

US EPA ARCHIVE DOCUMENT

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Technical Support Document
for the
Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone
(Clean Air Interstate Rule):
Reconsideration Notice of Proposed Rule

**Sulfur Dioxide Allowance Allocation Methodology Comparative
Analysis Technical Support Document**

EPA Docket number: OAR-2003-0053
December 2005

U.S. Environmental Protection Agency
Office of Air and Radiation

US EPA ARCHIVE DOCUMENT

Sulfur Dioxide Allocations Methodology Technical Support Document

This Technical Support Document (TSD) provides a description of the analysis done in support of EPA's response to the petition for reconsideration on the Clean Air Interstate Rule (CAIR) Sulfur Dioxide (SO₂) allocation methodology. It also provides information on data sources for the analyses.

This document includes details of the following analyses:

- Ratio of allocation to CAIR base case emissions scenario by parent company for 2015
- Ratio of allocation to projected emissions with CAIR controls (control case) by parent company for 2015
- Owner/operator level information for each of the above (base case and control case in 2015)

It also includes appendices of the data sources and methods for aggregating unit and plant level data to the owner/operator and parent/holding company level (Source: Memo from David Sellers, Perrin Quarles Associates, 12/02/05). The underlying data, including data for both 2010 and 2015, is available in the docket (OAR-2003-0053), as "SO₂ Allowance Allocation Methodology Comparative Analysis Data Files."

Overview

A variety of SO₂ allowance allocation methodologies were raised and analyzed during the rulemaking process. Aside from the method chosen by EPA, which is the allocation method chosen by Congress in title IV of the Clean Air Act, other methodologies analyzed included allocating on the basis of recent historic tonnage emissions, heat input (with alternatives based on heat input from all fossil generation, and heat input from coal- and oil-fired generation only) and heat output (with alternatives based on all generation and all fossil-fired generation).

While each allocation methodology suggested by commenters during the rulemaking process has its advantages and disadvantages for different companies and States, EPA explained in the final rule that its chosen methodology is reasonable on several grounds. First, EPA believes that "achieving SO₂ reductions for electric generating units (EGU) using the title IV allowances is necessary in order to ensure the preservation of a viable title IV program" (Response to Comments (RTC) at 511, section X.A.26, 2005). See also discussion in preamble to the final CAIR in section IX (70 FR 25290-91). Second, in using the title IV allowances, EPA relied on the selection by Congress of the permanent allocation methodology established in title IV for purposes of reducing SO₂ emissions. As stated in the RTC (p. 512), "Congress clearly did not choose a policy to regularly revisit and revise these allocations, believing that its allocations methodology for title IV

allowances would be appropriate for future time periods.” Third, title IV allowance allocations provide a logical and well understood starting point from which additional EGU SO₂ emission reductions can be achieved for Acid Rain units, which are the vast majority of affected CAIR EGUs.

Finally, EPA’s State-by-State analysis of several methods for SO₂ allocations shows that the use of title IV allowances to develop State budgets creates a reasonable result (see RTC, section X.A.26). In more than two-thirds of CAIR States (which account for about 80 percent of the total heat input in the CAIR region from 1999-2002), the State budget calculated using the title IV allowances results in the State receiving a percentage of total SO₂ allocations that is within the range of percentages resulting under other suggested SO₂ allocation methods (see RTC, Section X.A.26). For example, Ohio’s budget for 2010 under EPA’s method is 333,520 tons, which is about 9 percent of the total (CAIR region) budget of 3,619,196 tons.¹ When we calculated budgets and percentage share of the total budget for each of the alternative methodologies, we found that Ohio would receive the largest percentage of the CAIR region budget under the historic tonnage method (about 12%) and the smallest percentage share under the output method for all generation (about 5%). The title IV method, chosen by EPA, provides a percentage share of total allocations within the range set by the maximum and minimum percentages from all methods analyzed.

The policy decision to base the CAIR SO₂ budgets on the existing title IV allowance system, and EPA’s demonstration that the result of using the system is reasonable, fully support the use of an allocation system based on title IV allowances. Nevertheless, as a part of this reconsideration, EPA performed additional analyses, explained below, to evaluate the SO₂ allocation methodology in the final CAIR rule in light of the petitioner’s concerns. Similar to the State-by-State analysis, in these analyses, EPA compared three alternative SO₂ allowance allocation methodologies to the methodology in the final CAIR. However, in these analyses, EPA examined how allowances were distributed to companies relative to their projected SO₂ emissions because the petitioner claimed that the distribution of SO₂ allowances is inequitable and unreasonable. According to the petitioner, the allowance distribution will result in the petitioner’s relatively low-emitting units buying allowances from other relatively high-emitting units.

When evaluating the impact of the various allocation methodologies, computing allocations on a company-by-company basis is more appropriate than comparing allocations on a unit-by-unit basis, although allowances are allocated to units. This is because, while one unit could be allocated fewer allowances under one methodology, the methodology could result in another unit owned by the same company being allocated more allowances, which may offset the smaller allocation of the first unit. If the units are at the same source, the allowances can be used to cover emissions from either unit, and if the units are at different sources, allowances can be transferred from one source to the other at little or no cost. EPA analyzed the allocation methodologies at the parent company (e.g., at the holding company level where applicable). EPA also conducted this

¹ EPA’s methodology to calculate the Regional and State budgets is described in the TSD in the docket <http://www.epa.gov/cair/pdfs/finaltech06.pdf>

12/2/2005

analysis at the operating company level, which takes into account that holding companies may incur some cost to shift allowances between operating companies (which typically consist of units within a single State), especially in States with price-regulation over power generation. Believing that taking this into account would not have a major effect on the outcome of these analyses, EPA performed this portion of the analyses to test this assumption.

EPA utilized the best SO₂ allowance allocation, heat input, and emissions data available to the Agency at the time of this Response to CAIR Petition for Reconsideration. EPA's analyses encompassed about two-thirds of the total number of CAIR plants, over 95 percent of total annual allocations for all methodologies, and about 97 percent of the total projected emissions in the CAIR region during the years 2010 and 2015 and for both control and base cases (Note: 2015 analyses are described herein; 2010 figures and tables can be found in the docket, OAR-2003-0053, "SO₂ Allowance Allocation Methodology Comparative Analysis Data Files").

The three alternative allowance allocation methodologies EPA analyzed were suggested by various commenters during the rulemaking process. These methodologies are:

1. Allocating allowances based on more recent heat input data;
2. Allocating allowances based on more recent heat input data adjusted for fuel type (e.g. coal, oil and gas);
3. Allocating allowances based on more recent heat input data adjusted both for fuel type (e.g. coal, oil and gas) and for coal type (e.g. bituminous, sub-bituminous and lignite).

In comparing the CAIR final SO₂ allocation methodology and the three alternative methodologies, EPA took into account certain factors that are applicable to the CAIR final allocation methodology but not to the three alternative methodologies. For all four methodologies, EPA analyzed the resulting total allowance allocations, and the total projected emissions, for companies' sources located in the States subject to CAIR. In addition, for all the methodologies, EPA analyzed the relationship between allowances and emissions in two ways. In the first (see Section 1), EPA calculated the ratio of allowances to total projected emissions before CAIR controls (base case). This measures how much each company falls short of allowances relative to CAIR-required reductions and gives a sense of the effort required of companies to either purchase allowances or add controls to cover their activities after they consider their allocated allowances. Then, in the second approach (see Section 2), EPA calculated the ratio of allowances to total projected emissions with CAIR controls installed (control case). This way measures how many allowances a company would need to purchase or would be able to sell after controls are installed, or if companies would have excess allowances to sell if their units already had relatively low emissions.

