APPENDIX D

CONTROL COST SENSITIVITY ANALYSES

1.0 INTRODUCTION

This appendix presents the methodology and results for sensitivity analyses performed for a few key cost analysis parameters. A sensitivity analysis is performed on:

- The average annual incremental dollar per ton threshold for control measures selected in the analysis of the 0.08 3rd Max. ozone alternative;
- The dollar per microgram per cubic meter reduced threshold for control measures selected in the analysis of the $PM_{2.5}$ 15/50 alternative;
- The number of monitored counties in the analysis of the $PM_{2.5}$ 15/50 alternative;
- The adjustment factor applied to fugitive dust emission predictions in the analysis of the $PM_{2.5}$ 15/50 alternative;
- Attainment of the 0.08 3rd Max. ozone alternative incremental to partial attainment of the $PM_{2.5}$ 15/50 alternative; and
- Attainment of the $PM_{2.5}$ 15/50 alternative incremental to partial attainment of the 0.08 3rd Max. ozone alternative.

If attainment of the current ozone and/or PM_{10} standards is necessary to estimate the effect of these sensitivity analyses on the impacts of the 0.08 3rd Max. ozone standard and/or the $PM_{2.5}$ 15/50 standard, then the same sensitivity analysis is also performed for the current ozone and/or PM_{10} standards. Results for the current standards is presented in Appendix C.

These sensitivity analyses were performed in advance of the analyses presented in the main body of this report. The 98th percentile 24-hour PM air quality data used in the analyses presented in the main body of this report is more current than the 98th percentile PM air quality data used in these sensitivity analyses. Therefore, some direct comparisons between the results presented in this appendix and the results presented in Chapters 6 and 7 may not yield identical outcomes. Nonetheless, the conclusions drawn from the results of these sensitivity analyses are still valid.

2.0 ALTERNATIVE COST PER TON CONTROL MEASURE SELECTION THRESHOLDS IN THE OZONE COST ANALYSIS

The analysis documented in Chapter 7 of this report is based on an average annual incremental cost per ton control measure selection threshold of $10,000 (1990 dollars). This section presents the emission reduction and cost results for control measure selection under alternative dollar per ton thresholds: $7,000, $20,000, and no cut-off.

Table D.2.1 presents the national summary of emission reductions achieved as a percent of targeted levels for alternative average annual incremental dollar per ton control measure selection thresholds. For the range of control measure selection thresholds presented, VOC reductions achieved as a percent of targeted reductions is a narrow range from 33 to 38 percent. The NOx reductions achieved as a percent of targeted reductions is also a narrow range from 20 to 26 percent.

Table D.2.2 provides the distribution of reductions achieved versus reductions needed under alternative cost per ton control measure selection thresholds for the 0.08 3rd Max. alternative. As shown in this table, when the average annual incremental cost per ton control measure selection threshold is completely removed, one additional area is modeled to achieve enough reductions to reach full attainment. Under the more restrictive alternative thresholds, this same area achieves from 87 to 95 percent of the targeted reduction levels. When the threshold is lowered from $10,000 per ton to $7,000 per ton, the distribution does show a shift toward the lower quintile, with 4 more areas achieving less than 20 percent of their target levels.

Table D.2.1 National Summary of VOC and NOx Reductions Achieved as a Percent of Reduction Targets Under Alternative Dollar Per Ton Control Measure Selection Thresholds: 0.08 3rd Max. Standard[a]

Threshold	Target Reductions (tons per day)		Reductions Achieved Relative to Targets (tons per day)		Percent Achieved Relative to Targets (Percent)		Shortfall (tons per day)	
	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
$7,000/ton	4,598	3,648	1,519	728	33%	20%	3,079	2,920
$10,000/ton[b]	4,598	3,648	1,706	803	37%	22%	2,928	2,845
$20,000/ton	4,598	3,648	1,740	878	38%	24%	2,858	2,770
No Cut-off	4,598	3,648	1,750	933	38%	26%	2,848	2,715

a Emission reduction targets and achieved reductions are incremental to the 2010 CAA Baseline. Reductions in pollutants not targeted in each area are not included in this table.

b The $10,000/ton control measure selection threshold is used in the analyses presented in Chapter 7 of this report.

