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Appendix G

Revised Economic Impact Analysis with 1995 Baseline and
Additional Monitoring Costs

April 1999

APPENDIX G
REVISED ECONOMIC IMPACT ANALYSIS WITH 1995 BASELINE AND
ADDITIONAL MONITORING COSTS

This appendix reports on the revised economic impact analysis of MACT Standards conducted by the Agency. It includes the monitoring requirements for cement kilns and materials handling operations at cement plants, which are major sources, along with the compliance costs that were reflected in the original analysis. These additional requirements and their associated costs and applicability are summarized in docket item IV-B-9 (memorandum from E. Heath, RTI, to J. Wood, EPA, March 22, 1999). In conducting this revised analysis, the original 1993 baseline information that supported the economic analysis for proposal has been updated to 1995 to be consistent with the baseline used by the Agency for the Cement Kiln Dust (CKD) rulemaking and Hazardous Waste Combustion MACT Standards. The remainder of this appendix summarizes the revised baseline characterization for the economic analysis, the compliance costs associated with the additional monitoring requirements, and the revised economic impact results.

G.1 UPDATING ANALYSIS BASELINE

The baseline characterization of Portland cement markets and producers was updated to 1995 based on the Agency's economic analysis of the CKD rulemaking. This characterization is principally based on the Portland Cement Association's (PCA) U.S. and Canadian Portland Cement

Industry: Plant Information Summary and industry responses to the PCA survey of plant CKD generation and management, which was utilized by the Agency for the CKD rulemaking. Kiln- and plant-specific data from the PCA are supplemented with final product and input price data from the Bureau of Mines and the Energy Information Administration and with kiln-specific cement production cost estimates based on the published literature and modified for this analysis. Appendix A of the Regulatory Impact Analysis for the Cement Kiln Dust Rulemaking provides baseline data for each of the Portland cement kilns included in this analysis. This information is incorporated in an economic model of the industry.

Table G-1 lists the 20 regional markets for Portland cement included in this analysis. All U.S. Portland cement plants and kilns operating during 1995 are included in these 20 markets. The f.o.b. price of Portland cement for each regional market is derived as the capacity-weighted average of the state level f.o.b. prices obtained from the U.S. Bureau of Mines. The production of Portland cement within each market is the sum of the individual kiln production levels taken from EPA's industry survey adjusted to reflect 1995 levels according to regional production trends from the U.S. Bureau of Mines. Imports of Portland cement were obtained from the U.S. Bureau of Mines and mapped to each market based on the port of entry to the U.S. The foreign supplier, either Canada or the rest of the world, was also identified.

G.2 COMPLIANCE COSTS OF ADDITIONAL MONITORING REQUIREMENTS

Section 3 of the July 1996 EIA report provides engineering estimates of compliance cost for the originally proposed MACT Standards for model kilns. The economic impact

analysis has been revised to also include the following two monitoring components that will potentially affect nonhazardous waste burning kilns at major source plants:

