CHAPTER 6. MANUFACTURER IMPACT ANALYSIS

6A IMPACT ON FLUORESCENT LAMP BALLAST MANUFACTURER

6A.1 Manufacturer Impact Analysis Methodology

In determining whether a standard is economically justified, the Secretary of Energy is statutorily required to consider "the economic impact of the standard on the manufacturers and on the consumers of the products subject to such a standard." The legislation also calls for an assessment of the impact of any lessening of competition as determined in writing by the Attorney General. The purpose of the Manufacturer Impact Analysis (MIA) is to provide information that can be used to evaluate these impacts. The MIA estimates the financial impact of standards on manufacturers and calculates impacts on employment and manufacturing capacity.

Prior to initiating the detailed MIA for the ballast rulemaking, the Department prepared an approach document titled "Ballast Manufacturer Impact Analysis Analytical Approach." This document was presented at a public workshop held on April 28, 1998. It was based on the general framework for the MIA presented by the Department at a workshop in March 1997 and was modified for its application to the ballast rule. The revised document outlined procedural steps and identified issues for consideration.

As proposed in the approach document, the 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 Government Regulatory Impact Model (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 structure to facilitate the analysis of new ballast standards. In the Phase 3, Sub-Group Impact Analysis, the strawman cash flow was used as a template from which individual company level cash flows were developed by DOE and our firm (ADL). Phase 3 also entailed documenting additional impacts on employment and manufacturing capacity through an interview process. Finally in Phase 4, Industry Cash Flow, we aggregated the individual cash flows into three groups; group 1 includes all manufacturers, group 2 includes full line manufacturers of magnetic and electronic ballasts, and group 3 includes manufacturers producing only electronic ballasts.

6A.1.1 Phase 1: Industry Profile and Issue Identification

Phase 1 of the MIA 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.

Publicly available quantitative data published by U.S. Bureau of Census with regards to the ballast industry were presented 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. Summaries of these interviews were distributed 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 MIA 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 bestow consequences to 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 MIA should include consideration of direct industry suppliers.

6A.1.2 Phase 2: "Strawman" Industry Cash Flow Analysis

Phase 2 of the MIA had as its focus the "larger" industry. The analytical tool used for calculating the financial impacts of standards on manufacturers is the Government Regulatory Impact Model (GRIM). In Phase 2, GRIM was used to perform a "strawman" industry cash flow analysis.

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, or assist us in developing, its own cash flow analysis to be aggregated with all other manufacturer submittals.

In order to facilitate individual manufacturer analysis, the DOE prepared "strawman" scenarios using publicly available financial information. Individual cash flows were prepared 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. These were calculated 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 was presented in the document entitled "Financial Inputs to GRIM for the Ballast Rulemaking Analysis." This document was presented at the public workshop held on April 28, 1998. Strawman values for prices were derived 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, a typical ballast industry cost structure was developed using publicly available information from the Census of Manufacturers (CMs) and from transformer industry statistics (SIC# 3612) obtained from Robert Morris Associates (RMA) reports. Finally, in preparing the "strawman" industry cash flow analysis, the Department used the same ballast shipment scenarios developed for the National Energy Savings (NES) spreadsheet.

The strawman was used to provide a starting point which manufacturers could then use to come up with more recent and accurate inputs. The intent of the strawman was to use "placeholder" values in order to illustrate the working of the GRIM spreadsheet. Given the concerns raised over the accuracy of the strawman data, the Department does not intend to compare or refer back to these values.

6A.1.3 Phase 3: Sub-Group Impact Analysis

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

The interview process played a key role in the MIA, since it provided an opportunity for manufacturers to privately express their views on important issues and provide confidential information needed to assess financial, employment and other business impacts. To support the development of company cash flows, an 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 manufacturing assets also drew heavily on the information gathered during the interviews. The interview guide solicited both qualitative and quantitative information. Supporting information was requested whenever applicable.

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

6A.1.4 Phase 4: Industry Cash Flow

As previously described, using the GRIM spreadsheet and an interview guide, the ballast MIA was performed on a company-by-company basis. This process has the benefit of allowing 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. Manufacturers used their 1997 market shares in the 31.5 million "affected" magnetic ballast and the 36.5 million electronic ballast

market to develop their shipments of the "affected" magnetic ballasts and their direct electronic replacements respectively. As the total market shares added to a number greater than 100% of the market, we scaled each manufacturer's market share in the same ratio to bring the total market share to a 100%. We found close agreement in total market share for magnetic ballasts and a slightly more significant over-reporting of electronic ballast shares. We aggregated the individual cash flows into three groups, the first grouping includes all manufacturers, the second includes full line manufacturers of magnetic and electronic ballasts only, and the third group includes manufacturers producing only electronic ballasts. This aggregation scheme was selected as being the most representative of the range of impacts on individual manufacturers compared to the industry aggregate values.

6A.2 MIA RESULTS

6A.2.1 Industry Characterization

We developed an initial industry characterization using information from relevant industry and market publications, industry trade organizations, company financial reports, and product literature. This industry characterization report helped us in developing the "strawman" industry cash flow analysis and also aided in the development of a detailed and focused interview guide to perform the MIA. Specifically, shipment information was obtained from publicly available Current Industrial Reports (CIRs) published by the U.S. Bureau of Census. Financial and cost information was obtained from the Census of Manufactures (another Bureau of Census publication), SEC 10-K statements, Dun & Bradstreet reports, Robert Morris Associates' reports, and Moody's Company reports.

6A.2.1.1 Industry Shipments

Current Industrial Reports (CIRs), published by the U.S. Bureau of Census, provide detailed data on quantity and total value of U.S. shipments of fluorescent lamp ballast products. Census uses SIC code 36124 to describe the fluorescent lamp ballast industry. According to CIR data, 103.9 million fluorescent lamp ballasts, valued at $906 million, were shipped in 1997.

Census groups all ballast products into three main categories: 1) uncorrected power-factor magnetics, 2) corrected power-factor magnetics, and 3) electronics. In 1997, power-factor corrected (85% PF or above) magnetic ballasts accounted for 41% of the quantity and 38% of the value of shipments of all fluorescent lamp ballasts. In the same year, electronic ballasts made up 35% of the quantity and 54% of the value of shipments.

Figure 6A.1 presents the trend in the dollar value of manufacturers' shipments of lamp ballasts over the period 1990 through 1997. It shows that the shipment value of the uncorrected power-factor magnetic segment has remained fairly steady over the past 8 years—it increased an average 12% a year from 1990 to 1992 and has remained flat since then. The shipment value of corrected power-factor magnetics has been coming down gradually, while that of electronics has been increasing as they have gained market share over corrected power-factor magnetics.

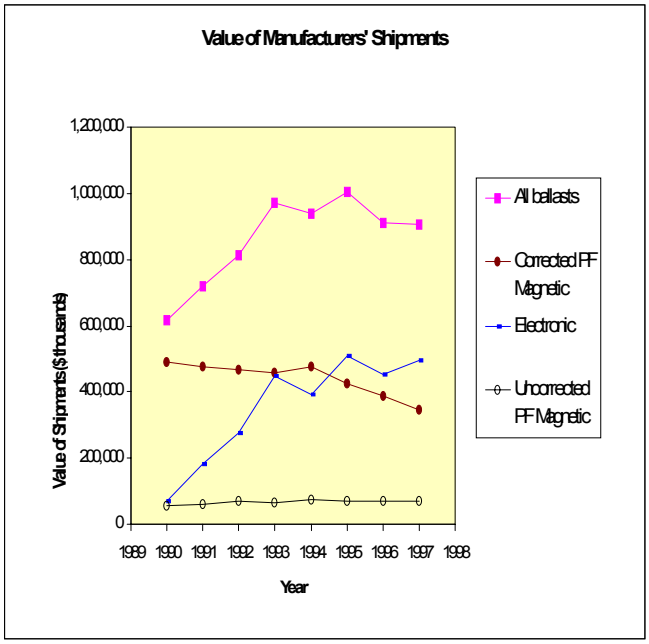

Figure 6A.1 Historical Trend in Value of Shipments of Fluorescent Lamp Ballast Products

Table 6A.1 presents the lamp ballast products that would be impacted by a DOE standard. These will be referred to as "affected" magnetic ballasts in this MIA report. The table also lists the cathode cutout and electronic ballast product classes that might serve as energy-efficient replacements to meet potential DOE standards at the cathode cutout ballast performance level or at the electronic ballast performance level.

Table 6A.1 "Affected" Magnetic Ballasts and Energy-Efficient Replacements

"Affected" Magnetic Ballasts	Cathode Cutout Replacements	Electronic replacements
1F40T12	1F40T12	1F40T12, 3F40T12, 1F32T8, 3F32T8
2F40T12	2F40T12	2F40T12, 3F40T12, 2F32T8, 3F32T8, 4F32T8
2F96T12		2F96T12
2F96T12HO	2F96T12HO	2F96T12HO

Most of the manufacturers interviewed believe that standard levels set at the cathode cutout ballast performance levels would not result in cathode cutout ballasts becoming a viable alternative as a mass market replacement for the "affected" magnetic ballasts. They reported that cathode cutout ballasts have been available in the marketplace for many years and have not achieved substantial market share, despite serious promotional efforts. In fact the sales of cathode cutout ballasts have declined over the past four years. The data submitted by the National Electrical Manufacturers Association (NEMA) to the Lawrence Berkeley National Lab (LBNL) show total industry shipments

of cathode cutout ballasts as follows: 1993—580,000; 1994—614,000; 1995—460,000; 1996—382,000; 1997—422,000. (Shipments for 1997 are annualized based on six months actual shipments). Manufacturers attributed this lack of success to both technical and marketplace factors.

Most manufacturers stated that a rule requiring cathode cutout ballast performance levels would just be a *de facto* electronic ballast rule. Manufacturers noted the downward trend in electronic ballast prices, which will thereby reduce the price advantage that cathode cutouts currently have over electronics. Additionally, not all magnetic ballast manufacturers produce cathode cutout ballasts. Those who did not manufacture cathode cutouts indicated that patented designs could lead to higher costs of manufacturing these ballasts. For these reasons, we were only able to collect data and assess the impacts of an electronic ballast performance level in this MIA report.

In 1997, 31.5 million "affected" magnetic ballasts were sold in the United States.[1] They represent 73% of all power-factor corrected magnetic ballasts sold in 1997. Table 6A.2 presents the value of shipments of "affected" magnetic ballasts, assuming that the average price of these "affected" magnetic ballasts ($8 per unit) is the same as that of all power-factor corrected magnetic ballasts.

Table 6A.2 Shipment and Value of Fluorescent Lamp Ballasts in 1997

Product	1997 Shipments (mil)	1997 Value of Shipments ($ mil)	% of Revenues of all ballasts	Average Price ($ per unit)
All Power-factor corrected magnetic ballasts	42.9	343.9	37.9%	8.0
"Affected" magnetic ballasts	31.5*	252.6	27.9%	8.0**
Uncorrected power-factor ballasts	24.5	68.5	7.6%	2.8
Electronic ballasts	36.5	494.0	54.5%	13.5
All ballasts	103.9	906.5	100%	8.7

* A subset of "All Power-factor corrected magnetic ballasts." Data provided by NEMA (all other information was obtained from CIRs)

** Assumes price is the same as that of all PF corrected magnetics

Using this average price of $8, revenues from "affected" magnetic ballasts in 1997 constituted approximately 28% of all manufacturer revenues in the fluorescent lamp ballast industry.

6A.2.1.2 Manufacturer Market Shares and Characteristics

Table 6A.3 lists the major fluorescent lamp ballast manufacturers and their characteristics. We conducted manufacturer interviews and plant visits with all of them during the October to December 1998 time frame.

[1] Information provided by National Electrical Manufacturers Association (NEMA).

Table 6A.3 List of Lamp Ballast Manufacturers

Manufacturer	Characteristics in "affected" categories
Advance Transformer Company	Producer of magnetic and electronic ballasts with domestic, Mexican and foreign facilities
Howard Industries	Producer of electronic ballasts with domestic production facilities
MagneTek	Producer of magnetic and electronic ballasts with domestic and Mexican production facilities
Motorola Lighting	Producer of electronic ballasts with domestic production facilities
Osram Sylvania	Producer of electronic ballasts with foreign production facilities
Robertson Worldwide	Producer of magnetic and electronic ballasts for specialty applications with domestic production facilities
SLi Lighting/PLP	Producer of electronic and magnetic ballasts with Mexican production facilities

The interviews conducted in 1996/1997 suggested that product mix, firm size, location of production facilities, and level of vertical integration were possible characteristics to be used in defining sub-group categories. After consultation with industry, we elected to group manufacturers exhibiting similar product mix characteristics for the MIA. This aggregation scheme was selected as it represents the most comprehensive way of reporting the variation of impacts on different manufacturers while ensuring confidentiality of individual manufacturers' positions. Based on information presented in Table 6A.3, the manufacturers were divided into the following two sub-groups:

Sub-group 1: Manufacturers of both magnetic and electronic ballasts

- Advance Transformer Company
- MagneTek, Inc.
- Robertson Worldwide
- SLi Lighting / PowerLighting Products

Sub-group 2: Manufacturers that produce only electronic ballasts

- Howard Industries
- Motorola Lighting, Inc.
- Osram Sylvania Products Inc.

The magnetic ballast industry has fewer manufacturers and, hence, is more concentrated than the electronic ballast industry. Table 6A.4 provides an overview of the number of manufacturers and market shares.

Table 6A.4 Number of Manufacturers and Market Shares

	Number of major manufacturers	Market share of the 4 largest manufacturers	Market share of top 7 manufacturers
Magnetic	4	>95%	>95%
Electronic	7	>70%	>95%

6A.2.2 Cash Flow Impacts

Manufacturers worked with us using the GRIM spreadsheet to evaluate the cash flow impacts of regulations on individual manufacturers. The GRIM spreadsheet calculates the change in net present value (NPV) for the manufacturer(s) following a regulation. Net present value (NPV) is defined, for the purposes of this analysis, as the present value of cash flows for the manufacturer(s) in question. The basic structure of the GRIM is a standard annual cash flow analysis which uses price and shipment information as an input, builds on manufacturing cost information, and accepts a set of regulatory conditions as changes in costs, associated margins and investments. The model calculates actual cash flows by year and then determines the present value of these cash flows, both without regulations (*Base Case*) and with regulations (*Standard Case*), using the appropriate discount rate.

For the purpose of this analysis, the *Base Case* scenario represents the business scenario in the absence of a standard. In case an electronic ballast standard comes into effect, it will change the mix of ballast products being sold in the market and their associated prices, costs and shipments. Such a scenario is called the *Standard Case* scenario. Hence, *Base Case* NPV implies the present value of cash flows in the absence of a standard. Similarly, *Standard Case* NPV implies the present value of cash flows in the scenario where a standard comes into effect. To project future cash flows, this analysis assumes 2000 as the announcement year of the standard, and 2003 as the year when the standard will come into effect.

In cooperation with us, individual manufacturers' cash flows were developed. To do this, manufacturers estimated future industry price trends, manufacturing costs, and the value and timing of necessary capital investments, both in the *Base Case* and the *Standard Case*. In preparing the GRIM cash flows, manufacturers used their own current and future forecasts of product mix for the various magnetic and electronic ballast product classes identified in Table 6A.1.

In developing cash flow estimates under the *Manufacturer Submittal* scenarios 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% market share of the new electronic market.

In order to analyze the potential impact of a new entrant(s) in the magnetic ballast industry, a "Magnetic Ballast New Entrant " scenario was also developed This scenario captures the likely cash flow impacts resulting from the redistribution of market shares among the existing manufacturers as a new entrant gains a 15% market share of the magnetic ballast market. 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.

Some of the important inputs required to develop cash flow estimates and NPV are industry

shipments, market shares, manufacturer prices, profit margins and capital investments. These are discussed in the next sections.

6A.2.2.1 Shipments

Magnetic ballast shipments have decreased in the past decade as electronic ballasts have been gaining market share. Some industry observers believe that the rate of decrease of magnetic ballast shipments will decline in the future while others maintain that it will continue at similar rates in the future. There was a general sentiment, however, that magnetic ballast sales will continue to decline in the future.

In 1997, 31.5 million "affected" magnetic ballasts were sold in the product classes for which DOE proposes to amend the energy efficiency standard. Analysis conducted by LBNL suggests that these 31.5 million "affected" magnetic ballasts will be replaced by 23.6 million electronic ballasts. LBNL's analysis takes into account that, on average, electronic ballasts drive more lamps than magnetic ballasts. The National Energy Savings (NES) spreadsheet developed by LBNL calculates the change in shipments of magnetic and electronic ballasts both in the *Base Case* and the *Standard Case*, by product categories, year-by-year. The GRIM spreadsheet uses shipment forecasts from the NES spreadsheet in conducting the cash flow analysis.

The fluorescent lamp ballast industry represented by its trade association (NEMA) and the Department of Energy (DOE) have agreed to consider two shipment scenarios that will bound the range of possible outcomes in future shipments.

Scenario 1: In the absence of a DOE standard, "affected" magnetic ballast shipments will decrease linearly until 2015 when they reach 10% of the 1997 value. Beyond 2015, shipments will remain constant at 10% of their 1997 value. This assumption equates to shipments declining at the rate of 5% of 1997 shipments per year, until 2015. This scenario is referred to as the "*5%*" shipment scenario in this report.

Scenario 2: In the absence of a DOE standard, "affected" magnetic ballast shipments will decrease linearly until 2027 when they reach 10% of the 1997 value. Beyond 2027, shipments will remain constant at 10% of their 1997 value. This assumption equates to shipments declining at the rate of 3% of 1997 shipments per year, until 2027. This scenario is referred to as the "*3%*" shipment scenario in this report.

