

US EPA ARCHIVE DOCUMENT

11.0 ECONOMIC IMPACT ANALYSIS (EIA)

11.1 RESULTS IN BRIEF

This section is not intended to present a full macroeconomic analysis of the impact of new standards on the U.S. economy as a whole. Rather, it is intended to portray potential impacts on various industries. Given the overall size of the U.S. economy and the estimated benefits and costs associated with the new standards, it is reasonable to expect the impact on the economy as a whole will be minor.

Results from analyses summarized in this chapter suggest the potential for a variety of economic impacts resulting from the application of the hypothetical control scenarios to attain the selected ozone and particulate matter (PM) standards, and meet the requirements of the proposed regional haze (RH) target program. For the selected PM standard, some establishments in 86 industries classified at the 3-digit SIC code level have an annual cost to sales percentage of at least 3 percent. For the selected ozone standard, some establishments in 25 industries classified at the 3-digit SIC code level have an annual cost to sales percentage of at least 3 percent. In general, there are a larger number of industries affected and a greater cost impact per industry for the PM-only alternatives compared to the ozone-only alternatives. Which specific industries or which establishments within these industries will actually be affected depends on the control strategy choices of the State and local level and therefore is difficult to predict with assurances of complete accuracy.

A very small proportion of establishments are potentially affected for most of the SIC codes affected by the selected ozone and PM standards and RH target program. For the selected PM standard, the estimated proportion of establishments potentially affected is 2.53 percent of all establishments in affected SIC codes, and 0.82 percent when estimated over establishments in all SIC codes. For the selected ozone standard, the estimated proportion of establishments

potentially affected is 0.13 percent of all establishments in affected SIC codes, and 0.05 percent when estimated over establishments in all SIC codes.

Results from an analysis of impacts to the electric power industry indicate that costs in 2010 from implementation of the 60 percent regional SO₂ cap are approximately \$2.6 billion; this is 1.30 percent of estimated electric power industry revenues in 2010. Price, closure estimates and employment impacts on this and other directly affected industries indicate the potential for a net gain in employment for industries directly affected by the regional SO₂ cap, but also the potential for closures of existing electric generation units that will likely be replaced by new more efficient electric generation units.

Impacts from an environmental protection industry model indicate that there is potential for a significant increase in revenues to a number of manufacturing industries including part of the air pollution control industry as a result of the changes to the NAAQS standards.

A characterization of small entity impacts predict some potential for negative impacts on small firms in a number of industries. However, these impacts will likely be mitigated by cost pass through to consumers, flexible implementation strategies when designed by the States, and new control technologies.

11.2 INTRODUCTION

This chapter summarizes results of the EIA associated with the alternative standards assessed in this regulatory impact analysis. The chapter provides information regarding the potential economic impacts associated with the hypothetical control strategy cost estimates presented in Chapters 6 , 7, and 8. Economic impacts on affected industries and source categories, consumers, and others are assessed.

The different analyses summarized in this chapter include:

- Screening Analysis. This consists of an annual control cost-to-sales ratio calculated for each industry or source category, as classified by 3-digit SIC code.
- Utility Industry Analysis. The Integrated Planning Model (IPM) is used to generate estimated economic impacts to electric utilities from applying control alternatives.
- Environmental Protection Industry Analysis. Potential pollution control industry impacts are assessed.
- Qualitative Market Impacts Analysis. Market data is employed to assess the potential incidence of control costs to affected industries versus consumers.
- Small Entity Impacts Analysis. Potential impacts on these entities are characterized using available economic and financial data.

The characterization of small entity impacts in this chapter does not represent a Regulatory Flexibility Analysis (RFA) as defined by the Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA). The PM and ozone National Ambient Air Quality Standards (NAAQS) and RH target program themselves do not impose requirements applicable to small entities. Refer to Chapter 2 for more details on why an RFA is not required for this rulemaking.

Economic impact estimates associated with the full attainment cost estimates presented in Chapter 9 are not computed in this analysis since these cost estimates are too speculative as input to economic impact estimation, and do not reflect estimates for selected control measures and potentially affected industries. The economic impacts associated with implementation of the PM and ozone national strategies, attainment of the current PM₁₀ and ozone standards, and the proposed RH target program also are not estimated in this analysis.

11.3 KEY CHANGES IN THE ECONOMIC IMPACT ANALYSIS FROM PROPOSAL RIA

This analysis builds on the economic impact analysis included within the December, 1996 RIAs for the PM and ozone NAAQS proposals. Key changes include:

- A qualitative market impact analysis is done using available price elasticities of demand and supply in order to provide information on potential economic impacts to affected consumers and producers.
- The Integrated Planning Model (IPM) is used to estimate economic impacts to the electric power industry from implementation of the 60 percent regional SO₂ cap.
- The Environmental Protection (EP) Industries economic model is used to estimate changes in revenues and employment for industries that provide goods and services for purposes of environmental protection.

11.4 SUMMARY OF AFFECTED INDUSTRIES

The purpose of the profile of affected industries is to summarize various market characteristics of economic sectors potentially affected by revisions to the PM and ozone NAAQS and the new RH rule. An industry profile provides information on economic sectors that may be valuable to the States for examining the impact of implementing the NAAQS and RH program. This information is background material for the screening, qualitative market and governmental entities analyses.

