Technical Support Document (TSD)

for the Transport Rule

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Alternative Significant Contribution Approaches Evaluated

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Alternative Significant Contribution Approaches Evaluated

The Transport Rule preamble discusses EPA's proposed approach to define emissions that constitute each upwind state's significant contribution to nonattainment and interference with maintenance downwind. This Technical Support Document (TSD) discusses alternative approaches that EPA evaluated. The TSD is organized as follows:

1. Introduction.
2. Air quality only approaches.
3. Cost per ton approach with uniform cost in all states.
4. Cost per air quality impact.
5. "Binning" of states based on air quality impact.

1. Introduction

Section 110(a)(2)(D)(i)(I) in the Clean Air Act (CAA) requires states to prohibit emissions that contribute significantly to nonattainment in, or interfere with maintenance by, any other state with respect to any primary or secondary NAAQS. The proposed Transport Rule would define these prohibited upwind state emissions with respect to the existing 8-hour ozone and fine particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS), i.e., the 1997 8-hour ozone and annual $PM_{2.5}$ NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS. Section IV.C and IV.D in the Transport Rule preamble discusses EPA's proposed approach to define emissions that constitute significant contribution and interference with maintenance in detail.

EPA developed and evaluated a number of different approaches attempting to quantify the emissions that are defined as each state's significant contribution and interference with maintenance, consistent with the judicial opinions interpreting section 110(a)(2)(D)(i)(I) of the Clean Air Act (see discussion of judicial opinions in preamble section IV.G). The Agency also held several "listening sessions" with interested parties and stakeholder groups and received written comments from several stakeholder groups. EPA considered these ideas and suggestions as it developed alternatives and further explored the most promising approaches.

This TSD describes and discusses the alternative approaches EPA evaluated for defining significant contribution and interference with maintenance. EPA is not proposing any of the alternative approaches

The alternative approaches described in this TSD were listed in section IV.H of the preamble. EPA evaluated several "general" classes of approaches. These include approaches based on: (1) only air quality; (2) only cost, with a uniform cost in all states; (3) cost per air quality impact (e.g., dollars per $\mu g/m^3$ or dollars per ppb); and (4) binning of states based on air quality impact. Often, multiple variations on each of the "general" approach classes were evaluated. Each of the general approaches is described in a separate section, below.

Sections 2, 3, 4, and 5, below, describe the approaches.

2. Air quality only approaches.

A number of air quality only approaches were considered. Generally, these approaches utilize air quality contribution modeling, then determine reductions in emissions based solely on the results of this modeling. These approaches include the "fixed air quality threshold limit" approach and the "cumulative air quality threshold" approach.

a. Fixed air quality threshold limit approach[1]: Under this approach, EPA would define a threshold limit value for an air quality contribution from an upwind state to a downwind monitor. All upwind states would have to reduce emissions such that their contribution to all downwind monitors is at (or below) the level of the threshold. The amount of air quality contribution above the threshold limit would determine the emission reduction required. The amount of air quality impact above the threshold limit to the maximally-impacted downwind nonattainment/maintenance monitor would determine the amount of significant contribution for the upwind state. The contributions from an upwind state to its maximal downwind

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[1] The D.C. Circuit opinion granting petitions for review of the CAIR indirectly discussed the use of fixed air quality thresholds. It noted that "[w]e observe initially that state SO_2 budgets are unrelated to the criterion (the "air quality factor") by which EPA included states in CAIR's SO_2 program. Significant contributors, for purposes of inclusion only, are those states EPA projects will contribute at least 0.2 $\mu g/m^3$ of $PM_{2.5}$ to a nonattainment area in another state. While we would have expected EPA to require states to eliminate contributions above this threshold, EPA claims to have used the measure of significance we mentioned above: emissions that sources within a state can eliminate by applying "highly cost-effective controls."" North Carolina v. EPA, 531 F.3d 896, 916-17 (D.C. Cir. 2008).

nonattainment and maintenance monitor can be found in Tables IV.C-13, 16, and 19 of the preamble.

