APPENDIX H

ECONOMIC IMPACT ANALYSIS SUPPORTING INFORMATION

1.0 SUMMARY OF PROFILE OF AFFECTED INDUSTRIES

1.1 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 RH rule follow the categorization established by the *Standard Industrial Classification Manual 1987* (Office of Management and Budget [OMB], 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.

The data referred to in this section are presented primarily on a 3-digit SIC code level. For eight industries this data is not available at the 3-digit SIC code level, and the data for these industries is presented at the 2-digit SIC code level.

The sales data referred to in this chapter were projected to 2010 production levels for consistency with the cost data that will be used in the EIA. Industry-specific growth factors were obtained from the Bureau of Economic Analysis (BEA).[4] Revenue data were also

converted to 1990 price levels using the 1987-1990 gross domestic product (GDP) implicit price deflator (DOC, 1992).[5]

1.2 MANUFACTURING

The Industry Profile for the Review of the PM_{10} NAAQS presents the number of establishments, firms, and employees in a given SIC code for each manufacturing industry that may incur costs associated with one or more of the selected control measures. It also presents average revenue per establishment by SIC code.

1.3 AGRICULTURE/MINING/CONSTRUCTION

Establishment and revenue data are not available by employment size category for SIC codes in the agricultural production sector (2-digit SIC codes 01 and 02). The Census of Agriculture also reports the average revenue per farm for all farms, and the average revenue per farm for farms with less than $500,000 revenue from agricultural products sold. This data is available
in the Industry Profile for the Review of the PM_{10} NAAQS.

1.4 AGRICULTURAL SERVICES, FORESTRY, MINING, AND CONSTRUCTION INDUSTRIES

The Industry Profile for the Review of the PM_{10} NAAQS contains establishment, firm, employment, and revenue data for the industries in the agricultural services, forestry, mining, and construction sectors that are potentially affected by the PM, ozone, and regional haze control measures examined. The sources that were used to obtain this data include *County Business Patterns, Census of Mining Industries,* and *Census of Construction Industries.*

Revenue data are not available for the agricultural service and forestry SIC codes (i.e., 07 and 08). Because of this limitation, payroll data were used as a surrogate for revenue data.

However, it should be noted that the use of payroll data as a surrogate for revenue data will likely underestimate revenues.

1.5 TRANSPORTATION, COMMUNICATIONS, AND UTILITIES

The Industry Profile for the PM_{10} NAAQS present the available Census data for the industries in the transportation, communications, and utility sectors potentially affected by the PM control measures examined. The 1992 data were converted to 2010 production levels and 1990 prices using the 1992 to 2010 BEA growth factor for the appropriate SIC code and the GDP implicit price deflator between 1990 and 1992.

1.6 WHOLESALE AND RETAIL TRADE AND REAL ESTATE, SERVICES

The Industry Profile for the PM_{10} NAAQS contains data for the wholesale trade, retail trade, and real estate sectors that were summarized from data published in *Enterprise Statistics*, the *1987 Census of Retail Industries*, and the *1992 Census of Financial, Insurance, and Real Estate Industries*. The 1992 data were converted to 2010 production levels and 1990 prices using the appropriate 1992-2010 BEA growth factor and the GDP implicit price deflator between 1990 and 1992. The Industry Profile also presents the establishment, firm, employment, and revenue data that were available from the Bureau of the Census for potentially affected SIC codes in the services sector. Individual publications used in developing the data were: *Enterprise Statistics 1987 Census of Service Industries*, and *1990 County Business Patterns*.

1.7 PUBLIC ADMINISTRATION

The Bureau of the Census publishes annual budget data for States and counties by government function (e.g., highways, public safety).

The Industry Profile for the Review of the PM_{10} NAAQS displays estimated expenditures in 2010 for affected government agencies. Except for SIC code 962, the list of agencies affected is

based on the SIC codes listed with emissions sources in the NPI that are potentially affected by the PM, ozone, and RH control measures examined. Control of paved and unpaved road emissions directly impacts SIC code 962– Regulation and Administration of Transportation Programs. For control measures affecting point sources identified with SIC code 971–National Security, revenue data are presented on a national level only because the Federal government is the entity directly impacted.

1.8 REFERENCES

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U.S. Department of Commerce, Bureau of the Census. *1987 Census of Retail Trade: Establishment and Firm Size.* RC-87-S-1. Washington, DC. Issued April 1990.

Table H.1 Summary of the Number of SIC Codes with Potential Economic Impacts for the Sequenced Ozone and PM Alternatives in the Year 2010 (Expressed as Average Annual Costs to Sales Ratios; Control Costs and Sales are in 1990$)

Alternative	Total No. of SIC Codes Potentially Affected	SIC Codes Affected - 0.01 Percent or Greater	SIC Codes Affected - 0.1 Percent or Greater	SIC Codes Affected - 1 Percent or Greater	SIC Codes Affected - 3 Percent or Greater	SIC Codes Affected - 5 Percent or Greater
Ozone 0.08, 3rd max. following $PM_{2.5}$ 15/50	379	273	224	134	84	61
$PM_{2.5}$ 15/50 following Ozone 0.08, 3rd max.	364	215	191	130	93	75

Table H.2 Percentage of Potentially Affected Establishments in 3 digit SIC Codes Potentially Affected by the Ozone and PM NAAQS, and in All Establishments Nationwide

Standard	Percentage of Establishments Potentially Affected out of All Establishments in Potentially Affected SIC Codes	Percentage of Establishments Potentially Affected out of All Establishments Nationwide
Ozone		
0.08, 5th max.	0.10	0.04
0.08, 4th max**	0.13	0.05
0.08, 3rd max.	0.16	0.06
PM		
16/65	1.51	0.49
15/65***	2.53	0.82
15/50	2.57	0.86

* Establishment counts reflect annual cost to sales percentages of 0.01 percent or higher
** Represents selected ozone standard
*** Represents selected PM standard

Comparison of the Integrated Planning Model's Forecast of the Operating Characteristics, Costs and Emissions of the Electric Power Industry from 2000 to 2010 under the Base Case and Further Controls under the New NAAQS

Table H.3 of this appendix provides a comparison of the IPM forecasts for operation, costs, and air emissions from the electric power industry from 2000 to 2010 for the Base Case and for additional pollution controls under the new National Ambient Air Quality Standards (NAAQS). The Base Case has a cap-and-trade program providing summer season reductions in NOx emissions in the 37 states that are in the Ozone Transport Assessment Group (OTAG). The scenario with added pollution controls increases the emissions reductions of SOx beyond the current CAAA Title IV requirements. See Section 11.6 for details.

The table shows the differences in the two cases of the operation of existing generation capacity, new capacity additions, and pollution retrofits that occur over time. These results appear under sections 10, 11, and 12 of the table. To assist the review of the table in these sections a key to the abbreviations is provided below:

Abbreviation	**Term**
MW	Megawatt
IGCC	Integrated Gasification Combined Cycle (Coal Gasification Technology)
CC	Combined-Cycle Natural Gas
Ret.	Retrofit
O/G	Oil/Gas Steam Unit
SCR	Selective Catalytic Reduction Technology (Post-Combustion NOx Control)
SNCR	Selective Non-Catalytic Reduction Technology (Post-Combustion NOx Control)
Carbon Inj/CI	Carbon Injection Technology for Mercury Control
GWh	Gigawatt Hours (Million kilowatt hours)

Table H.3 Comparison of the Integrated Planning Model's Forecast of the Operating Characteristics, Costs, and Emissions of the Electric Power Industry from 2000 to 2010 under the Base Case and Further Controls under the new NAAQS

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
1. Reserve Margin Capacity (MW)	705,321	702,636	745,244	745,168	801,549	801,549
Plus Firm Purchases (MW)	22,262	22,262	22,262	22,262	22,262	22,262
Plus Transmission (MW)	-	-	-	-	-	-
Total Reserve Margin Capacity (MW)	727,583	724,898	767,506	767,430	823,811	823,811
2. Peak Load (MW)	593,184	593,184	640,202	640,202	688,958	688,958
Less DSM(MW)	-	-	-	-	-	-
Plus Firm Sales (MW)	19,962	19,962	19,962	19,962	19,962	19,962
Plus Transmission Out (MW)	-	-	-	-	-	-
Net Demand (MW)	613,146	613,146	660,164	660,164	708,920	708,920
3. Reserve Margin (%)	19	18	16	16	16	16
4. Generation (GWh)	3,306,624	3,304,206	3,597,954	3,595,938	3,914,411	3,911,231