11.4.1 Types of Sources

The selected control measures cover stationary (point and area) and mobile (on-highway and nonroad) sources. These control measures cover both utility and non-utility point sources. The National Particulate Inventory (NPI) is the major source of information on the stationary and mobile sources covered in our analyses.

11.4.2 Stationary Point Sources

Point sources in the NPI are primarily facilities or establishments that emit 100 tons per year or more of one of the criteria air pollutants or precursors of such pollutants. The point source inventory also contains SIC codes for most of the facilities. For each of the incremental control measures, the Emission Reductions and Cost Analysis Model and the AirCost model [for sulfur dioxide (SO₂) costs] are used to identify all of the potentially affected facilities and their SIC codes. Additional information on stationary point sources is contained in the Industry Profile for Review of the NAAQS for PM₁₀ (U.S. Environmental Protection Agency, 1996a.)

11.4.3 Area Sources

The area source inventory accounts for stationary source emissions not included in the point source inventory. An area source is generally defined as a source that emits less than 100 tons per year of a criteria pollutant or precursors of such pollutants. In this inventory, the area sources are facilities or establishments that emit less than 100 tons per year of VOC, NO_x, PM, SO_x, and several PM precursors. They are identified either from the 1987 SIC Manual or from the National Emissions Inventory.

11.4.4 Mobile Sources

11.4.4.1 On-Highway Sources

The four types of on-highway sources are light-duty vehicles, medium-duty vehicles, heavy-duty vehicles, and light-duty trucks. The control measures reduce emissions of VOC and NO_x from these vehicles, and include fuel reformulations, new vehicle exhaust emission standards, and an enhanced inspection and maintenance (I/M) program. Additional information on these sources and control measures is available in the Industry Profile for Review of the NAAQS for PM₁₀ (U.S. Environmental Protection Agency, 1996a).

11.4.4.2 Nonroad Mobile Sources

Nonroad mobile sources include large compression ignition (diesel) engines, small recreational vehicle spark-ignition (gasoline) engines, and commercial marine vessels. Nonroad mobile source control measures include emission fees for commercial marine vessels, and reformulated gasoline and diesel fuel control measures for nonroad engines (U.S. Environmental Protection Agency, 1997a).

11.4.5 Industry Profile - Economic and Financial Data

Economic data used in estimating the potential economic impacts of implementing control measures associated with the PM and ozone NAAQS and the proposed RH target program follow the categorization established by the Standard Industrial Classification Manual 1987 (U.S. Office of Management and Budget, 1987). The data are reported by 3-digit SIC code, and include: the number of firms and establishments, employment, and sales revenue. The six major sectors are:

- Manufacturing;
- Agriculture, Mining, and Construction;
- Transportation, Communications, and Utilities;
- Wholesale and Retail Trade and Real Estate;
- Services; and
- Public Administration.

Additional information on the profile of affected industries is in section 1.0 of Appendix H .

11.5 SCREENING ANALYSIS

11.5.1 Introduction

Given the large number of SIC codes potentially affected, it is not feasible to develop a detailed economic profile and EIA for each industry potentially affected by one or more control measures employed in the cost analyses. It is possible, however, to conduct a screening analysis. A screening analysis calculates an annual average cost to sales percentage for each affected SIC code. The purpose of a screening analysis is to provide some signals of potential economic impacts, to show where more refined or detailed economic analysis may be warranted, and to eliminate the need for more extensive analysis of certain SIC codes, particularly in cases where the incremental cost impact is likely to be negligible. It does not, however, reflect any assumptions about specific impacts on a given establishment or type of establishment within an SIC code.

Perhaps the most comprehensive source of sales or revenue data is the 1987 Bureau of the Census' Enterprise Statistics (U.S. Department of Commerce, 1991a). This publication provides company, establishment, employment, and sales totals by employment size category (e.g., 101-200 employees) on a 2- and 3-digit SIC code level. Because the Enterprise Statistics data are not available for all potentially affected SIC codes (e.g., agricultural industries), this source was supplemented by other related Census publications (U.S. Department of Commerce, 1992).

Throughout this chapter, the term *establishment* is defined as a single physical location at which business is conducted or where services or industrial operations are performed. It is not necessarily identical to a *firm*, which may consist of one establishment or more. A *firm* is defined as a business consisting of one or more domestic establishments that the reporting firm specified under its ownership or control during the reporting year. *Employment* is defined as all employees (full-time and part-time) as reported on all establishment payrolls. The sales data reported in this chapter are on an establishment, rather than a firm level for two main reasons:

(1) the cost input data are provided on an establishment basis, and (2) establishment-level revenue data are available for more SIC codes than firm-level revenue data.

11.5.2 Methodology

An annual cost to sales percentage screening analysis is conducted to identify those industries or source categories potentially experiencing economic impacts as a result of imposition of the standard alternatives. Results of the screening analysis provide information regarding the potential severity of impacts on establishments in affected SIC codes.

This calculation, specifically, provides an indication of the magnitude of a price change that would have to occur in order for each industry to fully recover its annual control costs. The resulting ratio of cost to sales (revenues) represents the average price increase necessary for firms in the industry to recover the increased cost of environmental controls. If a price change in affected markets resulting from implementation of the standards is greater than the cost to sales percentage for affected establishments, then affected establishments will receive revenue in excess of the annual cost of control. The analysis was conducted at a 3-digit SIC code level because financial data are more often available at that level as compared to others.