Based on the trend in U.S. magnetic ballast closures in the past decade, a sensitivity analysis was also conducted to analyze the impact of standards under a scenario where the one remaining large U.S. magnetic ballast plant closes in 2003, irrespective of a standard. This analysis was conducted on the *Manufacturer Submittal* scenario under the 2015 shipment scenario. In conducting this sensitivity analysis, it is assumed that changes in market demand would cause magnetic ballast shipments to decline at twice the rate, i.e. 10% per year between 1999 and 2002, remain constant through 2005 and then continue declining at 5% per year beginning 2006. It is further assumed that

these abrupt changes in shipments will impact the magnetic ballast industry competitive dynamics by reducing profit margins in the 2000 through 2005 time frame.

Most manufacturers in Sub-group 1 believe that an electronic ballast standard will result in stockpiling of "affected" magnetic ballasts in the year prior to the standard. This would then result in a corresponding drop in shipments of electronic ballasts in the year that the standard comes into effect. Manufacturers supported their argument by stating that the implementation of an energy-efficiency standard on Jan 1, 1990 stimulated stockpiling and a "Boom/Bust" cycle. The industry fears that a costly "boom/bust" cycle may occur again if the new energy-efficiency standard is applied without provisions to discourage stockpiling. Quarterly shipment data was gathered to characterize the impact of the Jan 1, 1990 standard on shipments of magnetic ballasts. Figure 6A.2 graphs the quarterly shipment data. Shipment data in the few quarters proceeding the effective date of the 1990 standard show a 15% increase in shipments. This increase in shipments was followed by a 26% drop in shipments in the two quarters following the effective date of the 1990 standard.

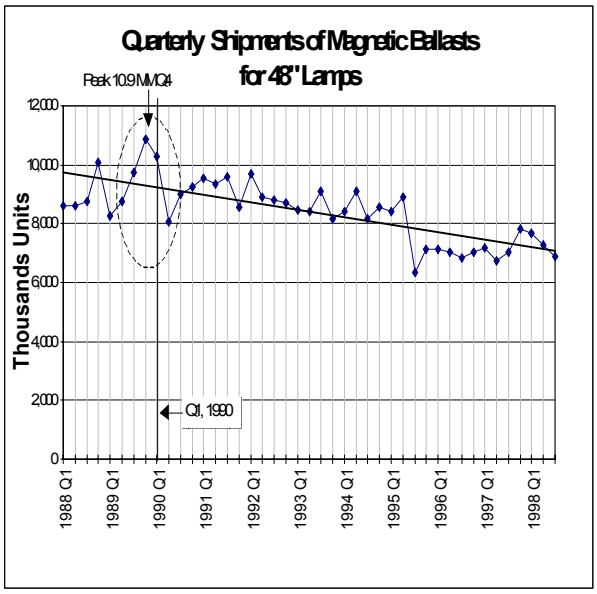

Figure 6A.2 Impact of January 1, 1990 Energy-efficiency Standard on Shipment of Magnetic Ballasts

We adapted the GRIM spreadsheet so that it could be used to analyze the impact of a shipment "spike," resulting from an electronic ballast standard. In conducting the MIA, we used a 15% shipment "spike" (increase in shipments by 15% in the year before the standard year, followed by a 15% decrease in shipments in the standard year) in modeling the impacts on cash flows.

Figures 6A.3 and 6A.4 illustrate the *5%* and the *3%* shipment scenarios. Both of these scenarios include the 15% shipment "spike" assumption.

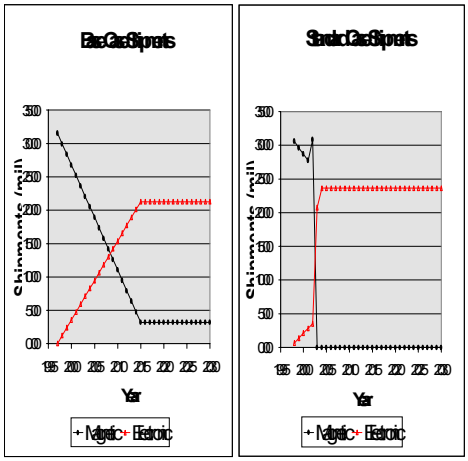

Figure 6A.3 *Base Case* and *Standard Case* Shipments in the *5%* Shipment scenario

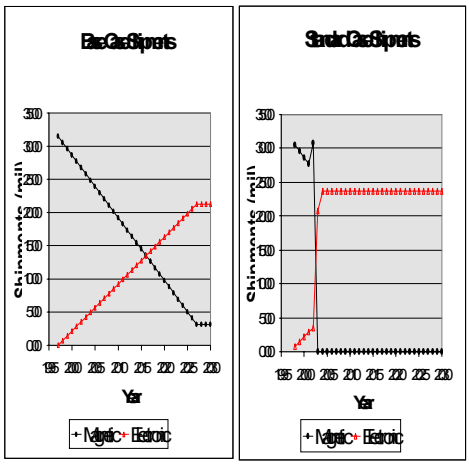

Figure 6A.4 *Base Case* and *Standard Case* Shipments in the *3%* Shipment Scenario

6A.2.2.2 Capital Investments

Manufacturers will have to increase their manufacturing capacities in order to meet the demand for additional electronic ballasts, both in the *Base Case* and the *Standard Case*. These one-time capital investments needed to increase manufacturing capacity are identified as capital conversion costs in the GRIM spreadsheet. Manufacturers provided capital conversion costs necessary to change over from "affected" magnetic to electronic ballasts. These costs are specified in dollars per electronic ballast. For example, a capital conversion cost of $2 per ballast means that a $2 million investment is needed to add manufacturing capacity to produce 1 million additional electronic ballasts annually.

Interviews confirmed that manufacturers typically invest capital one year in advance in order to meet the increased demand for electronic ballasts. The GRIM spreadsheet uses this assumption to model capital conversion costs both in the *Base Case* and the *Standard Case*. Capital conversion costs are needed in the *Base Case* to meet the increasing demand for electronic ballasts as magnetic ballast shipments gradually decline. In the *Standard Case*, capital conversion costs are required to prepare for the gradual market conversion to electronic ballasts in the years before the standard year, and also to meet the large increase in electronic ballast shipments resulting from the standard. Figure 6A.6 illustrates the timing and relative magnitude of capital conversion costs needed in the *Base Case* and the *Standard Case*.

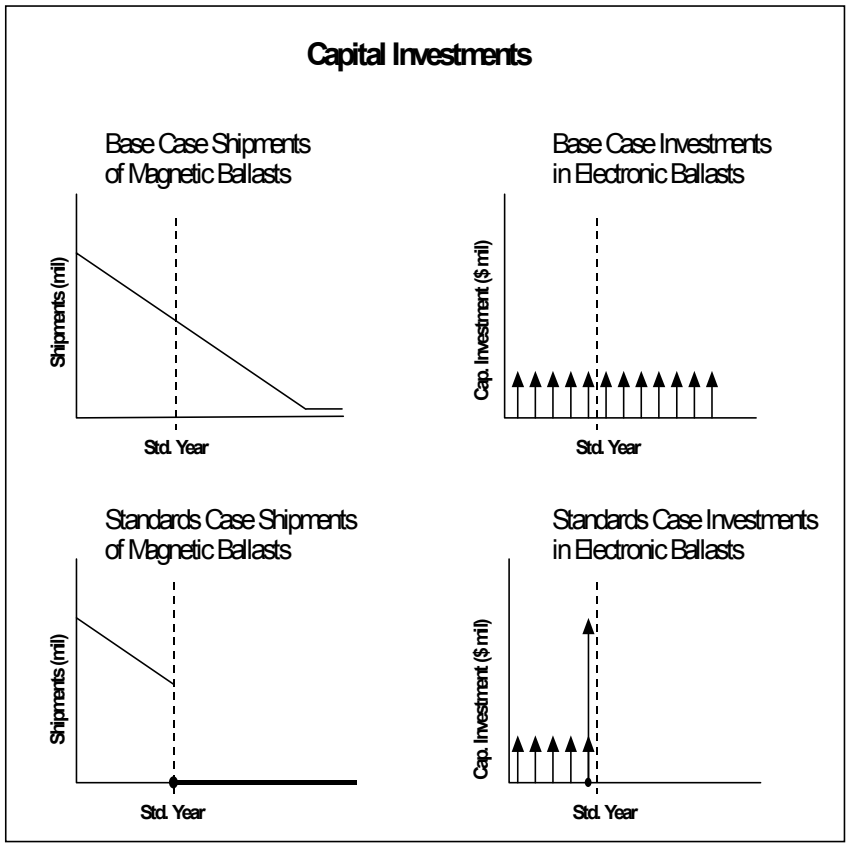

Figure 6A.5 Timing and Relative Magnitude of Capital Conversion Costs

6A.2.2.3 Industry Cash Flow Submittal

Each manufacturer was asked to develop its *Base Case* and *Standard Case* cash flows based on its estimates of future prices, profit margins and capital expenditures. Manufacturers developed their "most likely" projections for future revenues and profit margins based on their views of the future industry structure and competition dynamics. This scenario is referred to as the *Manufacturer Submittal* scenario in this report. In developing cash flow estimates under the *Manufacturer*

Submittal scenario it is assumed that manufacturers retain their 1997 shares of the existing electronic market in the new electronic market—the market created as "affected" magnetic ballast shipments are converted to electronic ballasts.

During interviews some manufacturers expressed their belief that a significant increase in the electronic ballast market resulting from an electronic ballast standard might encourage one or more new entrants into the U.S. market. They felt that this new entrant(s) might capture a significant portion of the new electronic market.

To ensure that the MIA captured the potential impacts of a new entrant(s) in the ballast market, cash flows and NPVs were evaluated assuming that a new market entrant(s) will capture 15% of the new electronic market in 2003. Manufacturer market shares in the 1997 electronic market are redistributed to accommodate the new market entrant(s). This scenario is referred to as the Electronic Ballast *New Entrant* scenario in this report. We used shipment weighted average financial parameters of all existing electronic ballast manufacturers (Sub-groups 1 and 2) to model the financial impact on the new entrant(s) in this scenario.

In order to analyze the potential impact of a new entrant(s) in the magnetic ballast industry, a "Magnetic Ballast New Entrant" scenario was also developed. This scenario captures the likely cash flow impacts resulting from the redistribution of market shares among the existing manufacturers as a new entrant gains a 15% market share of the magnetic ballast market.

From manufacturer interviews and cash flow submittals it was apparent that Sub-groups 1 and 2 had quite divergent views of the future industry competitiveness and corresponding electronic ballast profit margins. Most manufacturers in Sub-group 1 believed that there would be a squeeze in their margins in the *Standard Case* due to increased competitiveness and a potential new entrant. Sub-group 2, on the other hand, expected to gain efficiencies of scale from higher volumes and expressed the belief that their profit margins on this incremental part of their business would be equal to or higher than on their current electronic ballast business. To evaluate the impact of these divergent views, our firm (ADL) created an alternative scenario that assumes that each manufacturer's *Base Case* electronic ballast profit margins and market shares are maintained in the *Standard Case*. This scenario is referred to as the *Existing Dynamics* scenario in this report.

Table 6A.5 summarizes the various scenarios that were considered in conducting the ballast MIA. *Base Case* and *Standard Case* cash flows and NPVs were calculated for each manufacturer under each scenario. Individual manufacturer cash flows were then aggregated to report impacts on the two sub-groups. In addition to maintaining confidentiality, this sub-group level aggregation approach has the benefit of capturing variability between manufacturers. Hence, by aggregating cash flows at the sub-group level using the three different scenarios, both uncertainty and variability are being captured in this analysis.

Table 6A.5 Scenarios Used to Characterize Variability and Uncertainty in the Cash Flow Analysis

	Sub-group 1	Sub-group 2
Scenarios	**5% and 3% shipment scenarios** · *Manufacturer Submittal* · *Electronic Ballast New Entrant* · *Magnetic Ballast New Entrant* · *Existing Dynamics*	**5% and 3% shipment scenarios** · *Manufacturer Submittal* · *Electronic Ballast New Entrant* · *Magnetic Ballast New Entrant* · *Existing Dynamics*

Industry-wide impacts were calculated by simply adding the cash flow impacts on the two sub-groups that constitute the entire industry. For the industry, the *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. Therefore industry-wide impacts in the *5%* and *3%* shipment scenarios are presented under the *Manufacturer Submittal* and *Existing Dynamics* scenarios only. Tables 6A.6 and 6A.7 present the aggregated results of the cash flow analysis for impacts on the industry's "affected" magnetic ballast business only.

Table 6A.6 Cash Flow Impacts Resulting from an Electronic Ballast Standard Under the *5%* Shipment Scenario

Scenarios	Base Case NPV ($mil)	Standard Case NPV ($mil)	Change in NPV ($mil)	% Change in NPV
Cash flow impacts on the "affected" magnetic ballast business				
Sub-group 1				
Manufacturer Submittal	181.3	91.3	-90.0	-50%
New Entrant	181.3	91.6	-89.7	-50%
Existing Dynamics	181.3	111.4	-69.9	-39%
Sub-group 2				
Manufacturer Submittal	34.9	55.3	20.4	58%
New Entrant	34.9	49.0	14.1	40%
Existing Dynamics	34.9	44.2	9.3	27%
Industry (=Sub-group 1 + Sub-group 2)				
Manufacturer Submittal	216.3	146.6	-69.7	-32%
Existing Dynamics	216.3	155.6	-60.7	-28%

Table 6A.7 Cash Flow Impacts Resulting from an Electronic Ballast Standard under the *3%* Shipment Scenario

Scenarios	Base Case NPV ($mil)	Standard Case NPV ($mil)	Change in NPV ($mil)	% Change in NPV
Cash flow impacts on the "affected" magnetic ballast business				
Sub-group 1				
Manufacturer Submittal	210.7	97.1	-113.6	-54%
New Entrant	210.7	97.4	-113.3	-54%
Existing Dynamics	210.7	117.2	-93.5	-44%
Sub-group 2				
Manufacturer Submittal	26.2	53.7	27.5	105%
New Entrant	26.2	47.5	21.3	81%
Existing Dynamics	26.2	42.7	16.5	63%
Industry (Sub-group 1 + Sub-group 2)				
Manufacturer Submittal	237.0	150.8	-86.2	-36%
Existing Dynamics	237.0	159.9	-77.1	-33%

The cash flow results indicate that, looking solely at the impact on the "affected" magnetic ballast business, an electronic ballast standard will result in a loss in the value (NPV) of the ballast industry. Industry's NPV loss ranges from $60.7 million to $69.7 million and $77.1 million to $86.2 million under the *5%* and *3%* shipment scenarios respectively. Detailed year-by-year Industry cash flows for the *Base Case* and the *Standard Case* under the *Manufacturer Submittal* and *Business As Usual* scenarios are presented in Appendix C.

Both sub-groups will be disproportionately impacted when compared to the impacts on the entire industry. For Sub-group 1 NPV loss ranges from $69.9 to $90.0 and $93.5 to $113.6 under the *5%* and *3%* shipment scenarios respectively. Sub-group 2, on the other hand, shows an increase in NPV ranging from $9.3 to $20.4 and $16.5 to $27.5 under the *5%* and *3%* shipment scenarios respectively.

Sub-group 1 will be negatively impacted because of the loss of its profitable "affected" magnetic ballast business. Interviews with Sub-group 1 indicated that, on average, their "affected" magnetic ballast business is significantly more profitable than their electronics business. Lower profitability in the electronic business combined with their reduced market shares in the electronic ballast market is responsible for the disproportionately large negative impacts on this sub-group. Additionally, restructuring costs associated with plant closures and changes in capacity utilization add to the loss in value.

Any increase in electronic ballast sales represents an upside for Sub-group 2. Since this sub-group does not manufacture "affected" magnetic ballasts they experience no negative impacts. Hence, the overall impact of an electronic ballast standard on Sub-group 2 is positive.

6A.2.2.4 Industry Value of the Electronic Ballast Business

Tables 6A.6 and 6A.7 present the percentage change in industry value based on the value of the "affected" magnetic ballast segment in isolation. However, all of the manufacturers also produce electronic ballasts. In 1997, 36.5 million electronic ballasts were sold in the U.S. These sales generated $494 million in revenues for the industry (refer to Table 6A.2). We conducted a cash flow analysis to develop the industry value (NPV) of the business represented by these "unaffected" electronic ballasts. Results are presented in Table 6A.8.

Annual cash flows and NPV of the "unaffected" electronic ballast business were estimated using shipment weighted average values of prices, costs, and financial parameters provided by the manufacturers currently in that business. A future industry growth rate of 2.1% was estimated based on forecasts of U.S. GDP growth for the years 1997 to 2020[2]. Table 6A.8 presents the NPV calculated under two scenarios: 1) assuming there is no growth in electronic ballast sales, and 2) assuming a 2.1% annual growth rate in electronic ballast sales. From the resulting NPV values it can be concluded that a small variation from the 2.1% growth assumption will not materially affect the results of the analysis.

Table 6A.8 Industry Value of "Unaffected" Electronic Ballast Business Under Different Growth Rate Projections

Scenario	NPV of "unaffected" electronics business ($mil)
0% annual growth in electronic ballast sales	191.5
2.1% annual growth in electronic ballast sales	204.3

Tables 6A.9 and 6A.10 present the cash flow impacts of an electronic ballast standard on the ballast industry composed of all ballast product classes, both "affected" magnetic and electronic, considered under the DOE rulemaking. In 1997, the shipments of magnetic and electronic ballast product classes considered in the DOE rulemaking were approximately 31.5 million and 36.5 million ballasts respectively. In developing these cash flow impacts, it is assumed that the "unaffected" electronics business, represented by 36.5 million electronic ballasts, will grow 2.1% annually.

[2] Source: Annual Energy Outlook, 1999, published by the Energy Information Administration, Department of Energy. Industry sources stated that average growth rates for ballast sales are approximately equal to increases in commercial floor space, which in turn can be approximated as being equal to the increase in U.S. GDP.