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
Inter-Region Transmission (Gwh)	(11,232)	(10,309)	(11,549)	(9,923)	(10,428)	(8,719)
Pumping & Storage Losses (Gwh)	9,189	7,694	11,768	11,377	13,800	12,328
Plus Purchases (Gwh)	-	-	-	-	-	-
Less Sales (Gwh)	-	-	-	-	-	-
5. Total Supply for Demand (Gwh)	3,286,202	3,286,202	3,574,637	3,574,638	3,890,183	3,890,183
6. Projected Demand (Gwh)	3,286,203	3,286,203	3,574,638	3,574,638	3,890,183	3,890,183
Energy Not Served (Gwh)	-	-	-	-	-	-
Net Demand (GWh)	3,286,203	3,286,203	3,574,638	3,574,638	3,890,183	3,890,183
7. Dumped Energy (Gwh)	(1)	(1)	(1)	-	-	-
8. Total Supply for Demand (Gwh)	3,286,203	3,286,203	3,574,638	3,574,638	3,890,183	3,890,183
Less T&D Losses (Gwh)	252,933	252,933	275,133	275,133	299,420	299,420
9. Total Sales (Gwh)	**3,033,269**	**3,033,269**	**3,299,504**	**3,299,504**	**3,590,763**	**3,590,763**

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
Capacity Avoided Costs (US$/kW/a)	14	16	34	35	23	21
10. Capacity by Plant Type (MW)						
Scrubbed Coal	58,454	51,896	33,875	27,067	27,233	26,781
Unscrubbed Coal	111,732	133,017	41,394	105,169	22,990	69,709
Oil/Gas Steam	107,080	103,359	94,324	96,073	52,873	46,358
Nuclear	97,086	97,086	94,452	94,452	88,065	88,065
Hydroelectric	76,255	76,255	76,292	76,292	76,292	76,292
Combined Cycle (CC) Gas	22,946	22,946	51,976	61,808	106,608	136,682
IGCC	-	-	-	-	-	-
Turbine	54,159	54,338	71,677	64,726	79,320	60,219
Renewables	10,274	10,274	10,274	10,274	10,275	10,277
Pump Storage	21,069	21,069	21,069	21,069	21,069	21,069
Imports	11,200	11,200	11,200	11,200	11,200	11,200
Ret. Coal-CC	-	-	-	-	1,060	2,250
Ret. O/G-CC	-	-	-	-	34,117	33,620
Ret. Coal-IGCC	-	-	-	-	-	-
Ret. Scrubber	-	1,312	-	1,312	-	1,312
Ret. SCR	14,009	9,130	86,903	34,004	103,856	34,080
Ret. SNCR	114,338	81,068	134,909	95,387	141,607	98,629
Ret. SCR+Scrub	636	11,390	636	18,435	636	37,735

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
Ret. SNCR+Scrub	-	10,854	-	15,688	-	22,625
Ret. Gas Reburn	2,362	-	2,362	-	2,362	-
Ret. O/G SCR	13,361	17,083	23,698	21,889	31,662	34,323
Total	**714,962**	**712,277**	**754,922**	**754,846**	**811,227**	**811,227**
11. Capacity Additions and Changes by Plant Type (MW)						
Scrubbed Coal	-	-	-	-	-	-
Unscrubbed Coal	-	-	-	-	-	-
Oil/Gas Steam	-	-	-	-	-	-
Nuclear	-	-	-	-	-	-
Hydroelectric	-	-	-	-	-	-
Combined Cycle (CC) Gas	-	-	28,005	37,837	54,632	74,873
IGCC	-	-	-	-	-	-
Turbine	10,791	10,970	39,114	31,983	12,150	-
Renewables	-	-	-	-	2	3
Pump Storage	-	-	-	-	-	-
Imports	-	-	-	-	-	-
Ret. Coal-CC	-	-	-	-	1,060	2,250
Ret. O/G-CC	-	-	-	-	34,117	33,620
Ret. Coal-IGCC	-	-	-	-	-	-
Ret. Scrubber	-	1,312	-	-	-	-
Ret. SCR	14,009	9,130	72,894	24,874	16,953	76

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
Ret. SNCR	114,338	81,068	20,570	14,319	6,783	3,243
Ret. SCR+Scrub	636	11,390	-	7,045	-	19,300
Ret. SNCR+Scrub	-	10,854	-	4,834	-	6,936
Ret. Gas Reburn	2,362	-	-	-	-	-
Ret. O/G SCR	13,361	17,083	10,337	4,810	8,006	12,468
Total	**155,500**	**141,809**	**170,920**	**125,703**	**133,703**	**152,769**
12. Generation by Plant Type (Gwh)						
Scrubbed Coal	401,864	368,328	238,055	198,502	199,427	196,850
Unscrubbed Coal	587,710	692,677	234,154	599,179	128,385	326,240
Oil/Gas Steam	189,828	193,732	148,258	152,020	33,307	28,355
Nuclear	640,836	640,836	613,324	613,324	565,867	565,867
Hydroelectric	276,632	276,632	276,735	276,735	276,735	276,735
Combined Cycle (CC) Gas	95,244	110,819	291,838	380,051	556,858	759,409
IGCC	-	-	-	-	-	-
Turbine	18,499	21,691	39,318	31,244	37,398	23,070
Renewables	80,984	80,984	80,984	80,984	80,984	80,984
Pump Storage	7,116	5,958	9,113	8,810	10,687	9,547
Imports	37,900	37,900	37,900	37,900	37,900	37,900
Ret. Coal-CC	-	-	-	-	7,663	15,332
Ret. O/G-CC	-	-	-	-	244,747	229,758

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
Ret. Coal-IGCC	-	-	-	-	-	-
Ret. Scrubber	-	9,595	-	9,771	-	9,771
Ret. SCR	99,943	66,780	634,014	252,480	760,326	251,637
Ret. SNCR	789,262	561,764	915,088	643,064	913,213	602,239
Ret. SCR+Scrub	4,654	83,312	4,740	137,310	4,740	281,063
Ret. SNCR+Scrub	-	79,392	-	116,852	-	167,380
Ret. Gas Reburn	14,006	-	12,636	-	8,628	-
Ret. O/G SCR	62,105	73,764	61,797	57,710	47,545	49,092
Total	3,306,624	3,304,206	3,597,954	3,595,938	3,914,411	3,911,230
13. Capacity Factor by Plant Type (%)						
Scrubbed Coal	79	81	81	81	81	81
Unscrubbed Coal	60	59	65	65	64	53
Oil/Gas Steam	20	21	18	18	7	7
Nuclear	75	75	74	74	73	73
Hydroelectric	41	41	41	41	41	41
Combined Cycle (CC) Gas	47	55	64	70	60	63
IGCC	N/A	N/A	N/A	N/A	N/A	N/A
Turbine	4	5	6	6	5	4
Renewables	90	90	90	90	90	90
Pump Storage	4	3	5	5	6	5

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
Imports	39	39	39	39	39	39
Ret. Coal-CC	N/A	N/A	N/A	N/A	83	78
Ret. O/G-CC	N/A	N/A	N/A	N/A	82	78
Ret. Coal-IGCC	N/A	N/A	N/A	N/A	N/A	N/A
Ret. Scrubber	N/A	84	N/A	85	N/A	85
Ret. SCR	81	84	83	85	84	84
Ret. SNCR	79	79	77	77	74	70
Ret. SCR+Scrub	84	84	85	85	85	85
Ret. SNCR+Scrub	N/A	84	N/A	85	N/A	85
Ret. Gas Reburn	68	N/A	61	N/A	42	N/A
Ret. O/G SCR	53	49	30	30	17	16
Average	**53**	**53**	**54**	**54**	**55**	**55**
14. Total Annual Electric Generation Production Costs (1995$, MMUS$)*						
Variable O&M	2,687	2,997	2,955	3,403	3,139	3,965
Fixed O&M	19,095	19,175	19,547	19,638	19,588	19,888
Fuel	34,316	34,534	36,538	36,448	38,239	38,474
Capital (Levelized Estimate)	641	1,069	3,859	4,523	8,237	9,923
Total	**56,739**	**57,776**	**62,899**	**64,011**	**69,204**	**72,249**
15. Emissions						
SO_2	10,491	7,529	471	268	9,861	5,250
NOx (1,000 tons)-Annual	4,077	4,051	957	16	3,768	3,572

	Year 2000		Year 2005		Year 2010	
	Base Case	**New NAAQS**	**Base Case**	**New NAAQS**	**Base Case**	**New NAAQS**
NOx (1,000 tons)- Summer	-	-	-	-	-	-
CO_2 (1,000,000 Tons)	2,104	2,002	211	161	2,276	2,159
Carbon (1,000,000 Tons)	549	546	603	589	621	589
Mercury (Tons)	62	58	66	61	65	55

* Costs accounted for included those that relate to dispatch and determination of incremental costs above the base case. Some production costs that are not necessary for that calculation are not estimated in the model.