In order to conduct the screening analysis, it is necessary to:

- Use the cumulative (i.e., the total) cost estimates for the control strategies used in the cost analysis to calculate annual average costs per source category or industry on an SIC code basis;
- Divide the annual average costs by the number of affected establishments in the SIC code to provide an annual average cost per affected establishment for each affected SIC code;
- Divide the average annual cost per establishment by the average sales or revenue per establishment in potentially affected industries for each affected SIC code;

The result is the annual cost to sales percentage for each affected SIC code.

The number of establishments are estimated differently depending on the type of emission source. For point sources, the number of affected establishments represents the number of unique plants affected by each control measure. For area and mobile sources, U.S. Environmental Protection Agency (EPA) data are obtained on the number of affected establishments by county and SIC code by projecting from State-level data reported in County Business Patterns (U.S. Department of Commerce, 1991b), since it is not possible to calculate the number of unique establishments affected by each area and mobile source control measure. Generally, the number of establishments in counties reported in County Business Patterns that are affected by control measures is used to estimate the number of affected establishments.

National sales data are available by 3-digit SIC code from the Bureau of the Census' Enterprise Statistics and related publications (U.S. Department of Commerce, 1992). Because of the broad scope of the PM and ozone NAAQS and proposed RH target program, average national sales are used. For each potentially affected SIC code, an estimate of national average sales per establishment is prepared and used as the denominator for each average annual cost to sales percentage calculated. The annual cost to sales percentage estimates reflect the cumulative (total) annual control costs associated with one or more control measures imposed on an industry or source category.

11.5.3 Results

Table 11.1 presents a summary of the number of industries with potential impacts for each standard analyzed and for annual cost to sales percentages of at least 0.01, 0.1, 1, 3, and 5 percent (U.S. Environmental Protection Agency, 1997b). The ozone or PM standard with the potential to affect the greatest number of industries is the PM_{2.5} 15/50 standard, which potentially affects 364 3-digit SIC codes. There are potentially 88 3-digit SIC codes with some affected establishments that have annual cost to sales percentages of at least 3 percent for this standard, and 72 with some affected establishments potentially having annual cost to sales percentages of at least 5 percent. For the selected PM standard, there are 361 3-digit SIC codes with some establishments potentially affected. 86 3-digit SIC codes with some potentially affected

establishments have annual cost to sales percentages of 3 percent or greater for this standard, and 67 with some potentially affected establishments have annual cost to sales percentages of 5 percent or greater. For the selected ozone standard, there are 260 3-digit SIC codes with some establishments potentially affected. 25 3-digit SIC codes with some affected establishments potentially have annual cost to sales percentages of 3 percent or greater for this standard, and 13 with some potentially affected affected establishments have annual cost to sales percentages of 5 percent or greater. In general, the PM standards potentially affect more industries than the ozone standards, and the control cost impacts are higher for the PM standards.

Results for the sequenced standards are presented in Table H.1 of Appendix H. The results represent sensitivity analyses for examining the economic impacts associated with a PM following ozone analysis and an ozone following PM analysis. These sensitivity analyses represent an upper bound for economic impacts to affected industries based on preliminary cost data. Although the preliminary cost data used in these sensitivity analyses do not represent the final and most accurate set of cost data, the results of these analyses may provide insight into the magnitude of the annual cost to sales percentages associated with the sequenced standards.

Table 11.1 Summary of the Number of 3 digit SIC Codes with Potential Economic Impacts for Ozone, PM, and Regional Haze Alternatives in the Year 2010
(Expressed as Average Annual Costs to Sales Percentages;
Control Costs and Sales Are in 1990\$)**

Alternative	Total No. of 3 digit SIC Codes Potentially Affected	3 digit SIC codes affected - 0.01 Percent or greater	3 digit SIC codes affected - 0.10 Percent or greater	3 digit SIC codes affected - 1 Percent or greater	3 digit SIC codes affected - 3 Percent or greater	3 digit SIC codes affected - 5 Percent or greater
Ozone .08, 5th	261	225	175	57	24	11
Ozone .08, 4th*	260	226	174	59	25	13
Ozone .08, 3rd	263	232	182	64	28	14
PM _{2.5} 16/65 (98th percentile)	358	195	167	101	71	50
PM _{2.5} 15/65* (98th percentile)	361	198	172	119	86	67
PM _{2.5} 15/50 (98th percentile)	364	208	179	120	88	72

* Represents alternatives that are the selected standards.

** For ozone, the proportion of establishments that are potentially affected ranges from 0.10 to 0.16 percent as a percentage of establishments in affected SIC codes across the three standards analyzed; for PM, the proportion of establishments that are potentially affected ranges from 1.51 to 2.57 percent as a percentage of establishments in affected SIC codes across the three standards analyzed.

A very small proportion of establishments are potentially affected for most of the SIC codes affected by the new ozone and PM standards and RH target program. For the ozone standards, the proportion of establishments potentially affected ranges from 0.10 to 0.16 percent of all establishments in affected SIC codes across the standards. For the PM standards, the proportion of establishments potentially affected ranges from 1.51 to 2.57 percent in affected SIC codes across the standards. When measured against establishments in all SIC codes, the proportion of establishments potentially affected ranges from 0.04 to 0.06 percent for the ozone standards, and 0.49 to 0.86 percent for the PM standards. Estimates of the proportion of potentially affected establishments for each ozone and PM standard analyzed are listed in Table H.2 of Appendix H.

