implementation dates for all segments of the ballast market to comply with the new standards. The proposal also includes certain exemptions. All of these proposals are oriented toward mitigating financial impacts on manufacturers and ensuring a minimal level of disruption to the ballast replacement marketplace.

III. Methodology

The Process Rule outlines the procedural improvements identified by the interested parties. 61 FR 36974. The process improvement effort also included a review of the: (1) Economic models; (2) analytical tools; (3) methodologies; (4) non-regulatory approaches; and (5) prioritization of future rules.

The Department developed two new spreadsheet tools to meet the objectives of the Process Rule. The first spreadsheet calculates Life-Cycle-Cost (LCC) and Payback. The second calculates national energy savings (NES). We tailored versions of these two spreadsheets for the ballast analyses. The Department also completely revised the methodology used in assessing manufacturer impacts including the adoption of the Government Regulatory Impact Model (GRIM).

Additionally, DOE has developed a new approach using the National Energy Modeling System (NEMS) to estimate impacts of ballast energy efficiency standards on electric utilities and the environment. The Department used a version of Energy Information Administration's (EIA) NEMS for the utility and environmental analyses. NEMS simulates the energy economy of the U.S. and has been developed over several years by the EIA primarily for the purpose of preparing the Annual Energy Outlook (AEO). NEMS produces a widely-known baseline forecast for the U.S. through 2020 that is available in the public domain. The version of NEMS used for appliance standards analysis is called NEMS–BRS [5], and is based on the AEO99 version with minor modifications. NEMS offers a sophisticated picture of the effect of standards since its scope allows it to measure the interactions between the various energy supply and demand sectors and the economy as a whole.

[5] EIA approves use of the name NEMS to describe only an AEO version of the model without any modification to code or data. Because our analysis entails some minor code modifications and the model is run under various policy scenarios that deviate from AEO assumptions, the name NEMS–BRS refers to the model as used here.

a. Life-Cycle-Cost Spreadsheet

This section describes the LCC spreadsheet model used for analyzing the economic impacts of possible standards on individual commercial and industrial consumers. Details of the spreadsheet model can be found in Appendix A. We conduct the LCC analysis with a spreadsheet model developed in Microsoft Excel for Windows 95. When combined with Crystal Ball (a commercially available software program), the LCC model can use a Monte Carlo simulation to perform the analysis by incorporating uncertainty and variability considerations. The spreadsheet is organized so that ranges (distributions) can be entered for each input variable needed to perform the calculations. The LCC output can be either a point value when we use the average value of the inputs or a distribution when we use distributions for some or all of the inputs. In the analyses described in this notice, we used distributions for the most important input variables.

The life-cycle cost calculations include ballast and lamp costs (purchase price and installation cost for both and replacement cost for lamps only) and annual electricity costs of the lamp/ballast system operation over the lifetime of the ballast. The inputs to the life-cycle cost analysis include: The year standards take effect, the discount rate, the electricity price projections, ballast prices, annual lighting hours, ballast life, ballast input power, and initial and lamp replacement costs. Chapter 4 of the TSD contains the details of the life-cycle cost calculations.

In certain cases (when a T8 lamp/ballast system is considered as replacing a T12 lamp/ballast system), an additional input (mean lamp lumens) was required. We used this input to normalize the unequal light outputs for the two lamp types.

b. National Energy Savings Spreadsheet

In order to make the analysis more accessible and transparent to all stakeholders, we developed a spreadsheet model that uses Excel in Windows 95 to calculate the national energy savings (NES) and the national economic costs and savings from new standards. We can change input quantities within the spreadsheet. For example, one can easily change the ballast prices. Unlike the LCC analysis, the NES spreadsheet does not use distributions for inputs or outputs. We conduct sensitivities by running different scenarios.

DOE uses the NES spreadsheet to perform calculations of national energy savings based on user inputs similar to those for the LCC spreadsheet. The national energy savings, energy cost savings, equipment costs and net present value of benefits for several product classes are forecast from the chosen start year through 2030. The forecasts provide annual and cumulative values for all four output parameters.

The Department calculates the national energy savings by subtracting energy use under a standards scenario from energy use in a base case (no standards scenario). Energy use is reduced when an energy efficient magnetic (EEM) ballast is replaced by either a cathode cutout (CC) or an electronic ballast. For CC standards, the user can specify what percent of EEM ballasts are converted to electronic and what percent to CC. For an electronic standard, the user can specify what percent of EEM ballasts are converted to T12 or T8 electronic. Unit energy savings for each product class are the same as calculated in the LCC spreadsheet. Additional information about the NES spreadsheet can be found in Chapter 5 and Appendix B of the TSD.

User inputs include: (1) A choice from among several electricity price projections; (2) effective date of the ballast standard; (3) discount rate and discount year; (4) a shipments forecast; and (5) ballast assumptions. Ballast assumptions include inputs such as annual lighting hours and ballast prices. Additionally, we use a time series of conversion factors to change from site to source energy.

One of the more important components of any estimate of future impact is shipments. Forecasts of shipments for the base case and standards case were used as inputs to the NES spreadsheet. The shipments portion of the spreadsheet forecasts EEM ballast shipments from 1997 to 2030. One base case scenario assumes decreasing shipments of EEM ballasts until the year 2015. Another base case scenario assumes decreasing shipments until the year 2027. The decreasing shipments scenarios are determined by one user input: The year by which EEM ballast shipments decrease to 10 percent of the 1997 value. The decrease in EEM shipments is linear. Once that 10 percent value is reached, shipments remain at that value through 2030. Additional details on the various shipments forecasts are provided in Chapter 5 of the TSD.

c. Manufacturer Impact Analysis and Government Regulatory Impact Model (GRIM)

The manufacturer analysis estimates the financial impact of standards on manufacturers and calculates impacts on employment and manufacturing capacity.

Prior to initiating the detailed manufacturing impact analysis for the ballast rulemaking, the Department prepared a document titled ''Ballast Manufacturer Impact Analysis Analytical Approach.'' This document was presented at a public workshop held on April 28, 1998. We developed the approach from the general framework for Manufacturing Impact Analyses presented by the Department in March 1997 and modified for its application to the ballast rule. The document outlined procedural steps and identified issues for consideration.

As proposed in the Approach document, the manufacturer impact analyses (MIA) was conducted in four phases. Phase 1, Industry Profile and Issue Definition, consisted of two activities, namely, preparation of an industry characterization and the conduct of an issue identification workshop. The second phase, ''Strawman'' Industry Cash Flow, had as its focus the larger industry. In this phase, the GRIM was used to prepare a ''strawman'' industry cash flow analysis. Here the Department used publicly available information developed in Phase 1 to adapt the GRIM model structure to facilitate the analysis of new ballast standards. In the Phase 3, Sub-Group Impact Analysis, individual manufacturers used the strawman cash flow as a template from which individual company level cashflows were developed from GRIM. Phase 3 also entailed the documentation of additional impacts on employment and manufacturing capacity through an interview process. Finally in Phase 4, Industry Cash Flow, individual cash flows were aggregated into three groups, one including all manufacturers, a second including full line manufacturers of magnetic and electronic ballasts, and a third including manufacturers producing only electronic ballasts.

1. Phase 1, Industry Profile and Issue Definition

Phase 1 of the Manufacturer Impact Analysis consisted of two activities, namely, preparation of an Industry Characterization, and the conduct of an issue analysis workshop. Prior to initiating the detailed impact studies, the Department received input on the present and past structure and market characteristics of the ballast industry. This activity involved both quantitative and qualitative efforts to assess the industry and products to be analyzed. Issues addressed included manufacturer market shares and characteristics; trends in number of firms; the financial situation of manufacturers; and trends in ballast characteristics and markets.

We presented publicly available quantitative data published by U.S. Bureau of Census with regards to the ballast industry at the April 28, 1998, workshop. These reports include such statistics as the number of companies, manufacturing establishments, employment, payroll, value added, cost of materials consumed, capital expenditures, product shipments, and concentration ratios.

To further assist in performing the Industry Profile and to define key issues, the Department conducted a series of interviews with ballast manufacturers in late 1996 and early 1997. DOE distributed summaries of these interviews at the ''Public Workshop on the Revised Life Cycle Cost and Engineering Analysis of Fluorescent Lamp Ballasts,'' held on March 18, 1997.

The interviews and review of public literature suggested that the following guidelines be followed to assess the impacts of a new ballast standard. First, the Manufacturer Impact Analysis should be performed on a company-by-company basis and the industry impact constructed from an aggregation of impacts on individual companies. Second, the analysis should recognize the increasingly global nature of the ballast industry. Gains or losses in U.S. sales will have consequences for manufacturers regardless of where their production facilities are located. Where possible, the analysis should be structured to assess impacts at U.S. National, North American, and Global levels. Finally, the Manufacturer Impact Analysis should include consideration of direct industry suppliers and luminaire and lamp manufacturers. The Department recognized that manufacturers do not operate in isolation and that changes in production levels or economic health of a manufacturer can have significant impacts on its suppliers and other trade allies.

2. Phase 2, ''Strawman'' Industry Cash Flow

Phase 2 of the manufacturer analyses has as its focus the ''larger'' industry. As such, this phase resembles the Department's past practice of modeling a ''prototypical'' firm with average industry values. The analytical tool used for calculating the financial impacts of standards on manufacturers is the GRIM. In phase 2, we used GRIM to perform a ''strawman'' industry cash flow analysis. Section III.c below, describes briefly the GRIM's operating principles.

Given the relatively small number of firms in the industry, the Department proposed to create an Industry Cash Flow Analysis using a ''bottom-up'' approach. Essentially, each manufacturer was asked to provide its own cash flow analysis to be aggregated with all other manufacturer submittals.

In order to facilitate individual manufacturer analysis, the Department prepared ''strawman'' scenarios for a ''prototypical'' manufacturer from publicly available financial information. Manufacturers then performed their individual cash flows by modifying relevant parameters in the strawman to meet their own situation (price, cost, financial, shipments, *etc.*).

For the strawman, the Department prepared a list of financial values to be used in the GRIM industry analysis. We estimated these by studying publicly available financial statements of fluorescent lamp ballast manufacturers. A detailed definition of financial inputs and their values for a ''prototypical'' ballast manufacturer is contained in Attachment C of the document, entitled ''Financial Inputs to GRIM for the Ballast Rulemaking Analysis.'' We derived strawman values for prices from the Bureau of Census' Current Industrial Reports (CIRs). The dollar value of ballast shipments from factories is divided by the quantity of ballasts shipped to arrive at the per unit manufacturer price. In order to estimate manufacturing costs-labor, materials, depreciation/tooling, *etc.*—from the average manufacturer prices obtained from CIRs, we developed a typical ballast industry cost structure from publicly available information from the Census of Manufacturers (CMs) and from transformer industry statistics (SIC# 3612), and which we obtained from Robert Morris Associates (RMA) reports. Finally in preparing the draft industry cash flow analysis, the Department used the same ballast shipment scenarios developed for the NES spreadsheet.

3. Phase 3, Sub-Group Impact Analysis

The Department conducted detailed interviews with ballast manufacturers representing over 95 percent of domestic ballast sales to gain insight into the potential impacts of standards. During these interviews, the Department solicited the information necessary to evaluate cashflows and to assess employment and capacity impacts.

The interview process had a key role in the manufacturer impact analyses, since it provided an opportunity for manufacturers to express privately their views on important issues and provide confidential information needed to assess financial, employment and other business impacts. To support the development of company cashflows, the interview guide solicited information on the possible impacts of new standards on manufacturing costs, product prices, and sales. The evaluation of the possible impacts on direct employment, and assets also drew heavily on the information gathered during the interviews. The interview guide solicited both qualitative and quantitative information. We requested supporting information whenever applicable.

DOE asked interview participants to identify all confidential information provided in writing or orally. Approximately two weeks following the interview, we provided an interview summary to give manufacturers the opportunity to confirm the accuracy and protect the confidentiality of all collected information.

4. Phase 4, Industry Cash Flow

As previously described, we used the GRIM spreadsheet and an interview guide to perform the ballast Manufacturer Impact Analysis on a company-by-company basis. This process has the benefit of enabling the impacts of standards to be evaluated at multiple levels of aggregation. The total industry impact was constructed from an aggregation of impacts on individual companies. The Department aggregated the individual cash flows into three groups, one including all manufacturers, a second including full line manufactures of magnetic and electronic ballasts only, and a third group including manufacturers producing only electronic ballasts. This aggregation scheme was selected as the most representative of the range of impacts on individual manufactures compared to the industry aggregate values.

5. GRIM Spreadsheet

A change in standards affects a manufacturer's cashflow in three distinct ways. Increased levels of standards will: (1) Require additional investment; (2) raise production costs; and (3) affect revenue through higher prices and, possibly, lower quantities sold. To quantify these changes, the Department performs an industry and manufacturer cashflow analyses using the GRIM.

The GRIM analysis uses a number of inputs—annual ballast shipments; ballast prices; manufacturer costs such as materials and labor, selling and general administration costs, taxes, and capital expenditures—to arrive at a series of annual cash flows beginning from before implementation of standards and continuing explicitly for several years after implementation. The measure of industry net present values are calculated by discounting the annual cash flows from the period before implementation of standards to some future point in time. Additional information about the GRIM spreadsheet can be found in Chapter 6 of the TSD.

d. NEMS Environmental Analysis

The environmental analysis provides estimates of changes in emissions of nitrogen oxides (NO_X) and carbon from carbon dioxide (CO_2). The Department used NEMS–BRS for the fluorescent ballast environmental analyses (as well as the utility analyses). NEMS–BRS is run similar to the AEO99 NEMS except that commercial lighting energy usage is reduced by the amount of energy (electricity) saved due to proposed ballast standards. The input of energy savings are obtained from the NES spreadsheet. For the environmental analysis, the output is the forecasted physical emissions. The net benefits of the standard is the difference between emissions estimated by NEMS–BRS and the AEO99 Reference Case.

The environmental analysis is relatively straightforward from NEMS–BRS. Carbon emissions are tracked in NEMS–BRS using a detailed carbon module that provides robust results because of its broad coverage of all sectors and inclusion of interactive effects. The only form of carbon tracked by NEMS–BRS is CO_2. However, in this report the carbon savings are reported as elemental carbon.

The two airborne pollutant emissions that have been reported in past analyses, SO_2 and NO_X, are reported by NEMS–BRS. NO_X results are based on forecasts of compliance with existing legislation. In the case of SO_2, the Clean Air Act Amendments of 1990 set an emissions cap on all power generation. The attainment of this target, however, is flexible among generators and is enforced by applying market forces, through the use of emissions allowances and tradable permits. As a result, accurate simulation of SO_2 trading tends to imply that physical emissions effects will be zero because emissions will always be at, or near, the ceiling. This fact has caused considerable confusion in the past. There is virtually no real possible SO_2 environmental benefit from electricity savings as long as there is enforcement of the emission ceilings. Please see Appendix D of the TSD for a discussion of this issue.

Alternative price forecasts corresponding to the high and low economic growth side cases found in AEO99 have also been generated for use by NES and will be explored in a similar fashion with NEMS–BRS runs.

IV. Discussion of Comments

As noted above, the DOE proposed to revise the energy conservation standards applicable to fluorescent lamp ballasts on March 4, 1994. On January 31, 1995, the Department published a rulemaking determination that, based on comments received, it would issue a revised notice of proposed rulemaking for fluorescent lamp ballasts. Since that time, the Department conducted numerous meetings, workshops and discussions regarding energy efficiency standards for fluorescent lamp ballasts, resulting in a Draft Report on Potential Impact of Possible Energy Efficiency Levels for Fluorescent Lamp Ballasts, July, 1997; Summary of Inputs for the Technical Support Document: Energy Efficiency Standards for Fluorescent Lamp Ballasts, April 20, 1998; and Ballast Manufacturer Impact Analysis Analytical Approach, April 10, 1998. 62 FR 38222 (July 17, 1997) and 63 FR 16706 (April 6, 1998). A workshop was conducted on these analyses and documents on April 28, 1998. 63 FR 16706 (April 6, 1998). Based on comments and the growing popularity of electronic ballasts with T8 lamps, the Department solicited further comments specifically on the issue of whether market shifts (*e.g.,* from T12 to T8 lamps) should be considered in determining the impact of an energy conservation standard on commercial and industrial consumers, manufacturers and the nation. 63 FR 58330 (October 30, 1998). Further comments on the above analyses, and modifications resulting from those comments, culminated in publishing an analysis on the Codes and Standards Internet site (http://www.eren.doe.gov/buildings/codes__standards/applbrf/ballast.html) in April of 1999. We also conducted a workshop on that analysis on June 1, 1999. 64 FR 24634 (May 7, 1999). These analyses presented the impacts of standards on consumers, the nation and manufacturers. The Department considers all comments regarding this rulemaking made prior to the three documents and posted revised analyses listed above, to have been resolved or contained within comments pertaining to those documents. Therefore, in today's notice of proposed rulemaking, the Department is only addressing comments made relative to those documents. Additionally, the National Electrical Manufacturers Association (NEMA), the American Council for an Energy Efficient Economy (ACEEE), the Natural Resources Defense Council (NRDC), the Alliance to Save Energy (Alliance) and the Oregon Energy Office (Oregon) submitted a joint comment for amended fluorescent lamp ballast standards. (Joint Comment, No. 91). While these stakeholders had previously commented on the above three documents and the web posting, the Department assumes, based on their joint comment, that it supercedes their previous comments. Therefore, their previous comments are not addressed in today's notice.