Table 6A.9 Cash Flow Impacts under the *5%* Shipment Scenario, Assuming 2.1% Annual Growth in "Unaffected" Electronic Ballast Sales

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 (manufacturers of magnetic and electronic ballasts)				
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 (manufacturers of electronic ballasts only)				
Manufacturer Submittal	131.7	152.0	20.3	15%
Electronic Ballast New Entrant	131.7	145.8	14.1	11%
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%

Source: Ballast Manufacturer Impact Analysis, April 1999

Table 6A.10 Cash Flow Impacts Under the *3%* Shipment Scenario, Assuming 2.1% Annual Growth in "Unaffected" Electronic Ballast Sales

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 (as above)				
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 (as above)				
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%

Source: Ballast Manufacturer Impact Analysis, April 1999

In order to arrive at the results in Tables 6A.9 and 6A.10, the NPV of each sub-group's "unaffected" electronic ballast business was added to both the *Base Case* and *Standard Case* NPVs associated with the "affected" magnetic ballast business (presented in Tables 6A.6 and 6A.7). This methodology is consistent with assumptions used by ballast manufacturers in developing their

Manufacturer Submittal scenario. Cash flow impacts on the "affected" ballast business accounted for marginal effects on the entire electronics business.

Sub-group 1 experiences a larger negative impact than the whole industry. In the *Manufacturer Submittal* scenario the NPV of Sub-group 1 will reduce from $288.9 million to $198.9 million in the *5%* shipment scenario, representing an NPV loss of 31%. The corresponding percentage loss in NPV in the *3%* shipment scenario is 36%.

Additionally, sub-group 1 manufacturers produce magnetic ballasts not included in the product classes considered by this rulemaking. If the NPV of non-regulated magnetic ballasts were included in the definition of industry NPV, the reductions in percentage NPV loss would be lower. For instance the NPV loss for Sub-group 1 could be reduced from 31% to between 24.5 and 27.5% for the 5% shipment scenario depending on the assumed profitability of the non-power-factor-corrected market segment.[3]

6A.2.2.5 Uncertainty Analysis of Cash Flows

The NPV values presented in Tables 6A.9 and 6A.10 incorporate significant restructuring costs primarily associated with plant closures in the U.S. and Mexico. The large majority of these cost are directly associated with the closure of the remaining large magnetic U.S.-based ballast plant. In consideration of the past trend towards consolidation of magnetic ballast production in 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% per year between 1999 and 2002, remain constant through 2005 and then continue declining at 5% 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 are presented in Table 6A.11 below.

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[3] Assuming non-power-factor-corrected ballast profit margins are equal to power-factor-corrected ballast margins the loss in industry value is estimated at 24.5%. Some manufacturers have commented that non-power-factor ballast profit margins are lower than power-factor-corrected ballast margins. The value of 27.5% reduction in industry value is based on 50% lower margins for non-power-factor ballasts.

Table 6A.11. 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 (as above)				
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 (as above)				
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%

6A.2.2.6 Cash Flow Impacts

Tables 6A.9 and 6A.10 present the long-term cash flow impacts of a standard from the perspective of aggregate NPV. Since the GRIM spreadsheet calculates cash flows year-by-year it can be used to assess both long-term and short-term cash flow impacts from the perspective of annual cash flows.

Short-term cash flow impacts can help quantify the impact of a standard on capital investments and costs in years preceding the standard, and therefore provide valuable insights into the industry's ability to meet the standard. Results from a short-term impact assessment can also be useful to identify whether a standard will disproportionately burden any particular sub-group. Short-term negative cash flows can have negative business consequences. Due to the reduced availability of internally generated cash flows manufacturers may find it necessary to increase borrowing thereby adding to financial leverage. Diminished free cash flow may also make it difficult to meet

obligations to current and new debt holders and/or payment of dividends to shareholders.

Short-term impacts were quantified by summarizing the cash flow impacts on sub-groups of manufacturers in the few years proceeding and following the electronic ballast standard. Table 6A.12 presents these impacts.

Table 6A.12 Short-term Cash Flow Impacts Resulting from an Electronic Ballast Standard on the Business Represented by All Regulated Ballast Product Classes

Scenario: "Manufacturer Submittal"	**Cash flows ($ mil)**				
	Years preceding the Electronic Ballast Standard			**Years following the Electronic Ballast Standard**	
	2000	2001	2002	2003	2004
Sub-group 1					
Base Case	38.3	38.1	36A.1	34.9	33.1
Standard Case	38.1	35.3	1.5	9.1	12.8
Difference	-0.2	-2.8	-34.6	-25.8	-20.3
Sub-group 2					
Base Case	6.9	7.0	7.0	7.1	5.8
Standard Case	6.9	7.0	-0.3	1.4	10.2
Difference	0.0	0.0	-7.3	-5.7	4.4
Industry					
Base Case	45.2	45.1	43.1	42.0	38.9
Standard Case	45.0	42.3	1.2	10.5	23.0
Difference	-0.2	-2.8	-41.9	-31.5	-15.9

Table 6A.12 shows the differential negative cash flows due to an electronic ballast standard. This negative impact in the short-term has the following causes:

In years preceding the electronic ballast standard:

- capital investments required to build manufacturing capacity to meet the new standard;

In years following the electronic ballast standard:

- restructuring costs associated with plant closures and reduced capacity utilization, and
- reduced profitability of electronic ballasts in comparison to the magnetic ballast business.

Figures 6A.6, 7 and 8 describe the short-term and long-term cash flows for Sub-group 1, Sub-group 2 and the whole industry.

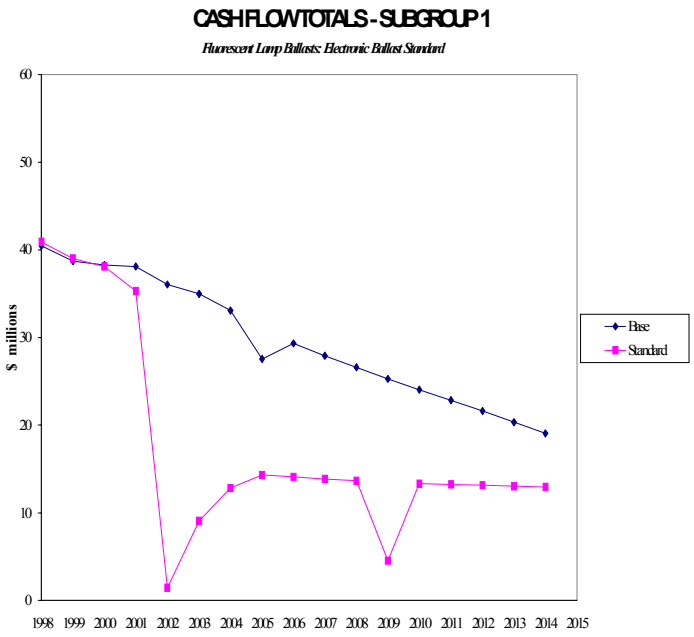

Figure 6A.6 *Base Case* and *Standard Case* Cash Flows for Sub-group 1 in the *Manufacturer Submittal* and *5%* Shipment Scenario

For Sub-group 1 it is seen that the large initial dip in cash flow, in the *Standard Case*, is not fully recuperated even by 2014. Sub-group 2, however, experiences a large increase in cash flow following the initial cash drain required to build new manufacturing capacity.

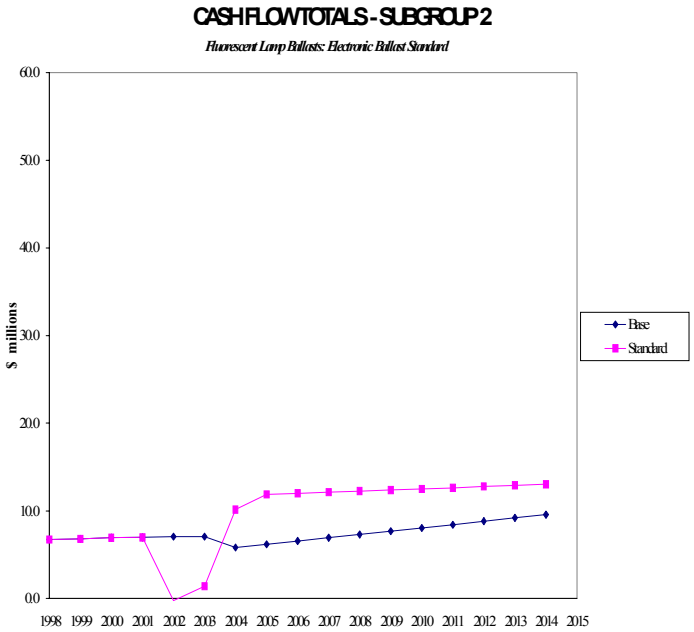

Figure 6A.7 *Base Case* and *Standard Case* Cash Flows for Sub-group 2 in the *Manufacturer Submittal* and *5%* Shipment Scenario

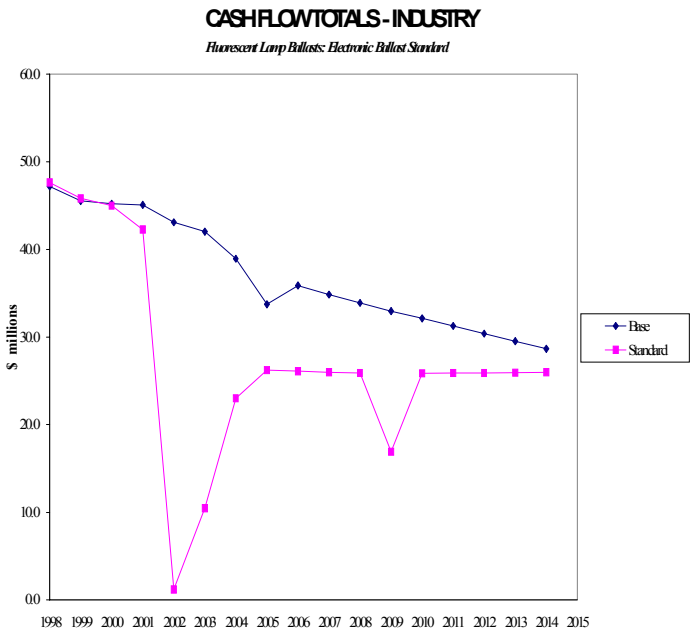

Figure 6A.8 *Base Case* and *Standard Case* Cash Flows for the Industry in the *Manufacturer Submittal* and *5%* Shipment Scenario

6A.2.3 Impacts on Manufacturing Capacity, Plant Closures and Loss of Capital Assets

One of the significant outcomes of new standards can be the consequential obsolescence of existing manufacturing assets, including tooling and investment. Our firm revised the GRIM spreadsheet in order to add features that explicitly provide the capability to include one-time charges such as plant closures and asset write-offs. Manufacturers incorporated their estimates for any one-time restructuring and other charges, when applicable, in developing their cash flows. The cash flow results presented in Tables 6A.6 through 6A.11 incorporate one-time charges resulting from plant closures, restructuring or consolidation to improve capacity utilization.

The *Manufacturer Interview Guide* used a series of questions to identify impacts on manufacturing capacity. These questions were developed to understand the impact of an electronic ballast standard on:

- U.S. and North American manufacturing capacity associated with the production of magnetic and electronic ballasts
- Capacity utilization and plant location decisions in the U.S. and North America both with and without standards
- The ability of manufacturers to upgrade or remodel existing facilities to accommodate

a new product mix

- The nature and value of stranded assets, if any

6A.2.3.1 Interview Results

In general, interviews confirmed that manufacturing capacities associated with "affected" magnetic ballast production would be negatively impacted. Also, most 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.

Some manufacturers in Sub-group 1 stated they would close plants within 6 to 24 months after the effective date of a standard. In all four plants could be impacted. Of these, two are in the U.S. and two are in Mexico.

U.S. Plants:

- A first plant manufactures both "affected" and other types (referred to as "unaffected") of magnetic ballasts. A new standard resulting in the loss of "affected" magnetic ballast sales will significantly reduce the capacity utilization of this plant and hence the viability of its operation. The manufacturer plans to close this plant and consolidate manufacturing of its "unaffected" ballasts in its Mexican manufacturing facility that currently produces a mix of "affected" and "unaffected" magnetic ballasts.
- A second plant manufactures materials used in the production of "affected" magnetic ballasts. Approximately one-third of the plant's output is associated with the manufacture of "affected" magnetic ballasts. The manufacturer believes that this loss could be sufficiently large to render unviable its component manufacturing business and thus cause the plant to be closed.

***Mexican Plants*:**

- One manufacturer reported that it would have to close part of its magnetic ballast manufacturing plant in order to continue operating at profitable levels. This is possible since the plant is modular in its design, manufacturing operations and construction.
- Another plant manufactures components used in the production of "affected" magnetic ballasts. Although this plant produces components for both "affected" and other types of ballasts, a new standard will dramatically reduce its capacity utilization thereby likely resulting in its closure.

From interviews and plant tours, it was generally observed that larger manufacturers in Sub-group 1 produced their electronic and magnetic ballasts in separate plants. Their large market shares favored facilities with high levels of automation, thereby reducing their ability to change over from magnetic to electronic ballast production. As a result they reported disproportionately greater negative impacts on their manufacturing capacities than smaller manufacturers.

Manufacturers in Sub-group 2 reported that they would add additional electronic ballast

capacity in their current plants to meet the new standard. Most reported that a three-year lead-time would provide them with sufficient time to expand manufacturing capacities. Since none of the manufacturers in this sub-group produce magnetic ballasts, they will not have any stranded assets. In addition, most plan to augment capacity in their current plants and hence did not report any significant restructuring costs resulting from plant consolidation or movement of manufacturing to other locations.

6A.2.3.2 Impact on Small Manufacturers

Among the manufacturers in Sub-group 1 that would be negatively impacted by an electronic ballast standard, two are smaller in size than the others. From the manufacturer interviews we gained an understanding of their current business operations, product mix, scale of revenues associated with the sales of "affected" magnetic ballasts, and the negative impact on their profits and capital assets resulting from a standard. Particular emphasis was placed on understanding their ability to raise capital, if needed, to meet the new standard.

The two "small" manufacturers currently produce both "affected" magnetic and electronic ballasts. Both the "small" manufacturers had their respective electronic and magnetic ballast manufacturing operations in the same plants. It seemed that their smaller size and less automated operations provided them with the flexibility to adapt to a new electronic ballast standard without significant asset write-offs or plant closures. In addition, neither of these manufacturers stated that an electronic ballast standard would force them to leave the industry or go out of business.

All four manufacturers in Sub-group 1 viewed the electronic ballast business as less profitable than their magnetic ballast business. Hence 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. However, unlike the two large manufacturers, the "small" manufacturers did not report any significant one-time plant closure costs that would worsen the negative impact on their cash flows. Hence, the negative cash flow impacts on the overall business represented by all regulated products, appear disproportionately smaller on "small" manufacturers when compared to the two large manufacturers—in the *5*% scenario, we estimate that small manufacturers will experience a 16% loss in their NPV compared to a 34% loss in NPV for all of Subgroup 1.

6A.2.4 Employment Impacts

In order to assess employment impacts due to an electronic ballast standard, the *Manufacturer Interview Guide* was used to explore current trends in ballast production employment and solicit manufacturer views on changes in employment patterns resulting from new energy efficiency standards. The employment impacts section of the interview guide was used to understand:

- Current employment levels associated with ballast manufacturing at each production facility

- Expected future employment levels both with and without an electronic ballast standard
- Differences in workforce skills, and issues related to retraining of employees

In order to maintain confidentiality employment impacts were aggregated and reported at the industry level.

In this section, employment impacts are reported using 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, 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.

6A.2.4.1 Employment Levels in 1998

Based on the manufacturer interviews, approximately one-third of the "affected" magnetic ballasts sold in the U.S. market are manufactured domestically, while the remaining two-thirds are manufactured in Mexico. Table 6A.13 provides the direct employment levels associated with the production of "affected" magnetic ballasts in the year 1998. To obtain these numbers, we aggregated the information manufacturers provided on employment levels at each of their production facilities.

Table 6A.13 Direct Employment Levels for Manufacturing "Affected" Magnetic Ballasts

Country of Manufacture	Direct Employment Levels in 1998
U.S.A	738
Mexico	2945

6A.2.4.2 Employment Levels in 2003: Absent Standards

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. However, all agreed that the demand for "affected" magnetic ballasts in the U.S. will continue to decrease at a rate of 3% to 5% a year until it reaches 10% of 1997 shipments.

Manufacturers in Sub-group 1 anticipate that direct employment associated with manufacturing "affected" magnetic ballasts will decrease approximately in the same proportion as shipments. Based on this information, in the year 2002 direct employment levels in "affected" magnetic ballast manufacturing will be 80% of the 1998 employment levels for the *5% scenario* and 88% for the *3% scenario*. This analysis assumes that there will be no loss in direct employment levels in 2002 as additional people will be needed to serve the likely surge in demand during the last two quarters. Hence direct employment levels in the year 2003 are assumed equal to 2002 levels.

Despite reduced production of "affected" magnetic ballasts, manufacturers plan to maintain their total (direct + associated) employment levels in 2003 at the 1998 levels by implementing the following actions:

- In small manufacturer plants where both magnetic and electronic ballasts are currently manufactured, manufacturers plan to maintain employment by moving "lost" jobs towards the production of products for other growing businesses.
- In large manufacturer plants where only magnetic ballasts are currently produced, manufacturers plan to continually consolidate their operations by increasing the production of other magnetic ballast product lines and by moving materials processing activities from other plants.

One of the manufacturers interviewed suggested a possible, but less likely, scenario where it might close one of its U.S. plants sometime after 2010 in the *5% shipment scenario*. 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.