The screening analysis indicates that many SIC codes may be impacted by the implementation of the selected measures, but many of the SIC codes affected may experience cost-to-sales percentages below 1 percent and have fewer than 1 percent of their establishments potentially affected. Based *only* on these ratios, and given that most establishments in these SIC codes are not potentially affected, impacts on most of the affected industries may not be substantial for the standards analyzed.

11.5.4 Limitations, Caveats, and Potential Biases

There are a number of assumptions and limitations to the screening analyses. They include:

- Assumptions and limitations specific to the cost inputs limiting the screening analyses include:
 - Detailed cost estimates are not prepared for each emissions source;
 - The analysis is not conducted at the firm level, the proper level for the analysis, since control cost data is only available at the establishment level;
 - Cost estimates are prepared at the average establishment level. The costs can not be estimated for establishments at the economic margin;

- Cost estimates are developed using information available through 1996; recent and future developments in technological innovation for pollution control through the 2010 analysis year could result in costs that are significantly lower than those utilized for this analysis.
- The average cost per plant shown for individual SIC codes affected by the area source fuel combustion and surface coating control measures does not differ because information is not available to identify specific costs for individual industries;
- Revenue (or sales) data used in these analyses represent national averages by industry. Average annual cost-to-sales percentages do not predict impacts on specific establishments;
- Because area and mobile sources are not individually inventoried, the actual number of establishments affected by these control measures is unknown. Generally, the number of establishments in affected counties that are reported in County Business Patterns (U.S. Department of Commerce, 1991b) is used to estimate the number of affected establishments;
- The lack of available input data preclude use of a general equilibrium model;
- Because of difficulties encountered in attempting to identify SIC codes for approximately 900 facilities in Oregon's point source inventory, these point sources are not included in the analysis;

11.6 UTILITY INDUSTRY IMPACTS

11.6.1 Introduction

The IPM (U.S. Environmental Protection Agency, 1996b) estimates cost impacts of regulatory control measures on the electric power industry (SIC 491). IPM also provides inputs to a separate spreadsheet model that estimates changes in employment to directly affected industries. It has been used to estimate cost impacts for various ozone precursor control strategies for the Ozone Transport Assessment Group (OTAG).

Electric power industry impacts assessed are potential price increases in electricity, closures of electric generation units, and employment shifts associated with control measures selected as

part of efforts to control SO₂ emissions 60 percent beyond that required to meet Title IV. That program is known as the 60 percent regional SO₂ cap.

11.6.2 Estimation of Electricity Price Increases

Electricity prices vary for each sector--residential, commercial, industrial, and transportation. The weighted average price for all of these sectors is reported as the average national electricity price in any year. In the past, these prices were largely derived from a cost-of-service pricing of power. State public service commissions set prices based on the costs for utilities to provide electricity and their need for a fair return on their investments to provide power.

In a competitive environment, pricing practices will be affected by the value of electricity to the customer, availability of alternatives, and supply availability in various areas of the country. Although it is clear that the electric power industry will want to pass on pollution control costs to consumers, how that may be done for different electric customers is unclear. As a simple way of considering potential average price increases resulting from this rulemaking, the annual incremental compliance costs of the 60 percent regional SO₂ cap are calculated as a percentage of the projected revenues or sales of the electric utilities in 2010. The methodology used here is similar to that employed in the screening analysis. Table 11.2 shows the cost to revenue percentage estimate. The incremental compliance costs for the electric power industry are estimated to be 1.3 percent of their projected revenues. Whether the electric utilities can fully recover these costs through an average price increase of this size will ultimately depend on the way the pricing of electric power is actually conducted by state utility commissions, the demand elasticities for different electricity demand sectors (residential, commercial, industrial), and the supply elasticities for newly competitive utility firms after deregulation occurs.

**Table 11.2. Incremental Pollution Control Costs^a
for the Electric Power Industry in 2010
as a Percent of Forecasted Revenues**

Forecast of Electricity Sales	3,590,763 million Kwh
Average Cost	6.4 cents/Kwh
Estimated Electricity Sales Revenues	\$209.88 billion
Incremental Pollution Control Costs	\$2.60 billion
Pollution Control Costs as a Percent of Revenues	1.30 percent

Note: Costs and Sales are in 1990\$.

The estimate of electricity revenues shown in Table 11.2 is developed by multiplying the forecasted sales for electric power to consumers in 2010 from the IPM by the average electricity price in 2010 forecasted in the Energy Information Administration's Annual Energy Outlook 1997, December 1996. Notably, this forecasted price by the Energy Information Administration only accounts for a part of the changes that are likely to occur through deregulation of the electric power industry. It is generally believed that electricity prices will fall as a result of deregulation. Therefore, the resulting estimate of future electricity revenues is likely to overstate the revenue that the industry will collect in 2010.