Table D.2.2 Distribution of Percent Progress Toward Achieving VOC and NOx Emission Reduction Targets Under Alternative Dollar Per Ton Control Measure Selection Thresholds: 0.08 3rd Max. Alternative

Threshold	Number of Initial Nonattainment Areas[a]						
	< 20%	20 - 40%	40 - 60%	60 - 80%	> 80%	Full Attain-ment	Total Number of Areas
$7,000/ton	10	10	5	1	1	1	28
$10,000/ton[b]	6	13	5	1	2	1	28
$20,000/ton	6	12	6	1	2	1	28
No Cut-off	6	12	5	2	1	2	28

a Number of areas incremental to the 2010 CAA baseline.

b The $10,000/ton control measure selection threshold is used in the analyses presented in Chapter 7 of this report.

Table D.2.3 presents the national control cost results under alternative average annual incremental cost per ton control measure selection thresholds. When the control measure selection threshold is removed, the total annual cost increases nearly 60 percent from $1.3 billion to $2.1 billion, yet as shown in Table D.2.2, only one more area achieves full attainment.

Table D.2.3 National Cost Summary Under Alternative Dollar Per Ton Control Measure Selection Thresholds: 0.08 3rd Max. Standard

Control Measure	Annual Control Cost (Millions 1990$)[a]			
	$7,000/ton	$10,000/ton	$20,000/ton	No Cut-off
National Ozone Strategy	330	330	330	330
Local Control Measures	720	1,000	1,400	1,800
Total	1,100	1,300	1,700	2,100

a Costs are incremental to the current ozone standard, to which the same $/ton threshold is applied. Totals may not agree due to rounding.

The relative insensitivity of modeled progress toward attainment is explained to some degree by control measure development efforts that tended to focus on known, currently available technologies with relatively reasonable implementation costs. Nonetheless, given the set of control measures in the analysis database, the conclusion is that the $10,000 per ton threshold does not seriously constrain modeling of full attainment, but does potentially prevent unreasonably high predictions of economic impacts.

3.0 ALTERNATIVE DOLLAR PER MICROGRAM PER CUBIC METER REDUCED CONTROL MEASURE SELECTION THRESHOLD IN THE PM COST ANALYSIS

The analysis presented in Chapter 6 of this document is based on a control measure selection threshold of $1 billion per microgram per cubic meter reduced. This section presents the projected number of nonattainment counties and cost results for control measure selection under alternative dollar per microgram per cubic meter reduced thresholds. A $500 million and a $2 billion threshold are examined. Limiting the pool of available control measures is intended to eliminate selection of control measures that either: 1) have little or no effect on air quality in a

projected nonattainment county; or 2) are extremely costly relative to the air quality benefit they achieve in a projected nonattainment county and therefore are unlikely to ever be implemented.

Tables D.3.1 and D.3.2 present the estimated number of initial and residual nonattainment counties by control region for the current PM_{10} standard and the $PM_{2.5}$ 15/50 standard under alternative cost per microgram per cubic meter reduced control measure selection thresholds. The number of residual nonattainment counties for the current PM_{10} standard declines from 30 to 29 under the $2 billion threshold. The number of initial nonattainment counties for the $PM_{2.5}$ 15/50 alternative declines from 85 to 84 under the $2 billion threshold due to additional air quality improvements achieved for the current PM_{10} standard to which the same threshold is applied. The number of residual nonattainment counties for the $PM_{2.5}$ 15/50 alternative increases by 10 percent, from 40 to 44, when the cost per microgram per cubic meter reduced threshold is cut in half to $500 million. The number of residual nonattainment counties for the $PM_{2.5}$ 15/50 alternative decreases by 10 percent, from 40 to 35, when the cost per microgram per cubic meter threshold is doubled to $2 billion.