Table H.4 - Employment Changes in 2010 Associated with the 50 Percent Regional SO_2 Cap

Job Sector/Activity	Employment Changes (in 1,000 jobs)
Electric Generation Units	(1.42)*
Pollution Controls for Electric Generation Units	5.23
Coal Mining	(1.20)
Coal Transportation	(3.25)
Natural Gas Production	6.78
Net Total	**6.14**

* - Parentheses denote a negative change, or job losses.

Table H.5 Employment Changes in 2010 in Eastern and Western United States Coal Production Associated with the 50 Percent Regional SO_2 Cap

Area	Employment Changes (in 1,000 jobs)
Eastern United States	0.37
Western United States	(1.57)
Entire United States	**(1.20)**

* - parentheses denote a negative change, or job losses.

2.0 OVERVIEW OF THE EP INDUSTRY I-O MODEL

The environmental protection (EP) industry input-output (I-O) model identifies the production and service activities that constitute environmental protection (EP) activities in the U.S. economy. The identification of these activities is accomplished by decomposing the 1982 benchmark I-O table (U.S. Department of Commerce, BEA, 1984 and 1991) for the United States into EP and non-EP.[1] At the time the model was developed, this was the most recent economic census years for which benchmark I-O tables had been compiled. The 1982 EP I-O table was updated to 1985, 1988, and 1991 by assuming that the expenditure patterns for the various pollution abatement processes remained constant over time.

The EP I-O tables characterize the sectors whose output is used to comply with environmental regulations as well as the sectors that demand EP goods and services. Summing down the column of the EP I-O table for each industry identifies the sectors that demand EP goods and services, while summing across the row of the EP I-O table for each industry identifies which goods and services are purchased to perform EP activities (i.e. the goods and services that serve as inputs to EP activities). In addition, the EP I-O tables classify EP activities according to the following five categories: external EP activities, internal EP activities, fixed capital formation for EP, household EP activities, and government EP activities.

External EP activities refers to establishments in which EP constitutes the main or secondary production activity. The key identifying characteristic of external EP activities is that they are delivered to other establishments, or a third party. External EP activities are represented as separate rows and columns in an I-O matrix. In Diagram 1, the entries depicted by the shaded column (n+1) represent the dollar value of the products purchased as intermediate inputs from other sectors in the economy by the external EP activities sector. The corresponding shaded row

[1]For details regarding construction of the EP I-O tables and limitations of the model see U.S. EPA, 1995a and 1995b.

in Diagram 1 represents the dollar value of the external EP activities that other industries purchase for use as an intermediate input.

Internal EP activities are for the establishment in which they are produced. Internal EP activities are ancillary activities analogous to administration or research and development activities. Internal EP activities are measured by inputs purchased for and combined as pollution abatement activity by a polluting industry and includes intermediate inputs and value added. Internal EP activities are not separated from the main activities of an establishment, and in this I-O framework, are accounted for by separating out that portion of total inputs used by polluting industries for pollution abatement. This adjustment is reflected by X_{ij}^{EP}, which represents intermediate inputs used for EP activities, in Diagram 1. The residual, X_{ij}^{NE}, represents intermediate inputs used for non-EP activities. Total value-added consists of value-added associated with EP activities, V_{ij}^{EP}, and value-added associated with non-EP activities, V_{ij}^{NE}.

The category **fixed capital formation for EP** represents the accumulation of fixed assets for EP and corresponds to gross private domestic investment in the I-O format. As an example, the purchase of a scrubber represents the accumulation of capital for air pollution abatement.

In addition, two other types of EP activities are performed in the United States. These are **EP activities performed by households and government**. Household and government EP activities are like EP investment activities in that they are represented by an adjustment to final demand in the I-O framework. Household, investment, and government EP activities are embodied in final demand, depicted by the adjustment Y_j^{EP} in Diagram 1. Final demand expenditures for non-EP activities are reprsented by Y_j^{NE}.

Application of the EP Industry I-O Model

To adjust for the assumption that all capital expenditures occur in one year (2010), annualized capital costs were used as a proxy for capital expenditures in a single year. For

sectors where annualized capital costs were not reported separately, total annualized costs were disaggregated into annualized capital and operation and maintenance (O&M) costs. When capital expenditures were reported separately for one 3-digit industry within a 2-digit SIC category, then the fraction of capital expenditures in total annualized costs was applied to all other 3-digit industries within the 2-digit category. When capital costs were reported separately for more than one 3-digit industry, then average fraction of capital costs in total costs was applied to all remaining 3-digit industries. When capital expenditures were reported separately for no 3-digit industries within a 2-digit category, an industry-wide average was applied.

To determine which goods and services are purchased, a generic air pollution control capital expenditures spending pattern (from the EP industry report) was applied to the capital expenditures estimates. For O&M expenditures, the O&M expenditure pattern for each sector for the 1991 input-output table in the EP Industry report was used.

In addition, the following additional assumptions were made:

- In the EP industry study, no expenditures were assigned to I-O 25 (Transportation and Warehousing) in 1991 so an average of the expenditure pattern for all of the other sectors was used.

- For the electric utility sector (I-O 27), fuel-switching costs were excluded.

- The unassigned costs for SIC 49 and the joint sector emissions were assigned to the Electric Utilities (I-O 27).

- The unassigned cost of SIC 37 were assigned to Motor Vehicles (I-O 21).

- SIC 348 was assigned to the Other Transportation sector (I-O 22).

- Government expenditures (SIC 90s) were assumed to follow the pattern for Non-defense Federal Government expenditures. The 1982 input-output table was used to generate an expenditure pattern for Non-defense Federal Government expenditures.

To estimate EP employment in 2010, data on employment and payroll for manufacturing in 1990 from the *1991 Annual Survey of Manufactures* were used to estimate the cost per worker in 1990. An estimate for the cost per worker in 2010 was generated by assuming that real wages increase by 2.56 percent each year between 1990 and 2010. Dividing the estimates of the expenditures on employees generated by the EP I-O table by the estimate of the cost per worker in 2010 yielded an estimate of EP employment.[1] The employment associated with internal EP expenditures is 16,279 and the employment associated with government EP expenditures is 10,249. These estimates are fairly consistent with the estimates generated by the EP industry report. For example, direct EP employment in 1991 was 741,186 while total annualized EP expenditures in 1991 (in 1991 dollars) were roughly $134 billion. This gives an EP employment to EP expenditure ratio of about .0000055. For these calculations an expenditure figure of about $6.6 billion was used and the estimate of employment of 26,528 gives an EP employment to EP expenditure ratio of .000004.

EP employment is likely to be underestimated since the calculations did not include expenditures for Nonclassifiable Establishments, Transportation Control Package, and Enhanced I/M. These expenditures, totalling roughly $156 million, did not correspond to any of the EP I-O sectors. Multiplying the $156 million of omitted expenditures by the 1991 EP employment to expenditure ratio (.0000055) indicates that EP employment may be underestimated by as much as 861 employees.[2]

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[1] Essentially, it was assumed that wages increase at the same rate as labor productivity. According to the U.S. Bureau of Labor Statistics, labor productivity index numbers (output per unit of labor for all of manufacturing) were 37.3 in 1949 and 113.4 in 1993. This corresponds to an annual compound growth rate of labor productivity of approximately 2.56 percent between 1949 and 1993.

[2]This assumes that the 1991 ratio and not the one generated in this study (.000004) is the correct one. Using the ratio generated in this study indicates that EP employment is underestimated by 623 individuals.

Table H.6 lists the types of good and services purchased, as a percent of total expenditures.