TABLE G-1. SUMMARY DATA FOR PORTLAND CEMENT MARKETS: 1995

Market	Number of		F.O.B. price (\$/ton)	Production (million short tons)			Total	Capacity Utilization
	Operating plants	Operating kilns		U.S.	Canadian	Rest of world		
Atlanta	8	18	\$3.40	5.57	--	1.64	7.21	94.2%
Baltimore/Philadelphia	10	23	\$57.37	7.31	--	0.22	7.53	94.8%
Birmingham	6	7	\$62.99	4.60	--	1.58	6.18	90.8%
Chicago	6	10	\$59.27	3.51	0.21	--	3.72	94.5%
Cincinnati	4	7	\$58.52	2.92	--	--	2.92	93.6%
Dallas/New Orleans	6	15	\$59.92	5.09	--	1.47	6.56	94.5%
Denver	5	9	\$69.78	2.83	--	--	2.83	92.6%
Detroit	4	10	\$60.74	4.98	1.67	--	6.65	95.6%
Florida	6	9	\$73.06	4.63	--	2.78	7.41	95.6%
Kansas City	7	18	\$58.57	3.67	--	--	3.67	89.5%
Los Angeles	7	14	\$52.23	6.99	--	0.25	7.24	91.2%
Minneapolis	2	3	\$62.87	1.70	0.41	--	2.11	98.2%
New York/Boston	4	5	\$71.66	3.21	0.52	0.75	4.48	97.3%
Phoenix	5	11	\$64.59	2.97	--	0.15	3.12	90.2%
Pittsburgh/Cleveland	4	8	\$60.53	1.76	1.27	--	3.03	88.7%
Salt Lake City	5	7	\$68.54	1.65	0.27	--	1.92	98.0%
San Antonio	7	11	\$54.23	5.38	--	0.53	5.91	96.4%
San Francisco	4	5	\$63.42	3.27	--	<0.01	3.27	93.3%
Seattle	2	2	\$67.07	1.10	0.84	0.55	2.49	92.0%
St. Louis	5	7	\$56.86	4.97	--	--	4.97	91.8%
U.S. average/total	107	199	\$61.64	78.10	5.20	9.94	93.23	93.6%

1. Continuous emissions monitoring for particulate matter at cement kilns (PM/CEM), and
2. Visible emissions monitoring of materials handling operations at cement plants.

The PM/CEM requirement carries an annual cost of \$57,623 for each affected kiln. The monitoring requirement at materials handling operations will cost 95 percent of the affected major sources \$5,514 per year and the remaining 5 percent \$12,484 annually. These compliance cost estimates were converted to 1995 dollar equivalents using the BLS producer price index for capital equipment (series id number WPUSOP3200).*

Since the level of control at individual cement kilns/plants is unknown, the economic analysis randomly determines affected producers based on national population rates of applicability developed from the engineering analysis. For this revised analysis, 80 percent of affected entities are assumed to be major sources (Docket item IV-B-8, memorandum from E. Heath, RTI, to J. Wood, EPA, March 16, 1999). These additional monitoring costs are included with the original compliance cost estimates for the MACT Standards to reevaluate the expected economic impacts at the national level through multiple simulations of the economic models as originally conducted in the economic analysis for the proposal.

*The original compliance cost estimates for the MACT Standard were converted from \$1993 to \$1995 using the following ratio: $1995\text{PPI}/1993\text{PPI} = 136.7/131.4 = 1.0403$, while the additional monitoring cost estimates were converted from \$1998 to \$1995 using the following ratio $1995\text{PPI}/1998\text{PPI} = 136.7/137.5 = 0.9942$.

G.3 ECONOMIC IMPACT ESTIMATES

Based on the revised economic analysis, this section provides the economic impact results at the national-level, which reflects the sum of the mean outcomes for each of the 20 regions. The 95 percent confidence interval is provided for each impact measure to reflect the uncertainty in plant assignments. The size of these intervals indicates the precision of the estimates. The model results are summarized below as market-, industry-, and society-level impacts due to the regulation. (Since these revised results account for both the change in baseline characterization [1995 from 1993] and the additional monitoring requirements and costs, they are not directly comparable to those reported in Section 4 of the July 1996 EIA report. To isolate the effects of the additional monitoring requirements and costs, Table G-A is provided at the end of this appendix. It provides the economic impacts of the MACT Standards for the revised baseline year of 1995 without the monitoring costs.)

G.3.1 Market-Level Results

Market-level impacts include the regional market adjustments in price and quantity for Portland cement, including the changes in foreign imports for the affected regions. As shown in Table G-2, the MACT Standards are expected to increase the national price for Portland cement by a small amount, roughly 1.1 percent, \$0.65 per short ton, while reducing domestic production by a somewhat larger amount, 2.2 percent, or about 1.7 million short tons per year. Regional markets that incur larger than average increases in market price and reductions in production include Kansas City (2.6 percent increase in price with a 2.3 percent reduction in