Tables D.3.3 shows the total national control cost under alternative cost per microgram per cubic meter reduced control measure selection thresholds for the current PM_{10} standard and the $PM_{2.5}$ 15/50 alternative. Starting with the $500 million threshold, when the threshold is doubled to $1 billion, the total cost of partial attainment of the $PM_{2.5}$ 15/50 standard increases by over 55 percent. When the cost per microgram per cubic meter threshold is doubled again to $2 billion, the total incremental cost of partial attainment of the $PM_{2.5}$ 15/50 standard increases by only about 10 percent. This apparently small increase in the incremental cost the $PM_{2.5}$ 15/50 alternative under the $2 billion threshold is explained by the large increase in incremental cost of the accompanying current PM_{10} standard, to which the same $2 billion threshold is applied. When the threshold is doubled to $2 billion, some relatively expensive control measures that are otherwise only selected in the $PM_{2.5}$ analysis are selected in the preceding analysis of the current

Table D.3.1 Summary of Initial and Residual Nonattainment Counties Under Alternative Cost per µg/m^3 Control Measure Selection Thresholds[a]: Current PM_{10} Standard

Control Region	$500 Million Threshold					
	Initial Nonattainment			Residual Nonattainment		
	Total	Annual	24-Hour	Total	Annual	24-Hour
Midwest/Northeast	5	1	5	5	1	5
Southeast	0	0	0	0	0	0
Rocky Mountain	12	0	12	8	0	8
South Central	4	1	4	2	1	2
West	15	4	15	11	3	11
Northwest	7	0	7	4	0	4
Nation	43	6	43	30	5	30

Control Region	$1 Billion Threshold					
	Initial Nonattainment			Residual Nonattainment		
	Total	Annual	24-Hour	Total	Annual	24-Hour
Midwest/Northeast	5	1	5	5	1	5
Southeast	0	0	0	0	0	0
Rocky Mountain	12	0	12	8	0	8
South Central	4	1	4	2	1	2
West	15	4	15	11	3	11
Northwest	7	0	7	4	0	4
Nation	43	6	43	30	5	30

Control Region	$2 Billion Threshold					
	Initial Nonattainment			Residual Nonattainment		
	Total	Annual	24-Hour	Total	Annual	24-Hour
Midwest/Northeast	5	1	5	5	1	5
Southeast	0	0	0	0	0	0
Rocky Mountain	12	0	12	8	0	8
South Central	4	1	4	1	0	1
West	15	4	15	11	3	11
Northwest	7	0	7	4	0	4
Nation	43	6	43	29	4	29

a Number of Tier 1 monitored counties. Initial nonattainment counties are determined incremental to partial attainment of the current ozone standard.

Table D.3.2 Summary of Initial and Residual Nonattainment Counties Under Alternative Cost per µg/m^3 Control Measure Selection Thresholds[a]: $PM_{2.5}$ 15/50 Alternative

Control Region	$500 Million Threshold					
	Initial Nonattainment			Residual Nonattainment		
	Total	Annual	24-Hour	Total	Annual	24-Hour
Midwest/Northeast	35	33	8	12	11	4
Southeast	8	8	0	1	1	0
Rocky Mountain	14	8	9	11	7	6
South Central	7	6	3	3	3	1
West	15	11	14	14	10	11
Northwest	6	0	6	3	0	3
Nation	85	66	40	44	32	25

Control Region	$1 Billion Threshold					
	Initial Nonattainment			Residual Nonattainment		
	Total	Annual	24-Hour	Total	Annual	24-Hour
Midwest/Northeast	35	33	8	11	9	4
Southeast	8	8	0	1	1	0
Rocky Mountain	14	8	9	9	6	4
South Central	7	6	3	2	2	0
West	15	11	13	14	10	11
Northwest	6	0	6	3	0	3
Nation	85	66	39	40	28	22