Limitations of the Approach

The estimates presented above are driven by the expenditure patterns used to allocate capital and operating and maintenance expenditures to specific I-O categories. These expenditure patterns were derived from dated and, oftentimes, incomplete engineering studies. This posed difficulties for estimating EP activities for years beyond 1982 in the original EP industry study, since this required assuming that the expenditure patterns for the various pollution abatement processes remained constant over time. Since the estimates presented above are for 2010, they are implicitly base on the assumption that expenditure patterns will remain unchanged for about 30 years.

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Figure H-1: The I-O Framework Modified to Display the EP Industry

TO / FROM	1	2	. . .	n	(n+1)	Y	X
1	$X_{11}^{NE}+X_{11}^{EP}$	$X_{12}^{NE}+X_{12}^{EP}$	. . .	$X_{1n}^{NE}+X_{1n}^{EP}$	$X_{1(n+1)}$	$Y_1^{NE}+Y_1^{EP}$	$X_1^{NE}+X_1^{EP}$
2	$X_{21}^{NE}+X_{21}^{EP}$	$X_{22}^{NE}+X_{22}^{EP}$		$X_{2n}^{NE}+X_{2n}^{EP}$	$X_{2(n+1)}$	$Y_2^{NE}+Y_2^{EP}$	$X_2^{NE}+X_2^{EP}$
.	.			.	.	.	.
.	.			.	.	.	.
.	.			.	.	.	.
n	$X_{n1}^{NE}+X_{n1}^{EP}$	$X_{n2}^{NE}+X_{n2}^{EP}$	. . .	$X_{nn}^{NE}+X_{nn}^{EP}$	$X_{n(n+1)}$	$Y_n^{NE}+Y_n^{EP}$	$X_n^{NE}+X_n^{EP}$
(n+1)	$X_{(n+1)1}$	$X_{(n+1)2}$	. . .	$X_{(n+1)n}$	$X_{(n+1)(n+1)}$	Y_{n+1}	X_{n+1}
V	$V_1^{NE}+V_1^{EP}$	$V_2^{NE}+V_2^{EP}$	. . .	$V_n^{NE}+V_n^{EP}$	V_{n+1}		
X	$X_1^{NE*}+X_1^{*EP}$	$X_2^{NE*}+X_2^{*EP}$	. . .	$X_n^{NE*}+X_n^{*EP}$	X_{n+1}		

Table H.6: Goods and Services Purchased by Type of EP Activity (as a fraction of total expenditures)

SIC codes	EP Industry I-O Sector	Internal EP Activities	Fixed Capital Formation (Investment)	Government EP Activities
011-085	1.Agriculture, forestry, and fisheries	0.0000	0.0000	0.0977
101-149	2.Mining	0.0000	0.0000	0.0075
152-179	3.Construction	0.0727	0.5870	0.1055
201-209	4.Food and kindred products	0.0000	0.0000	0.0232
211-214	5.Tobacco manufactures	0.0000	0.0000	0.0000
221-229	6.Textile mill products	0.0163	0.0150	0.0003
231-239	7.Apparel and other textile products	0.0000	0.0000	0.0003
241-249	8.Lumber and wood products	0.0000	0.0000	0.0001
251-259	9.Furniture and fixtures	0.0000	0.0000	0.0010
261-267	10.Paper and allied products	0.0000	0.0000	0.0019
271-279	11.Printing and publishing	0.0000	0.0000	0.0039
281-289	12.Chemicals and allied products	0.0120	0.0000	0.0034
291-299	13.Petroleum refining	0.0000	0.0000	0.0030
301-308	14.Rubber and plastic products	0.0000	0.0000	0.0014
311-319	15.Leather and leather products	0.0000	0.0000	0.0000
321-329	16.Stone, clay and glass products	0.0698	0.0000	0.0009
331-339	17.Primary metals	0.0000	0.0000	0.0020
341-349	18.Fabricated metal products	0.0000	0.0500	0.0034
351-359	19.Machinery, except electrical	0.0139	0.0720	0.0126
361-369	20.Electrical machinery	0.0000	0.0330	0.0203
371	21.Motor vehicles	0.0000	0.0000	0.0020
372-379	22.Other transportation equipment	0.0000	0.0000	0.0458
381-387	23.Instruments	0.0000	0.0280	0.0096

SIC codes	EP Industry I-O Sector	Internal EP Activities	Fixed Capital Formation (Investment)	Government EP Activities
391-399	24.Miscellaneous manufacturing	0.0000	0.0000	0.0008
401-478	25.Transportation and warehousing	0.0000	0.0370	0.0096
481-489	26.Communication	0.0000	0.0000	0.0127
491,493	27.Electric utilities	0.2282	0.0000	0.0071
492	28.Gas utilities	0.0115	0.0000	0.0015
501-573, 591-599	29.Trade	0.0000	0.0000	0.0148
602-653	30.Finance, insurance and real estate	0.0416	0.0000	0.0264
494-497, 581, 701-874	31.Other Services	0.2994	0.0000	0.1566
919-972	32.Government enterprises	0.0000	0.0000	-0.0010
part of 16-17	33.New sewer system facilities	0.0000	0.0000	0.0000
part of 16-17	34.Maintenance and repair of sewer system facilities	0.0000	0.0000	0.0000
494,4952	35.Water supply ("environmental")	0.0000	0.0000	0.0000
494,4952	36.Sewerage Systems	0.0000	0.0000	0.0000
495 (except 4952),496-497,part of 493	37.Solid Waste Management	0.0000	0.0000	0.0000
35646	38.Selected industrial air pollution control equipment	0.0000	0.1780	0.0000
	39.Noncomparable imports and scrap	0.0000	0.0000	0.0130
	40.Government industry	0.0000	0.0000	0.4181
	41.Other industry	0.0000	0.0000	-0.0060
	Payments to Employees	0.2346	0.0000	0.0000

SIC codes	EP Industry I-O Sector	Internal EP Activities	Fixed Capital Formation (Investment)	Government EP Activities
	Total	1.0000	1.0000	1.0000

NOTES

For reference, the total dollar values for these three EP activity categories are, respectively:
internal EP activities : $3.25 billion, capital expenditures: $2.22 billion, and government expenditures: $1.15 billion.

There are no external or household EP activities associated with these expenditures.

In generating these patterns, the expenses associated with Nonroad Engine Heavy Duty Retrofit ($8,193,930) seems to be most closely related to automotive repair shops and services, so these expenditures are assigned to Other Services (I-O 31). The expenses associated with Nonclassifiable Establishments (SIC 999--$1,291,000), Transportation Control Package ($12,570,000) and High Enhanced I/M ($141,773,000) are excluded due to the difficulty associated with assigning these expenditures to SIC codes.

I-O sectors 39-41 are special industries in the I-O table and do not correspond to any SIC codes. Government Industry (I-O 40) represents payments to government employees.

Explanatory Preface to Tables H.7 and H.8

The purpose of the cost-to-sales percentage analysis, the results of which are used in the selection criteria of industries for the qualitative market impact analysis, is to identify the most significant potential impacts for potentially affected establishments within each SIC code. In reviewing the analysis, it is useful to keep in mind that a high cost-to-sales percentage does not necessarily indicate the potential for significant impacts to an entire affected industry, since only a small percentage of establishments in the industry may be potentially affected. In fact, the number of establishments potentially affected by control measures generally represent a small component of the total industry.

It is also important to interpret the cost-to-sales results that are used in the selection criteria of industries for the qualitative market impact analysis with the understanding that the results are reported for potentially affected establishments and do not represent the average cost-to-average sales percentage across all establishments in an SIC code (i.e., both those identified as potentially affected and not potentially affected). A separate report presents the total costs and total revenue by control alternative across all establishments in each potentially affected SIC code. (See *Summary of Costs by SIC Code for Integrated Implementation of the Ozone and PM NAAQS*.) Because cost and revenue data are shown across all establishments in each SIC code, rather than for potentially affected establishments as in the cost-to-sales analysis, the summary of total costs by SIC code documented in the *Summary of Costs by SIC Code* often indicates very different results.

Finally, it is important to understand that the cost to sales analysis results, and therefore the qualitative market impact analysis results, can not accurately predict the actual year 2010 economic impacts resulting from implementation of the new NAAQS by the States. Instead, the purpose of the cost to sales and qualitative market impact analyses is to identify potentially significant economic impacts so that states can design implementation strategies to avoid any such impacts. In that regard, these analyses may be useful to States in their efforts to develop control strategies that minimize potentially adverse economic impacts.