TABLE G-2. SUMMARY OF NATIONAL-LEVEL MARKET IMPACTS OF THE MACT STANDARDS: 1995

	Baseline Values	With MACT Values		95 Percent Conf. Interval	
		Absolute Change	Percent Change	Lower Bound	Upper Bound
Market price (\$/short ton)	\$61.64	\$0.65	1.06%	\$0.62	\$0.69
Total Market output (10 ³ short tpy)	93,233	-885	-0.95%	-866	-904
Domestic production	78,097	-1,722	-2.21%	-1,679	-1,765
Foreign imports	15,137	837	5.53%	797	877

production), Salt Lake City (2.1 percent increase the price with a 4.6 percent reduction in production), Denver (2.3 percent increase in price with a 2 percent reduction in production), and Baltimore/Philadelphia (1.8 percent increase in price with a 2.1 percent reduction in production).

Foreign imports of Portland cement to the U.S. are projected to increase as a result of the price increase expected with the regulations. As shown in Table G-2, the MACT Standards are projected to increase foreign imports by 5.5 percent, or roughly 837,000 short tons annually. Regional markets that are expected to incur significant increases in foreign imports of Portland cement include Salt Lake City (14.8 percent increase), Baltimore/Philadelphia (12.9 percent increase), Pittsburgh/Cleveland (9.6 percent increase), Los Angeles (7.6 percent increase), Dallas/New Orleans (7.1 percent increase), San Antonio (7.1 percent increase), and Chicago (6.7 percent increase). Other regional markets affected by foreign imports include Florida (5.4 percent

increase), Detroit (4.5 percent increase), Atlanta (4.8 percent increase), and New York/Boston (4.4 percent increase). The impacts of foreign imports are significant in these regions as a result of the very price-responsive character of supply from foreign sources. Foreign supply also limits the ability of affected domestic producers to pass on the costs of the MACT Standards to consumers. In fact, the average increase in regional price for the sixteen markets affected by foreign imports was much lower (i.e., 1 percent) than the average increase for those markets without imports (i.e., 1.87 percent).

G.3.2 Industry-Level Results

Table G-3 summarizes the national-level industry impacts of the MACT Standards. As shown, industry-level impacts

TABLE G-3. SUMMARY OF NATIONAL-LEVEL INDUSTRY IMPACTS OF THE MACT STANDARDS: 1995

	Baseline Values	With MACT Values		95 Percent Conf. Interval	
		Absolute Change	Percent	Lower Bound	Upper Bound
Revenues (\$10 ⁶ /yr)	\$4,767.7	-\$53.7	-1.1%	-\$51.3	-\$56.1
Cement production	\$4,767.7	-\$53.7	-1.1%	-\$51.3	-\$56.1
Hazardous waste	NA	NA	NA	NA	NA
Costs (\$10 ⁶ /yr)	\$3,644.2	-\$30.4	-0.8%	-\$28.3	-\$32.5
Hazardous waste	NA	NA	NA	NA	NA
MACT Standards	\$0.0	\$38.6	NA	\$37.9	\$39.3
Cement production	\$3,644.2	-\$69.0	-1.9%	-\$66.8	-\$71.2
EBIT (\$10 ⁶ /yr)	\$1,123.5	-\$23.2	-2.1%	-\$22.1	-\$24.4
Operating Entities (#)					
Plants	107	-0.1	-0.1%	0.01	0.2
Kilns	199	-3.6	-1.8%	3.3	4.0
Employment (FTEs)	13,921	-334	-2.4%	-322	-345

EBIT = Earnings before interest and taxes
FTEs = Full-time equivalents

include an evaluation of the changes in revenue, costs, and profits (as measured by EBIT); cement plant and kiln closures; and the change in employment attributable to projected closures and changes in domestic cement production. Although the burning of hazardous waste impacts the profits of some kilns, data were not publicly available to account for these revenues and costs. Thus, they are not included in the analysis.