Table 6A.14 provides the employment levels directly associated with the production of "affected" magnetic ballasts (and their components) in the year 2002.

Table 6A.14 Direct Employment Levels in 2002

Country of manufacture	**Direct employment levels in 2002** ***5% scenario***	**Direct employment levels in 2002** ***3% scenario***
U.S.A	611	662
Mexico	2356	2591

Transition Plans: Manufacturers in Sub-group 1 described their transition plans as their manufacturing capacities are converted to electronic ballast production only. It was observed that individual manufacturers' transition plans were primarily driven by their scale of operation.

Large manufacturers with separate dedicated plants for manufacturing magnetic and electronic ballasts:

For these manufacturers, the loss of "affected" magnetic ballasts would greatly reduce capacity utilization in plants dedicated to manufacturing magnetic ballasts.

- One manufacturer anticipated closing its domestic magnetic ballast manufacturing plant and consolidating its magnetic ballast production in its Mexican plant. Such a scenario would result in loss of both "direct" and "associated" jobs. The "associated" jobs lost would, however, be added in the Mexican plant where the manufacturer plans to consolidate its "unaffected" ballast operations.
- Another large manufacturer reported that it would have to close a section(s) of its Mexican plant in order to continue operating at profitable levels. This is possible since the plant is modular in its design, manufacturing operations and construction.

Smaller manufacturers making both magnetic and electronic ballasts in the same plant:

For this group of manufacturers an electronic ballast standard will result in the loss of "direct" jobs involved in manufacturing "affected" magnetic ballasts. One smaller manufacturer stated that it would be able to shift lost jobs to manufacturing electronic or other types of ballasts in the same plant.

Sub-group 2 consists of three major manufacturers that produce only electronic ballasts. Two of them have manufacturing plants in the U.S and the third manufacturer produces its electronic ballasts in China. In the absence of a standard, these manufacturers reported a gradual increase in their employment levels as electronic ballasts gain market share over magnetic ballasts.

An electronic ballast standard in the year 2003 will create a large additional market for electronic ballasts. Manufacturers in Sub-group 2 provided estimates of the additional direct jobs that would result.

6A.2.4.3 Employment Impacts on the Industry

Employment impacts on the entire industry are obtained by aggregating the impacts on all seven manufacturers. Three of the seven manufacturers produce their electronic ballasts in the U.S., while the remaining produce them in Mexico or overseas. Table 6A.15 summarizes the employment impacts of an electronic ballast standard on the entire industry.

Table 6A.15. Industry-wide Employment Impacts of an Electronic Ballast Standard

Country of Manufacture	Direct Jobs Lost in Magnetic Ballast Manufacturing	Associated Jobs at Risk in Magnetic Ballast Manufacturing	Direct Jobs †‡ Gained in Electronic Ballast Manufacturing	Net Direct Jobs lost
2015 (~5% decline) shipment scenario				
U.S.A	666*	406**	500	166
Mexico	1570	190***	700	870
2027 (~3% decline) shipment scenario				
U.S.A	717	363**‡	557	160
Mexico	1727	161[3]	769	958

* Includes both factory and non-factory jobs supporting magnetic ballast production.

** These "associated" jobs are assumed relocated to Mexico

*** These "associated" jobs will be relocated to other plants in Mexico or elsewhere

† Includes jobs from Sub-groups 1 and 2

‡ Does not include potential associated jobs added in these plants

Uncertainty in 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 6A.15 assume a base case with an orderly decline in 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 magnetic U.S.-based ballast plant. In consideration of the past trend towards consolidation of magnetic ballast production in 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 Table 6A.16. 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 6A.16 Industry-wide Employment Impacts of an Electronic Ballast Standard Under the Scenario Where Us 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 †‡5 gained in electronic ballast manufacturing	Net Direct Jobs lost/gained
2015 (~5% decline) shipment scenario				
U.S.A	0*	0**	500	500 jobs gained
Mexico	2236	596***	700	1536 jobs lost
2027 (~3% decline) shipment scenario				
U.S.A	0	0	557	557 jobs gained
Mexico	2444	524***	769	1675 jobs lost

* Includes both factory and non-factory jobs supporting magnetic ballast production.

** These "associated" jobs are assumed relocated to Mexico

*** These "associated" jobs will be relocated to other plants in Mexico or elsewhere

† Includes jobs from Sub-groups 1 and 2

‡ Does not include potential associated jobs added in these plants

6A.2.5 OTHER IMPACTS

During the manufacturer interviews additional relevant industry issues were discussed:

- Impact of the decline in magnetic ballast shipments on Sub-group 1
- Differential impacts on the two sub-groups with regards to their ability to compete in the marketplace, after an electronic ballast standard is implemented
- Global competition
- Cumulative impacts of regulations

Each of these issues is discussed in greater detail in the following sections.

6A.2.5.1 Impact of the Decline in Magnetic Ballast Shipments on Sub-group 1

The decline in shipments of magnetic ballasts in the past decade has negatively impacted all the magnetic ballast manufacturers represented in Sub-group 1. Manufacturers have adopted different strategies to remain profitable in the marketplace.

- Some have aggressively pursued cost savings to remain competitive, including continual product redesigns and stronger business management controls

- Some have aggressively tried to maintain or increase market share to minimize or offset the impact of the overall market decline
- Some have closed plants in the U.S. and moved production to lower labor cost facilities in Mexico in order to maintain cost leadership and market position
- Some manufacturers have closed down one (or more) of their plants and consolidated operations in order to increase capacity utilization

Most manufacturers indicated that they continually re-adjust to optimize the production mix between their current plants in order to remain cost competitive. In addition, all manufacturers in Sub-group 1 plan to continue producing magnetic ballasts until the electronic ballast standard comes into effect.

6A.2.5.2 Differential Impacts on the Two Sub-groups with Regards to their Ability to Compete in the Marketplace

Manufacturer interviews revealed that ballast producers that offer both magnetic and electronic products have an advantage over manufacturers offering a limited product line. It was frequently stated that OEMs and distributors prefer "one-stop" shopping with full-line manufacturers as it reduces their transaction and order processing costs. The inability to provide a full-line of ballasts acts as a barrier for new entrants with only an electronic ballast product offering. Manufacturers in both the sub-groups seemed to agree with this argument. Industry sources stated that, partly for this reason, one manufacturer in Sub-group 2 intends to begin production of magnetic ballasts. This could potentially exert downward pressure on magnetic ballast margins, pushing them to levels lower than currently factored in the base case cashflow projections.

If an electronic ballast standard comes into effect, having both magnetic and electronic ballasts would no longer be an advantage in the marketplace, making market entry more attractive for firms not currently participating in magnetic ballast production. Some manufacturer(s) in Sub-group 2 stated that an electronic ballast standard would increase their ability to compete in the marketplace. Manufacturers in Sub-group 1 perceive this as a loss of competitive position. These changes in competitive environment were captured by the manufacturer cash flow projections.

6A.2.5.3 Global Competition

Most manufacturers recognize that a major portion of magnetic ballast manufacturing has moved just south of the Mexican border in the past decade. Lower labor costs in Mexico have helped them remain cost competitive.

When asked about the possibility of new entrants in the magnetic ballast market, some manufacturers in Sub-groups 1 and 2 anticipated one or more new entrants in the absence of a standard, while others did not.

Manufacturers differed on the likelihood of successful new entrants in the electronic ballast market. Most manufacturers in Sub-group 1 expected one or more major new players once an

electronic ballast standard is announced. Manufacturers in Sub-group 2 had differing opinions—some believed that there would be new entrants while others believed that there would be no new entrants in the "affected" electronic ballasts classes, only in specialty niches. The latter group emphasized that a lot of new entrants have come and gone in the last eight years without gaining any significant market share. They believe that the current manufacturers are in a better position to gain share in the market created by the additional electronic ballasts. They highlighted the importance of existing relations with OEMs and distributors as a barrier to new market entrants seeking to gain a large market share. The potential impacts of a new market entrant were captured in the "new entrant" scenario.

6A.2.5.4 Cumulative Impact of Regulations

Most manufacturers, except one, reported that they did not face any burden resulting from the imposition of cumulative regulations. One manufacturer, however, commented that the imposition of energy efficiency standards on small motors would limit the availability of capital for both its ballast and motor businesses.

6B. IMPACT ON SUPPLIERS TO THE FLUORESCENT LAMP BALLAST INDUSTRY

New energy-efficiency standards for fluorescent lamp ballasts will significantly alter the product mix of ballast shipments among magnetic, cathode cutout, and electronic types. Because magnetic and electronic ballast types differ significantly in their materials requirements, these changes in product mix will substantially affect the sales of ballast industry suppliers and trade allies. This chapter documents the financial and employment impacts that ballast industry suppliers might experience as a result of a new energy efficiency standard for ballasts.

We performed a detailed analysis of the impacts of an electronic ballast standard on ballast manufacturer suppliers. The methodology used for ballast suppliers was essentially the same as was used for the ballast manufacturers. The analysis includes a quantitative evaluation of manufacturer cash flows based on the GRIM spreadsheet. The information necessary for GRIM was collected during detailed interviews with ballast suppliers. The interview guide used to structure and organize the interview discussion invited supplier interviewees to discuss:

- The nature of materials and components they produce for ballast production
- The level of financial importance of these products to the plant or profit center
- Financial impacts of changes in ballast energy efficiency standards on the plant or profit center
- Employment impacts of a new ballast energy efficiency standard, and
- Recent market trends and their impacts.

Ballast manufacturers identified key supplier firms, and a number of additional supplier firms were identified through their attendance at one or more ballast workshops at the Department and/or their correspondence with the Department on ballast efficiency issues. The supplier companies identified are listed in Table 6B.1. In total 31 firms were invited to participate in interviews designed

to allow them to describe the impact new energy efficiency standards for ballasts might have on them. Eleven of these suppliers served magnetic ballast production, eleven electronic ballast production, and nine suppliers served both magnetic and electronic products.

Sixteen of the 20 organizations serving magnetic ballast applications participated in interviews and/or provided plant tours. Five organizations hosted plant tours as well as interviews. Eleven of the 20 organizations serving electronic ballast applications participated in interviews. Four of these hosted plant tours as well.

Table 6B.1 Supplier Companies Invited to Participate in Interviews.

Organization Name	Ballast Type Served	Material(s) Supplied
Advance Transformer Capacitors	Magnetic/electronic	capacitors
Aerovox	Magnetic/electronic	capacitors
MagneTek Capacitors	Magnetic/electronic	capacitors
MagneTek Wire	Magnetic/electronic	magnet and lead wire
Optec Sales, Inc.	Magnetic	magnet wire
Phelps Dodge Mag Wire	Magnetic	magnet wire
Rea Magnet Wire	Magnetic	magnet wire
Tempel Steel Co.	Magnetic	Case & CRML steels, stamping
United Tool & S--NJ	Magnetic	metal clamps
United Tool & S--TN	Magnetic	metal clamps
Bolmet, Inc.	Magnetic/electronic	metallized film
Steinerfilm	Magnetic/electronic	metallized film
Armco Steel	Magnetic/electronic	case & CRML steels
Inland Steel	Magnetic	case & CRML steels
LTV Steel	Magnetic	case & CRML steels
USX Corp.	Magnetic	case & CRML steels
WCI Steel	Magnetic	case & CRML steels
Texas Instruments	Magnetic/electronic	thermal protectors
P.D. George	Magnetic	wire coatings
Calhoun Pitch Company	Magnetic/electronic	potting materials
Pixley Richards	Electronic	plastic bobbins
Web Tool & Mfg.	Electronic	metal cases
Methode Electronics	Electronic	wire connectors
Dynacircuits Mfg	Electronic	circuit boards
Ferrite International	Electronic	ferrite cores
International Rectifier	Electronic	semiconductors
Littlefuse	Electronic	fuses
Murata Electronics	Electronic	ceramic capacitors
Parkview Metals	Electronic	Metal cases
Photocircuits Atlanta	Electronic	circuit boards
Shieldmate	Electronic	plastic insulators

6B.1. Impacts On Suppliers to Both Magnetic And Electronic Ballast Production

The industries supplying materials and/or components for magnetic ballasts frequently also serve electronic ballasts, although in some cases the individual companies are different. To the extent that materials and/or components for electronic and magnetic ballasts overlap, they are considered in this section. We used information from the literature and from ballast manufacturers to establish preliminary estimates of the important financial and employment factors of production and interviewed supplier plant personnel to gather more detailed financial and employment information from them.

6B.1.1 Cost of Materials for Magnetic Ballast

An estimated bill of materials for a 2F40T12 magnetic ballast, developed through discussions with ballast manufacturers, had a distribution of costs among material categories as shown in Figure 6B.1. The interviews with suppliers yielded a second distribution of prices charged by suppliers for the same categories of materials. The interview results are shown in Figure 6B.2. Comparison of the figures indicates reasonable agreement between the benchmark and the interview results and implies that reliable information was obtained through the interviews for the important material costs going into magnetic ballasts. The suppliers interviewed represent components and materials that account for approximately 91% of the average ballast cost of materials.

The "coverage" of each category of ballast component represented by the interviewed suppliers is approximated as follows:

- Capacitors: Approximately 57% (including some captive capacity) of the capacitors supplying the 31.5 million "affected" magnetic ballasts were reported by the interviewees. Virtually all the remaining are produced by ballast manufacturers' wholly owned subsidiaries. The impacts for these subsidiaries are covered in the calculation of ballast manufacturer impacts. Thus one or the other impact analysis accounts for nearly 100% of the capacitors for magnetic ballasts and metallized film capacitors for electronic ballasts. Coverage of capacitors serving electronic ballasts was less comprehensive because of the greater variety in capacitor types and less availability of domestic suppliers for interviews.

- Magnet and lead wire: Approximately 36 million pounds of lead and magnet wire are needed to supply 31.5 million "affected" magnetic ballasts, assuming .65 lb/F40 and 1.67 lb/F96 magnet wire and 20ft of lead wire per ballast. Respondents over-reported this about 10% at 39.7 million lb., within the error of the assumptions and consistent with 100% coverage of wire suppliers. Some of the same suppliers can serve the electronic ballast market, which requires only about one fourth the magnet wire per ballast for a smaller number of ballasts. Finally wire connectors are used in place of lead wire in some electronic ballasts, so this industry was considered and interviewed as well.

- Thermal protectors and metal clamps: All 31.5 million "affected" thermal protectors

were covered by interviewed suppliers, and 36.1 of 63 million (57%) stamped end clamps for laminations were considered. Some electronic ballasts also employ thermal protectors, and these were covered by the interviews also. We held discussions with potting and impregnating compound suppliers serving over half the magnetic and domestic electronic ballast markets.

- Cold rolled steel for cases and motor laminate (CRML) steel for ballast transformers: Interviewed suppliers reported sales of steel for ballast cases and metal lamination accounting for 25.9 of 31.5 million "affected" magnetic ballasts representing 82% coverage. Some of these suppliers also serve the electronic ballast industry. Some electronic ballast manufacturers purchase finished cases, and the industry supplying these cases is represented among the interviewees.

- Other: The remaining supplier industries represent approximately 9% of the cost of materials for magnetic ballasts and are generally small contributors to the totals. Materials and components included in this category include terminal boards, labels, and miscellaneous paper and tape products. Values for their economic and employment impacts were estimated by pro-rating the values for the above industries representing the other 91%.

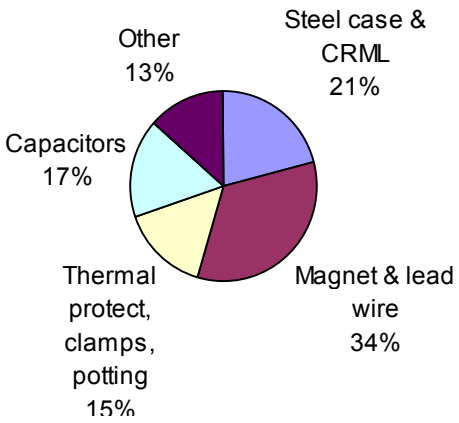

Figure 6B.1 Cost Distribution Provided by Ballast Manufacturers

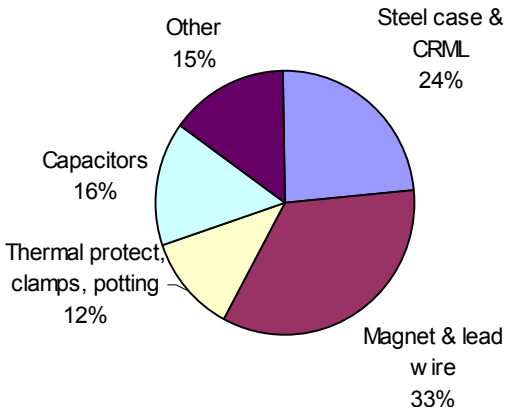

Figure 6B.2 Suppliers' Distribution of Revenues

Two secondary supplier industries, wire enamel and metallized film, provided some data that was used to supplement the employment impact estimates.

The high fraction of supplier industry coverage by the interviews and the good agreement between the benchmark cost of materials, Figure 6B.1, and that derived from interview data presented in Figure 6B.2 suggest that the sample of organizations interviewed is representative of the primary supplier industries as a whole. The estimated cost of materials for the weighted average "affected" magnetic ballast, including the F96 sizes is shown in Figure 6B.3. The additional magnet wire required for the F96 ballast types is reflected in the distribution of costs or supplier revenues shown in Figure 6B.3. Because magnet wire suppliers were covered by the interviews, the fraction of "other" materials shown in Figure 6B.3 is only 9%.