11.6.3 Closure of Electric Generation Units

The IPM considers which generation units are not economically efficient to operate in the future and retires them during the model run. The IPM reports the generation capacity that it closes during each simulation. The difference in closed generation capacity between the baseline for the revised NAAQS and the 60 percent regional SO₂ cap is the electric generation capacity that is estimated by the model to stop generating electricity due to implementation of the revised PM NAAQS. Closures that may occur in the baseline are not part of these estimates. In

^a As defined above in Section 1.

addition, these estimates only consider existing electric generation units whose costs may be fully depreciated at the time of closure.

Table H.3 in Appendix H provides a comparison of IPM model forecasts for operation (in terms of Gigawatt-hours), annual costs, and annual air emissions from the electric power industry for the baseline and for additional pollution controls selected as part of implementation of the 60 percent regional SO₂ cap. Results show that there is approximately the same electric generation capacity expected under the 60 percent regional SO₂ cap as compared to the baseline in the year 2010. This forecast is due to a predicted increase in combined-cycle natural gas unit capacity that is expected to offset a predicted decrease in coal steam and oil/gas steam generation capacity. Environmental gains result as new combined-cycle units are much more energy efficient than existing coal-fired and oil/gas steam units and produce less NO_x and negligible amounts of SO_x during their operation. These results do not predict changes in capacity for specific units.

11.6.4 Employment Changes

Employment changes that may occur due to the implementation of the 60 percent regional SO₂ cap are estimated. Implementation of the 60 percent SO₂ cap may lead to job losses in certain sectors and increases in others. To develop a general sense of the size of these employment shifts, a simple model is constructed to assess directly affected major sectors where there may be employment changes. Potential secondary or indirect impacts are not examined.

The analysis considers the following areas where impacts may directly occur:

- Closure of electric generation units;
- Changes in the mix of newly built electric generation capacity -- the building of new combustion turbines and combined-cycle units and the repowering of oil/gas steam and coal-fired units to combined-cycle natural gas units;

- Changes and additions to pollution control equipment installed and operated to control NO_x and SO_x emissions;
- Changes in coal demand, which affects the coal mining industry and transporters of coal, especially the railroads;
- Changes in natural gas demand, which affects the production, transmission, and distribution of natural gas.

Table H.4 of Appendix H shows results of EPA's analysis of the direct employment changes that may occur in 2010 as a result of the 60 percent regional SO₂ cap. A net increase in employment of 6,140 jobs overall is expected for the directly affected sectors listed above. Changes in employment in the sectors reported include potential employment changes in 2010 that may occur from providing fuels at different demand levels in 2010, as well as installation and operation of electric generation units and pollution control equipment. Results also include changes in employment that occur in operating the new mix of generation units, and pollution control equipment that is added at power plants before 2010 (but does not include employment changes associated with the installation of that equipment in earlier years).

Table H.5 of Appendix H provides details on the employment changes predicted to occur in the coal mining industry in the Eastern and Western regions of the U.S. due to changes in coal demand. Results from this table show there is a net decrease in jobs predicted for the coal mining industry alone, with reduction in jobs in the West offsetting an increase in jobs in that industry in the East. The predicted increases in Eastern coal mining employment result from the addition of scrubbers to many coal-fired electric generation units in the East to comply with the 60 percent regional SO₂ cap. Power plants that add scrubbers are expected to switch from Western to Eastern coals since Eastern coals are less expensive and can be used economically with scrubbers that remove 95 percent of sulfur from the relatively high sulfur content Eastern coal. Western coal mining industry employment losses are due to two factors: 1) the switch to Eastern coals by some coal-fired electric generation units and 2) the increased use of natural gas over coal in the electric power industry in the Eastern U.S. as a response to the 60 percent regional SO₂ cap.

11.6.5 Uncertainties, Limitations, and Potential Biases

There are several uncertainties, limitations, and potential biases inherent in these price, closures and employment change estimates. They include:

- The employment impact model does not take into account secondary or indirect employment impacts;
- The employment impact model relies on inputs of future coal use, natural gas demand, and capacity expansions and closures from IPM. Uncertainty exists associated with each of these inputs;
- The employment impact model does not consider the employment changes from the construction of new capacity (or losses from not constructing it) and only considers operating aspects of new capacity. There is no data readily available on labor inputs to construction of new electric generation capacity.

11.7 ENVIRONMENTAL PROTECTION ACTIVITIES

Even though an industry may bear a regulatory burden, the economic impact may be offset if other industries use its product in pollution control activities. For example, the potential direct economic impact associated with implementation of the ozone and PM NAAQS on the electric utility industry is likely to be negative. However, electricity is required to operate pollution control equipment used in other industries, and the electric utility industry will receive revenues from additional operation of pollution control equipment associated with the implementation of the ozone and PM NAAQS. Another example is that of the construction industry sector. The construction industry sector may experience negative economic impacts from compliance with the new NAAQS. However, the results of the environmental protection (EP) industry model show that the services of the construction industry sector may be in strong demand due to the capital expenditures required in other industries serviced by the construction sector as a result of the new NAAQS. Also, an additional source of revenue for the construction industry sector is from increased pollution control spending by governmental agencies associated with implementation of the new NAAQS. As a consequence, the net economic impact to the

construction industry sector could be positive. Similar comparisons can be made for other industries that the new ozone and PM NAAQS may potentially affect.