For the CAIR final methodology, EPA also considered both the allowance allocations and emissions for companies' sources both in the CAIR region and outside the CAIR region. EPA believes that this is appropriate because, under the CAIR final

methodology, if a company's sources outside the CAIR region have more title IV allowances than needed to cover their emissions under the Acid Rain Program, the company could transfer, at little or no net cost, excess allowances to the company's sources in the CAIR region for use to cover emissions under the CAIR trading program. Under the three alternative methodologies, which would require creating new CAIR SO₂ allowances independent of the existing title IV allocations, CAIR sources could not use title IV allowances held for sources outside (or in) the CAIR region for compliance with the CAIR SO₂ allowance holding requirement.

Opting into the Acid Rain Program

Further, in the analysis of the CAIR final methodology, EPA considered the allocation of title IV allowances to CAIR region units that are not currently in the Acid Rain Program but that could opt into the Acid Rain Program and receive title IV allowances (see 42 U.S.C. 7651i and 18 CFR part 74). This analysis assumed that companies owning non-Acid Rain units subject to CAIR would opt into the Acid Rain Program because they would receive title IV allowances to cover a portion of the units' emissions under CAIR. EPA believes this assumption is reasonable because any of these units has the option of becoming an Acid Rain Program opt-in unit at little cost. In contrast, the analysis of the three alternative methodologies did not consider Acid Rain Program opt-in allowances because these approaches do not use title IV allowances for CAIR compliance.

EPA maintains that the statutory and regulatory provisions governing Acid Rain Program opt-in units allow units that are subject to CAIR, but not to the Acid Rain Program, to opt into the Acid Rain Program. Under section 410(a) of the Clean Air Act, the owner or operator of any unit that emits SO₂ and "is not, nor will become, an affected unit" under the general applicability provisions of CAA title IV (i.e., starting in 2000, CAA sections 403(e)(for new units) and 405 (for existing units)) may apply to have the unit become an opt-in unit under the Acid Rain Program. 42 U.S.C. 7651i(a). (The separate treatment of "process sources" under sections 410(a) and (e) is not applicable to electric generating units covered by CAIR.) Section 410 was added to the Clean Air Act by the Clean Air Act Amendments of 1990, which were enacted on November 15, 1990.

EPA interprets section 410(a) to allow any SO₂-emitting unit not currently covered by the general applicability provisions to opt into the Acid Rain Program and be allocated SO₂ allowances, provided that certain requirements (e.g., emissions monitoring and reporting requirements under part 75 of the Acid Rain regulations) are met. EPA maintains that the section 410(a) language referring to a unit that "is not" an affected unit reflects the fact that one of the general applicability provisions (section 405) covers units in existence when the Clean Air Act Amendments of 1990 were enacted and that the section 410(a) language referring to a unit that "will [not] become" an affected unit reflects the fact that another general applicability provision (section 403(e)) covers units (i.e., units that had not even commenced construction in November 1990) that were not in existence at the time of enactment. In short, section 410(a) included language using both a verb in the present tense (i.e., "is not") to refer to existing units and a verb in the future tense (i.e., "nor will become") to refer to future units. EPA does not interpret the latter language -- which was necessary as a matter of grammar to refer to units not in existence in 1990 -- to bar, from opting in, currently operating units that are not covered by the generally

applicability provisions but that may become subject to those provisions sometime in the future. Consequently, a unit that currently has an exemption from the general applicability provisions, e.g., an exempt cogeneration unit under CAA section 402(17)(C) or 405(g)(6)(A)), may opt in under section 410(a), even if the exemption may be lost sometime in the future. Such a unit may become and remain an opt-in unit until the unit loses its exemption.

This interpretation of section 410(a) is reflected in the implementing regulations. For example, § 74.2 states that the opt-in regulations apply to units that “are not affected units under § 72.6 [the general applicability provisions]...and that are operating and are located in the 48 contiguous States of the District of Columbia”. 40 CFR 74.2. The opt-in regulations do not exclude operating units that are currently exempt from the general applicability provisions but that may subsequently lose their exemption. Moreover, § 74.46(b)(iii) specifically addresses how to treat opt-in allowance allocations for operating units that opt in but subsequently become subject to the general applicability provisions. Since the provision explains how to treat such allowance allocations for the year in which the units lose their exemption and for subsequent years, this supports EPA’s interpretation that currently exempt units may become opt-in units even though they may lose their exemption in the future.

EPA notes that the additional cost for CAIR units of opting into the Acid Rain Program will be minimal. The major cost for any unit to opt in is the cost of meeting emissions monitoring and reporting costs under part 75. Whether or not they become Acid Rain Program opt-in units, all units under CAIR already have to meet, and incur the costs of, part 75 emissions monitoring and reporting requirements.

1. Parent Company Base Case Analysis for 2015

Calculating the ratio of allowances to total projected emissions before CAIR controls (base case) measures how much each company falls short (or in excess) of allowance needs given current generation and controls. The median is the midpoint value when all values are listed in rank order, and is often used when there are extreme values in the data set skewing (in this case, inflating) the mean. EPA’s method has a median very similar to that of the respective medians for the alternative methods in 2015 (Table 1). This result is also true for 2010 (see CAIR docket: OAR-2003-0053, “SO₂ Allowance Allocation Methodology Comparative Analysis Data Files”).

Table 1. Median of Allocation Alternatives using Ratio of Allocation to Base Case Emissions for 2015

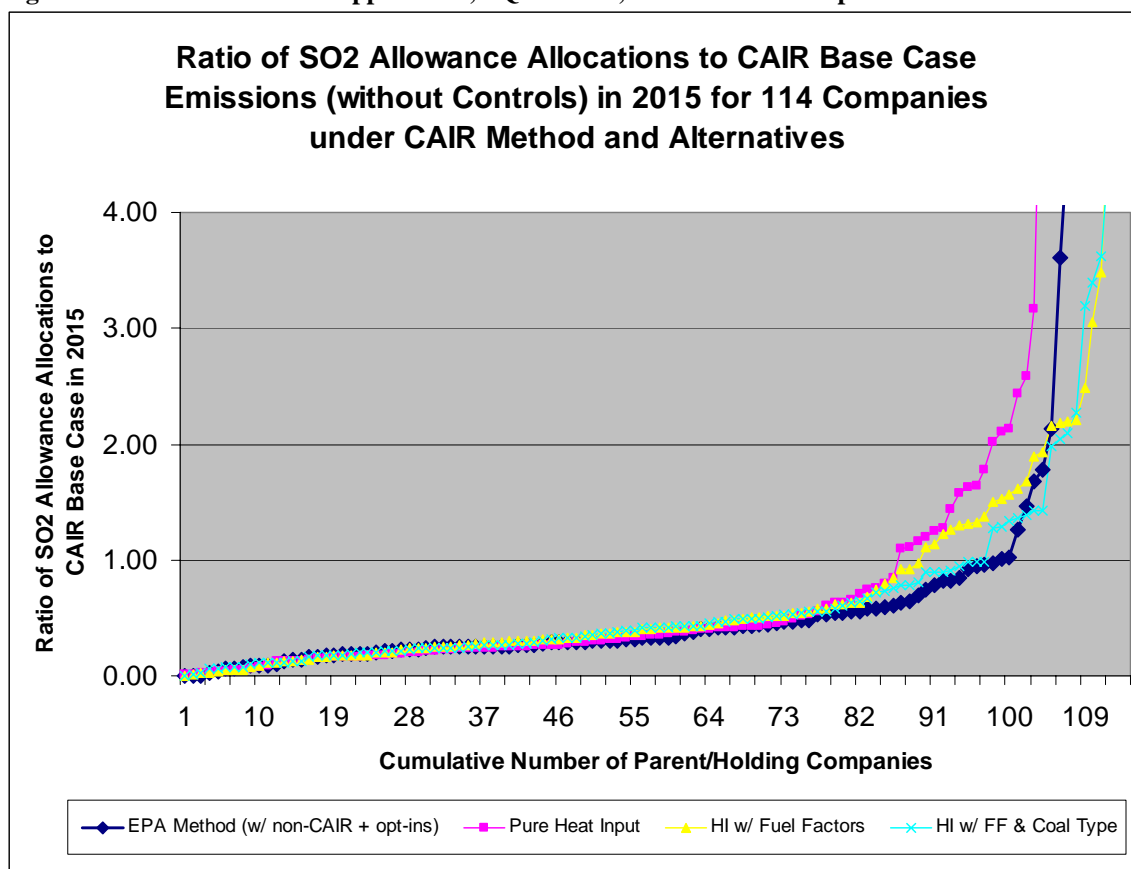
	Allocation Methods			
	EPA Method Based on Title IV	Pure Heat Input	Heat Input w/ Fuel Factors	Heat input w/ Fuel Factors & Coal Type
Median	0.3	0.4	0.4	0.4