Life Cycle Cost Parameters

Electricity price: The Edison Electric Institute and Mr. Glenn Schleede raised questions about the electricity prices used in the 1997 Report, particularly about the possible effects of increased competition in the utility industry on prices. (EEI, No. 12 at 2–3 and Schleede, No. 15 at 4–8 and 13–20 and No. 21 at 2–4).

To reflect increased competition in the electricity industry due to restructured markets, the AEO99 reference case assumes a transition to competitive retail pricing in five regions—California, New York, New England, the Mid-Atlantic Area Council (consisting of Pennsylvania, Delaware, New Jersey, and Maryland), and the Mid-America Interconnected Network (consisting of Illinois and parts of Wisconsin and Missouri).[6] The specific restructuring plans differ from State to State and utility to utility, but most call for a transition period during which customer access will be phased in.

The transition period reflects the time needed for the establishment of competitive market institutions and the recovery of stranded costs as permitted by regulators. The region-wide 10 percent rate reduction required in California is represented. For the other regions it is assumed that competition will be phased in between 1999 and 2007, with fully competitive prices beginning in 2008. In all the competitively priced regions, the generation price (the price for the energy alone) is set by the marginal cost of generation. Transmission and distribution prices are assumed to remain regulated.

Several comments, including EEI and Mr. Schleede suggested marginal electricity rates should be used instead of average values. (EEI, No. 12 at 2, Schleede, No. 15 at 6 and No. 21 at 3, CDA, No. 25 at 2 and NEMA, No. 27 at 20–21). Mr. Schleede also suggested that instead of using one electricity price for all years of the analysis, a projection of future electricity prices should be used. (Schleede, No. 15 at 5).

In response to comments on marginal energy prices, we performed a separate analysis, whose goal was to generate marginal electricity prices for the commercial sector. Because of the large number of electric utilities in the U.S., we chose a small subset of electric utilities for this analysis. We analyzed the electric bills (with and without standards) of a large number of commercial buildings in each of these utility districts. In the TSD (see Chapter 4), we show how a distribution of marginal electricity prices was obtained from this analysis of rate schedules for 24 utilities for the year 1997. We projected these marginal prices for each future year of the analysis by using the rate of decrease in the EIA Annual Energy Outlook 1999, as shown in Table 4.2 in Chapter 4 of the TSD. Alternative electricity price scenarios shown in Table 4.2 are also available to users of the Life Cycle Cost and National Energy Savings spreadsheets.

Mr. Schleede indicated that the sensitivity analysis, which considered the full distribution of U.S. commercial electricity prices, was an improvement over the previous practice of just using a point estimate. (Schleede, No. 21 at 1).

Additional comments on marginal electricity prices were received after the posting of analysis results on the DOE web site in April of 1999.

Mr. Schleede stated DOE and its contractors have continued their ambivalence about removing fixed costs from the life cycle cost calculations. (Schleede, No. 76 at 1).

Mr. Schleede is incorrect. We have used marginal electricity prices for all life-cycle cost savings calculations and there are no fixed costs in the marginal electricity prices used as described in Appendix B of the TSD.

EEI does not agree with the calculations of ''epsilon'' values as shown in the April 1999 text report entitled Life Cycle Cost Results. EEI would like to see how DOE handled the issues of lighting load factors (*e.g.,* the amount of lighting actually used during the day, such as 90 percent of the fixtures) which affect kWh energy reductions, and coincidence and diversity factors which will affect the kW demand reductions (and their economic impact). (EEI, No.48 at 2).

The Department describes the method in Appendix B of the TSD, Marginal Energy Prices report: Demand Decrement Due to Standards—The Role of Lighting Coincidence and Diversity.

EEI commented that a line in the LCC results writeup reads ''the change in the bill divided by the change in energy usage yields the marginal electricity price.'' EEI stated that this is not analytically correct. For commercial (and industrial) customers, there is a marginal kWh price and a marginal kW price that should not be ''blended'' for a cost analysis. The change in the kWh energy portion cost of the bill divided by the change in energy usage yields the marginal kWh energy price, and the change in the kW demand cost of the bill divided by the change in the peak kW demand (monthly and/or on-peak) yields the marginal kW demand price. These two marginal costs are separate and calculated differently. (EEI, No. 48 at 4).

The bill is a combination of the kWh (energy) and kW (demand) components, and the Department calculated them separately in order to derive the marginal electricity prices. The use of a proportional demand decrement (calculated as explained in Appendix B of the TSD, Marginal Energy Prices) enabled DOE to calculate each of the contributions to bill savings associated with kWh savings and kW savings.

Published sources for average commercial prices (defined as revenues from energy and demand charges combined, divided by energy sales) are expressed on a per kWh basis, ''blending'' the energy and demand charges. For consistency with those sources of projected commercial energy prices, the Department sees no practical alternative to including the kW (demand) savings component, expressed on a per kWh basis, in the derivation of marginal commercial prices.

EEI stated it is not sure how DOE performed the calculation of epsilons for industrial customers, as only the procedure for commercial customers was outlined in the text report (DOE web posting of April, 1999). (EEI, No. 48 at 4).

The epsilon distribution calculated for the commercial sector was also used for calculating the industrial marginal electricity prices from the industrial average electricity prices.

EEI stated that DOE used the ''average'' electric price, rather than the marginal electricity price, on the spreadsheet under the ''Results'' tab. This has the result of showing more favorable results for life cycle cost savings, paybacks, and the globalized

[6] For more information on restructuring assumptions, please see pp. 14–15 of the AEO99.

percentage of winners and losers. (EEI, No. 48 at 4).

The results (life-cycle cost savings, payback and percent winners and losers) are calculated using marginal prices applied to electricity savings. The sheet titled ''Results'' in the LCC version 4 spreadsheet does use average values for the purpose of calculating a life-cycle cost for each technology. However, this sheet was only provided as a check to allow the user to estimate LCC and payback periods using average values and then compare them to the results obtained with distributions (in Crystal Ball) for the main inputs. We will relabel the ''Results'' sheet to ''LCC and Payback Periods Using Average Values for All Inputs'' to avoid confusion in any future analysis.

Mr. Schleede stated that electricity prices are falling faster than the EIA forecast in Annual Energy Outlook, 1998 and 1999 Reference cases. (Schleede, No. 76 at 1).

DOE used the EIA forecast over the period 2003–2030. The rate of decrease over the last few years is influenced by electricity deregulation and seems unlikely to translate into a 27 year trend.

Mr. Schleede stated that there is a wide variation in electricity prices and many people and organizations would be forced to incur higher life cycle costs if DOE proceeds with ballast standards. (Schleede, No. 76 at 1).

The Department uses a distribution of electricity prices as input to its LCC analysis and reports the percentage of end-users with higher and lower LCC from ballast standards.

Annual Lighting Hours: The values we used for annual lighting hours in the 1997 Report were based on average values from energy audits performed by Xenergy, Inc. on over 25,000 buildings between 1990 and 1994, as described in Section A.4 of the 1997 Report.

EEI asked that a +/− range be given for the average annual operating hours. (EEI, No. 12 at 3).

We are using ranges of annual lighting operation hours, as shown in Figures 4.4 through 4.9 of the TSD, in calculating consumer life cycle costs. These distributions range from less than 200 hours of use to over 8,000 hours.

Other LCC Inputs: EEI asked if U-tube lamps were included. (EEI, No. 12 at 3).

U-tube lamps are driven by the same ballasts as straight-tube lamps; therefore, we did not conduct separate LCC analyses for them (the wattages and lamp prices are only slightly different). Ballasts that drive U-tube lamps are included in the NEMA data to generate shipments data for the NES (see National Energy Savings below).

EEI suggested that F96T8 lamp ballasts be included in the analysis. (EEI, No. 12 at 3). Other comments, on the limited re-opening of the record, also suggested including 8-foot T8 ballasts. (Osram Sylvania Inc, No. 34 at 3 and Motorola Lighting Inc., No. 33 at 2 and ACEEE, No. 77 at 3).

Since F96T8 lamp/ballast systems have small market shares, the Department did not collect data and analyze them separately or include them in today's proposed rule.

International Consulting Services (ICS) asked that the faster lumen depreciation of T8s be taken into account. (ICS, No. 17 at 5).

The *Lighting Upgrade Manual* published by EPA's Green Lights Program (EPA–430–B–95–009), February 1997 edition, Lighting Maintenance section, page 3, has a graph of lamp lumen depreciations. The four-foot T8 lamps have a flatter lamp lumen depreciation curve than do the four-foot T12 lamps, showing that T8s have slower lumen depreciation than T12. The same is true for the eight-foot T12 and T8 lamps. However, we did not consider this effect in the LCC analysis, as it does not generally impact lamp lifetime or relamping times, and, therefore, does not affect the result of the analysis.

National Energy Impacts

In the 1997 Report, we used the COMMEND model to project ballast sales and National Energy Impacts. In response to comments that COMMEND was difficult to understand and use, we developed a spreadsheet calculation tool for use in the TSD analyses as was previously discussed under Methodology. We used the NES spreadsheet to estimate national energy savings and economic parameters.

We divided the comments received on national energy impacts into five categories: COMMEND-related comments, the NES model and approach, shipments and market shares, lighting/HVAC (heating, ventilating, and air conditioning) interactions, and non-regulatory programs.

COMMEND-Related Comments

Several issues on COMMEND (*e.g.,* ballast sales) were raised by comments. Since today's analysis uses the NES spreadsheet model instead of COMMEND, these issues are no longer relevant and are not addressed.

Non-Regulatory Programs

EEI suggested that the impacts of voluntary efficiency programs should be more adequately taken into account. It also observed that although the dollar amount spent on Demand Side Management (DSM) programs has declined in recent years, the numbers of ballasts installed because of DSM programs may still have remained the same or even increased, since the price differential between magnetic and electronic ballasts has gone down (EEI, No. 12 at 1).

Since the NES spreadsheet that we used to calculate energy savings requires projections of future ballast shipments as an input, we must make some assumptions concerning the annual shipments of energy efficient magnetic (EEM) ballasts under a scenario of no amended standards. Since it is not possible to know how these shipments will change in the future, the Department decided to analyze several possible future scenarios. The influence of non-regulatory programs on magnetic ballast shipments is implicitly accounted for in these shipment scenarios (described in Chapter 5 of the TSD and also later in this proposed rule). Scenarios in which magnetic ballast shipments continue to decline over time, reflect some level of continued impact of non-regulatory incentive programs. See section V below for a more detailed description of the assumptions of these scenarios.

Since the release of the 1997 Report, the Department has undertaken a more detailed analysis of non-regulatory program impacts on the ballast market by studying utility DSM program impacts, ASHRAE/IES building code impacts, EPA Green Lights/EPA–DOE Energy Star Buildings, and DOE FEMP programs. We conducted a study [7] to estimate the number of fluorescent ballasts affected by DSM rebates from 1992 to 1997. We combined detailed analysis of data on spending amounts and units receiving rebates from several major utilities, accounting for up to 30 percent of the national total, with EIA estimates of national energy efficiency spending to produce estimates of ballasts rebated. Results indicate that the number of rebates and the percentage of the ballast market affected by rebates have both declined since 1995, at the same time that the magnetic ballast market began to level off. Under EPACT, the states are upgrading their building codes to match the lighting provisions in ASHRAE/IES Standard 90.1–1989. When revised as Standard 90.1–1999, the code's lower lighting power density limits will be an incentive for increasing use of electronic

[7] Busch, Chris, Turiel, I., Atkinson, B.A., McMahon, J.E., Eto, J.H. 1999. ''DSM Rebates for Electronic Ballasts: National Estimates (1992–1997) and Assessment of Market Impact.'' Lawrence Berkeley National Laboratory.

ballasts. DOE is preparing a new code for Federal buildings that will also encourage the use of electronic ballasts. The EPA programs (first Green Lights and now the EPA–DOE Energy Star Buildings) provide voluntary incentives for lighting upgrades that include electronic ballasts. The DOE FEMP Procurement Challenge and Federal Relighting Initiative are having modest but important impacts increasing the market share for electronic ballasts purchased for Federal buildings. Other programs such as the Voluntary Luminaire Program created by the National Lighting Collaborative under EPACT, NEMA's Energy Cost Savings Council, DOE's Rebuild America, and DOE's Lighting Technology Roadmap also provide incentives to move the market toward more efficient fluorescent ballasts.

Utility and Environmental Analyses

The NEMS has been used to estimate impacts of ballast energy efficiency standards on electric utilities. The Department used a version of EIA's NEMS, called NEMS–BRS, for the utility and environmental analyses. NEMS simulates the energy economy of the U.S. and has been developed over several years by the EIA primarily for the purpose of preparing the Annual Energy Outlook (AEO). NEMS produces a widely-known baseline forecast for the U.S. through 2020 that is available in the public domain. NEMS–BRS offers a picture of the effect of standards since its scope allows it to measure the interactions between the various energy supply and demand sectors and the economy as a whole.

Fuels for Electricity Generation: EEI pointed out that projections for oil and gas generation after 1995 are available from GRI, EPRI, and EIA, and DOE could use them in its analysis (EEI, No. 12 at 3).

Most analyses use EIA data such as electric utility fuel prices as a starting point. The important result for estimating the effect of standards on utility costs is not the overall fuel mix, but the marginal effect on fuel consumption and power plant construction.

EEI stated that the values used for the heat rate (for conversion of electricity from site to source energy) are overstated. It indicated that the analysis is using the total U.S. generation capacity (not a marginal capacity type of analysis) and is using EIA methodology. EEI asserts the values are overstated for the following reason: EIA assigns the same heat rate of fossil-fuel power plants to renewable power plants. This assumption creates an artificial heat rate for hydroelectric, wind, solar, biomass, and other forms of renewable energy. For the approximately 10 percent (and growing) portion of renewable electricity generation, EIA assigns a value of over 10,000 Btu/kWh to generation that has 0 Btu/kWh or 3,412 Btu/kWh. EEI states this factor alone leads to an overstatement of primary energy savings. In addition, EEI asserts that with the advent of restructuring, there are many new technologies that could lower the overall heat rate at a much quicker rate than shown in the 1999 Annual Energy Outlook (AEO). EEI proposes that the lower end of the ranges for national energy savings should be significantly lower to account for this possibility. (EEI, No. 48 at 3).

Table 5.3 in the TSD shows the site-to-source heat rates used in our analysis for the period 2003–2030. They are average rates for the commercial sector obtained from AEO99. We have compared these values to marginal values we obtained from a NEMS analysis. The marginal heat rate is the change in fuel delivered to generating stations divided by the change in electricity sales. For the NEMS analysis, we only considered thermal generation. For most years in the analysis period, the marginal heat rate was lower than the average heat rate. Overall, if we had used a marginal heat rate rather than the average heat rate, source quads would be reduced by about 4 percent.

EEI is in agreement with the analysis showing a declining heat rate over the analysis period. However, it asserts the values shown in AEO 1999 should be considered to be the high end of the range of inputs for the analysis period. (EEI, No. 48 at 3).

Other scenarios will show a faster rate of decline in heat rates over the next 20–30 years. The Department executed its analysis using the AEO99 Reference Case. The average heat rate extracted from AEO99 and used in the analysis declines from 10,871 Btu/kWh in year 2001 to 9,196 Btu/kWh in year 2030. This is equivalent to increasing the energy conversion efficiency of thermal power generation from 31 percent to almost 37 percent. This is a major assumed improvement, especially given that many generating assets in place today will still be serving marginal duty cycles during most of the forecast period.

Conservation Load Factor: EEI also stated that it was not clear how the Conservation Load Factor (CLF) was calculated, and asked if it was calculated on a regional level first and then aggregated, or at the national level only. (EEI, No. 12 at 3).

The CLF is not used in the NEMS analysis so this question is no longer relevant.

SO_2 and NO_X emissions: EEI suggested that because SO_2 and NO^X emissions have declined over the past several years, marginal emissions due to energy savings will be lower than average emissions. (EEI, No. 12 at 3).

Total emissions of SO_2 are unlikely to be affected by any policy, such as efficiency standards, because emissions are capped by legislation. The actual reduction in NO_X emissions will be determined by which marginal thermal generation is reduced through lower electricity sales. Most new capacity is likely to be both efficient and clean, and therefore operate at low marginal cost high in the dispatch order (*i.e.,* utilities will dispatch the newer, cleaner sources before going to the older, more expensive sources). Generation from these new resources is therefore unlikely to be reduced by a reduction in electricity sales. On the contrary, it is likely that the displaced generation will be from older, dirtier plants low in the dispatch order.

Appliance Standards Environmental and Utility Model (ASEUM): EEI and Mr. Schleede concurred that the ASEUM model's methodology may be outdated in an era of deregulated utilities that are unlikely to remain vertically integrated. (EEI, No. 12 at 4 and Schleede, No. 15 at 7–8).