Results from a supplemental analysis using the Environmental Protection Activities Model (EP) are shown in Table H.6 of Appendix H. This analysis examines the potential revenues to affected industries associated with a sequenced standard (PM 15/50 followed by ozone .08, 3rd max.). This analysis is conducted using a preliminary set of control cost data and thus results are also preliminary. These results represent an upper bound estimate of impacts to affected industries since these results are based on the PM 15/50 and ozone .08, 3rd max. standards which are more stringent than the selected PM and ozone standards. Despite these limitations, results from this analysis may provide insight into the magnitude and/or direction of the revenues for industries affected by implementation of the ozone and PM NAAQS. For a more detailed discussion of the EP model and results from this assessment, see section 2.0 in Appendix H.

It is important to characterize the relationship of the analysis described above to the other analyses presented in this RIA. The revenues that are projected by this analysis reflect the fact that each purchase for pollution control has a buyer and seller. While a dollar spent by the purchaser of a control device or service is a cost, it is also revenue for the seller. This should not be confused with social cost which enters into a benefit-cost analysis. It is another element of the distributional analysis which focusses on the impacts of the costs incurred in meeting regulatory requirements. Revenue gain to the seller should not be confused with profit. In the long run in a competitive market, revenues for the good or service being sold will be offset by the costs of producing the good or service.

11.8 QUALITATIVE MARKET IMPACTS ASSESSMENT

11.8.1 Introduction

The control costs estimated for each standard in the hypothetical control strategy analysis represent estimates of the direct cost impact to establishments, but these estimates do not account for pass-through of costs to consumers or cost reductions due to other market adjustments. Depending on certain market characteristics, the proportion of incremental production costs that a firm can pass on to its consumers can vary widely. This qualitative market impact assessment provides an indication of the level of costs that may be passed through to consumers, thus providing an estimate of how the control costs associated with the control alternatives may be distributed between producers and consumers.

11.8.2 Methodology

The steps of the qualitative market impact analysis methodology are as follows (U.S. Environmental Protection Agency, 1997c):

(1) Select industries meeting the criteria of: a) annual cost to sales ratios for potentially affected establishments of at least 1 percent, and b) having 1 percent or more of their establishments impacted for the proposed ozone and PM_{2.5} alternatives (ozone .08, 3rd and the PM_{2.5} 15/50) into the qualitative market analysis. The choice of these selection criteria is meant to focus the qualitative market analysis on those industries predicted in this analysis to have possible cost impacts and enough establishments potentially affected to warrant attention for additional economic impact assessment.

The criteria listed in step (1) focus on selecting industries with a high likelihood of a price increase if the hypothetical control scenarios used in the control strategy analyses are directly adopted by the States. Fewer affected facilities coupled with high costs to sales percentages increases the likelihood of reduced profitability and closures because, all other things being

equal, cost pass through is less feasible for affected facilities if they constitute a small percentage of the overall market.

(2) Convert the annual cost to sales percentage for potentially affected establishments to an annual cost to sales percentage for all establishments. The conversion is accomplished by multiplying the estimate of the proportion of affected establishments in each industry by the annual cost to sales percentages estimated for these affected establishments. The resulting product is used as a proxy for the relative cost per output in each industry (as classified by 3-digit SIC code), a value that is used in quantitative market analyses to determine equilibrium price and production.

(3) Obtain estimated own-price elasticities of demand and supply for each of the industries that meet the screening criteria. These elasticities should be long-run estimates since the analysis estimates economic impacts for the year 2010.

(4) Compare the control cost to sales percentage for all establishments calculated in step (1) with the available demand and supply elasticities collected in step (3) and the percentage of affected establishments within an affected industry to qualitatively assess the likelihood of cost passthrough and the relative impact of control measure costs on directly affected industries.

Estimates of price elasticities of demand and supply are needed to assess cost pass through. The price elasticity of demand is a measure of the responsiveness of product demand to a change in price of a product. Likewise, the price elasticity of supply is a measure of the responsiveness of supply of a product to a change in its price.

Elasticity estimates are used when they are available to provide an indication of how much of the control costs borne directly by firms in affected industries can be passed on to consumers. For example, pollution control costs shift supply curves upward. If demand for products from affected producers is inelastic (i.e., the price elasticity of demand is less than 1), then there will be a large price increase that allows a large cost pass through to consumers. If demand for

products from affected producers is elastic (i.e., the price elasticity of demand is greater than 1), then price increases will not be as large resulting in a small pass through of costs. The smaller the price elasticity of demand, the greater the level of pass through to consumers, and vice versa, all other things being equal. The higher the price elasticity of supply, the greater the level of potential passthrough to consumers and therefore the lower the incidence of cost on producers, and vice versa, all other things being equal. If the supply curve is completely flat (i.e., the price elasticity of supply is very large), then there will be full cost pass through regardless of the size of the price elasticity of demand.

It should be noted that most of the products from industries directly affected by the selected control measures are intermediate products to the output of end-use products.

Use of other elasticities, such as cross-price elasticities and elasticities of substitution, is not possible due to the lack of available data.

11.8.3 Results

The results of this analysis are based on the relative lack of ability of producers to pass through costs to consumers. Thus, the higher the estimated incidence of control costs to producers compared to consumers, the higher the estimated impact.

For the limited sample of industries that have the needed data, there are some industries that have a relatively low potential ability to pass through increased control costs associated with the new NAAQS. Since this RIA is based on a hypothetical implementation scenario, the impacts may not occur. However, the information in Table H.7 through H.13 of Appendix H may be very useful as States design the actual implementation strategies to attain the NAAQS.