Control Region	$2 Billion Threshold					
	Initial Nonattainment			Residual Nonattainment		
	Total	Annual	24-Hour	Total	Annual	24-Hour
Midwest/Northeast	35	33	8	9	7	4
Southeast	8	8	0	1	1	0
Rocky Mountain	13	8	8	7	5	2
South Central	7	6	2	2	2	0
West	15	11	13	13	10	10
Northwest	6	0	6	3	0	3
Nation	84	66	37	35	25	19

a Number of Tier 1 monitored counties. Initial nonattainment counties are determined incremental to partial attainment of the current ozone and PM_{10} standards, and the National $PM_{2.5}$ Strategy.

Table D.3.3 Summary of National Annual Control Costs Under Alternative Cost per µg/m^3 Control Measure Selection Thresholds[a] (Million 1990$)

Current PM_{10} Standard

Region	$500 Million Threshold	$1 Billion Threshold	$2 Billion Threshold
Midwest/Northeast	240	290	320
Northwest	130	140	160
Rocky Mountain	200	210	230
South Central	160	210	1,600
Southeast	--	--	--
West	100	130	180
National $PM_{2.5}$ Strategy	--	--	--
National Total[b]	840	990	2,500

$PM_{2.5}$ 15/50 Standard

Region	$500 Million Threshold	$1 Billion Threshold	$2 Billion Threshold
Midwest/Northeast	2,100	3,400	5,000
Northwest	190	260	430
Rocky Mountain	530	940	1,300
South Central	240	1,800	680
Southeast	130	130	130
West	290	380	539
National $PM_{2.5}$ Strategy	2,600	2,600	2,600
National Total[b,c]	6,100	9,500	10,600
Total of Current PM_{10} and $PM_{2.5}$ 15/50 Alternative[c]	6,900	10,500	13,100

a Costs for the current PM_{10} standard are incremental to partial attainment of the current ozone standard. Costs for the $PM_{2.5}$ 15/50 alternative are incremental to partial attainment of the current PM_{10} standard to which the same thresholds are applied.

b Totals may not agree due to rounding.

c The national totals include the cost of the National $PM_{2.5}$ Strategy. However, the Integrated Planning Model (IPM) used to assess utility sector impacts does not include the same control region definitions used in the PM Optimization Model, so the incremental $PM_{2.5}$ cost shown for each control region does not include the cost of the National $PM_{2.5}$ Strategy.

PM_{10} standard. A more illustrative estimate is the total combined cost of the current PM_{10} standard and the $PM_{2.5}$ 15/50 alternative, which is presented at the bottom of Table D.3.3. When the threshold is doubled from $1 billion to $2 billion, the combined incremental cost increases by about 25 percent.

The conclusion is that a few additional counties are estimated to reach full attainment of the PM alternatives as the cost per microgram per cubic meter reduced threshold is raised from $500 million to $1 billion, and again from $1 billion to $2 billion. The proportional increase in cost is greater than the proportional increase in the number of attaining counties in all cases.

4.0 ALL MONITORED COUNTY PM COST ANALYSIS

The analysis documented in Chapter 6 of this report is based on a set of 504 counties containing PM_{10} monitors that have met what this report refers to as *Tier 1* data completeness criteria for estimating $PM_{2.5}$ concentrations. The criteria and the monitoring tiers are discussed in Section 4.4.2.5 of Chapter 4. There are additional monitored counties (Tiers 2 and 3) for which the relatively incomplete data can be used to assess the potential for nonattainment with alternative $PM_{2.5}$ standards. For some of these monitored counties, attainment designations are modeled on only 1 or 2 data points every year. Since the data is less complete, including these counties in the analysis generates results that are inherently less certain.