Table H.7 Industries Meeting Selection Criteria for Qualitative Market Impact Analysis for the Ozone 0.08, 4th Max. Standard

SIC Code	SIC Description	Number of Establishments in Industry	Estimated Number of Establishments Potentially Affected	Percentage of Total Establishments Potentially Affected	Average Annual Cost-to-Sales Percentage
102	Copper Ores	47	2	4	29.3
109	Miscellaneous Metal Ores	319	4	1	2.3
141	Dimension Stone	190	1	1	1.6
144	Sand and Gravel	4,650	27	1	1.1
227	Carpets and Rugs	428	6	1	4.2
251	Household Furniture	10,102	60	1	3.5
282	Plastics Materials and Synthetics	1,365	25	2	1.2
284	Soap, Cleaners, and Toilet Goods	4,575	331	7	1.4
285	Paints and Allied Products	1,418	453	32	1.8
287	Agricultural Chemicals	1,736	70	4	4.2
324	Cement, Hydraulic	225	15	7	24.1
341	Metal Cans and Shipping Containers	1,009	146	14	4.7
343	Plumbing and Heating, Except Electric	1,499	18	1	33.1
359	Industrial Machinery, NEC	43,325	717	2	2.0
458	Airports, Flying Fields, & Services	2,777	29	1	12.8
494	Water supply	3,237	143	4	1.1

Table H.8 Industries Meeting Selection Criteria for Qualitative Market Impact Analysis for the $PM_{2.5}$ 15/65 Standard

SIC Code	SIC Description	Number of Establishments in Industry	Estimated Number of Establishments Potentially Affected	Percentage of Total Establishments Potentially Affected	Average Annual Cost-to-Sales Percentage
011	Cash Grains	405,008	6,394	2	1.4
013	Field Crops (except cash grains)	250,338	2,519	1	2.2
019	General Farms, Primarily Crop	48,847	660	1	3.5
08	Forestry	1,798	562	31	50.0
103	Lead and Zinc Ores	36	2	6	24.1
109	Miscellaneous Metal Ores	319	4	1	1.6
141	Dimension Stone	190	22	12	17.4
142	Crushed and Broken Stone	3,495	207	6	16.2
144	Sand and Gravel	4,650	62	1	4.9
147	Chemical and Fertilizer Minerals	231	6	3	57.1
149	Miscellaneous Nonmetallic Minerals	304	3	1	18.1
152	Residential Building Construction	113,986	14,696	13	17.4
153	Operative Builders	10,396	543	5	6.2
154	Nonresidential Building Construction	37,432	7,320	20	6.1
161	Highway and Street Construction	8,476	77	1	6.1
162	Heavy Construction (except highway)	20,299	989	5	5.1
204	Grain Mill Products	4,971	46	1	13.5
206	Sugar and Confectionery Products	2,142	14	1	2.8
207	Fats and Oils	1,128	7	1	1.8
242	Sawmills and Planing Mills	12,598	146	1	6.1
249	Miscellaneous Wood Products	6,980	43	1	4.4
262	Paper Mills	328	68	21	1.5
263	Paperboard Mills	225	24	11	1.4
281	Industrial Inorganic Chemicals	2,835	46	2	7.2
283	Drugs	2,630	14	1	2.6
286	Industrial Organic Chemicals	1,818	55	3	1.5
287	Agricultural Chemicals	1,736	12	1	9.0
295	Asphalt Paving and Roofing Materials	2,627	79	3	3.1
299	Misc. Petroleum and Coal Products	979	7	1	68.2
301	Tires and Inner Tubes	145	8	6	1.9
321	Flat Glass	124	1	1	1.1
322	Glass and Glassware, Pressed or Blown	1,008	12	1	8.2
324	Cement, Hydraulic	225	27	12	19.0
325	Structural Clay Products	1,183	15	1	3.8
328	Cut Stone and Stone Products	773	5	1	39.6
329	Misc. Nonmetallic Mineral Products	3,196	41	1	10.4
331	Blast Furnace and Basic Steel Products	2,588	51	2	16.6
332	Iron and Steel Foundries	2,392	20	1	1.9
333	Primary Nonferrous Metals	348	22	6	5.5
341	Metal Cans and Shipping Containers	1,009	12	1	4.8
343	Plumbing and Heating, Except Electric	1,499	16	1	40.6
359	Industrial Machinery, NEC	43,325	2,868	7	2.0
423	Trucking Terminal Facilities	147	1	1	6.2
491	Electric Services	4,934	121	2	5.8
496	Steam and air-conditioning supply	74	12	16	35.0
806	Hospitals	6,327	56	1	1.1
822	Colleges and Universities	2,973	43	1	10.0

Table H.9 Relative Market Impacts of SIC Codes for which Demand and Supply Elasticities Were Identified: Ozone 0.08, 4th Max. Alternative

SIC CODE	COST-TO-SALES PERCENTAGE ACROSS ALL INDUSTRY ESTABLISHMENTS	DEMAND ELASTICITY	SUPPLY ELASTICITY	NOTES ON ESTIMATED MARKET IMPACTS
324 (Cement, Hydraulic)	1.61	-0.9	7.0	This industry has greatest impact potential of industries in this table due to the substantially higher costs for this industry; however, impacts will be attenuated due to the cost pass-through potential associated with the combination of slightly inelastic demand and very elastic supply
102 (Copper Ores)	1.25	-0.5	0.7	Along with SIC code 285, this industry has the 2nd greatest impact potential of industries in this table; although costs are higher than SIC code 285, there is significantly more ability for costs to be passed-through to consumers given inelastic demand
285 (Paints and Allied Products)	0.56	-1.4	1.0	Along with SIC code 102, this industry has 2nd greatest impact potential of industries in this table; although costs are lower than SIC code 102, impacts are likely to be similar because of the relative lack of cost pass-though potential resulting from elastic demand
287 (Agricultural Chemicals)	0.17	-1.5	1.0	Industry impacts are expected to fall into the middle of the range of impacts for industries in this table; although this industry's elasticity figures seem to indicate the smallest cost pass-through potential, costs fall into the middle range of costs in this table
109 (Misc. Metal Ores)	0.03	-0.7	0.5	Along with SIC codes 251 and 282, this industry has the least impact potential of industries in this table; although inelastic demand points toward greater cost pass-through than those SIC codes, the significantly lower supply elasticity for this industry may completely counteract this effect
251 (Household Furniture)	0.02	-3.4	8.8	Along with SIC code 109 and 282, this industry has the least impact potential of industries in this table; quantity change is expected to be large relative to the cost increase due to the combination of very elastic demand and supply; this combination makes cost pass-through difficult to determine
282 (Plastic Materials)	0.02	-1.7	3.3	Along with SIC code 109 and 251, this industry has the least impact potential of industries in this table; quantity change is expected to be large due to combination of very elastic demand and supply; this combination makes cost pass-through difficult to determine

Table H.10 Relative Market Impacts of SIC Codes for which Demand and Supply Elasticities Were Identified: $PM_{2.5}$ 15/65 Standard