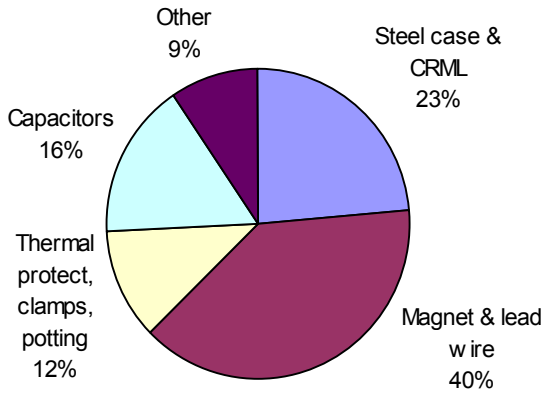

Figure 6B.3 Cost of Materials for "Affected" Magnetic Ballasts

Some of the capacitors, magnet wire, and lead wire contributing to the costs shown in Figure 6B.3 are attributable to captive plants owned and operated by the ballast manufacturers. These "captive" suppliers are not included in the supplier impacts because they are included in the manufacturer impact analysis. Although the captive supplier's financial and employment contributions are excluded from the results of the supplier analysis, data from these sources was useful in establishing reliable values for industry-wide financial and employment variables. In categories where few suppliers were interviewed, captive supplier cost data was also aggregated with supplier data to maintain confidentiality.

Only a very small fraction of the cost of materials for "affected" magnetic ballasts can be attributed to sources outside the U.S. This amounted to only about 0.25 million capacitors produced by non-captive plants. This quarter million capacitors, like the captive capacitors, magnet wire, and lead wire, is subtracted from the shipments required to serve the 31.5 million "affected" magnetic ballasts for the purposes of the financial and employment impact calculations to follow.

6B.1.2 Suppliers Serving both Magnetic and Electronic Ballast Manufacturers

Supplier interviews assessed the importance of the "affected" magnetic ballast business for each supplier to the magnetic ballast industry.

Capacitors: The largest suppliers of capacitors for "affected" magnetic ballasts are the ballast manufacturers themselves, and the profitability of these plants or profit centers tends to depend heavily on the production volumes of "affected" capacitors, in some cases 20 to over 50% of "sales" for the plant. The independent capacitor manufacturer segment is more diversified with respect to capacitor type and produces a greater variety of capacitors serving smaller, very competitive markets in addition to magnetic and/or electronic ballasts. This non-captive segment regards the "affected" capacitors as favorable products. This is because they generally are ordered in larger quantities with longer production runs than most other capacitors and thereby provide stability to the use of capital and labor that allows them to better compete for the smaller orders that make up much of the other 90% of their business.

Magnet and lead wire: This supplier segment is approximately 40% captive and the captive plants are highly dependent on "affected" magnet wire production. The impacts on captive plants, however, are incorporated into the ballast manufacturer impact analysis and, as explained earlier, will be excluded from this supplier impact analysis. Among the non-captive suppliers, magnet wire sales account for a wide range in fractions of total plant sales, from under 5% to about 25%. Industry participants at the low end of this range expect to accommodate a continued decline in industry shipments with small reductions in income and losses in employment. Plants more highly dependent on magnet and/or lead wire, however, have a critical need to replace any lost sales from reductions in magnetic ballast business, and development of such business is often a 3-5 year effort if successful. Wire connectors are targeted at electronic ballasts but are considered along with suppliers

to both magnetic and electronic ballast production because they can substitute for lead wire in electronic ballasts.

Metal stamping: These plants are often small businesses set up to serve a small number of important customers who purchase stamped parts in very large quantities. Dependence on "affected" magnetic ballast parts ranged from just over 30 to nearly 100% among the participants in this market, and these plants are highly dependent on sales of "affected" ballast products for survival in the short term.

Thermal protectors: These components are supplied to the "affected" ballasts almost exclusively by one supplier which dominates the thermal protector industry. Although the "affected" ballast applications account for a small portion of plant revenues, the fraction is high enough to seriously affect profitability relative to corporate requirements. These thermal protectors are used in some electronic ballasts also.

Specialty steel: Specialty steel suppliers are large steel companies with diversified product mixes. Generally less than 5% of their production capacity is allocated to ballast components. This market is important to them primarily because there are no readily available other customers for this product. As is the case with motor capacitors, the market for motor lamination steel is not growing significantly and any reduction in sales to the ballast industry would not likely be recovered elsewhere.

6B.1.3 Cash Flow Impacts

The financial variables for the major "affected" magnetic ballast supplier types are summarized in the second and third columns of Table 2. Significant fractions of the capacitor, magnet wire, and lead wire components used in "affected" ballasts are produced in-house by the ballast manufacturers themselves, and this portion is excluded here to avoid double counting. Table 6B.2 also reflects the exclusion of 250,000 foreign-produced "affected" capacitors. Domestic revenue per ballast for a component was estimated by multiplying the total cost of that component per ballast times the fraction of the market served by domestic suppliers. The domestic and foreign market shares were estimated by industry sources for each ballast component separately.

Many of the supplier industries for "affected" magnetic ballast production also supply their electronic ballast equivalents, although in some cases the production facilities are different. A new energy efficiency standard at the electronic ballast level could provide new markets for some of these supplier industries. We have estimated the extent to which these new market opportunities can mitigate the elimination of the $83 million in "affected" magnetic ballast component revenues. The following paragraphs illustrate the estimation procedure using capacitors as an example.

Table 6B.2 Estimated Financial Factors for Domestic "Affected" Magnetic Ballast and Selected Electronic Ballast Supplier Industries

	"AFFECTED" MAGNETIC		ELECTRONIC	
SUPPLIER INDUSTRY	**REVENUE PER BALLAST**	**ESTIMATED 1997 SALES[1] $Millions**	**REVENUE PER BALLAST**	**ESTIMATED 1997 SALES[1] $Millions**
Capacitors	$.62	$3.1	$1.21	$3.99
Magnet & Lead Wire, Connectors	1.48	26.4	.60	3.82
Thermal Protectors, Clamps, Potting	.45	14.2	.23	3.69
Steel Case & CRML	.89	28.0	.61	6.19
Other[2]	.36	11.3	.16	2.32
TOTAL		$83.00		$20.01

[1] Excluding shipments from captive and non-domestic plants.

[2] Miscellaneous "affected " components and three electronic matching components (paper, tape, and label).

Capacitors: The revenue per ballast for capacitors used in magnetic ballasts is taken from the cost of materials developed for an average "affected" magnetic ballast as presented in 6B. 3. The number of "affected" ballasts is assumed to be 31.5 million in 1997 shipments, but a substantial portion of capacitors are produced in captive plants owned and operated by ballast manufacturers and a small number are manufactured outside of the domestic U.S. The focus of the supplier analysis is on the impact a new energy efficiency standard will have on domestic supplier industries, so the non-domestic production is excluded from the estimated sales. The captive plants are considered in the ballast manufacturer impact analysis, where the financial and employment impacts of a new standard are estimated and those impacts include contributions from the capacitor operations. Thus "affected" magnetic ballast shipments and their direct electronic replacements containing captive capacitors are excluded to avoid double counting. The result of these exclusions is to reduce the shipments of "affected" magnetic ballast capacitors in 1997 to those required to serve about 5 million "affected" magnetic ballasts, which generate about $3 million in industry revenues.

Electronic ballasts for linear lamp fixtures require about 8-10 capacitors each and include ceramic, metallized polyester film, metallized polypropylene film, and electrolytic types. The total estimated cost of capacitors per average electronic ballast replacing the average "affected" magnetic ballast is approximately $1.21. We estimate that about 60% of the ceramic, all the metallized polyester film, 70% of the polypropylene film and half the electrolytic type purchased by North American plants are of foreign origin. In addition, some film capacitors are manufactured by captive capacity. We exclude these foreign and captive capacitors from the domestic sales reported in Table 6B.2. The revenue in $ millions provided the domestic supplier industry by a given electronic ballast manufacturer is:

$$MFGR_1 = 23.6x106 \times mktshare_1 \times fraction\_domestic_1 \times fraction\_noncaptive_1 \times cap\_price$$

Performing this calculation for each manufacturer and each capacitor type and summing over all ballast manufacturers yields an estimated total revenue to the domestic capacitor industries of $3.99 million as indicated in Table 6B.2. Thus although the value of capacitors contained in the 23.6 million ballasts representing the new market is over $28 million, only about $4 million represents revenue to domestic, non-captive suppliers. Still, the capacitor industries group is the only example in Table 6B.2 of actual growth in industry sales after the standard. Conversion costs to build the capacity required to produce the new capacitors are primarily associated with metallized film capacitors and amount to approximately $1-1.2 million if the standard year is 2003.

The estimation procedure can be summarized as a simple three-step process:

- Determine the cost of each component on a per-ballast basis,
- Estimate the domestic and non-captive fractions of each component for each ballast manufacturer, and
- Apply the previous equation for each ballast manufacturer and component combination and sum the results. The total magnetic ballast market involved will be 31.5 million rather than the 23.6 million shown in the equation, which illustrates an electronic ballast example. The "revenue per ballast" in Table 6B.2 represents the total cost per ballast of the components in each supplier industry grouping, and the sales amount represents the revenue received by U.S. domestic suppliers.

The domestic content or revenue per ballast has been shown for magnetic ballasts in Figure 6B.3. The equivalent discussion of materials costs and supplier revenues for electronic ballasts is outlined in Section 6B.2.4. Maximum shipments are 31.5 million "affected" magnetic ballasts and 23.6 million electronic ballasts that would replace them in the event of an electronic standard. Each supplier industry was considered separately and the results combined into the five groups shown in Table 6B.2. The industries included in the analysis included four types of capacitors, magnet wire, lead wire, wire connectors, thermal protectors, metal clamps, potting and impregnation compounds, cold rolled steel for cases, fabricated steel cases, cold rolled motor lamination steel, and some miscellaneous industries classified as "other".

The measure used to characterize the financial value of the industries is the net present value (NPV) of the industry cash flow under a specified set of conditions. The annual sales for each industry, along with the profitability, depreciation, discount rate, and capital expenditure rates reported by supplier plants, were used to calculate NPV cash flow values under the two base case scenarios. The NPV values are presented first as a reference case in Table 6B.3 and second as a "worst case" in Table 6B.4. The reference case assumes that, in the event of an electronic standard, domestic suppliers to the electronic ballast industry will maintain their 1997 shares in serving the new electronic ballasts. The "worst case" assumes that domestic suppliers will lose all the new market to foreign suppliers.

Table 6B.3. Estimated NPV in $Millions for Industries Supplying Both Magnetic and Electronic Ballasts, Assuming Domestic Supplier Industries Maintain Their 1997 Market Shares

INDUSTRY	5% Scenario, 1998-2015			3% Scenario, 1998-2027		
	Base	Standard	Change	Base	Standard	Change
Capacitors	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
Thermal Protectors, Clamps, Potting	8.55	7.05	**-1.51**	10.24	7.59	**-2.65**
Steel Case & CRML	16.59	12.45	**-4.14**	18.74	14.21	**-4.53**
Other	6.11	4.87	**-1.23**	6.81	5.18	**-1.63**
TOTAL	43.93	34.79	**-9.14**	49.52	37.07	-12.46

Table 6B.3 summarizes two scenarios.

- For the 5% scenario we assumed a base case wherein "affected" magnetic ballast shipments decline from their 1997 level (The NPV considers 1998-2015 values with 1998 the base year.) to 10% of that level in 2015 while their electronic substitutes increase proportionally. The standard case assumes the same rate of change in shipments until 2003 when the "affected" magnetic ballast shipment level drops to zero and the electronic substitutes rise to their maximum values. We use sales, profitability, and depreciation values for the electronic substitutes to calculate the net cash flow and the resultant net present value.
- For the 3% scenario we assumed a base case wherein "affected" ballast shipments decline more slowly, 3% of 1997 shipments per year, to 10% of that level in 2027 while electronic substitutes increase proportionally. The standard case in this scenario repeats this rate of decline in shipments, and like the first scenario, drops the level of "affected" ballasts to zero and adds electronic substitutes in 2003.

The results presented in Table 6B.3 indicate that in general the industry NPVs are lower for the standard cases than for the base cases. Except for the case of capacitors, this is because the substitute electronic ballast market is smaller than the "affected" magnetic ballast market and because the equivalent materials and components used in each electronic ballast are smaller and lower cost. Capacitor sales are higher for electronic in part because of the higher number of capacitors per electronic ballast and in part because of a higher market penetration from non-captive suppliers. The total impact on supplier cash flows for the 5% and 3% scenarios are -$9.1million and -$12.5million respectively.

Table 6B.3 assumes that all domestic supplier industries would capture the new market for electronic ballast components to the same extent they had in 1997. 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 results are presented in Table 6B.4.

Table 6B.4 Estimated Npv in $Millions for Industries Supplying Both Magnetic and Electronic Ballasts, Assuming Foreign Suppliers Capture All the New Electronic Ballast Market

INDUSTRY	5% Scenario, 1998-2015			3% Scenario, 1998-2027		
	Base	Standard	Change	Base	Standard	Change
Capacitors	1.28	.89	-.39	1.34	.92	-0.41
Magnet & Lead Wire, Connectors	11.40	8.06	-3.34	12.39	8.38	-4.03
Thermal Protectors, Clamps, Potting	8.55	5.69	-2.86	10.24	5.92	-4.31
Steel Case & CRML	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
TOTAL	43.93	29.82	-14.1	49.52	31.07	-18.45

6B.1.4 Employment Impacts

Tables 6B.5 and 6B.6 summarize the expected employment impacts for each of the primary supplier industries and one secondary industry for the two base case shipment scenarios. The methodology used to obtain these estimates is detailed in the following paragraphs.

Discussions with ballast manufacturers and suppliers allowed us to establish an estimated "labor content" value for each of the materials and components studied in order to provide a check on the reasonableness of job impact estimates reported through the interviews. Typically this was done by obtaining values for labor hours required per unit of component or material from two or more sources and by calculating an estimated labor cost per unit to compare with the total cost of the material. We were able to estimate reasonable and internally consistent values for labor content in terms of seconds of labor per ballast served and thereby estimate the approximate labor hours or number of full time job equivalents associated with serving "affected" magnetic ballasts. We used these estimates in conjunction with those provided directly by the suppliers interviewed to determine the employment levels associated with "affected" materials as of a reference year, 1998.

We assumed 1997 employment levels to decline by 3% and 5% for each of the four years 1998-2001 to arrive at the estimates shown in Tables 6B.5 and 6B.6. We assumed 2001 employment levels to remain constant in 2002 to serve the likely surge in demand during the last two quarters of "affected" components production. The jobs lost and gained represent a snapshot taken in the standard year 2003. The associated impact shown in the tables represents jobs

unrelated to ballast component production but "associated " in the same plant that is closed as a result of lost ballast-related business.

Table 6B.5 Estimated Employment Impacts for Magnetic/electronic Ballast Supplier Industries (3% Scenario)

INDUSTRY	JOBS LOST		POTENTIAL JOBS GAINED Electronic Ballasts
	Direct Impact	Associated Impact	
Capacitors	29		37
Magnet & Lead Wire, Connectors	76		11
Thermal Protectors, Clamps, Potting	57	Plant closure 23	15
Steel Case & CRML	63		14
Metallized Film	48		1
Other	44		9
TOTAL	317	23	87

Table 6B.6 Estimated Employment Impacts for Magnetic/electronic Ballast Supplier Industries (5% Scenario)

INDUSTRY	JOBS LOST		POTENTIAL JOBS GAINED Electronic Ballasts
	Direct Impact	Associated Impact	
Capacitors	27		34
Magnet & Lead Wire, Connectors	69		10
Thermal Protectors, Clamps, Potting	52	Plant closure 23	14
Steel Case & CRML	58		13
Metallized Film	44		1
Other	40		8
TOTAL	290	23	80

Capacitors: The capacitor industry suppliers estimated about 42-52 jobs associated with production of "affected" magnetic ballasts by non-captive plants. This implied a higher labor content

for the non-captive plants than for the captive plants and suggested a higher expected labor cost per capacitor than reported by the Census of Manufactuers. The estimate was adjusted downward to about 34 "affected" jobs as of 1997, leading to 29 or 27 remaining in 2002 corresponding to the 3% or 5% scenario, respectively. There is a potential for about 42 new capacitor jobs associated with supplying electronic ballasts, and this implies gains of 37 or 34 in 2003 jobs assuming the 3% or 5% scenario, respectively.

Magnet and Lead Wire, Connectors: The estimates of job impacts and labor intensities from the magnet wire and lead wire manufacturers agreed reasonably well and totaled 86 "affected" jobs which attrition reduced to 76 under the 3% scenario and 69 under the 5% scenario in the year before the standard year. On the electronic side, each ballast uses about one-fourth the magnet wire of the average magnetic ballast and about the same lead wire. Both components serve smaller numbers of ballasts (total electronic ballasts served are about 75% of magnetic and about 30% use foreign components), however, and wire connectors replace some lead wire. Assuming that domestic employment in magnet and lead wire production changes proportional to sales, employment serving the new electronic market would be 86 jobs magnetic x 3.82 revenue electronic/26.4 revenue magnetic = 12.4 jobs. This discounts to 11 and 10 jobs gained in 2003 under the 3 & 5% scenarios

Thermal Protector, Metal Clamps, Potting/impregnation: These industries are relatively small in terms of labor intensities but the metal clamp industry is highly dependent on the "affected" magnetic ballast market to cover fixed costs. At least one small plant that receives over 90% of its revenue from "affected" component sales would close immediately, and another with over 30% of its revenue from this source would be likely to close and bring about the associated impact shown in tables 6B.5 and 6B.6. Electronic ballasts do not use the type of clamps this industry produces. The thermal protector industry also would experience significant net losses in jobs since the demand for thermal protectors is much smaller in the electronic ballast industry. The potting and impregnation compound industry requires very little variable labor, and although the long-term impact of increasing market share for electronic ballasts is negative for this supplier the employment impact is limited to approximately one job lost.