Source: EPA calculations

In this analysis, companies are ranked in ascending order by their ratio of SO₂ allowance allocation to emissions. The distribution of ratios of allocation to emissions for each method were then charted in the figures below. The values under each method were rank-ordered independently, and therefore, the changes in ratios for an individual company are not represented here. The complete data file can be found in docket, which includes company-specific data to compare across the methods (OAR-2003-0053, "SO₂ Allowance Allocation Methodology Comparative Analysis Data Files").

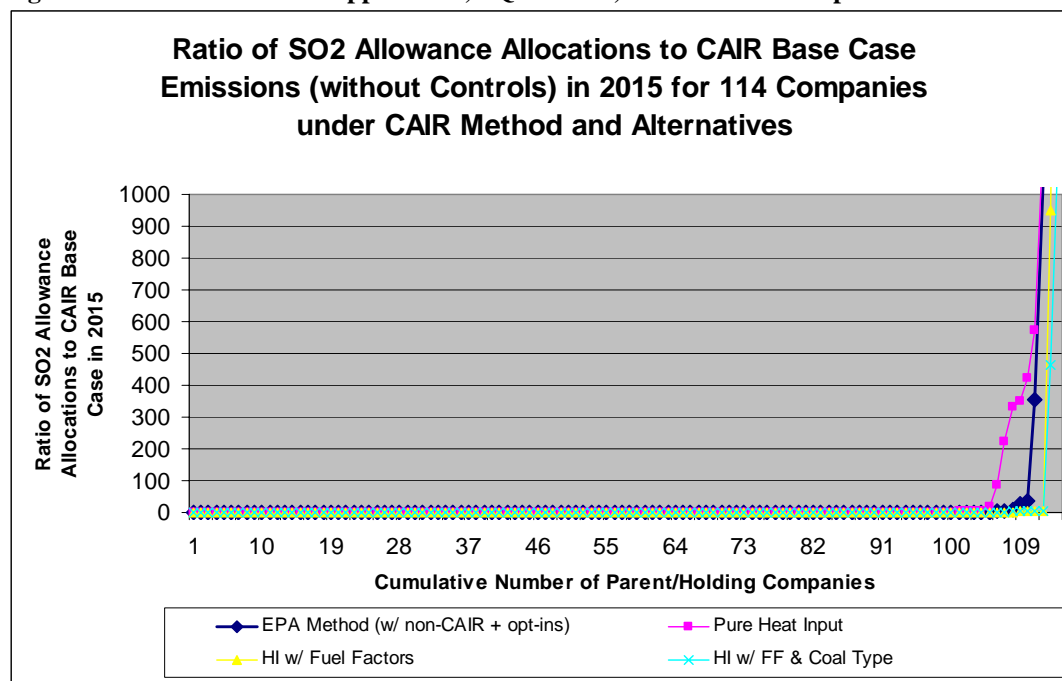
The figures below show values for more than 90 percent of companies, which are below a ratio of 4.0 (allowances to emissions). A smaller figure shows the effect of including all companies in the chart except for extreme values. Including extreme values would render the chart unreadable.

Figure 1. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



*Extreme values removed from Figure

Figure 2. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



*Extreme values excluded

The above figures show that EPA’s method – which is based on the title IV SO₂ allocation method – is not significantly different than the alternative approaches analyzed. Given the over-riding policy decision to maintain the title IV SO₂ trading program, EPA’s method is a reasonable approach for SO₂ allowance allocations under CAIR.

For 2015, EPA’s analysis shows that the cumulative number of companies with a variety of ratios of projected base case SO₂ allowance allocations to emissions are similar across the four methodologies. In 2015 EPA’s method provides up to a ratio of 1.7 allowances to base case emissions for the lower 90 percent of companies analyzed (out of 103 companies in 2015). The corresponding range of ratios for the alternative methods is 1.4 (heat input with fuel factors and coal type) to 3.2 (pure heat input).

EPA’s preliminary analysis of data for 2010 showed a similar relationship between data is in the docket (OAR-2003-0053, “SO₂ Allowance Allocation Methodology Comparative Analysis Data Files”).

2. Parent Company CAIR Control Case Analyses for 2015

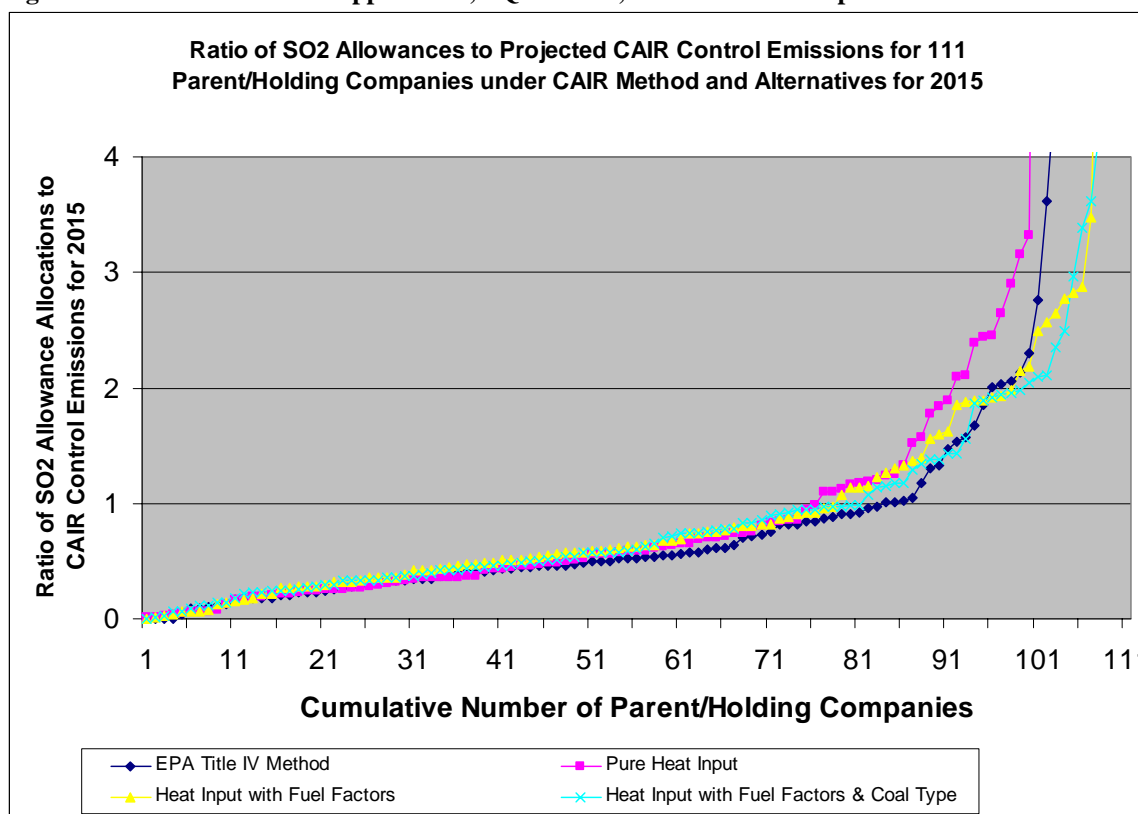
EPA calculated the ratio of allowances to total projected emissions with CAIR controls installed (control case). This approach measures how many allowances a company would need to purchase after controls are installed. The control case analyses, like the base case analyses, show that EPA’s method is not significantly different from the alternatives analyzed.