In the analysis presented in Chapter 6, control measures are targeted at Tier 1 monitored counties that are projected to violate the standard. In the analysis presented in this appendix, control measures are targeted at all monitored counties that are projected to violate the standard. Table D.4.1 shows the estimated number of residual nonattainment counties (when all monitored counties are counted) for both the current PM_{10} standard and the alternative $PM_{2.5}$ 15/50 standard under different control measure targeting assumptions. This table illustrates two key points. For the $PM_{2.5}$ 15/50 alternative, the number of *identified* residual nonattainment areas increases by 30 percent, from 41 to 53, when all monitored counties are counted (see Table 6.6 in Chapter 6). The second point is that targeting controls at the full set of potentially violating monitored

counties only reduces the number of monitored counties in residual nonattainment from 53 to 50.

The partial attainment cost associated with targeting all monitored counties is presented in Table D.4.2. When control measures are targeted at all potentially violating monitored counties, the national cost increases by $1.1 billion, or 12 percent.

Table D.4.1 Projected Number of Residual Nonattainment Counties: All Monitored Counties (Tiers 1, 2, and 3)

Control Region	PM_{10} 50/150 Current Standard					
	Controls Targeted to Tier 1 Potentially Violating Monitored Counties Only			Controls Targeted to All Potentially Violating Monitored Counties		
	Total	Annual	24 Hour	Total	Annual	24 Hour
Midwest/Northeast	6	1	6	6	1	6
Southeast	1	0	1	1	0	1
Rocky Mountain	9	1	9	9	1	9
South Central	5	1	3	3	1	3
West	13	3	13	11	3	11
Northwest	8	1	7	4	0	4
Nation	40	7	39	34	6	34
Control Region	**$PM_{2.5}$ 15/50 Standard**					
	Controls Targeted to Tier 1 Potentially Violating Monitored Counties Only			Controls Targeted to All Potentially Violating Monitored Counties		
	Total	Annual	24 Hour	Total	Annual	24 Hour
Midwest/Northeast	12	10	4	12	10	4
Southeast	2	1	1	2	1	1
Rocky Mountain	14	10	6	12	9	4
South Central	3	3	0	3	3	0
West	16	11	13	16	11	12
Northwest	6	3	4	5	2	4
Nation	53	38	28	50	36	25

Table D.4.2 Summary of Partial Attainment National Annual Control Costs Under Alternative Control Measure Targeting Scenarios[a] (Million 1990$)

Region	PM_{10} 50/150 Current		$PM_{2.5}$ 15/50	
	Tier 1 Monitored Counties Only	All Monitored Counties	Tier 1 Monitored Counties Only	All Monitored Counties
Midwest/Northeast	290	300	3,400	3,600
Northwest	140	170	260	390
Rocky Mountain	210	210	940	1,500
South Central	210	220	1,800	1,900
Southeast	--	4	130	190
West	130	145	380	450
National $PM_{2.5}$ Strategy	--	--	2,600	2,600
National Total[b]	990	1,000	9,500	10,600

a Costs for the 15/50 standard are incremental to attainment of the current PM_{10} standard for which the same all monitored county analysis is also performed.

b The national totals include the cost of the National $PM_{2.5}$ Strategy. However, the Integrated Planning Model used to assess utility sector impacts does not include the same control regions used in the PM Optimization Model, so the incremental $PM_{2.5}$ cost shown for each control region does not include the cost of the National $PM_{2.5}$ Strategy. All totals may not agree due to rounding.

5.0 FUGITIVE DUST ADJUSTMENT FACTOR IN THE PM COST ANALYSIS

This appendix presents the results associated for a 0.10 fugitive dust adjustment factor for the current PM_{10} standard and the $PM_{2.5}$ 15/50 alternative. The analysis presented in Chapter 6 is based on a fugitive dust adjustment factor of 0.25. This means that all fugitive dust emission projections are reduced by 75 percent to reduce the effect of fugitive dust on modeled PM air quality predictions. As discussed in Chapter 4, the 0.25 adjustment in general does a good job of accounting for the tendency of the PM air quality model to overestimate the impact of fugitive dust emissions on predicted PM air quality. However, in some areas, the 0.25 adjustment factor may not be large enough to compensate for the tendency of the PM air quality model to overestimate the impact of fugitive dust emissions on predicted PM air quality. For these areas,

a 0.10 adjustment factor may be more appropriate (i.e., fugitive dust emission projections are

reduced by 90 percent). The analysis in this appendix tests this hypothesis.