11.8.4 Uncertainties, Limitations, and Potential Biases

There are a number of uncertainties, limitations, and potential biases within this qualitative market analysis. They include:

- The distribution of costs is assumed to result in an average cost for a marginal establishment. This can lead to an under- or overestimate of cost and economic impacts;
- The assumption of all things being equal that underlies these elasticity estimates is weak. The control measures analyzed in this instance are applied across many different industries. There are many different changes in markets, including those for substitutes and compliments to products affected, occurring simultaneously. Most of these elasticity estimates are based on the assumption that the industry being regulated and its consumers are the only parts of the economy affected;
- Many of the estimates are over 20 years old. Most are not derived from rigorous statistical analyses. Changes in consumers' tastes and preferences over time may mean these estimates are no longer reliable indicators of consumers' behavior with regard to changes in prices;
- Elasticities are assumed to be constant across product prices and levels of output for a given 3-digit SIC code;
- Many of these elasticities are estimated assuming perfect competition in a single national/international market. For some industry sectors, however, markets may be regional. If this is the case, each region will be affected by the cost changes of establishments in that region and not by all establishments in the national/international market. Relative market impacts will therefore vary across regions depending on the locations of affected establishments.

11.9 SMALL ENTITY IMPACTS

11.9.1 Introduction

As explained in the preamble to the final rulemaking and in Chapter 2 of this RIA, the ozone and PM NAAQS and RH program will not impose any regulatory requirements on small entities. Any such requirements would arise from subsequent State regulatory actions. As a result, EPA is not required to conduct a Regulatory Flexibility Analysis under the Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act (RFA/SBREFA).

Nonetheless, EPA has conducted a more limited analysis of the potential impact on small entities of possible State strategies for implementing any new or revised NAAQS in order to provide relevant information to the States as they prepare implementation strategies. The results of this analysis are presented below.

11.9.2 Methodology for Characterization of Potential Impacts

Small entity impacts are characterized as follows (U.S. Environmental Protection Agency, 1997c):

- 1) Once the annual cost to sales percentages are computed in the screening analysis described above in section 11.5, revenue data for small firms and revenue data for all firms is collected for those affected industries that have an annual cost to sales percentage of 1 percent or greater for the selected PM standard (PM_{2.5} 15/65). The percentage of revenues from small firms in an affected industries having cost to sales percentages of 1 percent or greater is then computed. Conforming to Agency practices, small firms are defined according to the Small Business Administration (SBA) definitions (U.S. Environmental Protection Agency, 1997d). Definitions based on annual revenues, number of employees, or production capacity, and the SBA definitions are listed in Table H.13 of Appendix H. This data, along with estimates of the percentage of establishments potentially affected, are presented for industries affected for the selected PM standard.
- 2) Strategies to mitigate potential small entity impacts are then presented. Many of these have been implemented in various areas in the U.S.

11.9.3 Results

Table H.14 in Appendix H contains data on the 119 industries classified by 3-digit SIC codes affected by the PM 15/65 standard with an annual cost to sales percentage of 1.0 percent or above. This data provides some indication of the proportion of establishments in an affected industry that potentially may be impacted, and the likelihood of significant small business impacts in affected industries. This information may be of value to the States as they develop implementation strategies to attain the new ozone and PM NAAQS.

11.9.4 Uncertainties, Limitations, and Potential Biases

- It is not possible to differentiate costs for small establishments from large establishments for those establishments affected by area and mobile source control measures. Therefore, this small entity impact characterization assumes the same percentage magnitude of direct impact from area and mobile source control measures on affected smaller firms in an industry as affected larger firms.
- It is necessary to aggregate small firm revenue data at the 2-digit SIC code level rather than at the 3-digit SIC code level for some industries to derive a small business revenue estimate at the 3-digit SIC code level. This is due to a lack of small firm revenue data for the affected 3-digit SIC codes inside these 2-digit SIC codes. This occurs in 8 2-digit SIC codes.

11.9.5 Mitigation of Small Entity Impacts

Control measures employed in the cost analyses provide estimates of average incremental costs, not marginal costs. Except in the case of some point source control measures, these average costs do not take into account differences in production capacity (or scale effects). So the same cost of control is applied to each affected entity in a source category, regardless of its size or other important factors. Many sources in the emission inventory may qualify as small entities under the SBA size standards, though this information is not available in the emissions inventory used for this analysis. In order to meet the ozone standard, it is possible that States may require sources to apply traditional pollution control technology or retrofit existing

traditional pollution control technology. Since add-on controls can be capital-intensive, the capital recovery or the fixed component of the annual cost may be a high percentage of the total annual pollution control cost. Small entities, all other factors being equal, generally have less capital available for purchase of add-on pollution control technology than large entities. In addition, the control cost per unit of production for small entities will likely be higher than for large entities due to economies of scale. Thus, control measures requiring the use of add-on control technology may cause small entities affected by State rules to experience disproportionate economic impacts compared to large entities if no strategies to mitigate potential small entity impacts are available for implementation by States.

The analysis of the potential economic impacts of the selected control measures indicates that some small entities may be adversely impacted by implementation of the new NAAQS and RH target program. Actual impacts will depend on which strategies States decide to use to achieve needed reductions in emissions. However, potential impacts can be lessened and sometimes avoided through the use of flexible implementation strategies. Consequently, EPA is encouraging States to exercise regulatory flexibility for small entities when developing strategies to meet the standards adopted today.