EPA’s control case analyses encompassed 112 parent/holding companies with sources covered by the CAIR in 2015. For 2015, EPA’s analysis shows that the cumulative number of companies with a variety of ratios of projected base case SO₂ allowance allocations to emissions are similar across the four methodologies (Figures 3 and 4). EPA’s method has a median value for 2015 very similar to those of the alternative methods, as well (Table 2).

Table 2. Median of Allocation Alternatives using Ratio of Allocation to Base Case Emissions for 2015 Base and Control Cases

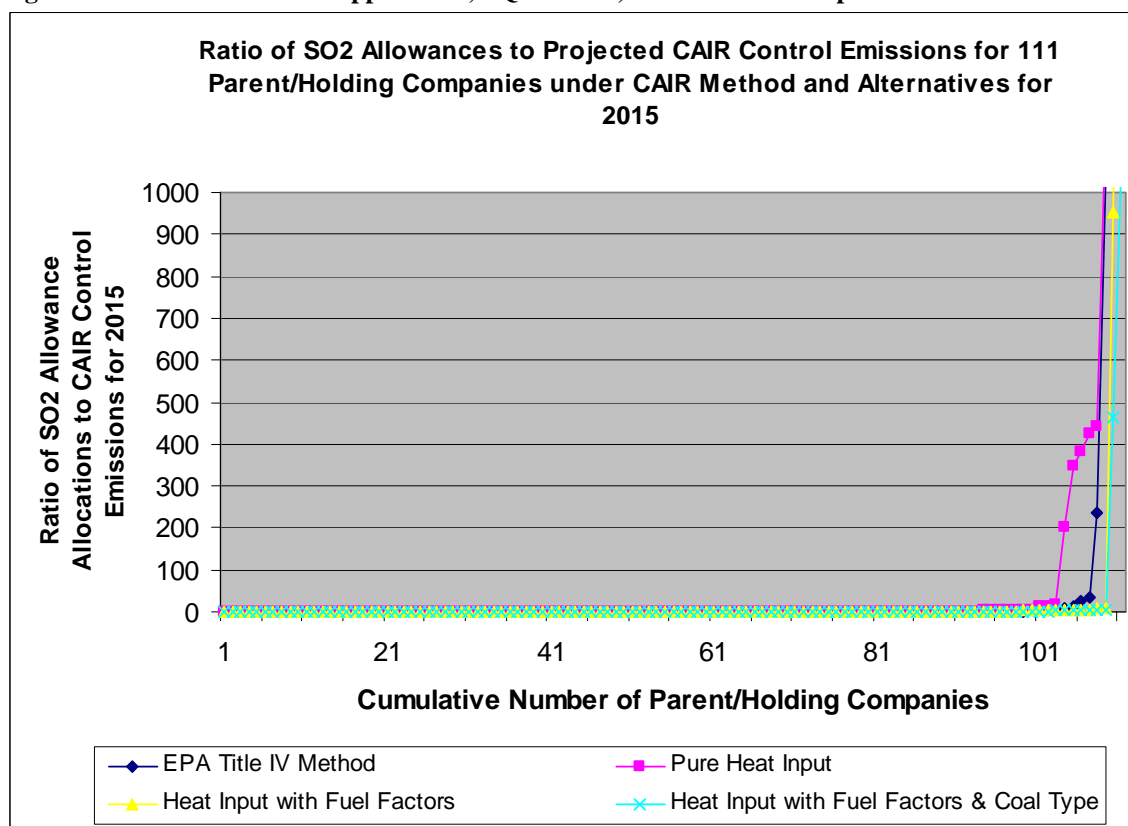
	Allocation Methods			
	EPA Method based on Title IV	Pure Heat Input	Heat Input w/ Fuel Factors	Heat input w/ Fuel Factors & Coal Type
Median	0.5	0.6	0.6	0.6

Figure 3. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



*Extreme values excluded.

Figure 4. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



*Extreme values excluded.

While allocations vary from company to company under the four methodologies, overall, the distributions of allowances that companies received relative to their projected emissions for the CAIR control case are very similar. For example, when looking at company-specific comparisons for the ten largest emitting parent companies with CAIR controls (which are likely to be the largest power companies overall), the difference between the ratio of SO₂ allocations to emissions for the EPA method and the next best alternative vary by less than a ratio of 0.1 for eight of the ten companies [see Table 3, Column labeled, “Ratio Difference (Max or Next Best Minus EPA Method)”. The exceptions were TXU and Cinergy. TXU is predicted to have a ratio 0.14 higher under the EPA method than the next best alternative, while Cinergy is predicted to have a ratio 0.22 lower than the higher of the four alternatives. Although Cinergy is predicted to have a larger ratio under a different method, even under EPA’s method, Cinergy should be able to account for 70 percent of its emissions with allowances after CAIR controls, according to this analysis (Table 3).

Other large companies (not in the top ten, as defined above) like, Duke and Allete have similar ratios across all methodologies (less than ten points variation). However, AES, South Carolina Public Service Authority, and FPL see increases in the allowance-to-emissions ratio greater than 0.1 with alternative methods. In all the methods analyzed, FPL is predicted to be able to account for all of its emissions and have an excess

available to be banked or sold. AES and South Carolina should be able to cover more than two-thirds and nearly one-half of their emissions (respectively) under EPA's method (Table 3).

The lack of consistency in direction of the change in ratio (increase or decrease), as well as the small overall change in ratios for large companies further suggests that no methodology stands out as providing a more reasonable method of allocation across all companies. This is true when examining allowance needs under either the base case or control case, as described above.