Table D.5.1 presents the projected number of residual nonattainment counties under each of the fugitive dust adjustment factor scenarios. As shown, the number of residual counties does not change significantly. Only 3 additional counties are modeled to achieve full attainment of the 15/50 standard.

Table D.5.2 presents the average post-control PM concentrations in projected residual nonattainment counties. This table confirms that the 0.10 fugitive dust adjustment factor has only a minor affect on the resulting average air quality in residual nonattainment counties.

Table D.5.3 presents the national annual control cost summary under each fugitive dust adjustment factor scenario. The annual control cost associated with partial attainment of the 0.10 fugitive dust adjustment factor is more than $2.3 billion less than the 0.25 fugitive dust adjustment factor case. The largest savings in cost for the 0.10 adjustment case occur in the South Central and Midwest/Northeast regions.

The conclusion is that the 0.10 adjustment has a minor effect on projected residual nonattainment and post-control air quality in the residual counties, but that the cost of achieving the resulting degree of attainment is significantly lower.

Table D.5.1 Projected Number of Residual Nonattainment Counties: 0.25 and 0.10 Fugitive Dust Adjustment Factors (Tier 1 Monitored Counties)

Control Region	PM_{10} 50/150 Current Standard					
	0.25 Fugitive Dust Adjustment Factor			0.10 Fugitive Dust Adjustment Factor		
	Total	Annual	24 Hour	Total	Annual	24 Hour
Midwest/Northeast	5	1	5	5	1	5
Southeast	0	0	0	0	0	0
Rocky Mountain	8	0	8	8	0	8
South Central	2	1	2	1	0	1
West	11	3	11	11	3	11
Northwest	4	0	4	4	0	4
Nation	30	5	30	29	4	29
Control Region	**$PM_{2.5}$ 15/50 Standard**					
	0.25 Fugitive Dust Adjustment Factor			0.10 Fugitive Dust Adjustment Factor		
	Total	Annual	24 Hour	Total	Annual	24 Hour
Midwest/Northeast	11	9	4	9	8	3
Southeast	1	1	0	0	0	0
Rocky Mountain	9	6	4	8	5	3
South Central	2	2	0	3	3	0
West	14	10	11	14	10	11
Northwest	3	0	3	3	0	3
Nation	40	28	22	37	26	20

Table D.5.2 Average Post-Control $PM_{2.5}$ Concentrations by Region Under Alternative Fugitive Dust Adjustment Factors[a]

Current PM_{10} Standard				
Region	**0.25 Fugitive Dust Adjustment Factor**		**0.10 Fugitive Dust Adjustment Factor**	
	Annual	**24-Hour**	**Annual**	**24-Hour**
Midwest/Northeast	18.2	63.0	18.6	64.2
Southeast	16.6	40.1	--	--
Rocky Mountain	16.3	50.6	15.9	50.3
South Central	17.5	47.2	17.1	48.4
West	16.8	66.1	16.9	66.2
Northwest	11.4	56.4	11.3	56.0
Nation	16.7	59.4	16.6	60.0

$PM_{2.5}$ 15/50 Alternative				
Region	**0.25 Fugitive Dust Adjustment Factor**		**0.10 Fugitive Dust Adjustment Factor**	
	Annual	**24-Hour**	**Annual**	**24-Hour**
Midwest/Northeast	16.2	56.5	16.8	58.5
Southeast	15.2	36.5	--	--
Rocky Mountain	14.8	46.2	14.7	46.5
South Central	16.1	43.3	15.9	45.1
West	16.1	63.3	16.2	63.7
Northwest	10.5	52.0	10.5	51.7
Nation	15.4	55.1	15.5	56.2

a Tier 1 monitored counties only.