Steel Cases and CRML Steel: Steel suppliers used labor per "affected" magnetic ballast served in an amount representing approximately 72 jobs in 1997. This level decreases to 63 and 58 in 2003 under the 3% and 5% scenarios, respectively. Steel case and CRML suppliers to the electronic ballast industry exhibit labor intensities per pound of product similar to those supplying magnetic ballast manufacturing, but the amount of CRML steel per ballast and the number of ballasts involved are lower for electronic ballasts. (The total new market for electronic ballasts in the event of an electronic standard is approximately 75% of the magnetic ballast market that would be replaced, and foreign suppliers would serve part of the new market.) The number of jobs supported by the electronic business should be about the same per dollar of revenue as for the magnetic business. That is, we assume that for the most part the same suppliers will support both ballast types. Thus the jobs gained for electronic will be about = magnetic jobs x (revenue electronic/revenue magnetic), or

Electronic jobs gained = 72 x ($6.2 million/$28 million) = 16 jobs gained.

This discounts to 13 and 14 jobs under the 5 and 3% scenarios. There is a recently emerging plastic case competitor industry that could capture a significant share of the market for electronic ballast cases. The impact of this development has not been included in the analysis because it is speculative at this time. Injection molded plastic cases require roughly 3 to a the labor of steel cases.

Metallized Film: This industry is a supplier to capacitor plants and thus could be considered a secondary industry, but it supplies the ballast industry directly as well through ballast manufacturers' capacitor subsidiaries. We did not determine the industry's financial structure and do not report on it here. Our interviews did determine a reasonable estimate of expected employment impact, however, and that estimate is included as a direct impact in Tables 6B.5 and 6B.6. Our estimate of the labor content of polypropylene film is approximately 12 seconds/"affected" magnetic ballast served, or about 55 jobs in 1997. We assume this number to decline to 48 in 2002 under the 3% scenario or to 44 under the 5% scenario. Increased production of electronic ballasts would, however, represent a new, but much smaller, market for the film. Industry sources estimate that about one third of the electronic ballast market uses domestic suppliers for metallized polypropylene capacitors and that these capacitors require about 2-8% as much film to serve each ballast as the magnetic ballast capacitors they might replace. Assuming the high-end value of 8%, the number of new jobs created to serve the new electronic market would be approximately one.

Other: We estimated the employment impact on the remaining supplier industries and three matching electronic ballast supplier industries (paper, tape, and label materials) by assuming a labor cost of 10% of revenue at a rate of $12.50 per hour. This yielded an estimate of approximately 50 jobs, which reduced to 44 and 40 under the 3% and 5% scenarios. The same assumptions on the electronic supplier revenue produced the potential job gains of 9 and 8 shown in Tables 6B.5 and 6B.6.

In summary, the expected employment impact of an electronic ballast standard on supplier industries is a loss of 340 jobs assuming the 3% scenario or 313 assuming the 5% scenario. If the supplier industries maintain their 1997 market shares of electronic ballast components, there is a potential for gaining back 87 jobs under the 3% scenario or 80 under the 5% scenario. These results lead to a net loss of 233-253 jobs depending on the scenario. To the exent that foreign suppliers make inroads on the electronic ballast market, the net employment losses would go up toward the 350 limit.

6B.1.5 Impacts of Recent Market Trends

Based on 1998 sales figures, shipments of corrected power factor magnetic ballasts have decreased over 20% since the peak year of 1994, according to Census data published through Current Industrial Reports. The Department surveyed ballast industry suppliers to learn how this trend has affected them and what measures they had taken to adjust to this market development. The Department also invited them to discuss how they plan to adjust to this trend in the future and to speculate on how a new energy efficiency standard would affect their businesses. This section briefly summarizes the answers to those questions as presented by the interviewed supplier representatives.

"Affected" capacitor sales have decreased in recent years to about 60% of the peak of this decade and the industry has survived through consolidation and by developing other markets. While one major ballast manufacturer stopped buying capacitors on the open market in favor of relying on

captive production, another reduced its domestic in-house production in favor of outsourcing part of its requirements. Profitability in the industry has decreased as it has developed less profitable niche markets to replace lost shipments to the magnetic ballast manufacturers.

The capacitor industry expects that layoffs and reduced revenues and income will result if an electronic level standard is adopted. They do not see growing alternative markets to enter that can absorb production lost from reduced ballast industry purchases. The capacitor industry is diversified among other applications for capacitors, including motors, HID lamp ballasts, power factor correction, microwave ovens, and other applications. All of these applications, however, are highly competitive, mature markets. The only apparent growth market, electronic lamp ballasts, is perceivec as risky since it is vulnerable to foreign competition and requires investment in capital equipment to convert from "affected" magnetic to electronic market segments. Industry sources estimate that foreign manufactured capacitors have about 70% of the market for metallized film capacitors for electronic ballasts manufactured in North America and can be expected to maintain or increase that in the future.

The impact of reduced shipments of "affected" magnetic ballasts on the magnet and lead wire industry has been mixed. One major ballast manufacturer has reduced its in-house wire manufacturing in favor of outsourcing while another has curtailed its outside purchases of wire in favor of preserving its in-house production. The net reduction in captive manufacturing of magnet and lead wire has provided some opportunities for outside suppliers to increase sales, but this benefit has accrued primarily to relative newcomers. The old-line suppliers have focused on building other businesses as sales to the ballast industry declined 2-3% per year. The industry expects that a new standard and loss of the "affected" magnetic ballast market would lead to layoffs at the old-line firms and threaten the survival of newcomer plants that are not sufficiently diversified.

Consolidation in the metal clamps industry has opened opportunities for expansion among the industry firms remaining, but loss of the "affected" magnetic ballast market will close some domestic plants. One small plant dependent on magnetic ballasts for nearly all its business would close immediately at the end of 2002 if a standard year of 2003 is established.

Specialty steel sales have decreased and consolidation of the market has allowed the current participants to survive by increasing market share. Loss of the "affected" magnetic ballast market would lead to lower revenues and lower employment in the industry as no growing markets are on the horizon.

The thermal protectors industry is increasing sales for automotive applications and has been searching for additional markets as the ballast market has declined. The industry would, however, have difficulty coping with a sudden loss of the "affected" magnetic ballast market. Small firms in the industry would face greater competition as larger, low-cost producers compete for niche markets formerly left to small producers.

The metallized film industry has investigated new markets and has gained a share of the

capacitor market supplying the electronic ballast industry. But electronic ballast capacitors use less than 10% as much film as capacitors for "affected" magnetic ballasts. Serving the electronic ballast capacitor industry is highly competitive, and well over half of the polypropylene film capacitors used in electronic ballasts are of foreign origin. The industry expects that a new standard and loss of the "affected" magnetic ballast market would lead to layoffs at the old-line firms and threaten the survival of newcomer plants that are not sufficiently diversified.

6B.2 Impacts on Suppliers to Electronic Ballast Production

We limited our investigation of the industries which supply the electronic ballast industry to those which use U.S.-based production facilities for this purpose. The electronic ballast supplier industries are higher in number (and supplying a larger variety of components) and more international in makeup than those allied with magnetic ballast production. Many electronic ballast suppliers, for example, produce their ballast components in Europe or Asia for export to ballast manufacturers serving U.S. markets.

6B.2.1 Cost of Materials

The estimated cost of materials for an electronic ballast substitute for the "affected" magnetic ballast shown in Figure 6B.3 and guide to the distribution of components that make up electronic ballasts is shown as Figure 6B.4. Because our focus with respect to the electronic ballast industry suppliers was to estimate the financial and employment impacts of a new energy efficiency standard on domestic supplier industries, we estimated the fraction produced domestically for each industry group represented in Figure 6B.4.

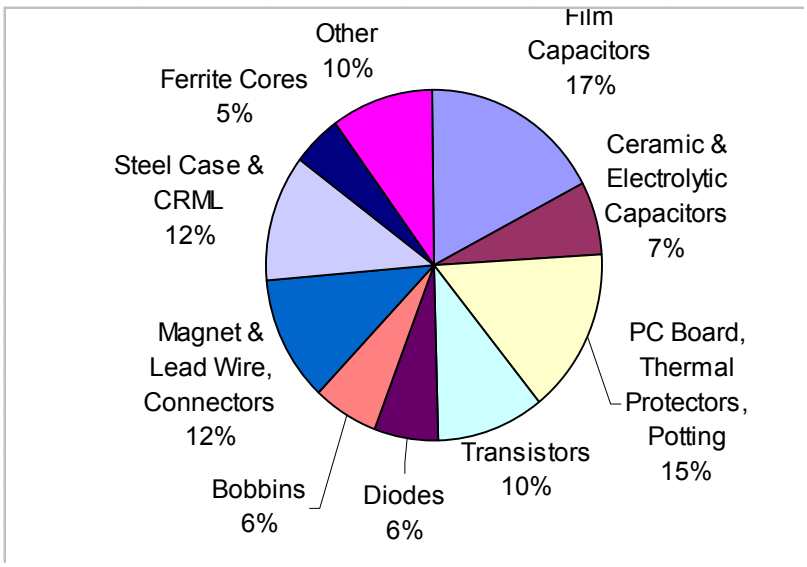

Figure 6B.4 Benchmark Cost of Materials for Electronic Ballasts

We found that about 70% of the revenue for components used in electronic ballasts go to foreign suppliers. This is in part because a substantial number of electronic ballasts are manufactured outside North America, and in part because large, low-cost electronic component manufacturing plants have been set up overseas to serve the industries producing personal computers and consumer electronics products. We have extracted the foreign-produced portions of the components shown in Figure 6B.4 and present the distribution of the 30% remaining domestic content of these materials and components in Figure 6B.5.

Figure 6B.5 summarizes the distribution of revenues to suppliers for components and materials produced in the U.S. for use in electronic ballasts. But we have already estimated the financial and employment impacts of an electronic ballast standard on those supplier industries, which provide components and materials for both electronic and magnetic ballasts. Reorganizing the domestic supplier industries shown in Figure 6B.5 allows us to highlight those we have already considered. Figure 6B.6 pulls out those industry groups and shows that over two thirds of the electronic ballast suppliers have already been analyzed for financial and employment impacts. This section focuses on the remaining suppliers.

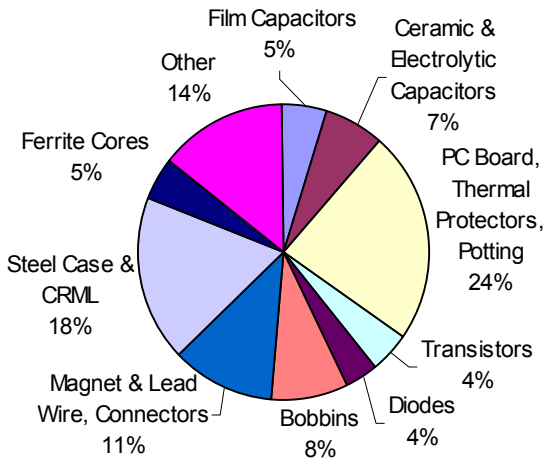

Figure 6B.5 Distribution of Cost among Domestic Components and Materials for Electronic Ballasts

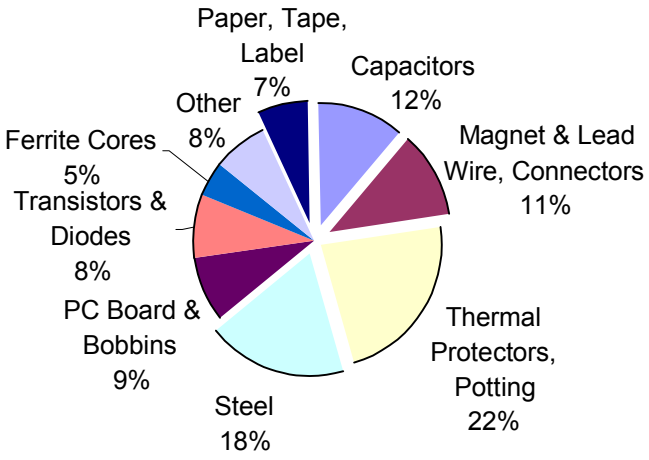

Figure 6B.6 About 70% of the Domestic Materials Cost for Electronic Ballasts Are Associated with Industries Serving Both Magnetic and Electronic Ballasts

6B.2.2 Financial Impacts

Financial values determined for electronic ballast supplier industries are shown in Table 6B.7. The estimated annual sales in Table 6B.7 assume that prices and domestic supplier market share will hold at 1997 levels. This is the reference case optimistic assumption as PC board prices and domestic market share dropped significantly in 1998 and industry sources expect this trend to

continue through 2003 when the new market for electronic ballasts stimulated by a new standard would emerge. Our interviews with manufacturers and suppliers have indicated that these trends will continue as physical size reductions, foreign competition, and market growth for electronic ballasts exert their impacts.

Table 6B.7 Estimated Financial Factors for Domestic Electronic Ballast Supplier Industries

SUPPLIER INDUSTRY	REVENUE PER BALLAST	ESTIMATED 1997 SALES[1]
PC Board, Bobbins	.83	$6.86 million
Other[2]	$1.23	$6.95 million
TOTAL		$13.81 million

[1] Domestic plants

[2] Transistors, diodes, ferrite cores, miscellaneous

The NPV cash flow estimates for the electronic industry suppliers are summarized for the 3% and 5% scenarios in Table 6B.8. The cash flow calculations were done separately for PC boards and bobbins and combined for presentation in the table. The "other" components were combined for the cash flow calculations. As indicated earlier, Table 6B.8 summarizes a reference case wherein domestic suppliers keep their 1997 market shares. The "worst case" would have foreign suppliers taking the entire new market and the cash flow values would decline to zero. Also, because of insufficient information, conversion costs to provide the production capacity to serve the new markets for bobbins and the "other" category have not been included in the cash flow calculations. Incorporating them would reduce the standard NPV.

Table 6B.8 Estimated Npv in $Millions for Supplier Industries Serving Only Electronic Ballasts

INDUSTRY	5% Scenario, 1998-2015			3% Scenario, 1998-2027		
	Base	Standard	Change	Base	Standard	Change
PC Board, Bobbins	1.87	2.81	**.94**	1.45	2.69	**1.24**
Other	.79	1.44	**.65**	1.04	1.88	**.84**
TOTAL	2.66	4.25	**1.59**	2.49	4.57	**2.08**

6B.2.3 Employment Impacts

We estimated employment impacts on the printed circuit board and injection-molded bobbins industries in the same way as described in Section 3.3.4 for the suppliers of components for both magnetic and electronic ballasts. PC boards and bobbins were considered separately and their employment impacts combined for presentation in Table 6B.9. The levels estimated by manufacturers added to 33 in 1997, which compared reasonably with 37 jobs estimated from industry revenues and standard labor rates. The remaining "other electronic" supplier industries: transistors,

diodes, ferrite cores, and miscellaneous small items, were not included in the interviews. Employment levels were estimated from revenues and assumed values for labor cost as a fraction of revenues and hourly labor rates. The 1997 employment level derived this way was 37 jobs, which amounted to 30 and 26 potential jobs gained under the 3% and 5% scenarios, respectively.

Table 6B.9 Estimated Employment Impacts for Electronic Ballast Supplier Industries

	POTENTIAL JOBS GAINED	
INDUSTRY	3% Scenario	5% Scenario
PC Board, Bobbins	27	23
Other Electronic	30	26
TOTAL	57	49

6B.3 COMBINED FINANCIAL AND EMPLOYMENT IMPACTS FOR ALL SUPPLIERS

In this section we combine the results from Section 3.3 which considered suppliers to both "affected" magnetic and electronic ballast manufacturers with those from Section 3.4 that considered suppliers now serving only the electronic ballast manufacturers to present the overall impacts on supplier industries.

6B.3.1 Financial Impacts

Tables 6B.10 and 6B.11 summarize the reference and worst cases, respectively. The reference case assumes that U.S. domestic suppliers will maintain their 1997 market shares of electronic ballast production if a new ballast energy efficiency standard were to become effective in 2003. The worst case, Table 6B.11, assumes that all the components and materials used in the new electronic ballasts will be supplied by foreign plants. The financial impact ranges from a reference case of a $7.6 million decline in NPV cash flow under the 5% scenario to a $20.7 million decline under the 3% scenario and assuming foreign suppliers provide all materials and components. Since some decline in domestic suppliers' market share has already taken place, the reference case results shown in Table 6B.10 are unlikely to be realized, but, on the other hand domestic suppliers can be expected to retain a portion of their market share. Thus, the expected financial impact should be in the range -$7.6 million to –$20.7 million.

Table 6B.10 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	**.94**	1.45	2.69	**1.24**
Other Electronic Suppliers	.79	1.44	**.65**	1.04	1.88	**.84**
TOTAL	46.59	39.04	**-7.55**	52.01	42.56	**-9.45**

Table 6B.11 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**

6B.3.2 Employment Impacts

The reference-case employment impacts under the 3% and 5% scenarios are summarized in Tables 6B.12 and 6B.13, respectively. The more gradual 3% decline in the base case leaves more jobs still at risk in 2003 than in the case of the 5% scenario. Thus the expected job losses are about 340 under the 3% scenario and about 313 under the 5% scenario. The potential for job gains from the increased production of electronic replacements is approximately 144 and 129 under the 3% and 5% scenarios. The resultant net job losses for the reference case conditions are 196 and 184. The

worst case condition, wherein all the new electronic ballast production is supplied by foreign firms, is summarized in Table 6B.14 and corresponds to the jobs lost results shown in Tables 6B.5 and 6B.6 without any compensating gains by electronic ballast suppliers. In the worst case, then, supplier industries' job losses would be in the 313-340 range.