Table 3. Ratio of Allowance Allocation to Emissions for Select High-Emitting Companies

Parent Company	2015 CAIR Control Scenario Allocation Methodologies					2015 Base Case Scenario Allocation Methodologies						
	EPA Method	Pure Heat Input	Heat Input with Fuel Factors	Heat Input with Fuel and Coal Type	Ratio Difference Next Best Minus EPA Method)	EPA Method	Pure Heat Input	Heat Input with Fuel Factors	Heat Input with Fuel and Coal Type	Ratio Difference (Max or Next Best Minus EPA Method)	In Top 10 (Y or N)	
Southern	0.49	0.47	0.51	0.50	0.01	0.25	0.24	0.26	0.26	0.00	yes	
AEP	0.71	0.72	0.77	0.75	0.06	0.24	0.23	0.24	0.24	0.00	yes	
TVA	0.46	0.48	0.49	0.51	0.05	0.29	0.30	0.31	0.32	0.03	yes	
DTE ENERGY CO	0.30	0.26	0.30	0.27	0.00	0.29	0.26	0.29	0.27	0.00	yes	
Ameren	0.44	0.44	0.46	0.48	0.03	0.25	0.24	0.25	0.27	0.02	yes	
LGE	0.48	0.49	0.48	0.47	0.02	0.35	0.36	0.35	0.34	0.01	yes	
TXU	0.64	0.37	0.50	0.49	-0.14	0.64	0.37	0.50	0.49	-0.14	yes	
Alliant Energy	0.28	0.27	0.27	0.25	-0.01	0.27	0.26	0.26	0.24	-0.01	yes	
Cinergy	0.70	0.83	0.82	0.93	0.22	0.25	0.30	0.30	0.33	0.04	yes	
Edison International	0.52	0.56	0.57	0.42	0.05	0.30	0.32	0.32	0.24	0.02	yes	
Duke	0.62	0.59	0.57	0.58	-0.03	0.59	0.56	0.55	0.55	-0.03	no	
AES	0.57	0.59	0.79	0.97	0.41	0.42	0.43	0.58	0.72	0.30	no	
SOUTH CAROLINA PUBLIC SERVICE AUTH.	0.44	0.57	0.58	0.58	0.14	0.32	0.42	0.42	0.43	0.11	no	
ALLETE INC	0.26	0.28	0.28	0.28	0.01	0.25	0.27	0.27	0.26	0.02	no	
FPL	13.76	18.62	6.61	2.97	4.86	4.59	6.21	2.21	0.99	1.62	no	

3. Owner/Operator-level Base Case and Control Case Analyses for 2015

EPA analyses at the operating company level take into account that companies may incur some cost to shift allowances across State lines, e.g. if the States involved regulate retail electricity sales. Believing that taking this into account would not have a major effect on the outcome of these analyses, EPA performed this portion of the analyses to test this assumption.

The results for the owner/operating company analyses were not a lot different than the parent/holding company analyses. In the below described analyses, EPA's method provides a ratio of allocations to emissions similar to the two heat input alternatives that include fuel factors. This is true for both 2010 (see docket: OAR-2003-0053, "SO₂ Allowance Allocation Methodology Comparative Analysis Datafile") and 2015 and with base case and control case emissions. One major difference seen in the owner-level analyses compared to the parent-level analyses for 2015 is that the pure heat input method provides extremely high allocation-to-emissions ratios to a larger number of companies. The reason for this trend is that it is the only allocation method of the four analyzed that does not include any fuel-weighting. Therefore, these companies with primarily gas generation,² having little or no emissions, are estimated to receive a disproportionately large number of allowances relative to their emissions under the pure heat input method. These gas generation companies, in general, will not be investing in controls to meet CAIR emissions reduction requirements. Many of these same predominantly gas generation companies have zero allowances under the EPA method because the units they operate commenced operations after 1990, which accounts for the number of companies at the lower end of the spectrum on EPA's curve of figures 5 through 8. Since these units have negligible SO₂ emissions, receiving no allowances will not significantly impact the operating companies (see docket, OAR-2003-0053, "SO₂ Allowance Allocation Methodology Comparative Analysis Data Files," for related data).

The median for the owner/operating companies in both control and base case scenarios is close to the medians of the other fuel factor methods analyzed for both 2010 and 2015, being only one-tenth lower than the next higher alternative (Tables 4 and 5). The trend of values for all methods begins to converge at the higher end of the spectrum, which can be seen in the smaller figures. Complete data tables supporting these analyses are in the docket (OAR-2003-0053), as "SO₂ Allowance Allocation Methodology Comparative Analysis Data Files."

² Companies that are in the 70th percentile or greater of ratios under the pure heat input approach (the top 68 out of 204 analyzed for CAIR control case and the top 61 of 209 for base case) are all exclusively gas-fired.

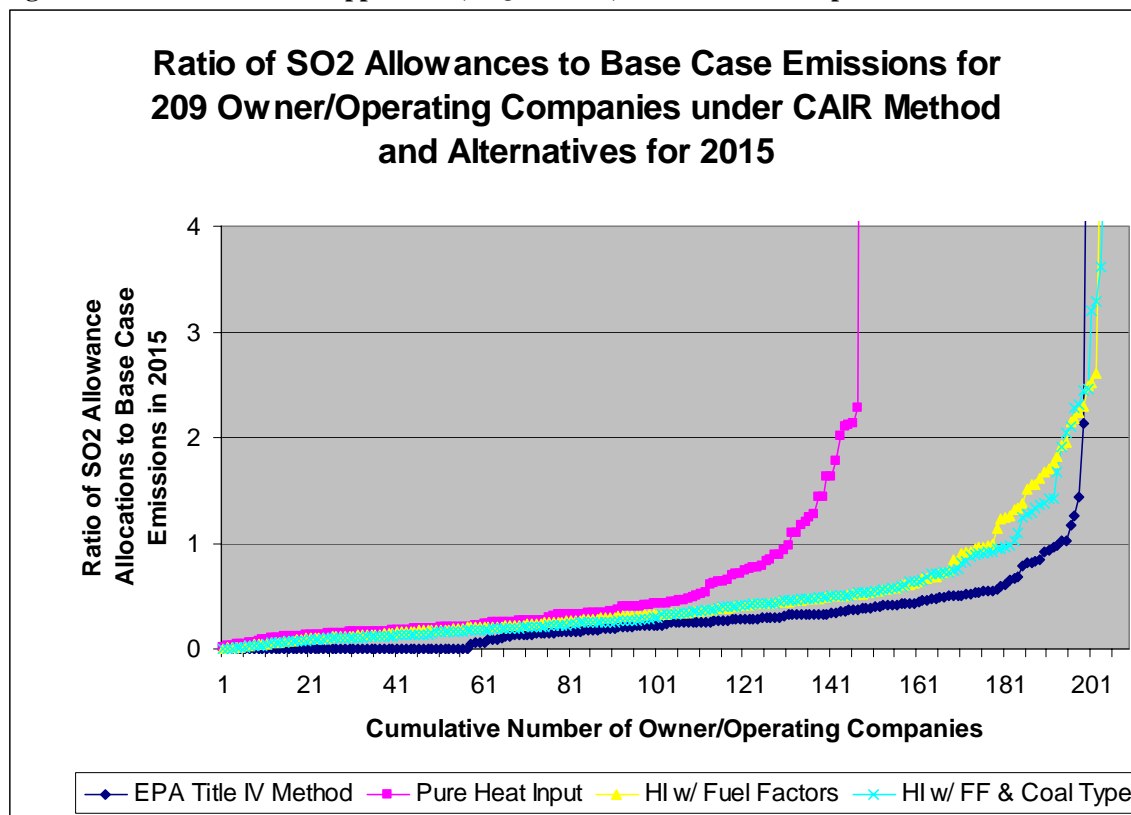
Table 4. Median Analysis of Allocation Alternatives using Ratio of Allocation to Base Case Emissions for 2010 & 2015