Table D.5.3 Summary of Partial Attainment National Annual Control Costs Under Alternative Fugitive Dust Adjustment Factor Scenarios[a] (Million 1990$)

Region	Current PM_{10} Standard		$PM_{2.5}$ 15/50	
	0.25 Adjustment	0.10 Adjustment	0.25 Adjustment	0.10 Adjustment
Midwest/Northeast	290	290	3,400	2,600
Northwest	140	130	260	250
Rocky Mountain	210	200	940	760
South Central	210	90	1,800	540
Southeast	--	--	130	30
West	130	130	380	380
National $PM_{2.5}$ Strategy	--	--	2,600	2,600
National Total[b]	990	850	9,500	7,200

a Costs for the 15/50 standard are incremental to attainment of the current PM_{10} standard for which the same all monitored county analysis is also performed.

b The national totals include the cost of the National $PM_{2.5}$ Strategy. However, the Integrated Planning Model used to assess utility sector impacts does not include the same control regions used in the PM Optimization Model, so the incremental $PM_{2.5}$ cost shown for each control region does not include the cost of the National $PM_{2.5}$ Strategy. All totals may not agree due to rounding.

6.0 EMISSION REDUCTION, AIR QUALITY, AND COST IMPACT RESULTS FOR THE $PM_{2.5}$ 15/50 ALTERNATIVE FOLLOWING THE 0.08 3rd MAX. OZONE ALTERNATIVE

This section discusses the emission reduction, air quality, and cost impact results for the $PM_{2.5}$ 15/50 alternative following partial attainment of the 0.08 3rd Max. ozone alternative. The results discussed in this section are estimated incremental to partial attainment of the current ozone and current PM_{10} standards, and the 0.08 3rd Max. standard.

The number of counties estimated in residual nonattainment for the $PM_{2.5}$ 15/50 standard and the overall amount of emission reductions achieved remains unchanged when the standard is analyzed incremental to partial attainment of the 0.08 3rd Max. alternative. This is because the total set control measures selected, and their associated emissions and air quality impacts, does not change significantly. However, due to the overlap of ozone nonattainment areas for the 0.08

3rd Max. standard and nonattainment counties for the $PM_{2.5}$ 15/50 alternative, the set of control measures selected specifically for the $PM_{2.5}$ 15/50 standard incremental to the 0.08 3rd Max. is smaller than the set of control measures selected for 15/50 incremental to the baseline.

Evidence of this smaller set of control measures specific to the $PM_{2.5}$ 15/50 standard incremental to the 0.08 3rd Max. should be reflected in a lower incremental cost of the $PM_{2.5}$ standard when it follows an ozone standard relative to the incremental cost of the same $PM_{2.5}$ standard measured against the baseline. Table D.6.1 presents the estimated control cost for current PM_{10} standard and the $PM_{2.5}$ 15/50 alternative incremental to partial attainment of the proposed 0.08 3rd Max. and incremental to the baseline (i.e., partial attainment of the current ozone and PM_{10} standards). When analyzed incremental to partial attainment of the 0.08 3rd Max. ozone standard, the total cost savings is slightly more than $100 million. The apparent small overall cost savings shown in Table D.6.1 is not conclusive evidence of a lack of synergy. Full attainment results for the alternative ozone standards might reveal additional synergies that would result in greater cost savings and additional progress toward attainment of the $PM_{2.5}$ standard.