Table 6B.12 Estimated Employment Impacts for Supplier Industries Assuming Domestic Suppliers Maintain Their 1997 Market Shares (3% Scenario)

INDUSTRY	JOBS LOST		POTENTIAL JOBS GAINED Electronic Ballasts
	Direct Impact	Associated Impact	
Capacitor	29		37
Magnet & Lead Wire	76		11
TP, Metal Clamp, Potting	57	Plant closure 23	15
Steel	63		14
Metallized Film	48		1
Other Magnetic/Electronic	44		9
PC Board, Bobbins			27
Other Electronic			30
TOTAL	**317**	**23**	**144**

Table 6B.13 Estimated Employment Impacts for Supplier Industries Assuming Domestic Suppliers Maintain Their 1997 Market Shares (5% Scenario)

INDUSTRY	JOBS LOST		POTENTIAL JOBS GAINED Electronic Ballasts
	Direct Impact	Associated Impact	
Capacitor	27		34
Magnet & Lead Wire	69		10
TP, Metal Clamp, Potting	52	Plant closure 23	14
Steel	58		13
Metallized Film	44		1
Other	40		8
PC Board, Bobbins			23
Other Electronic			26
TOTAL	**290**	**23**	**129**

Table 6B.14 Estimated Employment Impacts for Supplier Industries Assuming Foreign Suppliers Capture All the New Electronic Ballast Market

INDUSTRY	JOBS LOST (3% Scenario)		JOBS LOST (5% Scenario)	
	Direct Impact	Associated Impact	Direct Impact	Associated Impact
Capacitor	29		27	
Magnet & Lead Wire	76		69	
TP, Metal Clamp, Potting	57	Plant closure 23	52	Plant closure 23
Steel	63		58	
Metallized Film	48		44	
Other	44		40	
TOTAL	317	23	290	23

6C. IMPACT ON LUMINAIRE MANUFACTURING INDUSTRY

6C.1 Summary

New energy-efficiency standards for fluorescent lamp ballasts will significantly alter the product mix of ballast shipments among magnetic, cathode cutout, and electronic types. Because magnetic and electronic ballast types differ in some significant ways in their performance characteristics and prices, a new energy-efficiency standard has a potential for impacting ballast industry trade allies, including the luminaire manufacturers. Luminaire manufacturing is a $7 billion per year industry in the U.S. that employs about 60,000 people. The "affected" linear four and eight-foot fluorescent fixtures portion of the industry ships approximately $1.4 billion of product annually.

Arthur D. Little performed an analysis of the impacts of an electronic ballast standard on luminaire manufacturers. The methodology used was to conduct a literature review to characterize the luminaire industry and to carry out interviews with representatives of the major manufacturers of linear fluorescent luminaires serving commercial and industrial users. Ballast manufacturers and the literature review identified key luminaire manufacturer firms, and a number of additional firms were identified through their attendance at one or more ballast workshops at the Department and/or their correspondence with the Department on ballast efficiency issues. The eight manufacturers interviewed represent over 60% of fluorescent luminaire sales and over 80% of the linear fluorescent fixture market affected by the proposed new energy efficiency standard for ballasts.

Comments from luminaire manufacturers and other industry sources in past discussions or correspondence and our interviews with the manufacturers suggested that there are four broad issues of concern to them.

- Customer choice will be reduced by a standard and some luminaire purchasers will be forced to select higher cost options than they otherwise would, and some will choose higher energy consumptive options (incandescent or halogen) than fluorescent. The interview results suggest that the directions of these impacts are negative as suggested but that the impacts are

not easily quantifiable and are small overall.

- Exemptions for residential, dimming, and cold temperature applications, and for applications exhibiting problems with electromagnetic interference from high frequency electronically ballasted lighting. The manufacturers were generally in favor of these exemptions with some minority reservations on the residential exemption inasmuch as it opens the door for some commercial end users to install "affected" luminaires by purchasing the residential product. In general, the exemptions have the advantage of softening the abrupt impact of the standard year on the market and allow these selected market segments to maintain their uses of fluorescent lighting without major problems.
- Global competition is price competitive for linear fluorescent luminaires and elimination of low-cost "affected" magnetic ballasts could cause ballast manufacturers to raise prices on those remaining and being used for the export market, thus raising luminaire costs for domestic manufacturers. This issue is of concern to a small number of manufacturers who have substantial export business (nearly all export less than 5% of their shipments) or who are actively seeking to expand their export business.
- Direct financial and employment impacts due to possible short-term shortages of electronic ballasts, loss of the price premium for electronic ballast/T8 luminaires, or differences in profitability between the mix of electronic and magnetic-based luminaires in the base case from that for the standard case.

A majority of the interviewees believe that the electronic ballast industry will be able to supply the ballasts needed. A minority felt that a medium term shortage would develop in spite of the over capacity that currently exists in the industry.

About half of the manufacturers expected no or minimal impacts on profitability from a new standard while the remaining expected a range of negative impacts. The impacts were attributed to differences in profitability between base case and standard product mixes and to direct costs associated with changes in product literature, business processes, product testing and evaluation, and information management systems required by new product offerings emanating from a new standard. The aggregated "worst case" change in net present value due to profitability changes for the industry is negative in the range $9-18 million, assuming that the current premium margin for electronically ballasted luminaires remains constant in the base case. This is unlikely, however, as the recent trend has been toward convergence in margins between electronic and magnetic. Assuming continuation of this convergence of luminaire margins, a reasonable range of change in value to luminaire manufacturers is approximately -$3 to -$6 million in cash flow due to profitability differences. The other direct costs reported above amount to about $1 million. In summary the net present value of costs to the industry is approximately $4-7 million.

In addition, there were concerns expressed that a standard would divert resources from new product and technology introduction and result in lost opportunities. Also some luminaire manufacturers look to their ballast manufacturer allies to develop special ballast products for their luminaires, and to the extent that the ballast manufacturers are distracted by changes imposed by new standards, they cannot attend to technical assistance to luminaire manufacturers

Nearly all the manufacturers saw no significant impact on their employment levels as a result of a new standard, and no manufacturer suggested any quantitative employment impact.

6C.2 Introduction

New energy-efficiency standards for fluorescent lamp ballasts will significantly alter the product mix of ballast shipments among magnetic, cathode cutout, and electronic types. Because magnetic and electronic ballast types differ in some significant ways in their performance characteristics and prices, a new energy-efficiency standard has a potential for impacting ballast industry trade allies, including the luminaire manufacturers. This chapter documents the financial and other impacts that luminaire manufacturers might experience as a result of a new energy efficiency standard for ballasts.

Arthur D. Little performed an analysis of the impacts of an electronic ballast standard on luminaire manufacturers. The methodology used was to conduct a literature review to characterize the luminaire industry and to carry out interviews with representatives of the major manufacturers of linear fluorescent luminaires serving commercial and industrial users. The interview guides used to structure and organize the interview discussion invited manufacturer interviewees to discuss:

- Company opinions or positions on issues related to new energy efficiency standards for ballasts
- Changes in product design and production methods required to accommodate new energy-efficiency standards
- Cost and financial impacts of changes in ballast energy-efficiency standards
- Employment impacts of changes in ballast energy-efficiency standards

Ballast manufacturers and the literature review identified key luminaire manufacturer firms, and a number of additional firms were identified through their attendance at one or more ballast workshops at the Department and/or their correspondence with the Department on ballast efficiency issues. All of these manufacturers were invited to interview with Arthur D. Little concerning the issues listed above. The following manufacturers make up this list.

- Cooper Lighting Group
- Genlyte Thomas Group
  - Genlyte Group
    - Lightolier, Inc.
  - Thomas Industries
    - Day-Brite, Inc.
    - Wide-Lite, Inc.
- Holophane Corporation
  - Halophane merged with Lithonia in 1999
- H.E. Williams and Infinity Lighting, Inc.
- Hubbell Lighting, Inc.
- Lighting Corporation of America

  - Columbia Lighting Corporation
- Lithonia Lighting Company
- Peerless Lighting Corporation
  - Peerless merged with Lithonia in 1999
- Simkar Corporation

Arthur D. Little sent letters of invitation to 11 luminaire manufacturing organizations. The letters invited each individual to participate in a discussion structured around an interview guide developed in conjunction with the Department of Energy program manager and enclosed with the invitation letter. Follow-up phone calls determined that one manufacturer's production of luminaires using the "affected" magnetic ballasts is insignificant and the interview in that case was not done. Two other manufacturers, Holophane Corporation and Peerless Lighting Corporation, had been merged with Lithonia Lighting and input from them was obtained through a visit and interview meeting at Lithonia Headquarters. In summary, we conducted eight interviews representing information from ten of the 11 manufacturer organizations in the list above. One manufacturer had little or no production of the "affected" luminaires as mentioned above. The manufacturers interviewed represent over 60% of fluorescent luminaire sales and over 80% of the linear fluorescent fixture market affected by the proposed new energy efficiency standard for ballasts.

6C.3 Results

The lighting fixture manufacturing industry has grown from $4.8 billion in shipments in 1988 to $6.6 billion in 1997 while holding employment relatively constant at about 60,000. The commercial/institutional and industrial sectors, which make the most use of "affected" fluorescent fixtures, purchased $3 and $0.7 billion, or a little over half of 1997 shipments. Figure 6C.1 shows this shipment history.[4]

[4] Bureau of the Census, *Current Industrial Reports: Electric Lighting Fixtures-1997, MA36L(97)-1.*

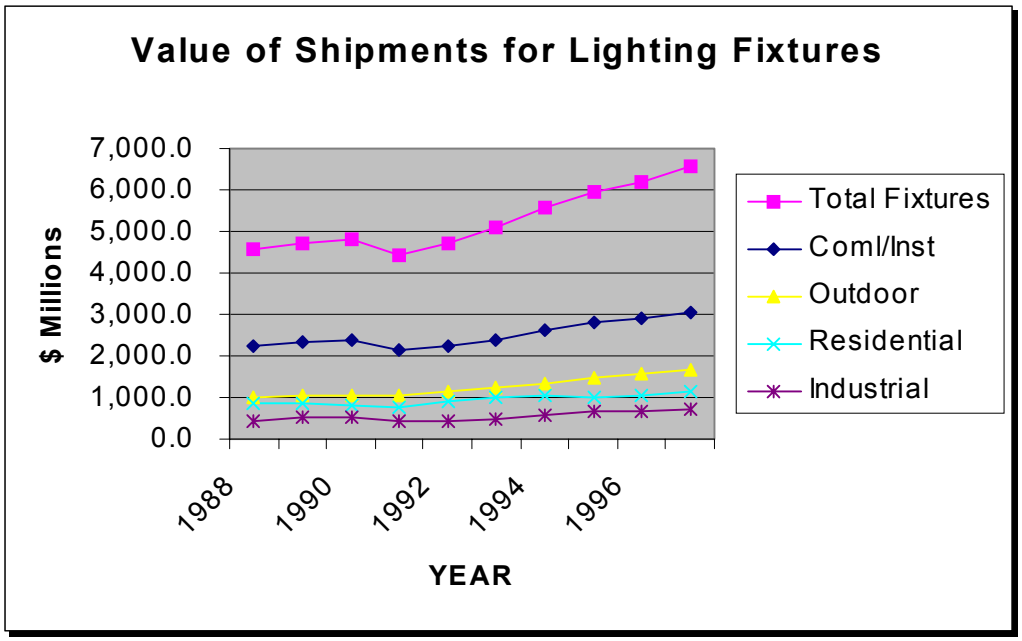

Figure 6C.1. The luminaire manufacturing industry grew from $4.8 billion to $6.6 billion in shipments during the decade ending in 1997.

From 1985 through 1996, 84 companies dropped out of the lighting fixture manufacturing business, 19 from the commercial/institutional sector. No new firms entered the business (excepting consolidations) except in the outdoor lighting classification. In 1995 there were 1096 plants[5] manufacturing lighting fixtures in the United States, 1.3% lower than in 1994. Most of these plants, over 60%, are small and employ fewer than 20 people each. Larger plants employing 50 or more account for about 30% of the facilities and many of these produce commercial/institutional lighting fixtures.

The commercial/institutional segment of the market accounts for nearly half the total value of lighting fixture shipments, as shown in Figure 6C.2, and is even more important to the fluorescent market.

[5] Economic Industry Reports, Inc. *The U.S. Lighting Fixtures Industry, An Economic & Market Study, 1998 Edition, Vol. 2.*

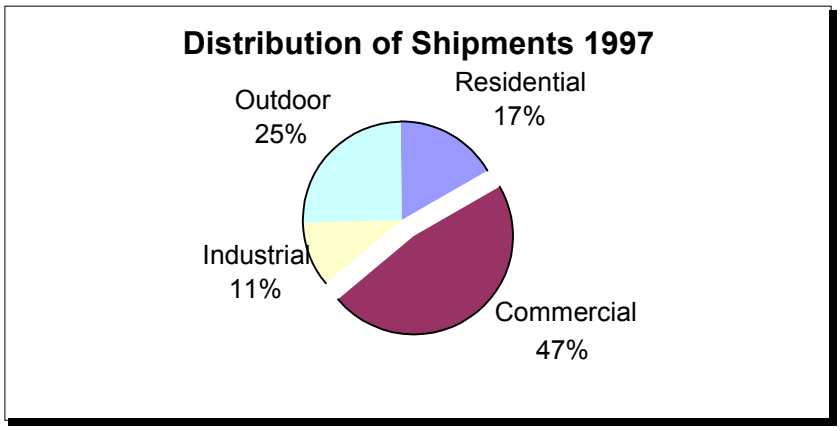

Figure 6C.2. The commercial market segment, including institutional buildings, is the major market for luminaires.

The latest publication of Current Industrial Reports[6], August 10, 1998, indicates 162 companies to be involved in producing fixtures for the commercial/institutional market in 1997. Approximately two dozen of these plants produce 4 and/or 8-foot linear fluorescent lamp fixtures. The total value of these fixtures, shown in Table 6C.1, was approximately $1.678 billion. The industrial general fluorescent lighting market adds another $0.142 billion for an upper bound of about $1.82 billion. Manufacturer interviews suggested that the total market for "affected" fixtures (those using either "affected" magnetic ballasts or their electronic ballast substitutes) was approximately $1.4 billion in 1998, which is consistent with the upper bound of $1.82 billion minus the $.4 billion in the "other" categories in Table 6C.1.

The $1.4 billion market for linear fluorescent luminaires is dominated by the top five manufacturing companies: Cooper Lighting, Genlyte Thomas Group (Lightolier and Day-Brite Lighting), Lighting Corporation of America, Hubbell Lighting, and Lithonia Lighting, all of which participated in the interviews. An approximate distribution of the markets served by these companies, including H.E. Williams/Infinity Lighting and Simkar Corporation that also participated, is shown in Figure 6C.3. These manufacturers as a group serve over 80% of this market.

[6] Bureau of the Census, Current Industrial Reports: *Electric Lighting Fixtures-1997, MA36L(97)-1*

Table 6C.1. Shipments of selected lighting fixtures for commercial/industrial applications, 1997.

Product Code	Product Description	Number of companies	Quantity	Value $Thousands
36462 --	Electric lighting fixtures, commercial and institutional, fluorescent			
	Recessed, air handle incl. heat extract			
	Lensed			
36462 80	2 X 4 feet, 4 lamp	10	In 52	In 52
36462 81	2 X 4 feet, 3 lamp	8	199	12,079
36462 82	2 X 4 feet, 2 lamp	10	127	7,134
36462 52	All other lensed, air handling	13	382	23,450
	Metal louvered			
36462 83	2 X 4 feet, 4 lamp	9	323	23,429
36462 84	2 X 4 feet, 3 lamp	10	1,450	102,121
36462 85	2 X 4 feet, 2 lamp	9	443	28,620
36462 53	All other mtl lvrd, air handling	12	1,980	130,343
	Non-metal louvered			0
36462 86	2 X 4 feet, 4 lamp	3	In 54	In 54
36462 87	2 X 4 feet, 3 lamp	3	"	(D)
36462 88	2 X 4 feet, 2 lamp	3	"	(D)
36462 54	All other non-metal lvrd, air hndlng	6	63	6,710
	Recessed, non-air hndl incl. heat extract			
	Lensed			
36462 89	2 X 4 feet, 4 lamp	23	3,354	141,426
36462 90	2 X 4 feet, 3 lamp	18	1,547	76,522
36462 91	2 X 4 feet, 2 lamp	17	1,896	73,031
36462 58	All other lensed, non-air hndlng	25	4,553	187,488
	Metal louvered			
36462 92	2 X 4 feet, 4 lamp	11	153	8,839
36462 93	2 X 4 feet, 3 lamp	11	672	29,546
36462 94	2 X 4 feet, 2 lamp	12	400	27,543
36462 56	All other mtl lvrd, non-air hndlng	15	393	23,619
	Non-metal louvered			
36462 95	2 X 4 feet, 4 lamp	9	86	4,303
36462 96	2 X 4 feet, 3 lamp	8	51	2,949
36462 97	2 X 4 feet, 2 lamp	10	39	2,054

36462 60	Other non-mtl lvrd, non-air hndlng	11	159	5,808
36462 49	Strip lights (surface)	51	9,538	217,360
36462 50	Strip lights (recessed)	11	340	11,429
36462 55	Ceiling systems, incl luminous ceilings	16	(X)	35,726
	Plastic wraparounds			
36462 40	4 foot, 2 lamp	27	1,997	62,582
36462 42	4 foot, 4 lamp	23	666	30,269
36462 51	Other plastic coml/inst wraparounds	24	1,572	56,462
36462 57	Wall mounted fixtures	54	1,442	88,746
36462 65	Under cabinet mount task light	32	2,555	87,440
	Surface and pendant, all other:			
36462 66	Lensed	48	4,527	145,993
36462 68	Louvered	24	229	24,957
36463 13	Industrial general lighting fluorescent	41	3,367	142,099
TOTAL				1,820,000
Affected	TOTAL less "other" in categories with linear lamps defined			1,420,000

Source: Current Industrial Reports

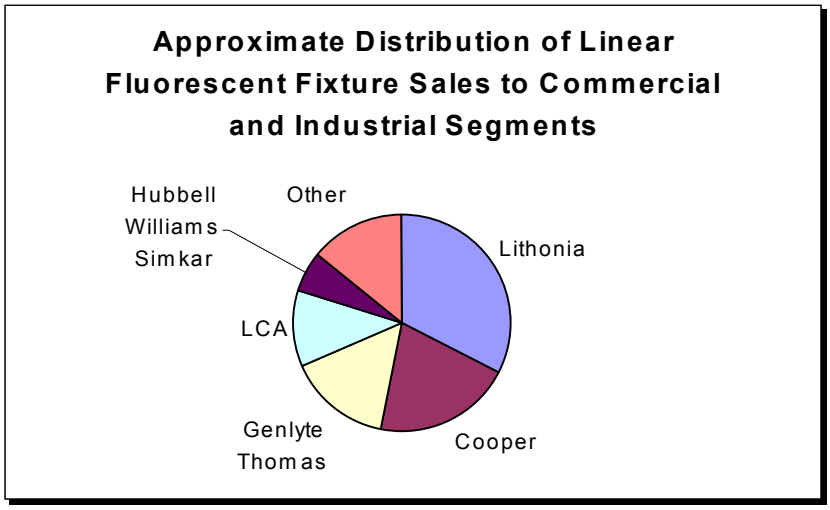

Figure 6C.3. The manufacturers that participated in the interviews account for over 80% of the market for linear fluorescent luminaires.