	Allocation Methods			
	EPA Method Based on Title IV	Pure Heat Input	Heat Input w/ Fuel Factors	Heat input w/ Fuel Factors & Coal Type
2010 Median	0.3	0.6	0.5	0.4
2015 Median	0.2	0.4	0.3	0.3

Table 5. Median Analysis of Allocation Alternatives using Ratio of Allocation to CAIR Control Emissions for 2010 & 2015

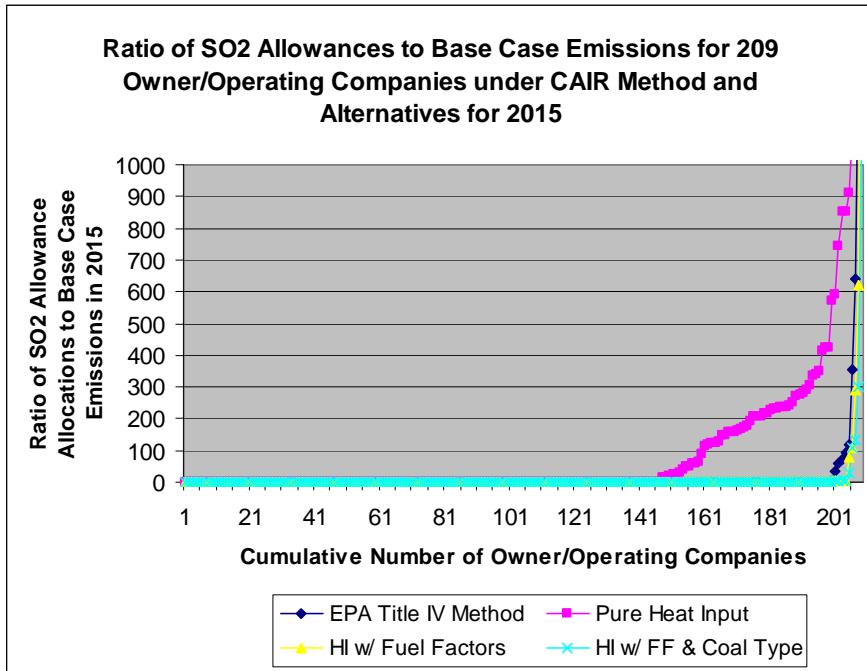
	Allocation Methods			
	EPA Method Based on Title IV	Pure Heat Input	Heat Input w/ Fuel Factors	Heat input w/ Fuel Factors & Coal Type
2010 Median	0.5	1.2	0.7	0.6
2015 Median	0.4	1.2	0.5	0.6

Figure 5. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



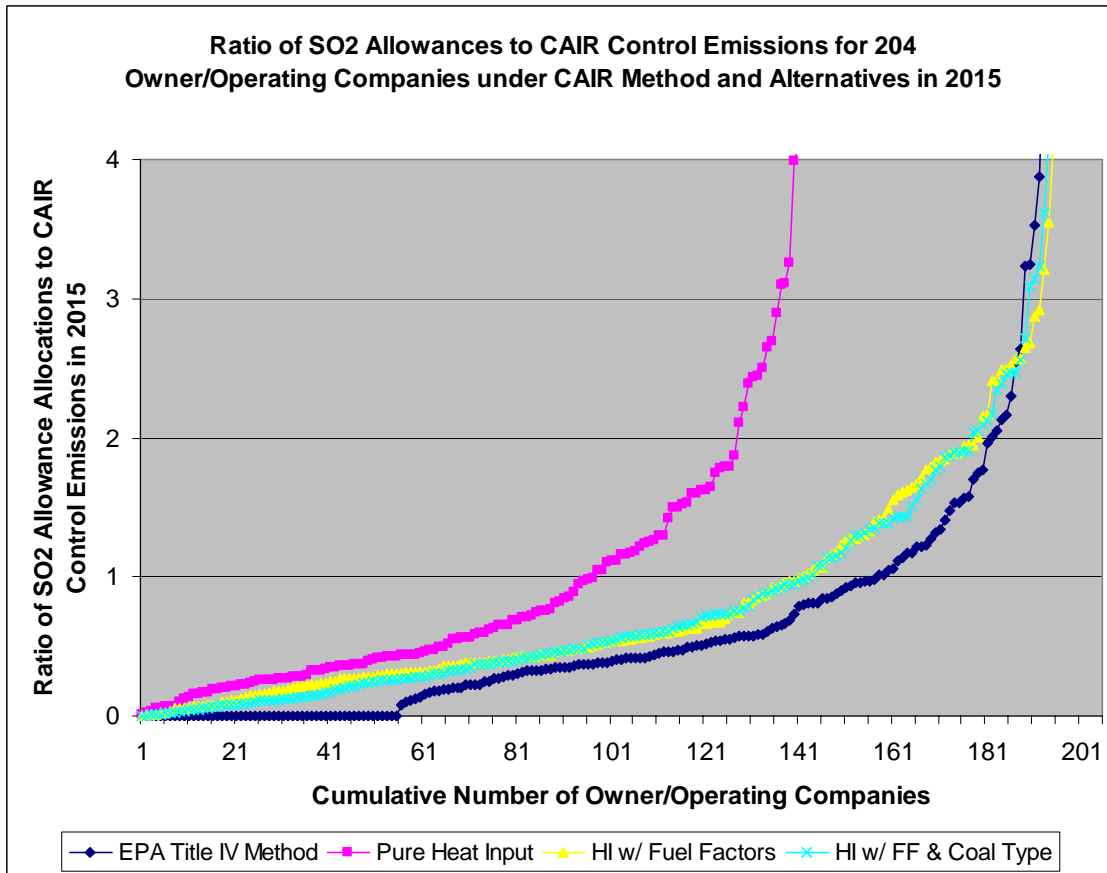
*Extreme values excluded.

Figure 6. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



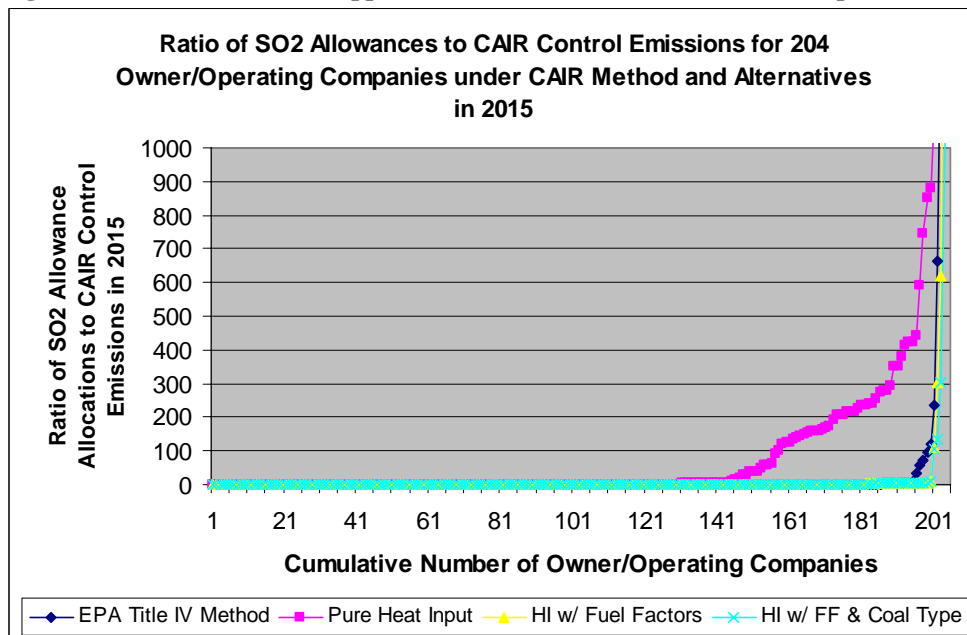
*Extreme values excluded

Figure 7. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



*Extreme values excluded

Figure 8. Source: EPA – see Appendix A, PQA Memo, for detailed description of data sources.