SIC CODE	COST-TO-SALES PERCENTAGE ACROSS ALL INDUSTRY ESTABLISHMENTS	DEMAND ELASTICITY	SUPPLY ELASTICITY	NOTES ON ESTIMATED MARKET IMPACTS
152 (Residntl. Bldg. Const.)	2.24	-1.1	3.0	This is one of three industries (see SIC codes 103 and 324) with greatest impact potential - 2nd highest costs, attenuated to a lesser degree than SIC code 324 by cost pass-through
324 (Cement, Hydraulic)	2.28	-0.9	7.0	This is one of three industries (see SIC codes 103 and 152) with greatest impact potential; highest cost industry impacts attenuated by cost pass-through potential associated with slightly inelastic demand/ and very elastic supply (producers' response greater than consumers' response)
103 (Lead and Zinc Ores)	1.34	-0.5	0.1	This is one of three industries (see SIC codes 152 and 324) with greatest impact potential because of combination of relatively high costs and lack of producer response to cost increase due to very inelastic supply
262 (Paper Mills)	0.31	-1.1	1.2	Impacts likely to fall at the high-end of the middle of range for industries in this table (although costs are lower than SIC code 331, potential for cost pass-through to customers is greater)
333 (Primary Nonferrous)	0.35	-0.8	1.2	Impacts likely to fall at the high-end of the middle range for industries in this table due to the combination of relatively high costs and pass-through potential (inelastic demand, elastic supply)
331 (Blast Furn./Basic Steel)	0.33	-1.9	1.2	After SIC codes 324, 152, and 103, this industry has the greatest impact potential (very elastic demand denotes low cost pass-through potential)
263 (Paperboard Mills)	0.15	-1.6	1.2	Impacts likely to fall in the middle of range for industries in this table; mid-level costs, and cost pass-through potential is smaller than for most other industries
287 (Agricultural Chemicals)	0.06	-1.5	1.0	Impacts likely to fall at the low-end of the range for industries in this table; relatively low costs but cost pass-through potential is smaller than for most other industries in table
019 (General Farms)	0.05	-0.5	0.8	Impacts likely to fall at the low-end of the range for industries in this table; relatively low costs and significant cost pass-through potential given inelastic demand
109 (Misc. Metal Ores)	0.02	-0.7	0.5	Impacts likely to fall at the low-end of the range for industries in this table; lowest costs and cost pass-through potential given inelastic demand
011 (Cash Grains)	0.02	-0.3	0.4	Along with SIC code 013, this industry has the lowest impact potential because of combination of lowest cost and relatively large cost pass-through potential due to inelastic demand
013 (Field Crops)	0.02	-0.7	1.0	Along with SIC code 011, this industry has the lowest impact potential because of combination of lowest cost and relatively large cost pass-through potential due to inelastic demand and unitary supply elasticity
332 (Iron & Steel Foundries)	0.02	-0.7	0.5	Impacts likely to fall at the low-end of the range for industries in this table; lowest costs and cost pass-through potential given inelastic demand

Table H.11 Relative Market Impacts for SIC Codes for which Only Demand Elasticities Were Identified: Ozone 0.08, 4th Max. Alternative

SIC CODE	COST-TO-SALES PERCENTAGE ACROSS ALL INDUSTRY ESTABLISHMENTS	DEMAND ELASTICITY	SUPPLY ELASTICITY	NOTES ON ESTIMATED MARKET IMPACTS[1]
341 (Metal Cans/Containers)	0.68	-0.2	n/a	This is one of three industries (see SIC codes 284 and 458) with the greatest impact potential; substantially higher costs are estimated for this industry, however, based on very inelastic demand, impacts may be significantly attenuated by cost pass-through potential
343 (Plumbing and Heating)	0.40	-0.2	n/a	Impacts of 2nd highest cost industry will be significantly attenuated by very inelastic demand, which facilitates cost pass-through to consumers; impacts may fall in the middle range of industry impacts in table (depending on supply elasticity)
458 (Airports & Services)	0.13	-1.2	n/a	This is one of three industries (see SIC codes 284 and 341) with the greatest impact potential; costs are higher than most in this table, and elastic demand constrains cost pass-through potential
284 (Soap & Toilet Goods)	0.10	-3.0	n/a	This is one of three industries (along with SIC codes 341 and 458) with greatest impact potential, although costs fall in the middle range, cost pass-through is substantially restrained due to highly elastic demand
348 (Ordnance)	0.09	-0.2	n/a	Impacts for this industry are likely to fall in the middle range of industries in this table, costs are somewhat lower than most, and cost pass-through potential is large due to very inelastic demand
227 (Carpets and Rugs)	0.06	-1.5	n/a	Impacts for this industry are likely to fall in the middle range of industries in this table; costs are relatively low, but elastic demand constrains cost pass-through potential
494 (Water Supply)	0.05	-0.1	n/a	Along with SIC codes 349 and 359, this industry has least impact potential; while costs are relatively low, cost pass-through potential is high
349 (Misc. Fabricated Metal)	0.05	-0.2	n/a	Along with SIC codes 494 and 359, this industry has least impact potential; while costs are relatively low, cost pass-through potential is high
359 (Ind. Machinery, nec)	0.03	-0.5	n/a	Along with SIC codes 349 and 494, this industry has least impact potential; while costs are relatively low, cost pass-through potential is high

[1]Impact assessments in this table are more speculative than those based on both demand and supply elasticity information.
n/a - not available

Table H.12 Relative Market Impacts of SIC Codes for which Only Demand Elasticities Were Identified: $PM_{2.5}$ 15/65 Standard

SIC CODE	COST-TO-SALES PERCENTAGE ACROSS ALL INDUSTRY ESTABLISHMENTS	DEMAND ELASTICITY	SUPPLY ELASTICITY	NOTES ON ESTIMATED MARKET IMPACTS[1]
High-Impact Potential (Relative to Other Industries in Table)				
080 (Forestry)	15.63	-0.9	n/a	This industry has the greatest impact potential because substantially higher costs are estimated for this industry; slightly inelastic demand indicates that cost pass-through potential is neither great nor small
496 (Steam & A/C Supply)	5.68	-1.2	n/a	This industry has the 2nd greatest impact potential, given its much higher costs than other industries, and the presence of elastic demand constraining the ability of producers to pass their costs onto consumers
154 (Nonresid. Bldg. Const.)	1.19	-1.0	n/a	Impact potential is relatively high due to 3rd highest cost and unitary demand elasticity
299 (Misc. Petrol. & Coal)	0.49	-0.4	n/a	Impact potential is relatively high based on relatively high cost, although cost-through potential is large given inelastic demand
343 (Plumbing and Heating)	0.43	-0.2	n/a	Impact potential is relatively high based on relatively high cost, however, impacts are lessened due to large cost pass-through potential indicated by inelastic demand
153 (Operative Builders)	0.32	-1.0	n/a	Potential impact is relatively high due to unitary demand elasticity and relatively high cost incidence
328 (Cut Stone Products)	0.26	-1.0	n/a	Given its higher than average costs and the pass-through potential associated with unitary demand elasticity, this industry has a relatively high impact potential
162 (Heavy Const-Nonhigh.)	0.25	-1.0	n/a	Potential impact is relatively high due to unitary demand elasticity and relatively high cost incidence
Middle-Impact Potential (Relative to Other Industries in Table)				
161 (High. & Street Const.)	0.06	-0.9	n/a	Impacts for this industry are expected to fall in the middle-range of industries in this table; basis for this assessment is the slightly lower than middle-range cost and a demand elasticity near unity
204 (Grain Mill Products)	0.13	-0.1	n/a	Impacts for this industry are estimated to fall in the middle range of industries in this table based on the combination of higher than middle-range cost and the large potential for cost pass-through associated with the most inelastic demand in this table
359 (Industrial Machinery)	0.13	-0.5	n/a	Impacts for this industry are predicted to fall on the high-end of the middle range of industries in this table due to the higher than middle-range cost and the potential for cost pass through to consumers
281 (Indus. Organic Chem.)	0.12	-0.2	n/a	Impacts for this industry are estimated to fall in the middle range of industries in this table; basis for this ranking is the middle-range costs and inelastic demand, which facilitate cost pass-through to consumers
301 (Tires and Inner Tubes)	0.11	-1.2	n/a	Impacts for this industry are estimated to fall on the high-end of the middle range of industries in this table due to the middle-range costs and relatively small potential for cost pass-through due to elastic demand
822 (Colleges & Universities)	0.14	-0.6	n/a	Impacts for this industry are predicted to fall on the high-end of the middle range of industries in this table; basis for this estimate is same costs as SIC code 491, but with much less elastic demand