The size of the export market in commercial and industrial lighting fixtures for the industry in general is shown in Figure 6C.4. Although a small number of companies have substantial sales in foreign markets (on the order of 10% of revenues), most manufacturers and the industry in general

show export shipments in the 1-5% of sales range with the industry average at about 2.5%. In 1997, for example, about $92 million in commercial and industrial luminaire shipments were exported from a total of $3768 million in shipments.

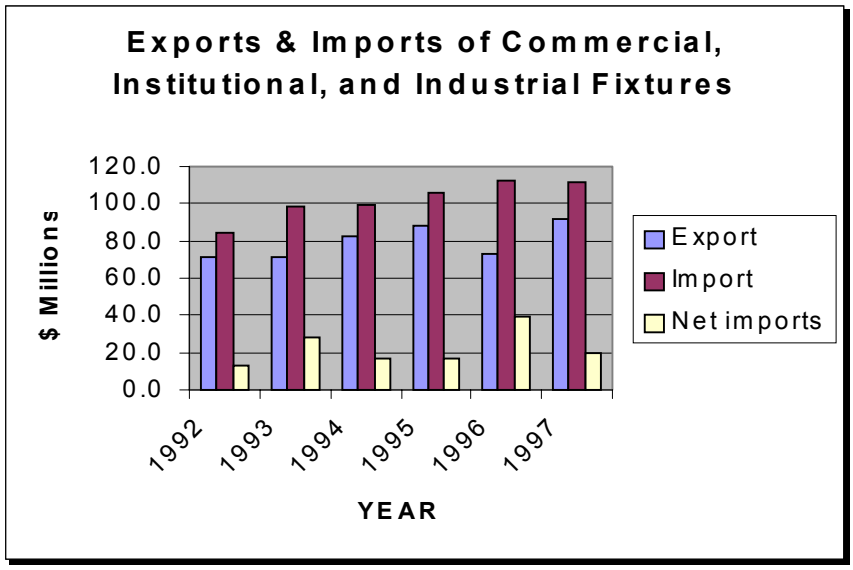

Figure 6C.4. The luminaire industry exports about 2.5% of its Commercial/Industrial production.

Our interviews with the manufacturers suggested that there are four broad issues of concern to them, and the following discussion of the interview results focuses on those areas:

- Customer choice will be reduced by a standard and some luminaire purchasers will be forced to select higher cost options than they otherwise would, and some will choose higher energy consumptive options (incandescent or halogen) than fluorescent.
- Exemptions for residential, dimming, and cold temperature applications, and for applications exhibiting problems with electromagnetic interference from high frequency electronically ballasted lighting.
- Global competition is price competitive for linear fluorescent luminaires and elimination of low-cost "affected" magnetic ballasts could cause ballast manufacturers to raise prices on those remaining and being used for the export market, thus raising luminaire costs for domestic manufacturers.
- Direct financial impacts brought about by possible shortages of electronic ballasts soon after a standard might take effect, loss of the price premium for electronic ballast/T8 luminaires, and differences in profitability between the current mix of electronic and magnetic-based luminaires can exhibit impacts on cash flow and employment.

6C.3.1 Customer Choice

There was general agreement that the fixtures most likely to be affected by higher electronic ballast prices being passed through were low-end, price sensitive ones sold primarily for residential, small commercial, and low usage applications that are not specified by architects or engineering/lighting design professionals. The applications include those using decorative lighting fixtures, primarily 4-foot fluorescents among the "affected" luminaires. Two potentially negative customer impacts of a new standard for these low-end, luminaires are the choice of less efficient incandescent or halogen lighting instead of higher cost electronically ballasted fluorescents and the choice of higher cost electronically ballasted luminaires for applications that do not show a positive payback. Most, not all, of the luminaire manufacturers felt that there would be some setbacks in fluorescent market share and some customers hurt by the reduction in choice resulting from a new standard, but to the extent that any attempted to quantify these impacts, the impacts were judged to be small. In summary the opinions ranged from no impact to slightly negative as suggested above.

6C.3.2 Exemption Issues

6C.3.2.1 Residential Applications.

We asked the manufacturers for comment on both a general exemption for residential applications and for a second option wherein the exemption would be limited to luminaires which used T8 lamps. Those manufacturers that offered opinions on the residential exemption agreed that limiting the exemption to luminaires using T8 lamps is tantamount to denying the residential exemption because the T8 magnetic ballast has no significant price advantage. The residential exemption was overwhelmingly, although not unanimously, endorsed. Some thought that since the residential market is largely magnetic, the changeover to electronic would upset the residential market more than it would the commercial market that is about 60% electronic already. This could result in some shortages of electronic ballasts, and could exacerbate the problems associated with consumer choice summarized in Section 4.3.1. Some felt that a residential exemption is important to maintaining a smooth transition toward electronic ballasts. The minority arguments against a residential exemption were simplicity (One standard for all "affected" ballasts, whether used in residences or businesses.) and the notion that the residential exemption represents a loophole through which commercial businesses or their contractors can purchase the residential ballasts for commercial building applications.

6C.3.2.2 Dimmable Systems

The manufacturers unanimously endorsed an exemption for dimmable systems. The major reasons were:

- The market is making the transition toward electronic dimmable ballasts, which capture over half the commercial grade market already
- Some applications are not adequately served by electronic ballast technology and an exemption allows time for these problems to be solved in an orderly way

6C.3.2.3 Cold Temperature Applications

Although some manufacturers pointed out that the T8/electronic instant start system is operable at low temperatures down to about 0 degrees F, there are some cold temperature storage and other applications that operate at lower than that. An exemption for low temperature applications would affect very little of the market but has the advantage of preserving that part of the market for fluorescent lighting.

6C.3.2.4 Electromagnetic Interference

The manufacturers unanimously endorsed an exemption for applications subject to interference from high frequency electromagnetic radiation from fluorescent lighting systems. The consensus is that the complexity of this issue, which involves many industries (both manufacturers and users of communications equipment and sensors) with conflicting uses for the available frequencies, will ensure a long period of discussions before general agreement is reached on which uses will employ which frequencies. Most manufacturers feel that a decade will be required to solve this problem. Meanwhile standard 461 requiring magnetic ballasts for fluorescent systems used in operating rooms and other less formalized barriers to electronic ballast use make an exemption for applications sensitive to electromagnetic interference desirable.

6C.3.3 Global Market Competition

Much of the export market for U.S. manufacturers is to North America and to other regions, such as Saudi Arabia, use "affected" magnetic ballasts in fluorescent fixtures. European markets, however, do not in general use those ballasts that would be affected by the proposed standard. The major concern of luminaire manufacturers is that a substantial reduction in production of "affected" magnetic ballasts will cause prices of "affected but exempt" and other export ballasts made in the same facilities to go up because of reduced economies of scale. Although domestic luminaire manufacturers throughout the industry would be affected in the same way by this increase in ballast prices, some foreign manufacturers would gain a cost advantage by continuing to use their current suppliers who would be unaffected by the standard. U.S. domestic luminaire manufacturers theoretically could purchase ballasts from these same foreign suppliers, but they feel that shipping and other costs associated with importing components would increase their costs above those of their foreign competitors. There is also some fear that some large jobs for which linear fluorescent fixtures are a key component, their reduced ability to compete for the key component will cause them to lose the entire job including other fixture types for which they are price competitive. Finally, although the export market is a small part of most domestic manufacturers' businesses, they see it as an important market with potential for growth if they can remain competitive in price.

6C.3.4 Manufacturer Financial and Employment Impacts

The potential contributing factors to luminaire manufacturer financial performance and employment level covered by the interviews were

- Availability of sufficient electronic ballasts under a new energy-efficiency standard,
- Loss of a price premium associated with electronic ballasts, which would become the commodity product, and
- Changes in profitability and employment as a result of a new cost structure and/or changes in revenues.

A majority of interviewees expect that electronic ballasts will be available in sufficient supply to serve the market under a new standard. A significant minority, however, felt that the shift from magnetic to electronic ballasts required would be beyond the ability of electronic ballast manufacturers to produce, particularly during the first year. Those who expect no availability problems cited the current over capacity in electronic ballasts, and those who do expect problems in availability suggest that the current over capacity is not sufficient to guarantee adequate supplies at stable prices during the first year or two under a new standard.

The manufacturers agreed that the T12 commodity product provides a low cost choice that would be lost under a new standard, and that this could lower margins by putting pressure on the price of T8 systems. Most also agreed, however, that the T8 and T5 would not become the new commodity and premium products respectively. Instead, product differentiation would depend on variations among T8 systems produced through capabilities such as dimmability and controls. T5, although emerging as an important advance, is still in the early stages of development and will be applied to niche markets until the price of the lamp comes down. Generally the expectation is that T5 systems will take a decade to mature, much in the same manner as happened with T8. Most luminaire manufacturers will not significantly change their development or production of T5 systems as the result of a new energy efficiency standard.

The expected impact on profitability or cash flow varied among the eight responding manufacturers which were evenly divided in number between those expecting no or minimal impacts and those expecting negative cash flow impacts. We estimated approximate net present value reductions in cash flows for the four manufacturers reporting changes related to a new energy efficiency standard. Three different rationales were presented in support of diminshed profitability and value.

One rationale suggested that current markups on electronic fixtures is higher than on magnetic, although this difference is narrowing, and that a new standard would eliminate the margin premium on electronics prematurely. This would reduce cash flow in the standard case from that of the base case and result in a lower value for the firm. A second emphasizes the price sensitivity of non-specification grade luminaires that results in low sales of electronic luminaires in one or two-lamp fixtures. Thus in this case electronic fixtures contribute very little to profit even though they command a premium markup. A new standard would raise profits if the margin could be maintained,

but it is highly likely that instead the market would force the prices of the electronic fixtures down significantly and the margin would turn out to be lower after than before the standard. The third situation is the case where the margin is actually higher on magnetic fixtures because of lower costs for acquiring and installing the more mature magnetic technology. Here a new standard would substitute a lower margin revenue stream for a high one. Applying these rationales to the manufacturers that exhibit them allows a rough estimate of the change in cash flow of the standard case from the base case.

The aggregated "worst case" change in net present value for the four firms is negative in the range $9-18 million ($13.5± 4.5 million), assuming that the current premium margin for electronically ballasted luminaires remains constant in the base case. This is unlikely, however, as the recent trend has been toward parity in margins between electronic and magnetic. Assuming this convergence continues without a new standard, the negative impact on value would be less. If the convergence were to be complete by the implementation date of a new standard, the impacts attributed to price margin differences would disappear and the total impacts reduce to about one third of the "worst case", or negative $3-6 million.

In addition, 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. Also some luminaire manufacturers look to their ballast manufacturer allies to develop special ballast products for their luminaires, and to the extent that the ballast manufacturers are distracted by changes imposed by new standards, they cannot attend to technical assistance to luminaire manufacturers.

Some luminaire manufacturers also estimated significant costs associated with changes in product literature, business processes, product testing and evaluation, and information management systems required by new product offerings emanating from a new standard. These costs total approximately $1 million.

Thus a likely range of costs to luminaire manufacturers brought about by a new energy efficiency standard for ballasts is approximately $4-7 million.

Nearly all the manufacturers saw no significant impact on their employment levels as a result of a new standard. Their production levels would not change as much as profitability. No manufacturer suggested any quantitative employment impact.

6D. IMPACT ON LAMP MANUFACTURING INDUSTRY

6D.1 Introduction

Three major manufacturers, GE Lighting, OSRAM Sylvania, Inc., and Philips Lighting Company dominate the market for linear fluorescent lamps in the U.S. Together these three manufactureres serve approximately 90% of the market. As trade allies of the fluorescent ballast manufacturing industry, they may exerience 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.

The Department, through Arthur D. Little, Inc., initiated confidential discussions with lamp manufacturers to invite their views on how a new standard might affect their businesses.
One lamp manufacturer, OSRAM Sylvania, had suggested in a Department Workshop with other stakeholders that a new standard is not needed because the market is accomplishing the transition to more energy-efficient systems on its own. But if a new standard is promulgated in any case, it should apply the standard only to ballasts sold to luminaire manufactureres for the new construction and major rennovation markets. The OSRAM Sylvania proposal suggests that ballasts sold through distribution channels for the replacement and retrofit markets be exempt from the standard. The written proposal[7] and subsequent comment[8] provide the reasons for segmenting the market in this way. Briefly, the proposal indicates that magnetic ballasts are required to serve the replacement market because the existing 34W energy saver T12 lamp is incompatible with high frequency electronic ballasts, and that the retrofit market is focused on energy efficiency improvements and is already nearly 100% T8/electronic ballast systems. In addition, the need to accommodate a sudden transformation in the replacement market from T12 to T8 lamps could cause a negative impact on lamp manufacturers.

Arthur D. Little invited representatives from each of the other two major lamp manufacturers to discuss their reactions to the OSRAM Sylvania proposal, and 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 and a review of the literature.

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[7] "Response to Federal Register Notice October 30, 1998 seeking further comments on revised standards for fluorescent lamp ballasts", #34, Letter from Peter Bleasby, OSRAM Sylvania, to U.S. Department of Energy, December 14, 1998.

[8] "Response to Fluorescent Lamp Ballast Workshop, June 1, 1999", Letter from Peter Bleasby, OSRAM Sylvania to U.S. Department of Energy, June 21, 1999.

6D.2 Results

There was strong agreement that a new standard would accelerate the shift in market share from T12 to T8 lamps. Although any forecast of the quantitative impact of this shift depends to some extent on the assumptions made, an estimate of 45-50 million additional T8 lamps required to serve the 19 million additional electronic ballasts brought into service under a new standard effective 2003 is reasonable. This is about 1/3 the size of the entire current production of about 140 million lamps. The manufacturers further agreed that 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% of the 1998 market of 340 million T12 lamps and more than 8 times the size of the 35 million unit replacement market for T8 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. But to serve the increased replacement market at the same time would require acceleration in capacity expansion for T8 production and early retirement of T12 capacity, which cause severe economic penalties.

A new high-speed production line for T8 requires an investment of approximately $40 million for a 45-million lamp per year capacity. Early retirement of an equivalent capacity of T12 production would cost about half that amount assuming it is about 50% depreciated. Lamp manufacturing industry operating margins would not change much over the long run. As a first simplistic approximation, then, the cost to the lamp manufacturing industry to accommodate a new ballast standard is approximately $20±10 million, less the portion of that capacity serving the OEM luminaire manufacturers. The lamp manufacturers can serve this OEM market as a normal course of business given a 3-4 year lead-time. Currently about two thirds of T8 lamps serve the OEM market and one-third the replacement market. If this split remains the same, the lamp industry would experience a loss in value of about 1/3 x ($20±10) or $3.3-10 million. There would also be a cost for accelerating the T8 production capacity a number of years ahead of that required for supplying the replacement market at today's growth rate. This issue was not fully explored.

Since the total production of fluorescent lamps is not significantly affected by the proposed standard, employment impacts are limited to changes in productivity and are minimal across the industry.

In summary, the major cost to lamp manufacturers to accommodate a new energy efficiency standard is the early retirement of production capacity now dedicated to producing T12 lamps. The impact is approximately $3.3-10 million in lost industry value.

Several other issues were explored with the manufacturers.

- There was agreement on the incompatibility of T8 & T12
- Neither lamp will operate correctly on the opposing ballast. This makes the spot replacements of T8/electronic in an otherwise T12/magnetic installation a potential maintenance nightmare, because it is not obvious to subsequent lamp maintenance personnel

that the ballast within the luminaire has been changed. Furthermore, there is no market developed for T12 electronic ballasts because (1) it is not economically viable, and (2) there is a mismatch between electronic ballasts and the most popular 34 watt energy saving T12 lamp. Thus the replacement market should be allowed to replace magnetic ballasts with magnetic.

- There should be a general exemption where low EMI ballasts are needed or required. Some progress is being made toward solving electromagnetic interference problems, but new problems are being discovered as well.
- Exemptions should be made for low temperature and dimming applications.
- There was some disagreement about the residential exemption centered mainly on the extent of the problem of crossover by small commercial businesses and some contractors using residential fixtures in commercial applications. Although this probably would happen, some in the industry feel that this is a minor problem while others believe that if a new standard is to exempt residential applications, there should be some provision to see that the exemption is not abused. Restricting the exemption to fixtures with T8 lamps, however, is tantamount to removing the exemption in practice.