*Extreme values excluded

Once the pure heat input approach is removed from consideration among the SO₂ allowance allocation alternatives for the reasons mentioned above, these owner/operating company analyses show results similar to the parent/holding company analyses described in sections 1 and 2. Among the three remaining methods that incorporate a fuel-adjustment factor, neither heat input methodology stands out as providing a more reasonable method of allocation across all companies when examining allowance needs under either the base case or CAIR control case. In addition, the CAIR method for allocating SO₂ allowances is supported by EPA's over-riding policy decision to preserve operation of the title IV SO₂ cap and trade program as the CAIR method.

Appendix A

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MEMORANDUM

TO: Chitra Kumar
FROM: David Sellers
RE: CAIR SO₂ Allocation Analysis Data
DATE: December 2, 2005

I. Background

This memorandum describes the data provided for a comparison of allocations and emissions for owners and parent companies under different SO₂ allocation methods under the Clean Air Interstate Rule (CAIR).

Each of the allocation options, which were provided by the Clean Air Markets Division (CAMD), are briefly described below and are followed by a discussion of the data sources and how the information was combined. The November 2, 2005, November 23, 2005, and November 30, 2005 data compilations have been provided separately by email.

The owner and parent company information was compiled to respond to a data request with a short turn-around time. As a result, there were simplifying assumptions for plants with multiple owners and no in-depth checking for recent ownership changes.

II. Allocation Options

A. Analysis 1: Allocations under the Existing CAIR Rule

This data compilation has two parts and displays the impact of allocations distributed per the current rule, which relies on existing Acid Rain allocations. Analysis 1a looks at allocations and projected emissions for Acid Rain units only. Analysis 1b adds CAIR affected non-Acid Rain units that potentially may opt-in to the Acid Rain Program to receive SO₂ allowances.

B. Analysis 2: Extending CAIR SO₂ Requirements on a Company Wide Basis

This analysis is similar to Analysis 1, except that the affected units include all Acid Rain units in the CAIR SO₂ states and any Acid Rain unit outside the CAIR SO₂ region belonging to a CAIR unit owner. Analysis 2 looks at allocations and projected emissions for Acid Rain units only. Analysis 2b, which was later added, includes CAIR affected non-Acid Rain units that potentially may opt-in to the Acid Rain Program to receive SO₂ allowances.

C. Analyses 3, 4, and 5: Allocate CAIR State SO₂ Budgets to All Affected Units Based on Baseline Heat Input

These analyses evaluate allocation approaches that are similar to the methodology in the model trading rule for the CAIR NO_x control program, which allocates a share of a state budget to a unit based on baseline heat input. All plants with a CAIR unit in the SO₂ control region (Acid Rain and non-Acid Rain) are included in the allocations. Analysis 3 uses a fuel neutral heat input approach, while Analysis 4 adjusts the baseline heat input based on fuel type (coal, oil, gas), and Analysis 5 adds coal type to the fuel adjustment factors.

III. Analysis Data Sources

A. Units and Plants

Analysis 1a includes all Acid Rain units in the CAIR SO₂ Region with initial allocations, existing Acid Rain units with opt-in allocations, and Acid Rain coal units (coal identified as the primary fuel in the monitoring plan) with zero allocations. Additional Acid Rain gas and oil primary fuel units in the CAIR SO₂ Region that did not receive initial allocations are also included. Analysis 1b adds non-Acid Rain coal fired units in the CAIR Region which may opt-in to the Acid Rain Program.

Analysis 2 includes the Analysis 1a units outside the CAIR region which share common owners with Analysis 1a units. The additional Acid Rain units outside the CAIR region were identified from the draft NEEDS file based on the common owner in the Utilname field of the spreadsheet (Draft NEEDS3_0_9_21_05v3ToEPA.xls). There were initially 382 units outside the CAIR region that were identified which had a CAIR region owner. Of these, there were 240 with a unique CAMD database ID (Acid Rain or NO_x Budget Program unit). The 240 units were matched with initial or opt-in allocations in the CAMD data which identified 102 units with Acid Rain Program allocations. The

102 units with allocations were then included in Analysis 2 with the Analysis 1a units. In addition, plants for which there were Acid Rain units without allocations were also added to the Analysis 2 plant level worksheet (11 plants with 22 units outside the CAIR region).

Analysis 2b adds the non-Acid Rain coal fired units in the CAIR Region which may opt-in to the Acid Rain Program.

Analyses 3, 4, and 5 include all Acid Rain units in the CAIR SO₂ region, and non-Acid Rain plants which have a boiler or combustion turbine serving a generator with nameplate capacity greater than 25 MW. The Acid Rain units are from the Acid Rain worksheet in the finaltech9.xls spreadsheet in the final CAIR technical support information available on EPA's website. The Acid Rain units were originally identified by a February 2004 query of the CAMD database. Non-Acid Rain plants are from the Non-Acid Rain worksheet in finaltech9.xls, and include plants which had a CAIR affected unit as identified from Energy Information Administration (EIA) data. The non-Acid Rain plants were further screened based on ongoing CAIR inventory work.

B. 2010 Acid Rain Allocations

2010 Acid Rain unit allocations were pulled from the CAMD database, and are shown in the Analyses 1a, 1b, and 2 spreadsheets. These are the allocations in Table A4 from the 1998 allowance reallocation.

The Analyses 1a, 1b, and 2 spreadsheet files also include fields showing the allocations reduced by 50 percent and 65 percent. These fields reflect the CAIR allowance surrender requirements in 2010 and 2015.

Applying the allowance surrender requirements in this manner to Acid Rain units outside the CAIR region in Analysis 2 will underestimate the allowances available for these units, as there is a 1 to 1 surrender requirement under the Acid Rain Program for emissions from these units in 2010 and 2015.

C. Opt-In Allocations

Acid Rain program opt-in allocations for existing opt-in units were obtained from CAMD in the file OPTIN04.xls. Opt-in allocations in the 2004 worksheet of that file were used for the Warrick and Alma opt-in units.

Opt-in allocations were estimated for potential coal-fired non-Acid Rain opt-in units using the average annual heat input for the 2001 - 2003 period from EIA data and the plant 2000 SO₂ rate from EPA's EGRID database. Estimates were calculated in this way because the annual heat input and SO₂ emission data for the periods required for opt-in calculations under 40 CFR Part 74 were not available for this analysis.

The allocations were calculated on a plant basis and divided evenly between the

units at multiple unit plants. Opt-in allocations were estimated for units at 31 plants. The opt-in allocations also were reduced by 50 percent and 65 percent to reflect CAIR allowance surrender requirements in 2010 and 2015.

The opt-in units are listed in the opt-in worksheet in the Analysis 1b spreadsheet.

D. Projected Emissions

Projected 2010 and 2015 annual SO₂ emissions from coal fired units under CAIR and the base case were taken from IPM model run files provided by CAMD:

- CAIR 2010 - EPA219b_CAIR_55_2010_Pechan
- CAIR 2015 - EPA219b_CAIR_55_2015_Pechan
- Base case 2010 - EPA219_BC_16b_2010_Pechan
- Base case 2015 - EPA219_BC_16b_2015_Pechan

The run files provide projected emissions for the coal fired units in 1,000 tons of SO₂.