The revenues and costs for the cement industry change as cement prices and production levels adjust to the imposition of the rule. The projected decline in industry profits of \$23.2 million, shown in Table G-3, reflects the projected loss in cement revenues of \$53.7 million, the post-regulatory compliance costs of \$38.6 million incurred by plants continuing to operate, and a reduction in cement production costs of \$69 million. The projected reduction in industry profits of \$23.2 million is less than the post-regulatory compliance costs because affected cement producers reduce their cement production resulting in higher market prices for cement, which effectively shifts a portion of the regulatory burden onto consumers. Furthermore, as shown in Table G-3, roughly 4 kilns are expected to close in response to the MACT Standards, or just under 2 percent of cement kilns operating in 1995. One cement plant may close under certain random draws of control applicability (as described in Section 3 of the EIA report). This accounts for the absolute change of slightly higher than zero shown in Table G-3.

As previously stated in the July 1996 EIA report, it is important to point out that the estimates of cement plant and kiln closures are sensitive to the accuracy of the baseline characterization of the cement plants and kilns and the allocation of compliance costs across these plants and kilns.

Uncertainty regarding the accuracy of the closure estimates is introduced through the use of a generalized cost function to project baseline operating costs at specific kilns, model kilns to project compliance costs at specific kilns, and the random determination of applicability of the regulatory controls and associated costs. These uncertainties are likely to influence the specific type of plant or kiln projected to close more so than the aggregate estimate of closures.

The regulation will also displace workers from jobs through its impacts on production assuming production and labor are related. As shown in Table G-3, based on the estimated reductions in domestic production of Portland cement, the MACT Standards are projected to reduce employment by 2.4 percent, or 334 full-time equivalents.

G.3.3 Social Costs of the Regulations

The cost of a regulatory policy is traditionally measured by the reductions in economic welfare that it generates. The welfare impacts resulting from the Portland cement MACT will extend to the many consumers and producers of Portland cement. Consumers of Portland cement will experience welfare losses due to the expected reductions in their consumption of Portland cement and the higher price they will pay for the with-MACT quantities as shown in Table G-3. Producer (owner) welfare impacts result from the loss in profits on the quantity of Portland cement no longer sold due to the higher prices and to the higher costs of production for the with-MACT quantities, to the extent that the expected price increase does not fully offset the cost increase. The value of these changes in economic welfare for consumer and producers were estimated using applied welfare economics principles.

For this analysis, the social cost estimate accounts for the expected market adjustments due to the regulation in the context of the imperfectly competitive market structure of the U.S. cement industry. The Office of Management and Budget explicitly mentions the need to consider market power-related welfare costs in evaluating regulations under Executive Order 12866. The social cost estimate is larger with imperfectly competitive market structures because the regulation exacerbates a pre-existing social inefficiency in which producers have market power and, in the course of their profit-maximizing behavior, produce too little output from a social perspective. As a result, the regulation reduces social welfare by more than the compliance costs because the market quantity is moved even further away from the socially optimal amount. This is the case for the cement industry.

As shown in Table G-4, the social cost of the regulation is estimated to be \$77 million annually and is distributed across consumers and producers of cement. Cement consumers' welfare declines by \$60.7 million annually due to the increase in prices and reductions in consumption. Owners of cement companies (in aggregate) are worse off by \$23.2 million annually, their reduction in profits.

There are distributional impacts across domestic producers--some gain, some lose as a result of regulation depending on their change in cost versus the change in market price. Foreign producers benefit by \$6.9 million annually as cement imports increase in response to higher U.S. cement prices.

TABLE G-4. SUMMARY OF NATIONAL-LEVEL SOCIAL COSTS
OF THE MACT STANDARDS: 1995 (\$10³/yr)

Stakeholders	With-MACT Values	95 Percent Conf. Interval	
		Lower Bound	Upper Bound
Consumer surplus loss	\$60,705	\$59,438	\$61,972
Producer surplus loss	\$16,305	\$15,156	\$17,454
Domestic producers	\$23,244	\$22,089	\$24,399
Foreign producers	-\$6,939	-\$7,219	-\$6,659
Social cost	\$77,010	\$75,459	\$78,561