It is true that the electric utility industry is undergoing a radical restructuring, and the assumptions of cost recovery underlying ASEUM are becoming dated. We agree that we needed other methodologies to carry out the utility analysis, and we used the NEMS–NAECA for this purpose.

Ballast Market Shift (From T12 Magnetic to T8 Electronic)

The 1997 Report, and all previous analyses, analyzed the impact of an electronic ballast standard by essentially assuming that users of magnetic ballasts with T12 lamps would switch to electronic ballasts with T12 lamps if the former ballast type became obsolete. As described in the Notice of Limited Reopening of the Record and Opportunity for Public Comment, the Department solicited comments on consideration of consumers who might choose electronic ballast T8 systems over electronic ballast T12 systems and consumers who might choose electronic ballasts over cathode cutout ballasts. 63 FR 58330 (October 30, 1998). DOE asked for comments on certain aspects of both the electronic ballast and the cathode cutout ballast standard levels: Whether a market shift from magnetic T12 ballasts to electronic T8 ballasts is likely, the extent of such a shift, and whether the impacts of these shifts should be considered.

In the Joint Comment, the stakeholders stated that they assumed 95 percent of consumers of electronic ballasts would switch from T12 to T8 lamps. (Joint Comment, No. 91 at 8).

Northwest Energy Efficiency Alliance (NEEA) stated that in its region with a mature market for electronic ballasts, the standard practice in new construction/renovation is a fixture with an electronic T8 ballast; this results partially from building codes as well as from economics. Cathode cutout systems are rare, with customers selecting electronic ballasts instead because of energy-efficiency, light quality, and the ability to drive multiple lamps. (NEEA, No. 38 at 1–2).

The Tennessee Valley Authority (TVA) explained that its procedure is to replace failed magnetic T12 ballasts with electronic T12 ballasts because of availability, cost (when the lighting hours are too short for a good payback with a T8 system); and maintenance (if only part of the ballasts in a space need replacement, the T12 lamps are retained). For major system replacement, electronic T8 systems were considered the first option. (TVA, No. 36 at 1).

The statute requires the Department to establish different classes where appropriate, and today's proposed rule would prescribe separate ballast efficacy factors for each lamp-ballast combination. To determine economic impact on manufacturers and consumers, DOE looks to reasonably predict likely market impacts. That is, some consumers with T12 lamps and magnetic ballasts would switch to T8 lamps with electronic ballasts if the magnetic T12 ballast was eliminated. Furthermore, the Secretary has determined to examine the impact of this consumer sub-group under economic factor 7.

Mr. Glenn Schleede comments that DOE has continued its long-standing practice of giving little consideration to the interests of real consumers who end up bearing the burden of energy efficiency standards. (Schleede, No. 76 at 2).

The Department believes it has considered the interests of real consumers, and any burdens on them, by including the full range of electric prices, ballasts prices, operating life and ballast life that consumers will experience and calculating the full range of impacts on consumers. Furthermore, we studied the economic impact of the standard on consumers by considering and evaluating likely consumer actions. As a result, we are presenting impacts on consumers moving from T12 lamps with magnetic ballasts to T12 lamps with electronic ballasts and also consumers moving from T12 lamps with magnetic ballasts to T8 lamps with electronic ballasts. Both of these likely occurrences arise from the consumer not being able to buy a T12 magnetic ballast under the standard being proposed. However, while modeling and giving consideration to consumer actions, the Department does not believe it can set standard levels based on consumer purchasing behavior given the conclusions of the court in *Natural Resources Defense Council* v. *Herrington,* 768 F. 2d 1355, 1406–07 (D.C. Cir. 1985), where the court stated that ''the entire point of a mandatory program was to change consumer behavior'' and ''the fact that consumers demand short payback periods was itself a major cause of the market failure that Congress hoped to correct.''

Manufacturer Impact Analysis

The general MIA methodology presented by the Department in March 1997, was developed with substantive input from ballast manufacturers on issues relevant to the ballast rulemaking. Ballast manufacturers provided very useful insights that resulted in the incorporation of new factors for consideration in the analysis of manufacturer impacts, namely impacts on domestic manufacturer employment, manufacturing capacity, plant closures and loss of capital investment. Cooperation from ballast manufacturers also helped DOE in proposing the interview guide approach as a critical MIA tool for identifying issues relevant to each individual manufacturer. The ballast rulemaking was the first for which DOE conducted one-on-one interviews with the manufacturers. This process helped DOE appreciate the usefulness of this methodology for assessing qualitative impacts.

The Department of Energy held a public workshop on April 28, 1998, to present information and invite comment on several topics relating to energy-efficiency standards for fluorescent lamp ballasts. One major topic for discussion was the Manufacturer Impact Analysis (MIA). In developing the Manufacturer Impact Analysis document for the April 28, 1998, workshop, DOE tried to address the concerns that ballast manufacturers raised with the Department in previous meetings or through personal interviews. In addition to tailoring the GRIM spreadsheet to the ballast rulemaking, DOE developed a revised questionnaire to capture all issues relevant specifically to the ballast industry and its suppliers.

Subsequent to the April 28 workshop, the Department met with industry representatives to discuss the rationale for using the cash flow analysis methodology to measure financial impacts. The Department also reviewed details of the spreadsheet calculations at this meeting. The discounted cash flow approach is a widely used technique for evaluating a company's value (Net Present Value (NPV)), and is frequently used in capital budgeting decisions for evaluating capital spending proposals. It is also used for evaluating financial impacts of plant closures and business restructuring. The Department agreed to revise GRIM to add features that explicitly provide the capability to include one-time charges such as plant closures and asset write-offs.

The Department believes that the modified GRIM accurately captured the financial impacts of a step change in technology. In contrast to other appliance rulemakings that make only incremental changes to standard levels, this rulemaking would result in standards based on a completely new technology. To comply with final standards, manufacturers would be required to make significantly higher capital investments (*e.g.,* new plants, equipment and production processes). The capital investment numbers input into GRIM reflect this step change in technology and produce negative impacts on the manufacturer's cash flows. Furthermore, the Subgroup Impact Analysis proposed in the MIA methodology and carried out in part through interviews with manufacturer representatives considered impacts on employment, manufacturing capacity and competitive effects due to an electronic ballast standard.

To ensure that the manufacturer impact analysis captured the potential impacts of a radically transformed ballast market, the Department and NEMA members developed a scenario analysis methodology to be included in the ballast MIA. In creating their projections for future revenues and profit margins, manufacturers were asked to consider two different competition scenarios. In the first scenario, it was assumed that manufacturers would maintain their current market share. In the second scenario, we asked manufacturers to consider the impact of a new entrant in the industry which would capture a 15 percent share. Under the new entrant scenario, we redistributed market shares and manufacturers were able to define new prices and costs (gross margins). The competition scenario analysis is described in greater detail in the TSD. Additional scenarios were constructed assuming a status quo in profit margins, the ''existing dynamics'' scenario, and a new entrant in the magnetic ballast market, or ''magnetic new entrant'' scenario.

We conducted the GRIM analysis and other elements of the MIA separately for each manufacturer. To report a representative variation in impacts between manufacturer sub groups while maintaining the confidentiality of individual manufacturers, DOE constructed three different cashflows: One for manufacturers of both magnetic and electronic ballasts, a second for manufacturers producing electronic ballasts only, and a third that combines both sub groups of manufacturers. Likewise, we evaluated employment and manufacturing capacity effects from an electronic ballast standard on a company-by-company basis and reported them for both subgroups. To the extent consistent with the confidentiality concerns of individual manufacturers, we reported important variations between manufacturers within subgroups qualitatively. The analysis results include a discussion of the impacts of the cashflow results on the business prospects of manufacturers in each subgroup, with reference to specific manufacturers where permitted by these manufacturers.

For the participating manufacturers, the GRIM analysis did not distinguish plants located outside the United States from United States' plants. We calculated employment impacts for these same firms and reported separate results for domestic and Mexican plants.

We performed a detailed analysis of the impacts of an electronic ballast standard on ballast manufacturer suppliers. This analysis included a quantitative evaluation of manufacturer cashflows and jobs. In total, 30 firms were invited to participate in interviews. Seventeen of these suppliers served magnetic ballast production, eleven electronic ballast production, and six served both magnetic and electronic markets. Nineteen organizations that serve magnetic ballast applications participated in interviews. Eight organizations that serve electronic ballast applications participated in interviews. In total, nine plant tours were held, five of which were at suppliers of magnetic products and four of which were tours of electronic supplier plants. The analysis demonstrated that the organizations interviewed provided a representative group of supplier industries, which we used to evaluate the impacts on supplier industries as a whole.

Additionally we visited one lamp manufacturer's fluorescent lamp plant and interviewed plant and corporate representatives. The Department decided to gather and analyze information on manufacturer impacts from other lamp manufacturers as well, and an analysis of this information is presented in Section V.

NEMA commented that the manufacturer impacts reported for a standard that began in the year 2003 were too severe and that standards that produced such impacts could not be economically justified. (NEMA, No. 85). NEMA, as a part of the Joint Comment, commented that their proposed staggered implementation dates mitigate such adverse impacts. (Joint Comment, No. 91 at 7).

Standards Proposals

NEMA described new market data on ballasts, as well as percentage of lamps driven by magnetic and electronic ballasts. This shows that electronic ballast penetration of the total commercial and industrial lighting market has increased to 55 percent of total ballast shipments in 1998. Electronic ballast market penetration has increased from 44 percent to 62 percent in 1998, when measured by the more relevant criteria of the number of lamps operated. For ballasts used only in commercial and industrial new construction, renovations and retrofits in 1998, electronic ballast penetration has increased to 63 percent, measured by ballast shipments, and to 70 percent measured by the number of lamps operated. (NEMA, No. 50 at 26 and Attachment B and NEMA, No. 85 at 44). ACEEE agreed with NEMA that the percentage of lamps ballasted electronically is the most important figure; however, the growth rate during 1993–1995 of 9 percent was larger than the growth rate of 2.8 percent from 1995 to 1998, supporting the ''Decreasing Shipments to 2027'' base case. (ACEEE, No. 77 at 9–10). Oregon Office of Energy noted that the magnetic ballast shipments increased in 1997 and remained stable in 1998, casting doubt on the base case scenarios that show steady decline of magnetic ballasts (Oregon, No. 81 at 5 and 7). The CEC also stated that a national standard would complement California's Title 24 building code policies by ensuring that savings are realized in retrofit applications as well as new construction. (CEC, No. 82 at 1).

Additionally, the Department received comments from the Vermont Residential Energy Efficiency Program, Conservation and Renewable Energy Systems, Broward County Florida, Alto Manufacturing Company, Rocky Mountain Chapter of the Sierra Club, State of Vermont, California Energy Commission, Northeast Energy Efficiency Partnerships, Pacific Gas and Electric, Northwest Energy Efficiency Alliance, Sacramento Municipal Utility District, Boston Edison, Eastern Utilities, Green Mountain Power, New York Power Authority, Eugene Water and Electric Board and 35 private citizens urging the Department to establish standards requiring electronic ballasts citing the delay in promulgating this rulemaking, the phasing out of utility incentive programs for ballasts, the energy savings and environmental and economic benefits.

In commenting on the possibility of a market shift, Osram Sylvania (OSI) proposed that the Department separately consider each of the three major ballast market segments: OEM (fixtures for new construction/renovation), Retrofit (early replacement of systems) and Replacement (existing ballast replacement at failure). The first two markets are appropriate for electronic T8 systems, while the third has existing reduced-wattage lamps that are incompatible with electronic ballasts.

OSI commented that 34-Watt lamps are incompatible with electronic ballasts because of their conductive coating that facilitates starting with magnetic ballasts. It stated that technical solutions were possible but impractical: ''Smart'' ballasts that overcome the problem for the 34-Watt lamp would not be compatible with 40-Watt high CRI lamps that meet the EPACT lamp standards and would be expensive; design of 34-Watt lamps without the conductive coating would be expensive; controlling the resistance of the conductive coating to allow compatibility with both ballast types would be unreliable over the range of lamps and over their normal lives, since the coating varies widely for any manufacturer and between manufacturers. The expenditure of resources by lamp manufacturers to design a lamp to meet this need would promote an obsolete system when the market should be moving toward T8 systems. OSI also stated that the lamp industry has the capacity to handle a market transition from a mixture of T12 to T8 lamps toward T8 lamps over a 3-year period, but would require a multi-million dollar capital investment and additional time to handle a more widespread transition for all market sectors. (OSI, No. 34 at 2–5).

A rapid shift to electronic ballasts would require lamp companies to make special adjustments to the lamps, or would drive end-users to purchase full-wattage T12 lamps. (OSI, No. 34 at 2 and OSI, No. 84 at 1). OSI recommended that BEFs be developed for 4-foot and 8-foot systems that disallow magnetic and cathode cutout ballasts (with several exemptions listed below) and that a standard with these BEFs be applied to OEM and retrofit ballasts 3 years after the standards publication date. Application of the standard BEFs to the replacement market would be delayed for 5 years beyond the effective date (a total of 8 years from publication), allowing development of retrofit incentive programs for building owners and allowing lamp manufacturers greater transition time for T8 lamp manufacture. Proposed exemptions include residential luminaires for T8 or smaller diameter lamps, dimming ballasts, 8-foot High Output, low-temperature, outdoor, magnetic ballasts, non-lighting applications, and ballasts with unresolved or unanticipated interference issues per application to the Department by a manufacturer or trade association. (OSI, No. 34 at 1–3).

Five comments supported the proposal by OSI to varying degrees. (Motorola Lighting Inc (MLI), No. 33 at 1–2, Holophane, No. 39 at 1–2, Lightolier, No. 40 at 1, and ASE No. 41 at 3, and Peerless Lighting, No. 52 at 1–3).

Motorola supported the proposal by OSI and recommended the application of new BEFs to the OEM and retrofit market at the earliest possible date. (MLI, No. 33 at 1). Motorola agreed with delaying the application of BEFs to the replacement market, but recommended a delay of two years rather than five years from the effective date. Further, it urged that BEFs for T8 magnetic ballasts be developed, and that all of the BEF levels be achievable by major ballast manufacturers. (MLI, No. 33 at 2). Holophane supported the OSI proposal, particularly the approach recognizing systems rather than components. It proposed that exemptions include dimming ballasts, 8-foot High Output outdoor ballasts, and special ballasts addressing interference issues. The luminaire manufacturers will be able to incorporate electronic ballasts as long as the ballast manufacturers can meet the demand; the only impact on their market will be the adjustment of lighting levels from fixtures with the new systems. Holophane recommended a delay of application of BEFs for the replacement market for ''a reasonable period of time.'' (Holophane, No. 39 at 1). Lightolier noted that 80 percent of its fixtures use electronic ballasts for T8 or T5 lamps; of the remainder, intended for the distributor/contractor market, less than half use electronic ballasts. Lightolier recommended that the Department give serious consideration to the OSI proposal. (Lightolier, No. 40 at 1). Peerless agreed with the analysis of the two market segments, stated that disallowing magnetic ballasts would have short-term repercussion including the development of T12 electronic ballasts for a short-term market, and that a delay period would allow the lamp manufacturing industry to adjust to the increased T8 market. (Peerless, No. 53 at 1–3). ASE urged that the analysis consider the separate effects on the 3 different market channels, and supported OSI's proposal for a time-limited exemption for replacement ballasts if such an approach is administratively feasible. (ASE, No. 41 at 2–3).

The Department decided to analyze the five and two year delay standards proposal suggested above. The description and results of this analysis are shown in section V of this notice.

The Joint Comment presented the Department with a proposal for segmenting the market and extending the implementation dates to mitigate the burdens to acceptable levels while maintaining most of the benefits of standards. For example, the phase-in period for the standards proposed in the Joint Comment is approximately five years, until April 1, 2005. This allows the manufacturers and the marketplace additional time to make an orderly transition from energy efficient magnetic ballasts to the more efficient ballasts that would be required if today's proposal were adopted. In addition, the Joint Comment proposed an additional five-year phase in for standards for ballasts intended for replacement market. While it is generally impossible to distinguish a ballast for the replacement market from one used in new construction or renovation, the Joint Comment recommends that replacement ballasts be labeled for replacement use, have output leads which, when fully extended, are less than the length of the lamp it is intended to operate and they are shipped in packages of ten or less. DOE agrees replacement ballasts, as proposed by the Joint Comment would not likely be used other than to replace an existing ballast. In addition to the above, the Joint Comment also proposed limiting the exemptions relative to the extant standards. For example, the standards found in the National Appliance Energy Conservation Amendments of 1988 provided exemptions for cold temperature and dimming ballasts. The Joint Comment proposed limiting the exemption for cold temperature ballasts to those capable of being dimmed to 50 percent or less of its maximum output and the cold temperature ballast exemption would be limited to ballasts for use with two F96T12HO lamps at an ambient temperature of −20°F and which is for use with outdoor signs. The recommended changes to the dimming and cold temperature exemptions will result in the standards being applied to products previously not subject to the standards. The standard for two F96T12HO lamps has not been modified, however, since it would apply to more products, the changes proposed by the Joint Comment will result in higher energy savings for this product class than if the standards were raised, but applied with the extant exemption. (Joint Comment, No. 91 at 5).