SIC CODE	COST-TO-SALES PERCENTAGE ACROSS ALL INDUSTRY ESTABLISHMENTS	DEMAND ELASTICITY	SUPPLY ELASTICITY	NOTES ON ESTIMATED MARKET IMPACTS[1]
295 (Asphalt Paving/Roofing)	0.09	-0.4	n/a	Impacts for this industry are predicted to fall in the middle range of industries in this table; basis for this estimate is the middle range cost estimate and the cost pass through potential associated with inelastic demand
329 (Misc. Nonmetallics)	0.13	-0.8	n/a	Impacts for this industry are expected to fall on the high-end of the middle range of industries in this table due to the higher than middle-range cost and the potential for cost pass-through indicated by demand elasticity near unity
491 (Electric Services)	0.14	-1.9	n/a	Impact potential is relatively high; although cost incidence falls into the middle range, very elastic demand indicates low cost-pass through potential
322 (Glass and Glassware)	0.10	-2.6	n/a	Impacts for this industry are estimated to fall on the high-end of the middle range of industries in this table due to the middle-range costs and small potential for cost pass-through due to very elastic demand
242 (Saw & Planing Mills)	0.07	-0.2	n/a	Impacts for this industry are predicted to fall on the low-end of the middle-range of industries in this table because of slightly lower than middle-range cost and inelastic demand, which facilitates cost pass-through to consumers
Low-Impact Potential (Relative to Other Industries in Table)				
399 (Misc. Manufacturers)	0.06	-0.6	n/a	This industry has impact potential relative to other industries in this table because of low cost and significant pass through potential associated with inelastic demand
341 (Metal Cans/Containers)	0.06	-0.2	n/a	Impacts for this industry are predicted to fall on the low-end of the middle-range of industries in this table because of the slightly lower than middle-range cost and inelastic demand, which facilitates cost pass-through to consumers
325 (Structural Clay Prods.)	0.05	-1.0	n/a	Impacts for this industry are expected to fall in the middle-range of industries in this table; basis for this assessment is the lower than middle-range cost and a unitary demand elasticity
423 (Truck Terminal Facils.)	0.04	-1.0	n/a	This industry has a relatively low impact potential; basis for this assessment is relatively low cost incidence and unitary demand elasticity
286 (Ind. Organic Chem.)	0.04	-0.8	n/a	Impacts for this industry are predicted to fall in the middle-range of industries in this table because of lower than middle-range cost and only slightly inelastic demand
207 (Fats and Oils)	0.01	-0.2	n/a	Along with SIC code 206, this industry has the least impact potential of industries in this table; basis for this ranking is the low cost and the large potential for cost pass-through associated with very inelastic demand
806 (Hospitals)	0.01	-1.7	n/a	This industry has very low impact potential relative to industries in this table; basis for this assessment is the low cost and relative lack of cost pass-through potential due to relatively high demand elasticity
321 (Flat Glass)	0.01	-1.0	n/a	This industry has very low impact potential relative to industries in this table; basis for this assessment is the second lowest demand elasticity associated with the lowest cost in this table
206 (Sugar & Confectionery)	0.02	-0.1	n/a	Along with SIC code 207, this industry has the least impact potential of industries in this table; ranking is based on the low cost and high cost pass-through potential associated with very inelastic demand

SIC CODE	COST-TO-SALES PERCENTAGE ACROSS ALL INDUSTRY ESTABLISHMENTS	DEMAND ELASTICITY	SUPPLY ELASTICITY	NOTES ON ESTIMATED MARKET IMPACTS[1]
283 (Drugs)	0.01	-1.8	n/a	Impact potential is relative low compared with other industries in this table; basis for this assessment is the low cost and relative lack of cost pass-through potential due to relatively high demand elasticity

[1]Impact assessments in this table are more speculative than those based on both demand and supply elasticity information.
n/a - not available

Table H.13 Small Business Administration's Small Business Size Standards and Assumptions Employed in Developing Small Business Revenue Data

SIC Code	SIC Description	Level of Detail/Assumptions for Developing Small Business Revenue[1]	SBA's Small Business Size Threshold[2]	Alternative(s)
019	General Farms, Primarily Crop		$0.5 million	PM
080	Forestry	See discussion in text	$5 million	PM
102	Copper Ores	Data are for SIC code 10	500 employees	Ozone
103	Lead and Zinc Ores	Data are for SIC code 10	500 employees	PM
141	Dimension Stone	Data are for SIC code 14	500 employees	PM
142	Crushed and Broken Stone	Data are for SIC code 14	500 employees	PM
144	Sand and Gravel	Data are for SIC code 14	500 employees	PM
147	Chemical and Fertilizer Minerals	Data are for SIC code 14	500 employees	PM
149	Miscellaneous Nonmetallic Minerals	Data are for SIC code 14	500 employees	PM
152	Residential Building Construction	Data are for SIC code 15 and are for < $25 million in revenues	$17 million	PM
153	Operative Builders	Data are for SIC code 15 and are for < $25 million in revenues	$17 million	PM
154	Nonresidential Building Construction	Data are for SIC code 15 and are for < $25 million in revenues	$17 million	PM
161	Highway and Street Construction	Data are for SIC code 16 and are for < $25 million in revenues	$17 million	PM
162	Heavy Construction (except Highway)	Data are for SIC code 16 and are for < $25 million in revenues	$17 million	PM
204	Grain Mill Products		500 employees	PM
227	Carpets and Rugs	Data are for SIC codes 224, 227, and 229	500 employees	Ozone
242	Sawmills and Planing Mills	Data are for SIC codes 241 and 242	500 employees	PM
249	Miscellaneous Wood Products	Data are for SIC codes 243, 245, and 249	500 employees	PM
251	Household Furniture	Data are for SIC code 25	500 employees	Ozone
281	Industrial Inorganic Chemicals	Data are for SIC codes 281, 282, and 286	1,000 employees	PM
287	Agricultural Chemicals		1,000 employees	Ozone & PM

SIC Code	SIC Description	Level of Detail/Assumptions for Developing Small Business Revenue[1]	SBA's Small Business Size Threshold[2]	Alternative(s)
295	Asphalt Paving and Roofing Materials	Data are for SIC codes 295 and 299; revenue data were estimated for the 250-499 employee category based on average revenue per establishment for the 500-999 employee category	500 employees	PM
299	Miscellaneous Petroleum and Coal Products	Data are for SIC codes 295 and 299; revenue data were estimated for the 250-499 employee category based on average revenue per establishment for the 500-999 employee category	500 employees	PM
322	Glass and Glassware, Pressed or Blown	Data are for SIC codes 321-3 and are for < 1,000 employees	750 employees	PM
324	Cement, Hydraulic	Data are for SIC codes 324-9 and are for < 1,000 employees	750 employees	Ozone & PM
325	Structural Clay Products	Data are for SIC codes 324-9	500 employees	PM
328	Cut Stone and Stone Products	Data are for SIC codes 324-9	500 employees	PM
329	Miscellaneous Nonmetallic Mineral Products	Data are for SIC codes 324-9	500 employees	PM
331	Blast Furnace and Basic Steel Products	Data are for SIC codes 331 and 339, for < 1,000 employees; revenue data were estimated for 500 to 999 employees based on average revenue per establishment for 2,500 to 4,999 employee category (data for 1,000-2,499 employee size category were not available)	750 employees	PM
333	Primary Nonferrous Metals	Data are for SIC codes 333-5 and are for < 1,000 employees	750 employees	PM
341	Metal Cans and Shipping Containers	Data are for SIC codes 341 and 346	500 employees	Ozone & PM
343	Plumbing and Heating, Except Electric	Data are for SIC codes 343 and 344	500 employees	Ozone & PM
348	Ordnance and Accessories, NEC		500 employees	Ozone
349	Miscellaneous Fabricated Metal Products	Data are for SIC codes 347 and 349	500 employees	Ozone

SIC Code	SIC Description	Level of Detail/Assumptions for Developing Small Business Revenue[1]	SBA's Small Business Size Threshold[2]	Alternative(s)
423	Trucking Terminal Facilities	Data are estimated based on the revenue per establishment ratio for each employment size category for SIC code 42, and applied to the establishment counts by category for SIC code 423	$5 million	PM
458	Airports, Flying Fields, and Services		$5 million	Ozone
491	Electric Services	SBA threshold was converted to revenue value ($276 million); data are for SIC codes 491-3, and value is for < $250 million	4 million megawatt-hours	PM
496	Steam and Air-Condition Supply	Data are for SIC codes 496 and 497, and represent revenues of < $10 million	$9 million	PM
822	Colleges and Universities	See discussion in text	$5 million	PM

[1] A blank in this column means that the data were available for the 3-digit SIC code.
[2] SBA, 1997.