The social cost estimates of Table G-4 provide the upper bound estimate of social costs and overstates the burden on cement consumers and likely understates the burden on cement producers. This overstatement is a result of the comparative static nature of the market analysis. This scenario reflects an intermediate-run analysis of the economic impacts of the regulation. Cement production decisions are constrained by existing cement capacity at each plant and within each market. These capacity constraints are an important factor in determining the social cost because there was very little excess capacity in the 1995 baseline employed by the economic analysis (the U.S. cement industry had a capacity utilization rate of 94 percent that year). Thus, typically available excess capacity from domestic producers was not available to offset increases in market prices and results in an upward bias in the social cost estimate. In the fullness of time, however, the projected increases in cement prices should lead to increases in cement capacity. Future increases in cement capacity should reduce the projected increases in regional

cement prices and increase cement consumption thereby reducing the loss to consumers and reduce the market power-related gains by existing cement producers.

G.4 SMALL BUSINESS IMPACTS

The Agency has identified 6 cement companies as being small businesses. They each operate a single plant and together have 13 kilns. Small companies are defined according to the SBA size standard for SIC 3241--hydraulic cement--as those companies that own Portland cement plants and have less than 750 total employees. Given the small number of cement plants and kilns owned by small businesses relative to the industry as a whole, it is important to point out that the random determination of applicability of the regulatory controls and the associated costs will introduce some uncertainties regarding the impacts projected for particular plants or kilns more so than for the aggregate estimates. The measures of economic impact presented for this small business analysis include the changes in revenue, costs, and pre-tax earnings; the post-regulatory compliance costs; cement plant and kiln closures; and the change in employment attributable to the change in output at these plants.

A summary of the economic impacts on cement operations owned by small businesses is provided in Table G-5. However, as opposed to the screening cost-to-sales analysis for small business summarized in the April 6, 1999 memorandum from Tyler Fox, RTI, to Tom Walton, EPA, these economic impacts account for the projected market adjustments from the economic models. As shown, the Agency's economic analysis indicates that small businesses will incur a total of \$2.46 million in compliance costs after market adjustments. The effect of these costs on

profitability is demonstrated through the impacts on EBIT. EBIT are projected to fall by \$3.5 million, which is more than the post-regulatory compliance costs. This result indicates that the competitive position of cement operations owned by small businesses may be negatively affected by the Standard. However, these impacts are not significant with the range of post-regulatory compliance costs likely to be incurred by these entities being close to the 95 percent confidence interval for change in EBIT. The observed variation in the change in EBIT across simulation runs indicates that these results are sensitive to the particular markets where these plants and kilns may be located and the imposition of regulatory costs across all producers within the market.

No cement plants owned by a small business are projected to close. However, one cement kiln owned by a small business may close under certain random draws of control applicability (as described in Section 3 of the EIA report). This accounts for the absolute change of slightly higher than zero shown in Table G-5. In addition, the regulation is expected to reduce employment by just over 8.9 percent, or roughly 56 employees. In percentage terms, the job losses at these plants are greater than the overall change in industry employment because these cement operations are typically smaller than average and have higher labor requirements per ton of cement produced than

TABLE G-5 SUMMARY OF IMPACTS ON SMALL BUSINESSES WITH
THE MACT STANDARDS: 1995

	Baseline Values	With MACT		95 Percent Conf. Interval	
		Absolute Change	Percent	Lower Bound	Upper Bound
Revenues (\$10 ⁶ /yr)	\$194.1	-\$9.5	-4.9%	-\$7.9	-\$11.2
Cement production	\$194.1	-\$9.5	-4.9%	-\$7.9	-\$11.2
Hazardous waste	NA	NA	NA	NA	NA
Costs (\$10 ⁶ /yr)	\$150.0	-\$6.1	-4.1%	-\$5.0	-\$7.1
Hazardous waste	NA	NA	NA	NA	NA
MACT Standards	\$0.0	\$2.5	NA	\$2.3	\$2.6
Cement production	\$150.0	-\$8.4	-5.7%	-\$7.4	-\$9.7
EBIT (\$10 ⁶ /yr)	\$45.1	-\$3.5	-7.7%	-\$2.9	-\$4.1
Operating Entities (#)					
Plants	6	0.0	0.0%	0.0	0.0
Kilns	13	-0.4	-3.1%	0.2	0.6
Employment (FTEs)	626	-56	-8.9%	-48	-64

EBIT = Earnings before interest and taxes
FTEs = Full-time equivalents

larger plants.