There are no projected emissions for gas and oil fired units in the IPM model run files. Projected emissions for gas fired units were calculated for this analysis based on the projected 2010 and 2015 annual heat input in the IPM model run files, and SO₂ emission factors (lb/mmBtu). There are no 2010 and 2015 projected oil fired heat inputs in the IPM model runs, so no projected emissions were calculated for oil fired units.

An SO₂ emission factor of 0.0006 lb/mmBtu was used to calculate projected emissions for gas fired units, as suggested by CAMD. This is the default SO₂ emission factor under Part 75 for units burning pipeline natural gas.

Matching between files was done at the plant basis because of differences between unit IDs in the model run files and the Acid Rain and non-Acid Rain inventory files. Unit level matches which are presented in the unit level worksheets in the spreadsheets for 1a, 1b, 2, and 2b did not capture all of the projected emissions because of the inconsistency in some unit IDs.

E. Owner and Parent Company Information

The initial owner/operator and parent company information was obtained from matches with the Draft NEEDS3_0_9_21_05v3ToEPA.xls file that was provided by CAMD. Owners that were missing from the NEEDS file were filled in by querying CAMD's Data and Maps database. Internet searches were used to identify parent company relationships beyond those initially identified in the NEEDs file. The searches were limited to units with allocations or coal fired units with projected emissions.

In Data and Maps, multiple owners are listed for several plants, but each has one

owner/operator. For these plants, the owner/operator was designated as the owner.

For municipalities, co-ops, and other owners/operators that do not have parent companies, the parent company field was populated with the owner/operator name.

Owners/operators and parent companies were not identified or matched for all of the plants in the different analyses. Table 1 shows the number of plants in each analysis dataset, the number of plants for which an owner or parent company was not identified, and the percent of 2010 allocations in each analysis associated with plants that did not have an owner or parent match. The table shows that the plants without owner or parent information accounted for a very small percentage of total allocations: under 1 percent to 4 percent.

Also for Analysis 2, there may be an additional number of plants outside the CAIR region which should have been included in the analysis population but may not have been identified because a parent company match was not made.

Table 1
Plants without an Owner or Parent Match

Analysis	Number of Plants	Plants without Owner Match	Plants without Owner Match as a Percent of Total 2010 Allocations	Plants without Parent Match	Plants without Parent Match as a Percent of Total 2010 Allocations
1a	796	18	0%	136	0%
1b	830	18	0%	136	0%
2	851	18	0%	136	0%
3	920	29	0.5%	182	4%
4	920	29	0.005%	182	0.05%
5	920	29	0.004%	182	0.04%

F. Plant Level Baseline Heat Input by Fuel - Analyses 3, 4 and 5

The 1999 through 2002 heat inputs (unit level for Acid Rain units and plant level for non-Acid Rain plants) were used for Analyses 3, 4, and 5, and were taken from the data used for the development of CAIR state NO_x budgets. The Acid Rain heat input data were from the CAMD database, and the non-Acid Rain heat input data were calculated from EIA data (the EIA-860b, EIA-759, and EIA-767 databases). The Acid Rain unit data assigns all of the unit's annual heat input to the primary fuel reported in the unit's monitoring plan. For the non-Acid Rain data, these analyses use the sum of plant

level heat input by coal, gas, and oil. These totals were used to assign an annual CAIR fuel type for Analyses 4 and 5 based on the following criteria from the CAIR model trading rule:

- Coal: If there is any coal heat input for the year, the unit is a coal unit for that year.
- Oil: If the unit is not coal, and the oil heat input is > 15 percent of the total annual heat input, the unit is an oil unit for that year.
- Gas: If the unit is not coal or oil, the unit is a gas unit for that year.

G. Baseline Heat Input Fuel Adjustment Factors -Analyses 4 and 5

In Analyses 4 and 5, the heat input data used in Analysis 3 are adjusted by a fuel adjustment factor for the different fuels burned (coal, oil, or gas). The adjustment factors reflect the relative SO₂ emission rates of each fuel type. For Acid Rain units, all of the unit's heat input was assigned to the primary fuel type reported in the unit's Part 75 monitoring plan. For non-Acid Rain units, the fuel type was based on the different fuels reported in the EIA databases and the CAIR rule definitions of coal, oil, and gas units.

The fuel adjustment factors were calculated using 2002 Acid Rain Program emissions data. Average SO₂ rates in lb/mmBtu were calculated for all coal, gas, and oil Acid Rain units based on the primary fuel type reported in a unit's monitoring plan. The adjustment factors were then calculated as the ratio of each primary fuel average SO₂ rate to the coal average SO₂ rate. The adjustment factors developed from the 2002 Acid Rain data are shown in Table 2.

**Table 2
 Fuel Type Heat Input Adjustment Factors**

Fuel Type	Number of Units	Average SO ₂ Rate* (lb/mmBtu)	Fuel Type Adjustment Factor
Coal	1,076	1.28	1.0
Oil	216	0.40	0.3
Gas	1,687	0.011	0.009

* Average SO₂ Rate calculated as the unweighted average of each unit average.

Analysis 5 uses the same adjustment factors for oil and gas, but adds additional coal type factors. Coal type information is not available in the CAMD data, so EIA 767 data from 2001 - 2003 were used to identify Acid Rain units which burn a single coal type (bituminous, subbituminous, or lignite). The 2002 Acid Rain emissions data were

used to calculate average SO₂ rates by coal type for the single coal units. Coal type adjustment factors were calculated by determining the ratio of SO₂ rates for each coal type to the lowest SO₂ rate coal type using the 2002 data. The coal type adjustment factors developed in this manner are shown in Table 3.

Table 3
Coal Type Heat Input Adjustment Factors

Coal Type	Number of Units*	Average SO ₂ Rate** (lb/mmBtu)	Coal Type Adjustment Factor
Bituminous	568	1.61	2.6
Subbituminous	8	0.61	1.0
Lignite	164	0.61	1.0

* Includes only units burning a single type of coal.

** Average SO₂ Rate calculated as the unweighted average of each unit average.

The annual heat inputs were adjusted for coal type by multiplying the heat input times the coal type adjustment factor and the fraction of coal heat input provided by each coal type in 1999 based on Hg ICR data for that year. These are the same data that were used for the Hg rule allocations. A factor of 1.0 was assigned to any coal fired unit which did not have Hg ICR coal data.

The simplifying assumption of similar coal types burned throughout the 1999 - 2002 period based on the 1999 coal data from the Hg ICR will not reflect the actual coals burned during each year for units which burn multiple coals. An analysis for the Hg rule allocations found that about 17 percent of the units burned a different coal combination in 2002 compared to 1999 based on EIA heat input data. Also, all multiple coal units will have different coal type ratios in 2000 through 2002 than in 1999 (about 17 percent of CAIR region coal units).

H. Baseline Heat Input Allocations - Analyses 3, 4, and 5

For Analyses 3 through 5, the highest three year average heat input during the period was calculated for each plant. Plants with less than four years data during the period used the average heat input of all available years. Also, only Acid Rain heat input years were used for plants which operated under the Acid Rain Program for only part of the baseline period.

The plant level three year averages were summed for each state, and then each plant SO₂ allocation was determined by the ratio of the plant's three year average to the

statewide three year average total heat input multiplied by the state CAIR SO₂ budgets (2010 and 2015). The state SO₂ budgets were taken from the final CAIR.

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