While some States may need to turn to small businesses for emission reductions, small businesses will likely be among the last sources States will choose to control. States may consider controls on small businesses only if such businesses are a significant part of an area's nonattainment problem and attainment cannot be reached through application of all available cost-effective measures to major sources. To the extent States consider controlling small businesses, EPA believes there are many ways States can mitigate the potential adverse impacts those businesses might experience. For example, States could choose to exempt or apply less stringent requirements to small businesses. Examples of such exemptions can be seen in existing EPA air-toxic standards for the printing, hazardous waste, and pharmaceutical industries. In these rules, EPA exempted small facilities or facilities with relatively low air emissions, or reduced the recordkeeping and monitoring burdens for affected facilities. States could also extend the effective date for control requirements for small businesses to 2010 or later.

Reductions needed earlier before the effective date would be obtained from other sources, perhaps using the Clean Air Investment Fund approach described below or through the use of innovative technologies. In addition, applying the most cost-effective control technologies first would tend to exclude small sources which often are not very cost-effective to control. States could also choose to apply control requirements to other businesses first, before requiring them for small businesses.

“Clean Air Investment Funds,” described in greater detail in Chapter 9.5.1 above, could be established to enable small businesses to purchase emission credits. Sources facing costs greater than a certain amount (e.g., \$10,000 per ton) would have the option to contribute the amount of the cut-off to the Fund, rather than install expensive emission controls. The Fund could then purchase needed reductions from more cost-effective sources. As described in Chapter 9.2 above, States may need to rely on existing and emerging technologies to attain the standards. If a state cannot demonstrate that it will attain the standard based on all reasonably available controls, examples of which are included in Chapters 5 and 9, the State may rely on innovative technologies as the basis for the remainder needed to reach attainment. EPA believes where States can provide the appropriate assurances that such innovative technologies will be available to be implemented in sufficient time for the area to attain the standard, EPA may accept a submittal similar to the type identified in CAA section 182(e)(5).

The EPA and States also will continue to provide compliance assistance to small businesses through compliance assistance centers and issuance of compliance guidelines designed specifically for small businesses.

Some small businesses are likely to benefit from the NAAQS implementation strategies. Many suppliers of air pollution control technologies which control ozone and fine particulate precursor emissions are small businesses who will likely benefit from implementation of the new standards.

Small businesses also may benefit from these implementation strategies if the increase in their product prices resulting from costs associated with implementation strategies exceed the increase in their costs per unit of production.

11.10 GOVERNMENTAL ENTITIES ANALYSIS

11.10.1 Introduction

This governmental entities assessment, along with the administrative costs assessment in Chapter 10, is not an unfunded mandates analysis (see Chapter 2), since the PM and ozone NAAQS and the RH target program do not impose requirements upon governmental entities. This section provides an illustration of the potential impacts of the control measures used in the cost analysis on affected government entities.

11.10.2 Results

Federal establishments potentially affected by PM or ozone control measures include military installations, sources in Federally managed permit programs on Tribal lands and on the Outer Continental Shelf (OCS), Federal prisons, regional electric power organizations (e.g., the Tennessee Valley Authority (TVA)), and other Federally owned or leased buildings and compounds. Federal buildings and compounds generally do not produce the type of emissions which would fall under the scope of the selected standards. As described in Chapter 4 above, electrical power sources are included in the baseline for the control cost analysis. These sources are not part of this chapter's definition of ozone sources, but power generating utilities are included in the emissions inventory. Few Federal prisons fall under the scope of these NAAQS. The number of Tribal and OCS potentially affected are also small. Thus, most of the Federal sources potentially affected are military installations.

Non-Federal sources or establishments include industrial point source, mobile source, and area source emissions. A number of State-owned establishments are identified in the

hypothetical control strategy analysis. These sources are incorporated in the non-Federal source category under the assumption they would require similar technical services from contractors as would a privately owned source of pollution.

Control measures identified as affecting Federal, State, and county-owned establishments include point, area, and mobile source measures. A list of these control measures is in Table H.15 of Appendix H. There is some potential for PM area and mobile source control measures to impact county governments and other governmental entities, while there is little potential for ozone precursor control to impact governmental entities. The actual number of governmental entities affected by PM and ozone area and mobile source measures is unknown, since area and mobile sources are not identified by individual source in the emissions inventories.

11.10.5 Uncertainties, Limitations and Potential Biases

The limitations of the governmental entities assessment include:

- The actual number of governmental entities affected by ozone precursor and PM area and mobile source measures is unknown, since area and mobile sources are not identified by source in the emissions inventories.

11.11 ENVIRONMENTAL JUSTICE

Executive Order 12898 (2/16/94), “Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations,” requires that each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minorities and low-income populations (Federal Register, 1994).

Since the actual distribution of economic impacts from these standards will depend on the specific implementation strategies employed by States, it is not possible to rigorously assess environmental justice concerns in this analysis. It is anticipated, however, that the costs

associated with these standards will likely be spread widely across various industries and many consumers nationwide; whereas, the benefits from these standards will likely be concentrated in urban areas with high concentrations of minority and low-income populations.

11.12 REFERENCES

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