G.5 REFERENCES

Memorandum from E. Heath, RTI, to J. Wood, EPA:OAQPS:ESD:MICG, March 16, 1999, National costs revised to include PM CEMs and annual monitoring of materials handling facilities, and all costs revised to 1995 dollars.

Memorandum from E. Heath, RTI, to J. Wood, EPA:OAQPS:ESD:MICG. March 22, 1999. "National Costs (in 1995 dollars) for the Final Portland Cement Rule."

Memorandum from Tyler Fox, RTI, to Tom Walton, EPA. April 6,

1999. "Revised Small Business Analysis for Proposed Cement Malt Standards with Additional Monitoring Requirements."

U.S. Environmental Protection Agency. "Regulatory Impact Analysis of Cement Kiln Dust Rulemaking." Final Report prepared by Research Triangle Institute, RTP, NC. June 1998.

TABLE G-A. REVISED ECONOMIC IMPACT RESULTS FOR ORIGINALLY
PROPOSED MACT STANDARDS: 1995 BASELINE

	Baseline	With Regulation	Changes from Baseline	
			Absolute	Percent
MARKET-LEVEL IMPACTS				
Market price (\$/short ton)	\$61.64	\$62.17	\$0.53	0.9%
Market output (10 ³ short tpy)	93,233.4	92,519.0	-714.4	-0.8%
Domestic production	78,096.5	76,688.9	-1,407.6	-1.8%
Imports—rest of world	9,939.5	10,378.5	439.0	4.4%
Imports—Canada	5,197.4	5,451.6	254.2	4.9%
INDUSTRY-LEVEL IMPACTS				
Revenues (\$10 ³)	\$4,767,661	\$4,722,460	-\$45,201	-1.0%
Cement production	\$4,767,661	\$4,722,460	-\$45,201	-1.0%
Hazardous waste	NA	NA	NA	NA
Costs (\$10 ³)	\$3,644,193	\$3,618,904	-\$25,289	-0.7%
Hazardous waste	NA	NA	NA	NA
MACT Standards	\$0	\$30,946	\$30,946	NA
Cement production ^a	\$3,644,193	\$3,587,958	-\$56,235	-1.5%
EBIT (\$10 ³)	\$1,123,468	\$1,103,556	-\$19,912	-1.8%
Operating entities (#)				
Plants	107	107	0	0.0%
Kilns	199	196	-2.8	-1.4%
Employment (FTEs)	13,921	13,639	-282	-2.0%
SMALL BUSINESS IMPACTS				
Revenues (\$10 ³)	\$194,073	\$185,775	-\$8,298	-4.3%
Cement production	\$194,073	\$185,775	-\$8,298	-4.3%
Hazardous waste	\$0	\$0	\$0	0.0%
Costs (\$10 ³)	\$148,962	\$143,479	-\$5,483	-3.7%
Hazardous waste	\$0	\$0	\$0	0.0%
MACT Standards	\$0	\$1,812	\$1,812	NA
Cement production ^a	\$148,962	\$141,667	-\$7,295	-4.9%
EBIT (\$10 ³)	\$45,111	\$42,296	-\$2,815	-6.2%
Operating entities (#)				
Plants	6	6	0	0.0%
Kilns	13	13	-0.1	-1.1%
Employment (FTEs)	626	575	-51	-8.2%
DISTRIBUTION OF SOCIAL COSTS (\$10³)				
Consumer surplus loss		\$49,145		
Producer surplus loss		\$14,289		
Domestic producers		\$19,912		
Foreign producers		-\$5,623		
Social costs of regulation		\$63,435		

^aCement production costs include baseline CKD management costs.
EBIT = earnings before interest and taxes
NA = not available