V. Analytical Results

a. Efficiency Levels Analyzed

The Department utilized two base case forecasts of shipments of magnetic ballasts without standards as follows:

Base Case: Decreasing Shipments to 2015 (5 percent reduction)

In this base case, we assumed magnetic ballast shipments after 1997 decrease at the rate at which most magnetic ballasts declined from 1993 through 1997, reaching a base level by 2015. This rate of decreasing magnetic ballasts shipments represents a reduction of approximately 5 percent per year relative to 1997 shipments. The base level represents 10 percent of the magnetic ballast shipments in 1997 for each ballast class, and is carried out to 2030. This base case assumes that non-regulatory programs as well as market forces result in the same rate of transition to electronic ballasts as observed from 1993 through 1997.

Base Case: Decreasing Shipments to 2027 (3 percent reduction)

In this base case, we assumed magnetic ballast shipments decrease at a slower rate, reaching the same base level by 2027. This rate of decreasing magnetic ballasts shipments roughly represents a reduction of 3 percent per year relative to 1997 shipments. The base level represents 10 percent of the magnetic ballast shipments in 1997 for each ballast class, and is carried out to 2030. This base case assumes that non-regulatory programs and market forces affect a slower rate of transition to electronic ballasts than observed in recent years.

The Department also analyzed the impact of two trial standard levels; one was for electronic ballasts and the other for cathode cutout ballasts.

Electronic Ballast Standards Scenarios

We also evaluated the following scenarios to capture the range of national impacts from likely consumer choices (scenarios 1 and 2) and to evaluate suggested implementation schemes presented in comments (scenarios 3 and 4) for electronic ballast standards:

Scenario 1. This scenario assumes that 100 percent of magnetic T12 ballasts are converted to electronic T12 ballasts. This scenario is intended to model the impacts of minimal compliance with the standard in regard to commercial and industrial consumer choice.

Scenario 2. This scenario assumes that all magnetic T12 ballasts are converted to electronic ballasts, with 5 percent becoming T12 ballasts and 95 percent becoming T8 ERS ballasts. This scenario is intended to model the trends in the current market where nearly all (95 percent) of electronic ballasts purchased from 1993—1997 have been T8 ballasts.

Scenario 3. This scenario assumes that the new/renovation luminaire market segment converts all magnetic T12 ballasts to electronic T8 ballasts starting on the effective date. We assume that this segment comprises 70 percent of the total magnetic T12 ballast market, based on the current luminaire market. The remaining 30 percent assumed replacement market has an additional delay of 5 years, after which these ballasts are converted to electronic ballasts, with 5 percent becoming T12 ballasts and 95 percent becoming T8 ballasts. This scenario allows a differing impact of the standards on these two market segments by providing an additional adjustment period for the replacement market for users in existing buildings and on lamp manufacturers to prepare for the new ballast type and market shift.

Scenario 4. This scenario has identical assumptions to scenario 3, except that the additional delay period for the replacement market is 2 years.

We compared each of the above four standard level forecasts with that of the two different base cases. We denoted forecasts under the ‘‘Decreasing Shipments to 2015’’ base case as scenarios 1A, 2A, 3A, and 4A. We called forecasts runs with the ‘‘Decreasing Shipments to 2027’’ base case scenarios 1B, 2B, 3B, and 4B.

Cathode Cutout Trial Standards

For cathode cutout standards, we also evaluated the following scenarios to capture the range of national impacts from likely consumer choices for a possible cathode cutout standard:

Scenario 5. This scenario assumes that 100 percent of magnetic T12 ballasts are converted to cathode cutout T12 ballasts. The exception is the F96T12 ballast class, for which there is no cathode cutout option. These ballasts are assumed to remain as magnetic ballasts under the standards. This scenario is intended to model the impacts of minimal compliance with the standard in regard to commercial and industrial consumer choice.

Scenario 6. This scenario assumes that the 30 percent replacement market T12 ballasts are converted to cathode cutout T12 ballasts, and the 70 percent new/renovation market T12 ballasts are converted to electronic ballasts, with 5 percent of the electronic ballasts becoming T12 ballasts and 95 percent becoming T8 ballasts.

We denoted forecasts run with the Decreasing Shipments to 2015 base case as 5A and 6A. We called forecasts run with the Decreasing Shipments to 2027 base case Scenario 5B and 6B.

Joint Comment

In addition, we evaluated two scenarios based on the standards recommended by the Joint Comment: Decreasing magnetic ballast shipments to 2015 and decreasing magnetic ballast shipments to 2027. In evaluating the joint comment proposal, the Department also used a third shipment scenario (flat magnetic ballast shipment forecast) as the upper bound as described in Appendix E of the TSD.

b. Significance of Energy Savings

To estimate the energy savings through the year 2030 due to revised standards, we compared the energy consumption of ballasts under the base case to the energy consumption of ballasts complying with the standard. As discussed above, there are eight electronic ballast standards scenarios and four cathode cutout standards scenarios.

The results presented in Tables V.1a and V.1b use the AEO Reference Case forecast. (The TSD shows the results for the AEO High and Low cases, with total benefits respectively higher and lower than those for the Reference Case.) The tables show the energy savings for each of the standards scenarios.

TABLE V.1A.—ENERGY SAVINGS FROM ELECTRONIC STANDARDS

Electronic standards for units sold from 2003 to 2030								
Scenario	Scen 1A T12 Decr2015	Scen 1B T12 Decr2027	Scen 2A T12/T8 Decr2015	Scen 2B T12/T8 Decr2027	Scen 3A Decr2015	Scen 3B Decr2027	Scen 4A Decr2015	Scen 4B Decr2027
Total Quads Saved	1.01	1.79	1.66	2.93	1.43	2.66	1.57	2.84
Total Quads Saved w/ HVAC	1.08	1.9	1.76	3.12	1.52	2.82	1.67	3.02

TABLE V.1B.—ENERGY SAVINGS FROM CATHODE CUTOUT STANDARDS

Cathode cutout standards for units sold from 2003 to 2030				
Scenario	Scen 5A 100% CC Decr2015	Scen 5B 100% CC Decr2027	Scen 6A 37% CC Decr2015	Scen 6B 37% CC Decr2027
Total Quads Saved	0.48	0.85	1.12	1.98
Total Quads Saved w/HVAC	0.51	0.91	1.19	2.11

The Department finds that each of the standards scenarios considered above would result in a significant conservation of energy. Energy savings from the electronic ballast standards scenarios range from 1.01 Quads to 2.93 Quads of source energy without considering HVAC savings. The energy savings are larger for the slower decreasing shipments forecast to 2027 compared to those with the faster decreasing shipments forecast to 2015. Energy savings for scenario 2 with T8 electronic ballasts are almost 65 percent greater than those for scenario 1 with T12 electronic ballasts. For scenario 3, the five-year phase-in period causes a savings reduction of around 10 to 15 percent from that of scenario 2. For scenario 4, the 2-year phase-in period results in a savings reduction of about 5 percent from scenario 2. For the cathode cutout standards scenarios, energy savings range from 0.48 Quads to 1.98 Quads without considering HVAC savings. The scenario 6 savings from partial conversion to electronic ballasts are about 2.3 times higher than those of scenario 5. The additional HVAC savings increase the total energy savings for all levels by 6.25 percent.

In Table V.2, we present the energy savings of the Joint Comment. The results use the AEO Reference Case forecast with the energy savings from 2005 to 2030. The energy savings of the Joint Comment range from 1.20 Quads to 2.32 Quads without considering HVAC savings.

TABLE V.2.—ENERGY SAVINGS, RESULTING FROM JOINT COMMENT

Energy savings, resulting from joint comment, for units sold from 2005 to 2030		
Scenario	Dec 2015	Dec 2027
Total Quads Saved	1.20	2.32
Total Quads Saved w/ HVAC	1.27	2.46

c. Payback Period

The Act requires the Department to examine payback periods to determine if the three year rebuttable presumption of economic justification applies. In Table V.3, we list the median payback periods for product classes and design options. While we did not analyze the effect of a two-year delay in the effective date of the comments as found in the Joint Comment, because the cost of energy varies little between the two years (2003 and 2005), we believe the paybacks shown below are representative of a 2005-effective standard as well.

TABLE V.3.—SUMMARY OF PAYBACK PERIOD

Product class	Design option	Sector	Median payback (yrs)
1F40	T12 CC	Commercial	24.8
	T12 ERS	Commercial	6.4
2F40	T12 CC	Commercial	10.7
	T12 ERS	Commercial	5.4
3F40	T12 CC	Commercial	9.9
Tandem-Wired	T12 ERS	Commercial	6.4
3F40	T12 CC	Commercial	11.5
Not Tandem-Wired	T12 ERS	Commercial	3.3
4F40	T12 CC	Commercial	9.3
	T12 ERS	Commercial	4.8
2F96	T12 EIS	Commercial	5.9
	T12 EIS	Industrial	8.8
2F96HO	T12 CC	Commercial	2.1
	T12 ERS	Commercial	2.4
	T12 CC	Industrial	5.4
	T12 ERS	Industrial	3.1

d. Economic Justification

1. Economic Impact on Manufacturers and Consumers

We performed a Manufacturer Impact Analysis (MIA) to determine the impact of standards on manufacturers. The complete analysis is Chapter 6 of the TSD. In general, manufacturers of ''affected'' magnetic ballasts and their suppliers would be negatively impacted. Also, most ballast manufacturers reported that they would add additional electronic ballast capacity to meet a new standard. None of the manufacturers stated that they would leave the industry or go out of business as a result of an electronic ballast standard. Commercial and industrial consumers will also be affected by increased ballast standards in that they will experience higher purchase prices for ballasts and lower operating costs for lighting systems. These impacts are best captured by changes in life cycle costs which are discussed in section V.d.2.

Ballast Manufacturer Analysis

In conducting the analysis, we conducted detailed interviews with seven ballast manufacturers that together supply more than 95 percent of the domestic magnetic and electronic ballast markets. The interviews provided valuable information used to evaluate the impacts of a new standard on manufacturers' cash flows, manufacturing capacities and employment levels. The MIA was performed on a company-by-company basis. We elected to group manufacturers exhibiting similar product mix characteristics, as this represents the most comprehensive way of reporting the variation of impacts on different manufacturers while ensuring the confidentiality of individual manufacturers' positions. Based on information obtained from manufacturer interviews, we divided the manufacturers into two sub-groups:

TABLE V.4.—BALLAST MANUFACTURER

Sub-group 1 Manufacturers of both magnetic and electronic ballasts	Sub-group 2 Manufacturers that produce only electronic ballasts
Advance Transformer Company MagneTek, Inc. Robertson Worldwide SLi Lighting/PowerLighting Products	Howard Industries. Motorola Lighting, Inc. Osram Sylvania Products Inc.

Impacts on the entire industry were obtained by aggregating the impacts on the two sub-groups.

Impacts on Ballast Manufacturer Cash Flows

As summarized, four cash flows were calculated for each shipment forecast. Manufacturers worked with us to develop their most likely cash flow impacts for both the 2015 and 2027 Industry shipment scenarios. These cash flows are identified by the name ''Manufacturer Submittal.'' In developing cash flow estimates under the Manufacturer Submittal scenario it is assumed that manufacturers retain their 1997 shares of the electronic market in the new electronic market. The ''Electronic Ballast New Entrant'' scenario was devised in order to capture the likely cash flow impacts resulting from the redistribution of market shares among the existing manufacturers as a new entrant gains a 15 percent market share of the new electronic market. A ''Magnetic Ballast New Entrant'' Scenario was also developed to analyze the potential impact of a new entrant(s) in the magnetic ballast industry. This scenario captures possible cash flow impacts resulting from the redistribution of market shares among the existing manufacturers as a new entrant gains a 15 percent share of the magnetic ballast market. Finally, in order to evaluate how assumptions concerning future market dynamics contributed to the impacts reported in the Manufacturer Submittal scenario, we prepared a separate cash flow that assumes no change in magnetic and electronic ballast profit margins before and after standard: the ''Existing Dynamics'' scenario. The four scenarios are summarized below:

Manufacturer Submittal: Cash flows and net present value (NPV) were calculated using manufacturer prices, manufacturing costs, operating margins, capital investment estimates, and other financial parameters as provided by the individual manufacturers. This scenario reflects each manufacturer's expectation of its ''most likely'' future profitability under new standards with the constraint that it assumes that its electronic ballast market share remains at the 1997 level.

Electronic Ballast New Entrant: This scenario assumes that one or more new entrants will capture 15 percent of the new electronic ballast market. Manufacturer market shares in the 1997 electronic market are redistributed to accommodate the new market entrant(s).

Magnetic Ballast New Entrant: This scenario assumes that one or more new entrants will capture 15 percent of the magnetic ballast market beginning in the year 2000, both in the Base Case and the Standards Case. This assumption is supported by the fact that a few of the existing electronic ballast manufacturers have publicly announced plans to manufacture and/or source magnetic ballasts in the U.S., irrespective of a DOE standard. Existing manufacturer market shares in the 1997 magnetic ballast market are redistributed to accommodate the new market entrant(s). Furthermore, this scenario assumes that the new entrant(s) will result in increased competition, which will reduce the profitability of the magnetic ballast business from its current levels to those seen in the more competitive electronic ballast business post-standards.

Existing Dynamics: This scenario assumes that there will be no change in competitive dynamics when an electronic ballast standard comes into effect, and hence electronic ballast manufacturer market shares and profit margins in the case of a standard will remain similar to their values in the absence of a standard.

Tables V.5 and V.6 summarize the financial impacts for the four scenarios under the two base case forecasts of shipments. The impacts reported are the change in NPV and this change as a percentage of the industry value represented by the cash flow generated by all (magnetic and electronic) ballast shipments in the regulated product classes. Note that for the industry results, the Electronic Ballast New Entrant scenario is the same as the Manufacturer Submittal scenario because the new entrant(s) cash flow was modeled using shipment weighted average financial parameters of all existing electronic ballast manufacturers.

TABLE V.5.—CASH FLOW IMPACTS OF AN ELECTRONIC BALLAST STANDARD UNDER THE 2015 (5% DECLINE) SHIPMENT SCENARIO

Scenarios	Base case NPV ($mil)	Standard case NPV ($mil)	Change in NPV ($mil)	Change in NPV (%)
Cash flow impacts on business represented by all regulated product classes—Magnetic and Electronic				
Sub-group 1 (magnetic and electronic producers)				
Manufacturer Submittal	288.9	198.9	–90.0	–31
Electronic Ballast, New Entrant	288.9	199.1	–89.8	–31
Magnetic Ballast, New Entrant	216.2	161.6	–54.6	–25
Existing Dynamics	288.9	219.0	–69.9	–24
Sub-group 2 (electronic only producers)				
Manufacturer Submittal	131.7	152.0	20.3	15
Electronic Ballast, New Entrant	131.7	145.8	14.1	11

TABLE V.5.—CASH FLOW IMPACTS OF AN ELECTRONIC BALLAST STANDARD UNDER THE 2015 (5% DECLINE) SHIPMENT SCENARIO—Continued

Scenarios	Base case NPV ($mil)	Standard case NPV ($mil)	Change in NPV ($mil)	Change in NPV (%)
Magnetic Ballast, New Entrant	131.7	152.0	20.3	15
Existing Dynamics	131.7	141.0	9.3	7
Electronic Ballast New Entrant				
Electronic Ballast, New Entrant	0.0	6.0	6.0	–
Magnetic Ballast New Entrant				
Magnetic Ballast, New Entrant	4.5	2.0	–2.5	–55
Industry (Sub-group 1 + Sub-group 2)				
Manufacturer Submittal	420.6	350.9	–69.7	–17
Electronic Ballast, New Entrant	420.6	350.9	–69.7	–17
Magnetic Ballast, New Entrant	352.4	315.6	–36.8	–10
Existing Dynamics	420.6	359.9	–60.7	–14

TABLE V.6.—CASH FLOW IMPACTS OF AN ELECTRONIC BALLAST STANDARD UNDER THE 2027 (3% DECLINE) SHIPMENT SCENARIO

Scenarios	Base case NPV ($mil)	Standard case NPV ($mil)	Change in NPV ($mil)	Change in NPV(%)
Cash flow impacts on business represented by all regulated product classes—Magnetic and Electronic				
Sub-group 1 (magnetic and electronic producers)				
Manufacturer Submittal	318.3	204.6	–113.7	–36
Electronic Ballast, New Entrant	318.3	204.9	–113.4	–36
Magnetic Ballast, New Entrant	220.9	161.7	–59.2	–27
Existing Dynamics	318.3	224.7	–93.6	–29
Sub-group 2 (electronic only producers)				
Manufacturer Submittal	123.0	150.5	27.5	22
Electronic Ballast, New Entrant	123.0	144.3	21.3	17
Magnetic Ballast, New Entrant	123.0	150.5	27.5	22
Existing Dynamics	123.0	139.5	16.5	13
Electronic Ballast New Entrant				
Electronic Ballast, New Entrant	0.0	6.0	6.0	–
Magnetic Ballast New Entrant				
Magnetic Ballast, New Entrant	6.2	2.2	–4.0	–65
Industry (Sub-group 1 + Sub-group 2)				
Manufacturer Submittal	441.3	355.1	–86.2	–20
Electronic Ballast, New Entrant	441.3	355.1	–86.2	–20
Magnetic Ballast, New Entrant	350.1	314.4	–35.7	–10
Existing Dynamics	441.3	364.2	–77.1	–17

Uncertainty Analysis of Cash Flows

The NPV values presented in the above tables incorporate significant restructuring costs primarily associated with plant closures in the U.S. and Mexico. The large majority of these costs are directly associated with the closure of the remaining large U.S.-based ballast plant. In consideration of the past trend towards consolidation of magnetic ballast production to Mexico, a sensitivity analysis was conducted on the cash flows assuming that the restructuring costs associated with the plant closures would occur in the base case (in absence of standards). It was found that these costs contribute approximately $14 million to the negative impacts under all scenarios.