Table H.14 Summary of SIC Codes with Cost to Sales (Revenues) Percentages of 1 Percent or Greater: $PM_{2.5}$ 15 µg/m^3 annual average/65 µg/m^3 24-hour average Alternative[1]

SIC Code	SIC Description	Percentage of Total Establishments Potentially Affected	Percentage of Small Firm to All Firm Revenue[2]
011	Cash Grains	1.0	89
013	Field Crops (except cash grains)	0.6	70
019	General Farms, Primarily Crop	0.9	80
08	Forestry	9.2	60
103	Lead and Zinc Ores	5.6	22
109	Miscellaneous Metal Ores	1.3	22
14	Nonmetallic Minerals, Except Fuels	0.0	72
141	Dimension Stone	10.5	72
142	Crushed and Broken Stone	3.3	72
144	Sand and Gravel	1.1	72
147	Chemical and Fertilizer Minerals	1.7	72
149	Miscellaneous Nonmetallic Minerals	1.0	72
152	Residential Building Construction	12.7	66
153	Operative Builders	5.1	66
154	Nonresidential Building Construction	19.4	66
161	Highway and Street Construction	4.8	54
162	Heavy Construction (except highway)	4.7	54
177	Concrete Work	0.0	87
179	Misc. Special Trade Contractors	0.0	80
179	Misc. Special Trade Contractors	0.0	80
201	Meat Products	0.0	16
202	Dairy Products	0.1	33
203	Preserved Fruits and Vegetables	0.2	20
204	Grain Mill Products	0.9	31
206	Sugar and Confectionery Products	0.5	24
207	Fats and Oils	0.6	53
208	Beverages	0.1	71
209	Misc. Food and Kindred Products	0.1	53
221	Broadwoven Fabric Mills, Cotton	0.3	21
224	Narrow Fabric Mills	0.4	42
227	Carpets and Rugs	0.5	42
229	Miscellaneous Textile Goods	0.1	42
242	Sawmills and Planing Mills	0.3	78
243	Millwork, Plywood & Structural Members	0.1	78
244	Wood Containers	0.1	78
249	Miscellaneous Wood Products	0.4	78
251	Household Furniture	0.0	41
262	Paper Mills	18.6	6
263	Paperboard Mills	10.2	6
267	Misc. Converted Paper Products	0.2	38
281	Industrial Inorganic Chemicals	1.5	14
283	Drugs	0.5	11
284	Soap, Cleaners, and Toiler Goods	0.1	18
285	Paints and Allied Products	0.4	48
286	Industrial Organic Chemicals	2.8	11
287	Agricultural Chemicals	0.6	43
289	Miscellaneous Chemical Products	0.2	48
295	Asphalt Paving and Roofing Materials	2.6	70
299	Misc. Petroleum and Coal Products	0.6	70
301	Tires and Inner Tubes	5.5	23

SIC Code	SIC Description	Percentage of Total Establishments Potentially Affected	Percentage of Small Firm to All Firm Revenue[2]
305	Hose & Belting & Gaskets & Packing	0.1	18
306	Fabricated Rubber Products, NEC	0.2	18
308	Miscellaneous Plastics Products, NEC	0.0	60
321	Flat Glass	0.8	19
322	Glass and Glassware, Pressed or Blown	0.9	19
324	Cement, Hydraulic	8.9	54
325	Structural Clay Products	1.2	47
326	Pottery and Related Products	0.1	47
327	Concrete, Gypsum, and Plaster Products	0.3	47
328	Cut Stone and Stone Products	0.5	47
329	Misc. Nonmetallic Mineral Products	1.1	47
331	Blast Furnace and Basic Steel Products	1.5	19
332	Iron and Steel Foundries	0.5	28
333	Primary Nonferrous Metals	4.9	26
334	Secondary Nonferrous Metals	0.3	19
339	Miscellaneous Primary Metal Products	0.1	19
34	Fabricated Metal Products	0.0	54
341	Metal Cans and Shipping Containers	1.0	47
343	Plumbing and Heating, Except Electric	0.9	62
344	Fabricated Structural Metal Products	0.0	62
346	Metal Forgings and Stampings	0.1	47
347	Metal Services, NEC	0.0	62
348	Ordnance and Accessories, NEC	0.3	8
349	Misc. Fabricated Metal Products	0.1	62
35	Industrial Machinery and Equip.	0.0	35
351	Engines and Turbines	0.5	11
352	Farm and Garden Machinery	0.2	27
353	Construction and Related Machinery	0.1	37
359	Industrial Machinery, NEC	6.1	60
36	Electronic and Other Electric Equip.	0.0	22
361	Electric Distribution Equipment	0.1	28
362	Electrical Industrial Apparatus	0.0	24
363	Household Appliances	0.4	9
366	Communications Equipment	0.1	15
37	Transportation Equipment	0.0	5
371	Motor Vehicles and Equipment	0.4	5
372	Aircraft and Parts	0.1	3
39	Misc. Manufacturing Industries	0.0	65
393	Musical Instruments	0.2	65
399	Miscellaneous Manufactures	1.5	65
411	Local and Suburban Transportation	0.0	55
422	Public Warehousing and Storage	0.0	70
423	Trucking Terminal Facilities	0.7	50
449	Water Transportation Services	0.1	26
458	Airports, Flying Fields, & Services	0.3	21
478	Miscellaneous Transportation Services	0.1	46
49	Electric, Gas, and Sanitary Services	0.0	1
491	Electric Services	1.8	12
496	Steam and air-conditioning supply	14.9	34
502	Furniture and Homefurnishings	0.0	81
503	Lumber and Construction Materials	0.0	73
506	Electrical Goods	0.0	63

SIC Code	SIC Description	Percentage of Total Establishments Potentially Affected	Percentage of Small Firm to All Firm Revenue[2]
508	Machinery, Equipment, and Supplies	0.0	79
509	Miscellaneous Durable Goods	0.0	44
515	Farm-Product Raw Materials	0.2	77
521	Lumber and Other Building Materials	0.0	26
526	Retail Nurseries and Garden Stores	0.0	69
541	Grocery Stores	0.0	27
651	Real Estate Operators and Lessors	0.0	59
653	Real Estate Agents and Managers	0.0	53
723	Beauty Shops	0.0	88
753	Automotive Repair Shops	0.0	91
769	Miscellaneous Repair Shops	0.0	71
806	Hospitals	0.8	1
809	Health and Allied Services, NEC	0.0	54
821	Elementary and Secondary Schools	0.0	0
822	Colleges and Universities	1.2	2
836	Residential Care	0.0	55
863	Labor Organizations	0.0	0
873	Research and Testing Services	0.0	24

[1] Examination of the source category/control measure detail indicates some anomalies concerning SIC codes. For example, Surface Mining - Loading/Storage is associated with SIC code 204 - Grain Mill Products. The likely explanation for these occurrences is miscoding of the SIC codes for point sources, most of which came from the 1985 National Acid Precipitation Assessment Program inventory. For California and Oregon industrial point sources, SIC codes originate from State-supplied plant-level information.

[2] Denotes percentage of all revenues in an SIC codes that is owned by small firms.

Table H.15 Control Measures Affecting County Governments for: Ozone 0.08, 3rd max. , followed by $PM_{2.5}$ 15/50 (98th percentile)

Source Category	Control Measure
Point Source Control Measures	
Internal Combustion (IC) Engines - Gas, Diesel, Liquid Petroleum Gas	Selective Catalytic Reduction
IC Engines- Gas	Low Emission Combustion
IC Engines- Gas	Nonselective Catalytic Reduction
IC Engines- Oil	Selective Catalytic Reduction
Industrial, Commerical, and Institutional (ICI) Boilers	Scrubber
ICI Boilers- Coal	Fabric Filter
ICI Boilers- Coal/Fluidized-Bed Combustion	Selective Noncatalytic Reduction - Urea Based
ICI Boilers- Coal/Stoker	Selective Noncatalytic Reduction - Urea Based
ICI Boilers- Distillate Oil	Low-NOx Burners
ICI Boilers- Distillate Oil	Selective Catalytic Reduction
ICI Boilers- Gas	Fabric Filter
ICI Boilers- Natural Gas	Low-NOx Burners
ICI Boilers- Natural Gas	Oxygen Trim + Water Injection
ICI Boilers- Natural Gas	Selective Catalytic Reduction
ICI Boilers- Oil	Fabric Filter
ICI Boilers- Process Gas	Oxygen Trim + Water Injection
ICI Boilers- Residual Oil	Low-NOx Burners
ICI Boilers- Residual Oil	Selective Catalytic Reduction
Industrial Incinerators	Selective Noncatalytic Reduction
Space Heaters - Natural Gas	Oxygen Trim + Water Injection
Wood Furniture Coating	Incineration
Area and Mobile Source Control Measures	
On-Highway Heavy-Duty Diesel Vehicles	Retrofit Program
Paved Roads	Vacuum Sweeping
Prescribed Burning	Increase Fuel Moisture
Residential Wood Construction	Education & Advisory Program

Source Category	Control Measure
Unpaved Roads - Rural	Chemical Stabilization
Unpaved Roads - Urban	Hot Asphalt Paving