Table D.6.1 Partial Attainment Cost Summary for Current PM_{10} Standard and the $PM_{2.5}$ 15/50 Alternative--Total Annual Cost, Tier 1 Monitored Counties (Million 1990$)

Region	Incremental to Baseline[a]		Incremental to 0.08 3rd Max[b]	
	Current PM_{10} Standard	$PM_{2.5}$ 15/50	Current PM_{10} Standard	$PM_{2.5}$ 15/50
Midwest/Northeast	290	3,400	290	3,300
Northwest	140	260	140	260
Rocky Mountain	210	940	210	940
South Central	210	1,800	210	1,800
Southeast	--	130	--	110
West	130	380	120	350
National $PM_{2.5}$ Strategy	--	2,600	--	2,600
National Total[c]	990	9,500	970	9,400
Combined Total	10,500		10,400	

a Costs for the current PM_{10} strategy are incremental to partial attainment of the ozone standard. Costs for the $PM_{2.5}$ 15/50 standard are incremental to partial attainment of the current PM_{10} standard.

b Costs are incremental to partial attainment of the 0.08 3rd Max. ozone standard, which includes partial attainment of the current ozone standard.

c The national totals include the cost of the National $PM_{2.5}$ Strategy. However, the Integrated Planning Model used to assess utility sector impacts does not include the same control regions used in the PM Optimization Model, so the incremental $PM_{2.5}$ cost shown for each control region does not include the cost of the National $PM_{2.5}$ Strategy. All totals may not agree due to rounding.

7.0 EMISSION REDUCTION AND COST IMPACT RESULTS FOR 0.08 3rd MAX. OZONE ALTERNATIVE FOLLOWING THE ALTERNATIVE $PM_{2.5}$ 15/50 STANDARD

This section discusses the emission reduction and cost impact results for the 0.08 3rd Max. ozone alternative following partial attainment of the $PM_{2.5}$ 15/50 alternative. The results discussed in this section are estimated incremental to partial attainment of the current ozone and current PM_{10} standards, and the $PM_{2.5}$ 15/50 alternative.

The number of areas estimated in residual nonattainment for the 0.08 3rd Max. standard

and the overall amount of emission reductions achieved remains unchanged when the standard is analyzed incremental to partial attainment of the $PM_{2.5}$ 15/50 alternative. This is because the total set control measures selected, and their associated emissions and air quality impacts, does not change significantly. However, due to the overlap of ozone nonattainment areas for the 0.08 3rd Max. standard and nonattainment counties for the $PM_{2.5}$ 15/50 alternative, the set of control measures selected specifically for the 0.08 3rd Max. standard incremental to the $PM_{2.5}$ 15/50 standard is smaller than the set of control measures selected for 15/50 incremental to the baseline.

Evidence of this smaller set of control measures specific to the 0.08 3rd Max. standard incremental to the $PM_{2.5}$ 15/50 alternative should be reflected in a lower incremental cost of the ozone standard when it follows a $PM_{2.5}$ standard relative to the incremental cost of the same ozone standard measured against the baseline. Table D.7.1 presents the estimated control cost for the 0.08 3rd Max. standard incremental to partial attainment of the $PM_{2.5}$ 15/50 alternative and incremental to the baseline (i.e., partial attainment of the current ozone standard). When analyzed incremental to partial attainment of the $PM_{2.5}$ 15/50 standard, the total cost savings is nearly $100 million. The apparent small overall cost savings shown in Table D.7.1 is not conclusive evidence of a lack of synergy. Full attainment results for the alternative $PM_{2.5}$ standard might reveal additional synergies that would result in greater cost savings and more progress towards attainment of the alternative ozone standard.

Table 7.10 National Summary of Partial Attainment Control Costs for Alternative Ozone Standards Following a $PM_{2.5}$ Standard

Control Measure	Annual Control Cost (Millions 1990$)	
	Incremental to Partial Attainment of the Current Ozone Standard	Incremental to $PM_{2.5}$15/50[b]
National Ozone Strategy	330	330
Local Control Measures	1,020	920
Total[c]	1,350	1,250

a Costs are incremental to the partial attainment of the current ozone standard.

b Costs are incremental to partial attainment of the $PM_{2.5}$ 15/50 alternative, which includes partial attainment of the current ozone and PM_{10} standards.

c Totals may not agree due to rounding.