A sensitivity analysis was also conducted to analyze the impact of certain business risks. Specifically, a scenario was developed whereby changes in market demand would cause magnetic ballast shipments to decline at twice the rate, *i.e.*, 10 percent per year between 1999 and 2002, remain constant through 2005 and then continue declining at 5 percent per year beginning 2006. It was further assumed that these abrupt changes in shipments impact the magnetic ballast industry competitive dynamics by reducing profit margins in the 2000 through 2005 time frame, to levels observed in the electronic ballast market.

The cash flow impacts with the 2003 plant closure assumption and the business risks as outlined above are presented in the Table V.7.

TABLE V.7.—CASH FLOW IMPACTS OF AN ELECTRONIC BALLAST STANDARD UNDER THE 2015 (5% DECLINE) SHIPMENT SCENARIO WITH PLANT CLOSURES IN THE BASE CASE IN 2003

Scenarios	Base case NPV ($mil)	Standard case NPV ($mil)	Change in NPV ($mil)	Change in NPV (%)
Cash flow impacts on business represented by all regulated product classes—Magnetic and Electronic Sub-group 1				
Manufacturer Submittal	288.9	198.9	–90.0	–31
Manufacturer Submittal with plant closure in 2003	275.2	198.9	–76.3	–28
Business risk: abrupt change in shipments	263.7	179.5	–84.2	–32
Sub-group 2				
Manufacturer Submittal	131.7	152.0	20.3	15
Manufacturer Submittal with plant closure in 2003	131.7	152.0	20.3	15
Business risk: abrupt change in shipments	131.7	152.0	20.3	15
Industry (Sub-group 1 + Sub-group 2)				
Manufacturer Submittal	420.6	350.9	–69.7	–17
Manufacturer Submittal with plant closure in 2003	406.9	350.9	–56.0	–14
Business risk: abrupt change in shipments	395.4	331.5	–63.9	–16

Impacts on Ballast Manufacturer Employment

Employment impacts are reported in two categories:

Direct employment impacts: These impacts consider jobs directly involved with the production of ''affected'' magnetic or electronic ballasts. In facilities producing ''affected'' and other types of ballasts, only direct and overhead jobs related to ''affected'' ballasts are considered in this category. In situations where ballast companies own component manufacturing operations, such as capacitor plants or magnet wire operations, job impacts on these plants are reported within this category. Impacts on other component suppliers are presented in a separate section titled ''Impact on Suppliers to the Fluorescent Lamp Ballast Industry.''

Associated employment impacts: These impacts consider jobs impacted by business decisions driven by the ''direct'' employment impacts. For example, if in a manufacturing plant with 100 employees, 50 are producing ''affected'' magnetic ballasts and the remaining 50 are producing ''unaffected'' magnetic ballasts, such as residential ballasts, then an electronic ballast standard would result in the loss of 50 direct jobs. Faced with this situation the company might decide to close operations in its plant due to the dramatically reduced capacity utilization. Such a decision would result in the loss of the remaining 50 jobs. These 50 jobs would then be reported as ''associated'' employment impacts.

Manufacturers in Sub-group 1 anticipate that absent standards, direct employment associated with manufacturing ''affected'' magnetic ballasts will decrease approximately in the same proportion as shipments. Faced with this decline, manufacturers in Sub-group 1 intend to maintain high plant capacity utilization by replacing the loss in direct jobs with new associated jobs. These new associated jobs may be the result of new product introductions, plant consolidations or decisions to make in-house, parts currently sourced from suppliers.

The uncertainty with regards to the timing of any plant closures in the base case—after the year 2003—results from the difficulty in anticipating how many associated jobs can be maintained in the long run. Gains in associated jobs will not necessarily maintain plant capacity utilization in the long run and a threshold may be reached that requires the plant to be closed. For example, one manufacturer suggested that for its supplier plant a drop of 30 percent in capacity could lead to closure.

Table V.8 summarizes the employment impacts of an electronic ballast standard under the two shipment scenarios. The table assumes a standards effective date of 2003.

TABLE V.8.—INDUSTRY-WIDE EMPLOYMENT IMPACTS OF AN ELECTRONIC BALLAST STANDARD (ORDERLY DECLINE IN U.S. MANUFACTURING)

Country of manufacture	Direct jobs lost in magnetic ballast manufacturing	Associated jobs at risk in magnetic ballast manufacturing	Direct jobs [4,5] gained in electronic ballast manufacturing	Net direct jobs lost
2015 (5% decline) shipment scenario				
USA	[1]666	[2]406	500	166
Mexico	1570	[3]190	700	870

TABLE V.8.—INDUSTRY-WIDE EMPLOYMENT IMPACTS OF AN ELECTRONIC BALLAST STANDARD (ORDERLY DECLINE IN U.S. MANUFACTURING)—Continued

Country of manufacture	Direct jobs lost in magnetic ballast manufacturing	Associated jobs at risk in magnetic ballast manufacturing	Direct jobs [4][5] gained in electronic ballast manufacturing	Net direct jobs lost
2027 (3% decline) shipment scenario				
USA	717	[2] 363	557	160
Mexico	1727	[3] 161	769	958

[1] Includes both factory and non-factory jobs supporting magnetic ballast production.
[2] These ''associated'' jobs are assumed relocated to Mexico.
[3] These ''associated'' jobs will be relocated to other plants in Mexico or elsewhere.
[4] Includes jobs from Sub-groups 1 and 2.
[5] Does not include potential associated jobs added in these plants.

Uncertainty in Ballast Manufacturer Employment Impacts

As previously discussed, there exists some uncertainty relative to the closure date of current magnetic ballast production facilities in the base case. The employment impacts presented in Table V.8 assume a base case with an orderly decline in the U.S. magnetic ballast employment until 2015 or 2027. The large majority of these employment impacts are directly associated with the closure of the remaining large U.S.-based magnetic ballast plant.

In consideration of the past trend towards consolidation of magnetic ballast production to Mexico, a sensitivity analysis was conducted on the employment impacts assuming that the employment impacts associated with the plant closures would occur in the base case (in absence of standards). These impacts are detailed in the Table V.9. The scenario assumes that the lost U.S. jobs would be picked up by increased manufacturing activity in the Mexican plants, thereby increasing the employment impact of a standard on Mexican jobs.

TABLE V.9.—INDUSTRY-WIDE EMPLOYMENT IMPACTS OF AN ELECTRONIC BALLAST STANDARD UNDER THE SCENARIO WHERE (U.S. MAGNETIC BALLAST PLANTS CLOSE IN 2003 IN THE BASE CASE)

Country of manufacture	Direct jobs lost in magnetic ballast manufacturing	Associated jobs at risk in magnetic ballast manufacturing	Direct jobs [4][5] gained in electronic ballast manufacturing	Net direct jobs lost/gained
2015 (5% decline) shipment scenario				
U.S.A	[1] 0	[2] 0	500	500 jobs gained
Mexico	2236	[3] 596	700	1536 jobs lost
2027 (3% decline) shipment scenario				
U.S.A	0	0	557	557 jobs gained
Mexico	2444	[3] 524	769	1675 jobs lost

[1] Includes both factory and non-factory jobs supporting magnetic ballast production.
[2] These ''associated'' jobs are assumed relocated to Mexico.
[3] These ''associated'' jobs will be relocated to other plants in Mexico or elsewhere.
[4] Includes jobs from Sub-groups 1 and 2.
[5] Does not include potential associated jobs added in these plants.

Impacts on Ballast Manufacturing Capacity

It is likely that an electronic ballast standard would negatively impact magnetic ballast production capacity in the U.S. and Mexico. As mentioned previously, there is evidence to suggest that magnetic ballast production facilities in the U.S. may be closed regardless of a standard, and a sensitivity analysis was conducted to examine the impacts of this scenario. While there is a degree of uncertainty over what will happen to domestic magnetic ballast production facilities in the absence of a standard, in all likelihood, the imposition of a new electronic ballast standard will result in the closure of one magnetic ballast production facility in the U.S., and in the partial closure of another in Mexico. Additionally two manufacturer-owned (captive) ballast supplier facilities would most likely be impacted: A capacitor plant in Mexico could close and a magnet wire plant, located in the U.S., could also close.

Although the scenario whereby magnetic ballast production facilities are closed in 2003 in the base case was examined, all manufacturers in Sub-group 1 suggested that in the absence of a standard they would continue to manufacture ''affected'' magnetic ballasts in their current manufacturing plants. They did not anticipate any plant closures or shifting of production of ''affected'' magnetic ballasts from one plant to another before the year 2010.

Table V.10 summarizes the possible impact of a new electronic ballast standard on existing manufacturing plants in the U.S. and Mexico, assuming plants remain open in the base case as manufacturers predict.

TABLE V.10.—IMPACTS ON MANUFACTURING CAPACITY DUE TO AN ELECTRONIC BALLAST STANDARD

Plant	Location	Description	Action
Plant 1	U.S.A	Magnetic ballast	Closure.
Plant 2	U.S.A	Magnet Wire	Possible Closure.
Plant 3	Mexico	Magnetic ballast	Partial Closure.
Plant 4	Mexico	Capacitors	Closure.
Plant 5	U.S.A	Electronic ballast	Expansion.
Plant 6	U.S.A	Electronic ballast	Expansion.
Plant 7	Mexico	Electronic ballast	Expansion.
Plant 8	Mexico	Electronic ballast	Expansion.

An electronic ballast standard would lead to increased electronic ballast manufacturing capacity in the U.S. and Mexico. In order to meet increased sales resulting from a new electronic ballast standard, two of the four manufacturers in Sub-group 1 plan to develop additional electronic ballast manufacturing capacities in Mexico. The smaller manufacturers in Sub-group 1 plan no major plant closures or expansions and will accommodate the new product mix requirements within their existing facilities. In Sub-group 2, two manufacturers stated that they would add significant electronic ballast manufacturing capacity in the U.S. to meet the new standard.

Impact on Small Ballast Manufacturers

Two relatively small manufacturers currently produce both ''affected'' magnetic and electronic ballasts. One of these manufacturers would be a ''small business'' as defined in the Regulatory Flexibility Act (See discussion in the Procedural Issues and Regulatory Reviews section of this preamble). Both the small manufacturers had their respective electronic and magnetic ballast manufacturing operations in the same plants. It seems their smaller size and less automated operations provides them with the flexibility to adapt to a new electronic ballast standard without significant asset write-offs or plant closures. However, the negative impacts on the small manufacturers' cash flows from operations were similar in proportion to those reported by the two large manufacturers in Sub-group 1. As a result, in the 5% scenario, we estimate that small manufacturers will experience a 16 percent loss in their NPV compared to a 34 percent loss in NPV for the two large manufacturers.

As with other Sub-group 1 manufacturers, neither of these manufacturers stated that an electronic ballast standard would force them to leave the industry or go out of business.

Impact on Ballast Industry Suppliers

New energy-efficiency standards for fluorescent lamp ballasts will also affect ballast industry suppliers. To estimate this impact, we performed a detailed analysis of the impacts of an electronic ballast standard on suppliers to the ballast industry. We invited 31 supplier firms to participate in interviews. These firms were identified by manufacturers to represent the key components contained in the bills of materials for ''affected'' magnetic and electronic ballasts. Eleven of these suppliers served magnetic ballast production, eleven electronic ballast production, and nine supplier plants served both magnetic and electronic production. Sixteen of the 20 organizations serving magnetic ballast production participated in interviews and/or provided plant tours. Eleven of the 20 organizations serving electronic ballast production participated in interviews and/or provided plant tours.

Table V.11 shows an average (weighted by shipment levels) distribution of materials and components cost for ''affected'' magnetic ballasts. Interviews and literature sources provided information needed to estimate financial and employment impacts of a new energy efficiency standard for ballasts on suppliers responsible for approximately 91 percent of the cost of materials.

TABLE V.11.—COST OF MATERIALS FOR ''AFFECTED'' MAGNETIC BALLASTS

Material type	Contribution to total cost of materials (%)
Magnet and Lead Wire	40
Steel case and CRML	23
Capacitors	16
Thermal protectors, clamps, potting	12
Other	9

The industries analyzed and represented are:

- Cold rolled steel finished for ballast cases
- Cold rolled motor laminate (CRML) steel for use primarily in transformers
- Magnet wire
- Lead wire
- Thermal protectors
- Clamps to secure the stack of CRML stamped sections making up the ballast transformer to the proper size
- Potting and impregnation compounds
- Capacitors

With the exception of a very small fraction of metallized film capacitors produced outside the U.S. and materials produced in plants owned and operated by the ballast manufacturers themselves, all of these components are produced domestically in the United States. Except for the clamps, all these industries (not necessarily the same plants) also serve the production of electronic ballasts. The analyses for financial and employment impacts considered materials supplied to magnetic and electronic ballasts together for those industries which serve both markets.

Table V.12 exhibits a similar distribution of materials and components costs for an electronic ballast alternative to the ''affected'' magnetic ballast. The table shows a higher number of components for electronic ballasts. The cost of materials for electronic ballasts is approximately 30 percent higher than that for ''affected'' magnetic ballasts.

TABLE V.12.—BENCHMARK COSTS FOR ELECTRONIC BALLASTS

Item	Contribution to total cost of materials (%)
Film Capacitors	17
PC Board, Thermal Protectors, Potting	15

TABLE V.12.—BENCHMARK COSTS FOR ELECTRONIC BALLASTS—Continued

Item	Contribution to total cost of materials (%)
Steel case and CRML	12
Magnet and lead wire, connectors	12
Transistors	10
Ceramic and Electrolytic capacitors	7
Bobbins	6
Diodes	6
Ferrite Cores	5
Others	10

The analysis of supplier impacts focuses on domestic (production facilities within the United States) suppliers. A substantial portion of the components that go into producing electronic ballasts is produced in foreign plants. We estimated the fraction of each component produced domestically in 1997. To the extent that domestic suppliers can maintain this market share, they could recover some of the ''affected'' magnetic ballast revenue and associated employment level that they would lose if an electronic ballast energy efficiency standard were to go into effect. The industries analyzed were producers of printed circuit boards and bobbins. No first hand financial or employment information was collected from industry representatives for transistors, diodes, or ferrite cores. We combined these three industries with a half dozen other smaller contributors to the cost of materials and assumed pro-rated values for net income, depreciation, and capital expenditure levels to estimate cash flow for this group. This ''other'' group of suppliers represents approximately 27 percent of supplier revenue, meaning about 73 percent of electronic ballast supplier financial values is based on direct contact with industry representatives. The comparable figure for the magnetic ballast supplier side is 9 percent ''other'' and 91 percent based on interviews with suppliers.

The analysis considers a reference case wherein domestic suppliers maintain their 1997 market shares in the electronic ballast component market. Through discussions with supplier industries it became apparent that there existed some uncertainty as to the probability that ballast manufacturers would continue to source their components domestically in the event of an electronic standard. To bracket the uncertainty, separate cash flows were performed for the extreme case where all components for electronic ballasts were purchased from foreign sources. The financial impacts associated with the reference and ''worst'' cases are summarized in the following Tables.

TABLE V.13.—ESTIMATED NPV IN $MILLIONS FOR SUPPLIER INDUSTRIES, ASSUMING DOMESTIC SUPPLIER INDUSTRIES MAINTAIN THEIR 1997 MARKET SHARES (REFERENCE CASE)

Industry	5% Scenario, 1998–2015			3% Scenario, 1998–2027		
	Base case	Standard case	Change $mil	Base case	Standard case	Change $mil
Capacitor	1.28	1.59	0.31	1.34	1.74	0.41
Magnet, Lead Wire, Connectors	11.40	8.83	−2.57	12.39	9.27	−3.13
TP, Metal Clamps, Potting & Impregnating	8.55	7.05	−1.51	10.24	7.59	−2.65
Steel	16.59	12.45	−4.14	18.74	14.21	−4.53
Other Mag/Electronic Suppliers	6.11	4.87	−1.23	6.81	5.18	−1.63
PC Board, Bobbins	1.87	2.81	0.94	1.45	2.69	1.24
Other Electronic Suppliers	.79	1.44	0.65	1.04	1.88	0.84
Total	46.59	39.04	−7.55	52.01	42.56	−9.45

TABLE V.14.—ESTIMATED NPV IN $MILLIONS FOR SUPPLIER INDUSTRIES, ASSUMING FOREIGN SUPPLIERS CAPTURE ALL THE NEW ELECTRONIC BALLAST MARKET (WORST CASE).

Industry	5% Scenario, 1998–2015			3% Scenario, 1998–2027		
	Base case	Standard case	Change $mil	Base case	Standard case	Change $mil
Capacitor	1.28	.89	−.39	1.34	.92	−0.41
Magnet, Lead Wire, Connectors	11.40	8.06	−3.34	12.39	8.37	−4.03
TP, Metal Clamps, Potting & Impregnating	8.55	5.69	−2.86	10.24	5.92	−4.31
Steel	16.59	11.05	−5.54	18.74	11.54	−7.20
Other	6.11	4.13	−1.97	6.81	4.31	−2.50
PC Board, Bobbins	1.87	0.25	−1.62	1.45	0.15	−1.3
Other Electronic Suppliers	0.79	0.16	−0.64	1.04	0.09	−0.94
Total	46.59	30.23	−16.36	52.01	31.3	−20.69

The financial impact ranges from a reference case $7.55 million decline in NPV cash flow under the 5% scenario to a ''worst'' case $20.69 million decline under the 3% scenario.

Impacts on Supplier Employment

The reference-case employment impacts under the 3% and 5% scenarios are summarized in Table V.15 and indicate a range of 313–340 jobs lost and potential for 129–144 to be gained back. If all the new electronic ballast market were to go to foreign firms, no jobs would be gained back, and thus in the worst case about 313–340 domestic jobs would be lost.

TABLE V.15.—ESTIMATED EMPLOYMENT IMPACTS FOR SUPPLIER INDUSTRIES ASSUMING DOMESTIC SUPPLIERS MAINTAIN THEIR 1997 MARKET SHARES.

Industry	5% Scenario, 1998–2015			3% Scenario, 1998–2027		
	Jobs lost	Potential jobs gained	Net jobs lost [gained]	Jobs lost	Potential jobs gained	Net jobs lost [gained]
Capacitor	27	34	[7]	29	37	[8]
Magnet & Lead	69	10	59	76	11	65
TP, Metal Clamp,	52	14	38	57	15	42
Steel	58	13	45	63	14	49
Metallized Film	44	1	43	48	1	47
Other Magnetic/Electronic	40	8	32	44	9	35
PC Board, Bobbins	0	23	[23]	0	27	[27]
Other Electronic	0	26	[26]	0	30	[30]
Associated Plant Closure	23	....	23	23	....	23
Total	313	129	184	340	144	196

Impacts on Luminaire Manufacturers

The Department interviewed eight luminaire manufactures with a combined market share approaching 85 percent of the market segments affected by a new ballast standard. The Department specifically investigated how a new energy efficiency standard for ballasts might change luminaire manufacturer profitability and cash flow. Of the eight manufacturers interviewed, two reported they will suffer no impacts and two others believe their impacts would be minimal. The four other manufacturers believe they will suffer varying levels of decreased company value.

From the information obtained in the interviews, estimates of reductions in NPV were prepared for each of the four manufacturers reporting negative impacts. These projections incorporated the financial figures and rationale provided by the manufacturers. Three different rationales were presented in support of diminished profitability and value.

One or more manufacturers are experiencing greater profitability with electronic ballasts. The NPV reduction assumes that a standard which eliminates magnetics as the commodity product would render electronic ballasts the commodity product and competition would eliminate the premium for electronic ballasts.

One or more manufacturers are experiencing greater profitability with magnetic ballasts. The NPV reduction is a direct consequence of replacing sales of higher margin products by lower margin sales.

The third view presented concerns the high price sensitivity of low-end luminaires, particularly one and two lamp strip lights. It was assumed for that analysis that not all incremental costs for electronic ballasts could be passed on to consumers with a corresponding reduction in profit margin.

For both shipment scenarios, the aggregated reduction in NPV for the four firms totals approximately 13.5 million dollars assuming the current difference in margins for luminaires incorporating magnetic or electronic ballasts would continue absent standards. This appears to be a very speculative assumption given the trend towards convergence of magnetic and electronic luminaire margins reported by most luminaire manufacturers. If in fact margins do converge by the implementation date of a new standard, the impacts attributed to price margin differences disappear and the total impacts are reduced to a value of approximately 4.5 million dollars.

In addition to the previous financial impacts, manufacturers reported significant other costs and business disruptions associated with potential new ballast standards. There were concerns expressed that a standard would divert resources from new product and technology introduction and result in lost opportunities. Large efforts would also be needed to revise product literature and perform photometric tests. Further, many business processes and information systems relative to materials management and other systems would need to be revised. The costs associated with these issues, not including lost opportunities were reported to be approximately one million dollars.

Impacts on Luminaire Manufacturer Employment

Of the eight luminaire manufacturers interviewed, six stated that employment impacts from an electronic ballast standard would be be minimal, if any, within their companies. Two manufacturers, however, believe a new standard would probably reduce employment levels in their U.S. facilities. This reduction is assumed to be caused by reductions in export sales and a loss of flourescent luminaire sales in favor of incandescent luminaires. Based on its analysis of these issues and in agreement with the majority view of interview participants, the Department believes the employment impacts of a ballast standard would be minimal.

Two manufacturers expressed a concern that since their export markets are primariliy magnetic, a drop in domestic ballast manufacturing volumes would cause upward pressure on magnetic luminaire prices and compel them to raise export prices for luminaires. Local luminaire manufacturers, they believe, could find less costly sources for magnetic ballasts resulting in decreased export sales for U.S. companies. Furthermore, these manufactures fear that given the importance of linear flourscent fixtures in most customer orders, winning or losing a project can depend heavily on price levels of the these luminaires. If flourecscent luminaire sales are lost to local competitors then, they believe, U.S. companies could also lose sales of HID luminaires, emergency lighting, exit signs and various other products. The Department believes these employment impacts would be very small for two reasons. First economic theory and real world experience suggests that in competitive markets, overcapacity leads to increased—not decreased—price competition. Second the export market is concentrated in the Canadian and Mexican markets where U.S. ballast manufacturers are major participants and could compete with local ballasts manufacturers.

Another stated potential cause of reduced U.S. luminaire manufacturing jobs is the possible movement away from flourescent luminaires in favor of incandescent luminaires in the more first cost sensitive commercial market segments. However, there was considerable differences of opinion as to the significance of any such movement in lighting systems. The general view was that there is already a significant cost premium for fluorescent lighting and this premium is not likely to greatly increase given ballast pricing trends. Therefore the Department has not included any employment reductions for luminaire manufacturers because of this potential effect.

Impacts on Lamp Manufacturers

Three major manufacturers, GE Lighting, OSI, and Philips Lighting Company dominate the domestic market for linear fluorescent lamps. Together these three manufacturers serve approximately 90 percent of the U.S. market. As trade allies of the fluorescent ballast manufacturing industry, they may experience an impact from a new energy-efficiency standard applied to fluorescent lamp ballasts. Some ballast and lamp industry sources and others have speculated that a new energy-efficiency standard for ballasts would substantially accelerate the transition from T12 lamps to T8, thus having an impact on lamp manufacturers as well as ballast manufacturers.

As discussed previously, OSI commented that the lamp industry had the capacity to handle the transition from T12 lamps to T8 lamps in the OEM market resulting from an electronic ballast rule over a period of three years. OSI believes, however, it doubtful the lamp industry could handle, in addition, any significant transition to T8 lamps of the installed base of T12 lamps in less than 8 years following an electronic ballast rule. OSI commented that if magnetic ballasts were no longer available, large resources would be diverted to the development of energy saving T12 lamps compatible with electronic ballasts or electronic ballasts compatible with energy saving T12 lamps.

The Department invited representatives from each of the three major lamp manufacturers to estimate the impact that a new ballast standard might have on them. One manufacturer chose not to participate in the discussions, so the following results are based on talks with two major manufacturers.

There was agreement that a new standard would accelerate the shift in market share from T12 to T8 lamps. The manufacturers further agreed the current transition to T8 lamps is being handled well and that any acceleration in the transition must be served while retaining enough T12 capacity to serve the replacement market. The replacement market for T12 lamps is large, over 85 percent of the 1998 market of 340 million lamps were T12 lamps. The lamp manufacturing industry can gear up to serve the increase in OEM demand for T8 lamps with a 3–4 year lead-time. However, to serve any increased replacement market at the same time would require an acceleration in capacity expansion for T8 production and early retirement of T12 capacity which would have financial impacts.

The Department is uncertain as to how the replacement market might respond to today's proposed standard. Consumers might make spot replacements, as suggested by ACEEE earlier, or ballast manufacturers may develop electronic T12 ballasts compatible with T12 energy saver lamps or there could be an acceleration to T8 lamps in the replacement market. Given this uncertainty, we did not attempt to quantify the impact on lamp manufacturers of an electronic ballast standard applied to the replacement ballast market before the 8 year implementation date suggested by OSI.

2. Life-Cycle Cost

More efficient ballasts would affect commercial and industrial consumers in two ways: operating expense would probably decrease and purchase price would probably increase. We analyzed the net effect by calculating the LCC. Inputs required for calculating LCC include end-user prices for ballasts and lamps, electricity rates (cents/kiloWatthour), energy savings, annual lighting operating hours, labor rates, installation times, period of the analysis, ballast lifetimes, lamp lifetimes, and discount rates. A detailed discussion of the sources and methods used for arriving at an estimate of these parameters is in the TSD. Briefly, we obtained end-user prices for ballasts from a survey of ballast distributors from various parts of the country; we estimated marginal electricity rates as described later in this section; we based operating hours upon Xenergy building energy audit data; we derived installation costs from journeyman wages listed in the National Electrical Estimator 1995; the period of analysis is the ratio of ballast life to the annual operating hours; lamp life is the average of lamp life under spot and group replacement where spot replacement lamp life is the lamp rated life from manufacturer's catalog and group replacement is 75 percent of the rated life; and the discount rate is 8 percent.

We estimated the marginal electricity rates by first calculating the marginal rate faced by a sample of commercial customers in buildings throughout the U.S. This was compared with the average electricity rates for the same customers. The percent difference between the average and marginal rates (Epsilon) was calculated for each customer. We then used this Epsilon distribution to convert the average electricity price from a specific United States utility into marginal electricity price by using the formula:

Marginal Electricity Price = Average Electricity Price x (1 + Epsilon)

We performed a probability-based LCC analysis with a computer program called Crystal Ball. For each of four inputs (ballast price, electricity price, ballast lifetime, and annual lighting hours) to the LCC model, we defined a probability-based distribution of the input to account for the variability of the input. Instead of using a single "average" value to represent the input in its entirety, we used the whole distribution to calculate the LCC. The output of the LCC model is a mean LCC savings for each product class as well as a probability distribution or likelihood of LCC reduction or increase.

We present a summary of the results in Table V.16. The column titled "Delta LCC" gives the change in LCC when switching from the baseline option of EEM ballast to the listed design option. "% Winners" represents the probability of the design option resulting in reduced LCC. Table 4.4 of the TSD also shows the life cycle cost impacts when starting from an energy efficient magnetic T8 ballast.

TABLE V.16.—SUMMARY OF DELTA LCC* RESULTS

Product class	% Market	Design option	Sector	Delta LCC	
				Mean (1997$)	%Winners**
1F40	5	T12 CC	Commercial	−4	7

TABLE V.16.—SUMMARY OF DELTA LCC* RESULTS—Continued

Product class	% Market	Design option	Sector	Delta LCC	
				Mean (1997$)	%Winners**
		T12 ERS	Commercial	4	68
2F40	36	T12 CC	Commercial	−2	31
		T12 ERS	Commercial	6	80
3F40	1	T12 CC	Commercial	−2	33
Tandem-Wired		T12 ERS	Commercial	5	68
3F40 Not	10	T12 CC	Commercial	−4	23
Tandem-Wired		T12 ERS	Commercial	18	98
4F40	22	T12CC	Commercial	−2	36
		T12 ERS	Commercial	12	87
2F96	23	T12 EIS	Commercial	7	75
		T12 EIS	Industrial	−2	35
2F96HO	2	T12 CC	Commercial	11	90
		T12 ERS	Commercial	28	98
		T12 CC	Industrial	1	50
		T12 ERS	Industrial	15	94

*A positive Delta LCC implies a LCC savings whereas a negative number implies an increase in LCC
**% ballasts with reduced life cycle cost (winners), noted as ''certainty level'' by Crystal Ball.

3. Energy Savings, Net Present Value and Net National Employment

As indicated, we conclude that standards will result in significant savings of electricity by ballasts for each standards scenario. These energy savings have value to society, as measured by the net present value analysis. The net present value analysis is a measure of the net savings to society from standards and are summarized in the following tables.

TABLE V.17A.—NET PRESENT VALUE FROM ELECTRONIC STANDARDS

Electronic standards for units sold from 2003 to 2030 discounted at 7% to 1997 (in billion 1997 $)*								
Scenario	Scen 1A T12 Decr2015	Scen 1B T12 Decr2027	Scen 2A T12/T8 Decr2015	Scen 2B T12/T8 Decr2027	Scen 3A Decr2015	Scen 3B Decr2027	Scen 4A Decr2015	Scen 4B Decr2027
Total Benefit	1.97	3.13	3.22	5.13	2.68	4.46	2.98	4.85
Total Equipment Cost	1.01	1.62	0.8	1.27	0.64	1.08	0.72	1.18
Net Present Value	0.96	1.51	2.43	3.86	2.03	3.38	2.26	3.68

*Total Benefit and Net Present Value do not include HVAC savings.

TABLE V.17B.—NET PRESENT VALUE FROM CATHODE CUTOUT STANDARDS

Cathode cutout standards for units sold from 2003 to 2030 discounted at 7% to 1997 (in billion 1997 $)				
Scenario	Scen 5A 100% CC Decr2015	Scen 5B 100% CC Decr2027	Scen 6A 37% CC Decr2015	Scen 6B 37% CC Decr2027
Total Benefit	0.94	1.49	2.18	3.47
Total Equipment Cost	0.78	1.26	0.58	0.93
Net Present Value	0.16	0.23	1.60	2.54

Since the covered lamp ballasts are commercial products, these net savings apply to American business and industry. NPV is the difference between additional equipment costs and electricity cost savings. The NPV for the electronic ballast standards scenarios ranges from about 0.96 billion to 3.86 billion dollars (1997 dollars). NPV increases under the slower decreasing shipments forecast to 2027. NPVs for scenario 2 with T8 electronic ballasts are about 2.5 times those for scenario 1 with T12 electronic ballasts. For scenario 3, the five-year phase-in period causes an NPV reduction of around 15 percent over scenario 2. For scenario 4, the 2-year phase-in period results in an NPV reduction of about 5 percent over Scenario 2.

For the cathode cutout standards scenarios, NPV ranges from 0.16 to 2.54 billion dollars. For scenario 6, the NPV is 10 to 11 times greater than that of scenario 5. Note that we did not include HVAC energy cost savings in any of the NPV calculations.

The net present value analysis from the standards in the Joint Comments is summarized in Table V.18.

TABLE V.18.—NET PRESENT VALUE RESULTING FROM JOINT COMMENT

Joint comment standards for units sold from 2005 to 2030 discounted at 7% to 1997 (in billion 1997 $)		
Scenario	Dec2015	Dec2027
Total Benefit	1.95	3.51
Total Equipment Cost	0.53	0.91
Net Present Value	1.42	2.60

The Department committed in its 1996 Process Improvement Rule to develop estimates of the employment impacts of proposed standards in the economy in general. 61 FR 36983.

As discussed above, energy efficiency standards for ballasts are expected to reduce electricity bills for commercial and industrial consumers, although these savings are likely to be partially offset by increased costs for lighting equipment. The resulting net savings are expected to be redirected to other forms of economic activity. These shifts in spending and economic activity are expected to affect the demand for labor, but there is no generally accepted method for estimating these effects.

One method to assess the possible effects on the demand for labor of such shifts in economic activity is to compare sectoral employment statistics developed by the Labor Department's Bureau of Labor Statistics (BLS). The BLS regularly publishes its estimates of the number of jobs per million dollars of economic activity in different sectors of the economy, as well as the jobs created elsewhere in the economy by this same economic activity. BLS data indicate that expenditures in the electric sector generally are associated with fewer jobs (both directly and indirectly) than expenditures in other sectors of the economy. There are many reasons for these differences, including the capital-intensity of the utility sector and wage differences. Based on the BLS data alone, we believe the increase in the demand for labor resulting from shifts in economic activity would offset any reduced demand in the domestic ballast industry as a result of a ballast standard.

In developing this proposed rule, the Department attempted a more precise analysis of the impacts on national labor demand using an input/output model of the U.S. economy. The model characterizes the interconnections among 35 economic sectors using the data from the Bureau of Labor Statistics. Since the electric utility sector is more capital-intensive and less labor-intensive than other sectors (see Bureau of Economic Analysis, Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II), Washington, D.C., U.S. Department of Commerce, 1992), a shift in spending away from energy bills into other sectors would be expected to increase overall employment. The results of the Department's analysis are shown in Appendix E of the TSD. This analysis also concluded that the shifts in sectoral expenditures likely to result from the proposed ballast standard would likely increase the net national demand for labor.

While both this input/output model and the direct use of BLS employment data suggest the proposed ballast standards are likely to increase the net demand for labor in the economy, the gains would most likely be very small relative to total national employment. For several reasons, however, even these modest benefits are in doubt:

- Unemployment is now at the lowest rate in 30 years. If unemployment remains very low during the period when the proposed standards are put into effect, it is unlikely that the standards could result in any net increase in national employment levels.
- Neither the BLS data nor the input-output model used by DOE include the quality or wage level of the jobs. One reason that the demand for labor increases in the model may be that the jobs expected to be created pay less than the jobs being lost. The benefits from any potential employment gains would be reduced if job quality and pay are reduced.
- The net benefits from potential employment changes are a result of the estimated net present value of benefits or losses likely to result from the proposed standards, it may not be appropriate to separately identify and consider any employment impacts beyond the calculation of net present value.

Taking into consideration these legitimate concerns regarding the interpretation and use of the employment impacts analysis, the Department concludes only that the proposed ballast standards are likely to produce employment benefits that are sufficient to offset fully the expected adverse impacts on employment in the domestic ballast industry.

Because this is the first time DOE has performed such an analysis for an efficiency standards rulemakings, public comments are solicited on the validity of the analytical methods used and the appropriate interpretation and use of the results of this analysis.

4. Lessening of Utility or Performance of Products

An issue of utility that was considered was the possibility of interference with certain equipment, such as medical monitoring equipment, caused by the high frequency of electronic ballasts. To prevent any interference that cannot be solved by electronic ballast designers, the Department is not establishing a standard for T8 ballasts, thereby allowing magnetic T8 ballasts for such applications.

5. Impact of Lessening of Competition

The determination of this factor must be made by the Attorney General.

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. The energy savings from ballast standards result in reduced emissions of carbon and NO_X. Cumulative emissions savings over the 18-year period modeled are shown in Table V.19.

TABLE V.19.—CUMULATIVE EMISSIONS REDUCTIONS (2003–2020)

Emission	Range for Electronic Standards (standards 1–4)	Range for Cathode Cut-out Standards (standards 5 and 6)	Range Resulting from Joint Comments
Carbon (Mt)	12–30	6–20	11–19
NO_X (kt)	41–97	20–65	34–60

The annual carbon emission reductions range up to 2.3 Mt in 2020 and the NO_X emissions reductions up to 5.7 kt in 2015.[8,9] Total carbon and NO_X emissions for each of the 12 studied standards are reported in Tables D–1a and D–1b, Appendix D, of the TSD. In addition, equivalent results for the high and low economic growth cases for standards level 2b are reported in Table D–2 of the TSD. The outcome of the analysis for each case is shown as both

[8] million metric tons (Mt).

[9] thousand metric tons (kt).

emissions and deviations from the AEO99 Reference Case result. Emissions for the Joint Comment are presented in Appendix E of the TSD.

7. Other Factors

We present in Table V.20 a summary of the life-cycle cost results for those subgroups of commercial and industrial consumers who, if forced by standards to purchase electronic ballasts, would choose to switch from T12 to T8 lighting systems. The column titled ''Delta LCC'' gives the change in LCC when switching from the baseline option of EEM ballast to the listed design option. ''% Winners'' represents the probability of the design option resulting in reduced LCC.

TABLE V.20.—SUMMARY OF DELTA LCC* RESULTS

Product Class	Design Option	Sector	Delta LCC	
			Mean (1997$)	%Winners**
1F40	T8 ERS	Commercial	17	98
2F40	T8 ERS	Commercial	18	98
3F40 Tandem-Wired	T8 ERS	Commercial	27	98
3F40 Not Tandem-Wired	T8 ERS	Commercial	56	100
4F40 w/o Dual Switching	T8 ERS	Commercial	54	100
4F40 Dual Switching	T8 ERS	Commercial	44	99

*A positive Delta LCC implies a LCC savings whereas a negative number implies an increase in LCC
** % ballasts with reduced life cycle cost (winners), noted as ''certainty level'' by Crystal Ball.

For commercial and industrial consumers that choose four foot T8 lamps with their electronic ballasts, who in the current market represent 95 percent of purchasers of electronic ballasts, 98 to 100 percent will have life cycle cost savings which average 17 to 54 dollars. We did not evaluate commercial and industrial consumers of eight foot lamps, but we expect them to have similarly robust positive results.

As stated, the Department analyzed the Joint Comment in terms of national energy savings, net present value, national employment impacts and emission reductions. These results are also shown in Appendix E of the TSD. For the common scenario between the Department's analysis and the Joint Comment proposal of a market transformation by 2027 and a shift to T8 lamps, the above benefits are approximately 24 percent less than the Department's analysis which started the standards in the year 2003. However, the burdens on the manufacturers are also reduced to lower levels. The manufacturers have commented that their proposed staggered implementation dates mitigate the adverse impacts.

e. Conclusion

Section 325(l) of the Act specifies that the Department must consider, for amended standards, those standards that ''achieve the maximum improvement in energy efficiency which the Secretary determines is technologically feasible and economically justified'' and which will ''result in significant conservation of energy.'' Accordingly, the Department first considered the benefits and burdens of the max tech level of efficiency, *i.e.,* electronic ballast standards. Furthermore, in considering this standard level, the Department considered the staggered implementation scheme recommended in the Joint Comments.

Significant Conservation of Energy

The Department concludes that an electronic ballast standard saves a significant amount of energy. The energy savings reported for an electronic ballast standard in the Department's analysis ranged between 1.20 to 2.32 Quads of energy, not including the HVAC effects. The Department considers energy savings within this range to be significant.

Technological Feasibility

The Department concludes that an electronic ballast standard is technologically feasible as these products are currently available and comprise roughly half of the market.

Summary of Economic Impacts

In determining economic justification, the Department considered the burdens and benefits of an electronic ballast standard. The burdens accrue to the manufacturers of magnetic ballasts, some of their suppliers and employees, and to some commercial and industrial consumers who, because of factors such as lower than average electric costs or hours of operation, will experience increased life cycle costs. On the other hand, most commercial and industrial consumers will benefit from lower life cycle costs due to energy savings. These lower costs to the nation's businesses and industries produce increased jobs in the economy at large and the energy savings result in reduced atmospheric emissions. The Department gave considerable weight to the recommendations of the Joint Comment which attempts to balance these burdens and benefits. The proposal reduces energy savings by approximately 24 percent compared to the Department's analysis for the common scenario of a market transformation by 2027 and a shift to T8 lamps. These reductions come mainly from delaying the effective dates of the standards from the year 2003 to 2005 and later for replacement ballasts. However, these same extensions also reduce the impacts of the standards on manufacturers from what the Department estimated to levels which the manufacturers state are mitigated. While the Department did not revise the MIA, we believe the manufacturers' statement in the Joint Comment that the impacts on them from the proposal are mitigated is sufficient to conclude that, given the benefits, today's proposed standards are economically justified.

Economic Impact on Manufacturers

Over the range of cash flow scenarios and shipment forecasts that the Department studied for standards starting for all classes in 2003, we estimated that manufacturers that produce both magnetic and electronic ballasts would loose between 54.6 and 113.7 millions of dollars of NPV as a result of electronic standards. Manufacturers that currently produce electronic ballasts only were estimated to gain 9.3 to 27.5 millions of dollars of NPV. Domestic suppliers to the ballast industry were expected to loose between 7.55 and 20.69 millions of dollars of NPV. Luminaire manufacturers were expected to loose between 5.5 and 14.5 millions of dollars of NPV. Cumulatively, the Department estimates that businesses involved in the ballast industry would have net losses of between 47.4 and 121.4 millions of dollars of NPV as a result of electronic standards starting in the year 2003. This loss of value comes mainly from the lower profitability of the electronic ballast market compared to the magnetic ballast market. Additionally, restructuring costs associated with plant closures and expansions and changes in capacity utilization make up the rest of the loss in value.

Manufacturers report that a domestic magnetic ballast manufacturing plant, and possibly a domestic magnet wire plant, would close if an electronic ballast standard became effective in 2003. It was also reported that a capacitor plant and part of a magnetic ballast manufacturing plant, both located in Mexico, would also close. Additionally, it was reported that two domestic electronic ballast manufacturing plants, and two located in Mexico, would expand. The Department has included these assumptions in the above NPV values.

However, given the downward trend in magnetic ballast shipments, statements by manufacturers that the market is transitioning away from magnetic ballasts and the movement of domestic magnetic ballast manufacturing facilities to Mexico in recent years, it certainly seems possible that the plants associated with magnetic ballasts might be closed, or moved to Mexico, even in the absence of standards. Therefore, the Department also considered a scenario where the domestic magnetic ballast manufacturing facilities close in the base case. Under this assumption the losses to manufacturers that produce both magnetic and electronic ballasts, and to the total industry, would be reduced by 13.7 million dollars from the previous figures to a range of 33.7 to 107.7 millions of dollars of NPV.

Employment Impacts

Given the manufacturer reported plant closure and expansion assumptions, the Department estimated that between 666 and 717 direct domestic magnetic ballast manufacturing jobs, along with 313 to 340 domestic supplier jobs, would be lost. The Department also estimated that between 500 and 557 direct domestic electronic ballast manufacturing jobs, along with zero to 144 supplier jobs would be created. Thus, the Department estimated that the impact on direct domestic employment in the ballast industry would be a net loss of between 350 and 500 jobs.

However, given the movement of domestic magnetic ballast manufacturing facilities to Mexico in recent years, it certainly seems possible that many of these jobs would be moved to Mexico in the absence of an electronic ballast standard. Therefore, the Department also considered a scenario where the domestic magnetic ballast manufacturing facility closes in the base case. Under this scenario, no direct domestic magnetic ballast manufacturing jobs would be lost and the impact on direct domestic employment in the ballast industry would be a net gain of between 500 and 557 jobs.

In addition to the direct domestic jobs, the Department also estimated that there are between 363 and 406 associated domestic jobs in the ballast industry that, while not being eliminated, are at risk of being moved to Mexico as a result of business decisions. Additionally, the Department estimated that between 1,570 and 1,727 direct magnetic ballast manufacturing jobs in Mexico would be lost while 700 to 769 direct electronic ballast manufacturing jobs would be created in Mexico. Under the scenario where the domestic magnetic ballast manufacturing facility closes in the base case, no associated domestic jobs are at risk of being moved to Mexico as result of standards, while the direct magnetic ballast manufacturing jobs lost in Mexico grows to between 2,236 and 2,444 jobs.

Consumer Impacts

As a result of the Department's analysis, we believe most commercial and industrial consumers will save money. In total, we estimated the energy savings to have a net present value to American business and industry of 1.42 to 2.60 billion dollars, depending on the forecast of switching from magnetic ballasts to electronic ballasts in the absence of standards, and the rate of switching from T12 to T8 lamps in the face of standards.

Commercial consumers will experience lower life cycle costs which range from an average savings of 4 dollars for a 1F40T12 ballast to an average savings of 18 dollars for a 3F40T12 not tandem-wired ballast. Within these respective averages, 68 to 98 percent of the consumers will have lower life cycle costs while 32 to 2 percent will have higher life cycle costs. Those commercial consumers who also switch to T8 lamps will experience even lower life cycle costs which range from an average savings of 17 dollars for a 1F40T8 ballast to an average savings of 56 dollars for a 3F40T8 ballast. Within these respective averages 98 to 100 percent of the consumers will have lower life cycle costs. The Department believes almost every commercial consumer who switches to an electronic ballast for T8 lamps will save money.

Industrial consumers using F96T12 lamps, who represent 26 percent of F96T12 lamps, will experience higher life cycle costs with average costs of 2 dollars per ballast. Within that average, 35 percent will have lower life cycle costs while 65 percent will have higher life cycle costs. The above industrial consumer impacts are for T12 lamps and, while we did not evaluate industrial consumers of eight foot T8 lamps, we expect them to have a much larger proportion with lower life cycle costs as was the case for all consumers of four foot lamps who switch from T12 to T8 lamps.

National Impacts

As stated earlier, the energy savings reported for an electronic ballast standard in the Department's analysis ranged from 1.20 to 2.32 Quads of energy. These energy savings would result in carbon emission reductions of 11 to 19 million metric tons and NO_X emission reductions of 34 to 60 thousand metric tons.

Net Benefits of Proposed Standard

After carefully considering the analysis, comments and benefits versus burdens, the Department proposes to amend the energy conservation standards for fluorescent lamp ballasts as proposed by the Joint Comment. The Department concludes this standard saves a significant amount of energy and is technologically feasible and economically justified. In determining economic justification, the Department finds that the benefits of energy savings, consumer life cycle cost savings, national net present value increase, job creation and emission reductions resulting from the standard outweigh the burdens of the loss of manufacturer net present value, possible plant closings and job loss and consumer life cycle cost increases for some users of fluorescent lamp ballasts covered by today's notice.

VI. Procedural Issues and Regulatory Review

a. Review Under the National Environmental Policy Act

In issuing the March 4, 1994 Proposed Rule for energy efficiency standards for eight products, one of which was fluorescent lamp ballasts, the Department prepared an Environmental

Assessment (EA) (DOE/EA–0819) that was published within the Technical Support Document for that Proposed Rule. (DOE/EE–0009, November 1993.) We found the environmental effects associated with various standard levels for fluorescent lamp ballasts, as well as the other seven products, to be not significant, and we published a Finding of No Significant Impact (FONSI). 59 FR 15868 (April 5, 1994).

In conducting the analysis for today's Proposed Rule, the Department evaluated design options as suggested in comments. As a result, the energy savings estimates and resulting environmental effects from revised energy efficiency standards for fluorescent lamp ballasts in today's proposal differ somewhat from those that we presented for fluorescent lamp ballasts in the 1994 Proposed Rule. Nevertheless, the environmental effects expected from today's Proposed Rule would fall within ranges of environmental impacts from the revised energy efficiency standards for fluorescent lamp ballasts 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 Executive Order by the Office of Information and Regulatory Affairs (OIRA).

The draft submitted to OIRA and other documents submitted to OIRA for review have been made a part of the rulemaking record and are available for public review in the Department's Freedom of Information Reading Room, 1000 Independence Avenue, SW, Washington, DC 20585, between the hours of 9:00 a.m. and 4:00 p.m., Monday through Friday, telephone (202) 586–3142.

The following summary of the Regulatory Analysis focuses on the major alternatives considered in arriving at the proposed approach to improving the energy efficiency of consumer products. The reader is referred to the complete draft ''Regulatory Impact Analysis,'' which is contained in the TSD, available as indicated at the beginning of this NOPR. It consists of: (1) A statement of the problem addressed by this regulation, and the mandate for government action; (2) a description and analysis of the feasible policy alternatives to this regulation; (3) a quantitative comparison of the impacts of the alternatives; and (4) the national economic impacts of the proposed standard.

DOE identified the following eight major policy alternatives for achieving consumer product energy efficiency. These alternatives include:

- No New Regulatory Action
- Informational Action
  —Product Labeling
  —Consumer Education
- Financial Incentives
  —Tax Credits
  —Rebates
- Voluntary Energy Efficiency Targets
- Mass Government Purchases
- Lighting Research and Development
- Building Codes
- The Proposed Approach (Performance Standards)

Each alternative has been evaluated in terms of its ability to achieve significant energy savings at reasonable costs, and has been compared to the effectiveness of the proposed rule. These alternatives were analyzed with the NES model, as explained in the RIA section and Appendix B of the TSD. The results are reported for lighting energy savings only (HVAC interactive impacts would increase the savings by 6.25 percent). Many alternatives assume a conversion rate, which means the percentage of ballasts that would be magnetic for any year in the base case that are T8 electronic in the alternative case; the base case already assumes that some ballasts would be electronic without policy action. The performance standards case has a 100 percent conversion rate to electronic ballasts.

If no new regulatory action were taken, then no new standards would be implemented for these products. This is essentially the ''base case.'' For this analysis, we considered two base cases (the ''Decreasing shipments to 2015'' case and the ''Decreasing shipments to 2027'' case). In this section, we report two values for the base cases and policy alternatives, corresponding to each base case respectively. For the base cases, between the years 2003 and 2030, there would be expected energy use of 83.3–90.6 Quads (87.9–96.6 EJ) of primary energy, with no energy savings and a zero net present value (see Appendix B of the TSD for the derivation of these estimates).

Several alternatives to the base cases can be grouped under the heading of informational action. They include consumer product labeling and DOE public education and information programs. Both of these alternatives are already mandated by, and are being implemented under the Act. In addition, there are other programs that promote currently-efficient technologies. These include the National Electrical Manufacturers Association's Energy Cost Savings Council, the Environmental Protection Agency's Energy Star Buildings/Green Lights Program, and the Energy Policy Act's Voluntary Luminaire Program. One base case alternative would be to estimate the energy conservation potential of enhancing these programs. To model this possibility, we assumed that the market impacts of these programs resulted in a 3 percent annual conversion rate to electronic ballasts. This resulted in energy savings equal to 0.05–0.09 Quad (0.05–0.09 EJ), with net present value estimated to be $0.08–0.12 billion.

Another base case alternative would be to assume that enhanced labeling and consumer education promote advanced technologies, such as daylighting. To model this possibility, we assumed that some consumers influenced by the policy would select electronic dimming ballasts, while others would select regular electronic ballasts. For those using dimming ballasts, we assumed that the fluorescent lamp ballast kiloWatthour savings were 40 percent higher for F40 and F96 fluorescent lamp ballasts, that there was no daylighting potential for industrial sector F96HO, that incremental prices for dimming fluorescent lamp ballasts were seven dollars higher than for regular electronic ballasts, and that there was an annual 0.6 percent conversion rate to dimming fluorescent lamp ballasts. The annual conversion rate for the remaining consumers affected by the policy who selected regular electronic ballasts was 2.4 percent. This possibility resulted in energy savings of 0.05–0.10 Quad (0.06–0.10 EJ), with a net present value of $0.08–0.13 billion.

Various financial incentive alternatives were tested. These included tax credits and rebates to consumers, as well as tax credits to manufacturers. Both the tax credits to consumers and the consumer rebates were assumed to reduce the incremental ballast expense for electronic ballasts by 50 percent. We assumed that the tax credits caused a conversion rate to electronic ballasts of 7 percent. The tax credits to consumers showed a change from the base case, saving 0.12–0.21 Quad (0.12–0.22 EJ) with a net present value of $0.20–0.31 billion. Consumer rebates were assumed to result in a conversion rate of 12 percent. Consumer rebates showed slightly higher energy savings; they would save 0.20–0.36 Quad (0.21–0.38 EJ), with a net present value of $0.34–0.53 billion.

Another financial incentive that was considered was a tax credit to manufacturers for the additional costs of producing electronic ballasts. In this scenario, we assumed a tax credit of 20 percent of the increased costs to manufacturers for retooling in the years 2001–2003 (when these costs would be incurred).[10] These costs depreciated over a ballast lifetime resulted in a $0.04 reduction in the incremental purchase price. The tax credits to manufacturers had an insignificant effect, with no energy savings and a zero net present value.

Two scenarios of voluntary energy-efficiency targets were examined. In the first one, the proposed energy conservation standards were assumed to be voluntarily adopted by all the relevant manufacturers 5 years later than mandatory standards. In the second scenario, the proposed standards were assumed to be adopted 10 years later. In these scenarios, voluntary improvements having a 5-year delay, compared to implementation of mandatory standards, would result in energy savings of 0.84–1.91 Quads (0.88–2.02 EJ), and a net present value of $0.96–2.04 billion; voluntary improvements having a 10-year delay would result in 0.34–1.05 Quads (0.36–1.1 EJ) being saved, and a net present value of $0.33–0.96 billion. These scenarios assume that there would be universal voluntary adoption of the energy conservation standards by fluorescent lamp ballast manufacturers, an assumption for which there is no reasonable assurance.

Another policy option that we reviewed was that of massive purchases of electronic ballasts by Federal, State, and local governments. We modeled this policy by assuming that all ballasts purchased by these government entities were electronic ballasts, which, coupled with a modest impact on the remaining market, resulted in a 10 percent national conversion rate. This policy option resulted in energy savings of 0.17–0.30 Quad (0.18–0.32 EJ) and a net present value of $0.25–0.40 billion.

We also reviewed a policy of lighting research that could [there is no cost reduction in this policy] add more efficient alternatives to fluorescent electronic T–12 and T–8 ballasts. To analyze this option, we assumed that the conversion rate to controls, such as dimming fluorescent lamp ballasts, was 1.6 percent, that there was a time delay of 5 years for new technology options to reach the market, that the incremental kiloWatthour savings was 40 percent, and the increase in the incremental electronic ballast cost was seven dollars. This resulted in energy savings of 0.01–0.04 Quad (0.01–0.05 EJ), with a net present value that we estimated to be $0.01–0.04 billion.

Still another policy option that we reviewed was one of aggressive promotion of state adoption and enforcement of commercial building codes, including those for major lighting system renovations. To analyze this option, we assumed a one percent to three percent electronic ballast conversion, for each base case, respectively. This resulted in energy savings of 0.05–0.15 Quad (0.05–0.16 EJ), and a net present value of $0.06–0.18 billion.

Lastly, all of these alternatives must be gauged against the performance standards that are being proposed in this NOPR. Such performance standards would result in energy savings of 1.20–4.90 Quads (1.27–5.17 EJ) (without HVAC savings) and the net present value would be an expected $1.42–5.41 billion. (These estimates represent the lower and upper bounds of the results of all scenarios analyzed). As indicated in the paragraphs above, none of the alternatives that were examined for these products saved as much energy as the proposed rule. Also, most of the alternatives would require that enabling legislation be enacted, since authority to carry out those alternatives does not presently exist.

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. Small businesses are defined as those firms within an industry that are privately owned and less dominant in the market.

The Standard Industrial Classification (SIC) Code for fluorescent lamp ballast manufacturers is 36124. To be categorized as a ''small'' fluorescent lamp ballast manufacturer, a firm must employ no more than 750 employees.

In the fluorescent lamp ballast industry, there is one ''small'' manufacturer who produces both ''affected'' magnetic and electronic ballasts. The ''small'' manufacturer has its electronic and magnetic ballast manufacturing operations in the same plant. Its smaller size and less automated operations would seem to provide it with the flexibility to adapt to a new electronic ballast standard without significant asset write-offs or plant closures.

The negative impacts on the ''small'' manufacturer's cash flows from operations, however, would likely be similar in proportion to those of the larger manufacturers.

Since only one of the seven manufacturers of fluorescent lamp ballasts is ''small,'' the Department concludes that its proposed energy-efficiency standards rulemaking would not affect a ''substantial'' number of ''small'' manufacturers. In addition, the firm's flexible manufacturing operations, along with the expected proportional financial impacts, strongly suggests that the proposed energy-efficiency standards would not produce ''significant'' economic impacts on that one manufacturer.

In view of the foregoing, the Department has determined and hereby certifies pursuant to section 605(b) of the Regulatory Flexibility Act that, for this particular industry, the proposed standard levels in today's Proposed Rule will not ''have a significant economic impact on a substantial number of small entities,'' and it is not necessary to prepare a regulatory flexibility analysis.

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

[10] Manufacturer Impact Analysis, conversion capital expenditures (see the TSD, chapter 6).

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 proposed 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 that might require compensation under the Fifth Amendment to the United States Constitution.

g. Review Under Executive Order 13132

Executive Order 13132 (64 FR 43255, August 4, 1999) imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. Agencies are required to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and carefully assess the necessity for such actions. DOE has examined today's proposed rule and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. State regulations that may have existed on the products that are the subject of today's proposed rule were preempted by the Federal standards established in the NAECA Amendments of 1988. States can petition the Department for exemption from such preemption based on criteria set forth in EPCA.

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 this Proposed Rule responds 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 Proposed Rule would establish energy conservation standards for fluorescent lamp ballasts that are designed to achieve the maximum improvement in energy efficiency that 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 this Proposed Rule.

i. Review Under the Treasury and General Government Appropriations Act of 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any proposed rule or policy that may affect family well-being. Today's proposal would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

j. Review Under the Plain Language Directives

Section 1(b)(12) of Executive Order 12866 requires that each agency shall draft its regulations to be simple and easy to understand, with the goal of minimizing the potential for uncertainty and litigation arising from such uncertainty. Similarly, the Presidential memorandum of June 1, 1998 (63 FR 31883) directs the heads of executive departments and agencies to use, by January 1, 1999, plain language in all proposed and final rulemaking documents published in the **Federal Register**, unless the rule was proposed before that date.

Today's proposed rule uses the following general techniques to abide by Section 1(b)(12) of Executive Order 12866 and the Presidential memorandum of June 1, 1998 (63 FR 31883):

- Organization of the material to serve the needs of the readers (stakeholders).
- Use of common, everyday words in short sentences.
- Shorter sentences and sections.

We invite your comments on how to make this proposed rule easier to understand.

VII. Public Comment Procedures

a. Participation in Rulemaking

The Department encourages the maximum level of public participation possible in this rulemaking. Individual commercial and industrial consumers, representatives of consumer groups, manufacturers, associations, States or other governmental entities, utilities, retailers, distributors, manufacturers, and others are urged to submit written statements on the proposal. The Department also encourages interested persons to participate in the public hearing to be held in Washington, DC, at the time and place indicated at the beginning of this notice.

The DOE has established a comment period of 75 days following publication of this notice for persons to comment on this proposal. We will make available for review in the DOE Freedom of Information Reading Room all public comments received and the transcript of the public hearing.

b. Written Comment Procedures

Interested persons are invited to participate in this proceeding by submitting written data, views or arguments with respect to the subjects set forth in this notice. We provided instructions for submitting written comments at the beginning of this notice and below.

You should label comments both on the envelope and on the documents, ''Fluorescent Lamp Ballast Rulemaking (Docket No. EE–RM–97–500),'' and submit them for DOE receipt by the date specified at the beginning of this notice. Please submit one signed copy and a computer diskette (WordPerfect 8) or ten (10) copies (no telefacsimiles) to:

U.S. Department of Energy, Attn: Brenda Edwards-Jones, Office of Energy Efficiency and Renewable Energy, EE–41, 1000 Independence Avenue, SW, Washington, DC 20585–0121, (202) 586–2945, e-mail: Brenda.Edwards-Jones@ee.doe.gov.

The Department will also accept electronically-mailed comments, but you must supplement such comments with a signed hard copy.

All comments received by the date specified at the beginning of this notice and other relevant information will be considered by DOE before final action is taken on the proposed regulation.

All written comments received on the proposed rule will be available for public inspection at the DOE Freedom of Information Reading Room, as provided at the beginning of this notice.

If you submit information or data that you believe is confidential, and should not be publicly disclosed, you should submit one complete copy of your document and ten (10) copies or one electronic copy from which the information believed to be confidential has been deleted. We will make our own determination regarding the confidentiality of the information or data according to our regulations at 10 CFR 1004.11.

Factors of interest to DOE, when evaluating requests to treat information as confidential, include: (1) A description of the item; (2) an indication as to whether and why such items of information have been treated by the submitting party as confidential, and whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known or available from other sources; (4) whether the information has previously been available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person that would result from public disclosure; (6) an indication as to when such information might lose its confidential character due to the passage of time; and (7) whether disclosure of the information would be in the public interest.

c. Public Hearing

1. Procedure for Submitting Requests to Speak

The time and place of the public hearing are indicated at the beginning of this notice. The Department invites any person who has an interest in these proceedings, or who is a representative of a group or class of persons having an interest, to make a written request for an opportunity to make an oral presentation at the public hearing. Such requests should be labeled both on the letter and the envelope, ''Fluorescent Lamp Ballast Rulemaking (Docket No. EE–RM–97–500),'' and should be sent to the address, and must be received by the time specified, at the beginning of this notice. Requests may be hand-delivered or telephoned between the hours of 8:30 a.m. and 4:30 p.m., Monday through Friday, except Federal holidays.

The person making the request should briefly describe the interest concerned and, if appropriate, state why he or she is a proper representative of the group or class of persons that has such an interest, and give a telephone number where he or she may be contacted. Each person selected to be heard will be so notified by DOE as to the approximate time they will be speaking.

Each person selected to be heard is requested to submit an advance copy of his or her statement prior to the hearing as indicated at the beginning of this notice. In the event any persons wishing to testify cannot meet this requirement, that person may make alternative arrangements in advance by so indicating in the letter requesting to make an oral presentation.

2. Conduct of Hearing

The Department reserves the right to select the persons to be heard at the hearing, to schedule the respective presentations, and to establish the procedures governing the conduct of the hearing. The length of each presentation is limited to 15 minutes.

A DOE official will be designated to preside at the hearing. The hearing will not be a judicial or an evidentiary-type hearing, but will be conducted in accordance with 5 U.S.C. 533 and section 336 of the Act. At the conclusion of all initial oral statements at each day of the hearing, each person who has made an oral statement will be given the opportunity to make a rebuttal statement, subject to time limitations. The rebuttal statement will be given in the order in which the initial statements were made. The official conducting the hearing will accept additional comments or questions from those attending, as time permits. Any interested person may submit, to the presiding official, written questions to be asked of any person making a statement at the hearing. The presiding official will determine whether the question is relevant, and whether time limitations permit it to be presented for answer.

Further questioning of speakers will be permitted by DOE. The presiding official will afford any interested person an opportunity to question other interested persons who made oral presentations, and employees of the United States who have made written or oral presentations with respect to disputed issues of material fact relating to the proposed rule. This opportunity will be afforded after any rebuttal statements, to the extent that the presiding official determines that such questioning is likely to result in a more timely and effective resolution of such issues. If the time provided is insufficient, DOE will consider affording an additional opportunity for questioning at a mutually convenient time. Persons interested in making use of this opportunity must submit their request to the presiding official no later than shortly after the completion of any rebuttal statements and be prepared to state specific justification, including why the issue is one of disputed fact and how the proposed questions would expedite their resolution.

Any further procedural rules regarding proper conduct of the hearing will be announced by the presiding official.

A transcript of the hearing will be made, and the entire record of this rulemaking, including the transcript, will be retained by DOE and made available for inspection at the DOE Freedom of Information Reading Room as provided at the beginning of this notice. Any person may purchase a copy of the transcript from the transcribing reporter.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Energy conservation, Household appliances.

Issued in Washington, D.C., on January 18, 2000.

Dan W. Reicher,

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 proposed to be 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; 28 U.S.C. 2461 note.

2. Section 430.32 of subpart C is amended by revising paragraph (m) to read as follows:

§ 430.32 Energy conservation standards and effective dates.

* * * * *

(m) *Fluorescent lamp ballasts.*

(1) Except as provided in paragraphs (m)(2), (m)(3), and (m)(4) of this section, each fluorescent lamp ballast—

(i) (A) Manufactured on or after January 1, 1990;

(B) Sold by the manufacturer on or after April 1, 1990; or

(C) Incorporated into a luminaire by a luminaire manufacturer on or after April 1, 1991; and

(ii) Designed —

(A) To operate at nominal input voltages of 120 or 277 volts;

(B) To operate with an input current frequency of 60 Hertz; and

(C) For use in connection with an F40T12, F96T12, or F96T12HO lamps shall have a power factor of 0.90 or greater and shall have a ballast efficacy factor not less than the following:

Application for operation of	Ballast input voltage	Total nominal lamp watts	Ballast efficacy factor
One F40 T12 lamp	120	40	1.805
	277	40	1.805
Two F40 T12 lamps	120	80	1.060
	277	80	1.050
Two F96T12 lamps	120	150	0.570
	277	150	0.570
Two F96T12HO lamps	120	220	0.390
	277	220	0.390

(2) The standards described in paragraph (m)(1) of this section do not apply to:

(i) a ballast that is designed for dimming or for use in ambient temperatures of 0° F or less, or

(ii) A ballast that has a power factor of less than 0.90 and is designed for use only in residential building applications.

(3) Except as provided in paragraph (m)(4) of this section, each fluorescent lamp ballast—

(i) (A) Manufactured on or after April 1, 2005;

(B) Sold by the manufacturer on or after July 1, 2005; or

(C) Incorporated into a luminaire by a luminaire manufacturer on or after April 1, 2006; and

(ii) Designed—

(A) To operate at nominal input voltages of 120 or 277 volts;

(B) To operate with an input current frequency of 60 Hertz; and

(C) For use in connection with an F40T12, F96T12, or F96T12HO lamps; shall have a power factor of 0.90 or greater and shall have a ballast efficacy factor not less than the following:

Application for operation of	Ballast Input voltage	Total nominal lamp watts	Ballast efficacy factor
One F40 T12 lamp	120	40	2.29
	277	40	2.29
Two F40 T12 lamps	120	80	1.17
	277	80	1.17
Two F96T12 lamps	120	150	0.63
	277	150	0.63
Two F96T12HO lamps	120	220	0.39
	277	220	0.39

(4) (i) The standards described in paragraph (m)(3) of this section do not apply to:

(A) A ballast that is designed for dimming to 50 percent or less of its maximum output;

(B) A ballast that is designed for use with two F96T12HO lamps at ambient temperatures of −20° F or less and for use in an outdoor sign;

(C) A ballast that has a power factor of less than 0.90 and is designed and labeled for use only in residential building applications; or

(D) A replacement ballast as defined in subparagraph (ii).

(ii) For purposes of this paragraph (m), a replacement ballast is defined as a ballast that:

(A) Is manufactured on or before June 30, 2010;

(B) Is designed for use to replace an existing ballast in a previously installed luminaire;

(C) Is marked ''FOR REPLACEMENT USE ONLY'';

(D) Is shipped by the manufacturer in packages containing not more than 10 ballasts;

(E) Has output leads that when fully extended are a total length that is less than the length of the lamp with which it is intended to be operated; and

(F) Meets or exceeds the ballast efficacy factor in the following table:

Application for operation of	Ballast input voltage	Total nominal lamp watts	Ballast efficacy factor
One F40 T12 lamp	120	40	1.805
	277	40	1.805
Two F40 T12 lamps	120	80	1.060
	277	80	1.050
Two F96T12 lamps	120	150	0.570
	277	150	0.570
Two F96T12HO lamps	120	220	0.390
	277	220	0.390

* * * * *

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