Generally, the largest contributors to a downwind monitor are from nearby states (and the contributions can be quite large). Since there are a number of nonattainment and maintenance monitors at locations throughout the eastern United States, most upwind states have a substantial air quality contribution to at least one monitoring site in a downwind state (as an example, Table 2-1 summarizes the air quality contributions for annual $PM_{2.5}$). As a result, assessed across all states and monitors, the magnitude of the emissions reductions necessary to reduce these contributions to a lower threshold level (e.g., 0.15 $\mu g/m^3$) for nearly all of the upwind states would be very large and, by consequence, lead to a cumulative reduction of air quality impact well beyond what would be required for each individual downwind monitor to reach attainment/maintenance. The magnitude of emissions reductions necessary to reduce the emissions to a higher threshold level (e.g., 1.0 $\mu g/m^3$) results in fewer states making reductions, with the cumulative air quality improvements possibly insufficient for each individual downwind monitor to reach attainment/maintenance. The emissions reductions for some of the states might still be very large.

As an illustrative example of this approach applying a low threshold, if the maximum impact of anthropogenic SO_2 and NO_x from an upwind state to a downwind monitor is 2 $\mu g/m^3$ and the threshold limit is 0.15 $\mu g/m^3$, the upwind state would have to reduce emissions by an amount that would decrease its air quality impact by 1.85 $\mu g/m^3$. If the air quality impact were proportional to emissions, this upwind state would have to reduce its total emissions of SO_2 and NO_x (from all sources, not just the power sector) by 92.5% (i.e., 1.85/2 $\mu g/m^3$) in order that its air quality impact not exceed 0.15 $\mu g/m^3$. A consequence of this air quality approach is that the threshold levels used in CAIR (i.e., 0.2 $\mu g/m^3$), or as specified in the Transport Rule proposed approach (i.e., defined as 1% of the NAAQS or 0.15 $\mu g/m^3$ for the annual $PM_{2.5}$ standard) result in emissions reductions from nearly all upwind states well beyond what would be needed for all of the downwind areas to attain the standards and possibly exceeding what might be achievable through available control measures. For example, if a state were required to reduce its NO_x emissions from all sources by 92.5% (as described in the example above), this would require elimination of nearly all NO_x emissions from the power generation sector and impose dramatic reductions across many other sectors (including mobile).

Table 2-1. Maximum Downwind Air Quality Contributions to Nonattainment or Maintenance for Annual $PM_{2.5}$ ($\mu g/m^3$) and the Percent Reductions in All Anthropogenic SO_2 and NO_x Emissions that would be Needed to Reduce the Maximum Contributions to Threshold Levels of 0.15 $\mu g/m^3$ and 0.5 $\mu g/m^3$, Respectively.

Upwind State	Maximum Downwind Contribution to Nonattainment or Maintenance for Annual $PM_{2.5}$ ($\mu g/m^3$)		Percent Reduction if Threshold is 0.15 $\mu g/m^3$		Percent Reduction if Threshold is 0.50 $\mu g/m^3$
Alabama	0.46		67%		0%
Arkansas	0.09		0%		0%
Connecticut	0.09		0%		0%
Delaware	0.20		25%		0%
Florida	0.29		48%		0%
Georgia	0.63		76%		21%
Illinois	1.01		85%		50%
Indiana	2.09		93%		76%
Iowa	0.31		52%		0%
Kansas	0.09		0%		0%
Kentucky	1.68		91%		70%
Louisiana	0.34		56%		0%
Maine	0.02		0%		0%
Maryland	0.62		76%		19%
Massachusetts	0.13		0%		0%
Michigan	0.72		79%		31%
Minnesota	0.19		21%		0%
Mississippi	0.07		0%		0%
Missouri	1.38		89%		64%
Nebraska	0.08		0%		0%
New Hampshire	0.02		0%		0%
New Jersey	0.68		78%		26%
New York	0.49		69%		0%
North Carolina	0.19		21%		0%
North Dakota	0.05		0%		0%
Ohio	2.03		93%		75%
Oklahoma	0.08		0%		0%
Pennsylvania	1.60		91%		69%
Rhode Island	0.01		0%		0%
South Carolina	0.26		42%		0%
South Dakota	0.02		0%		0%
Tennessee	0.68		78%		26%
Texas	0.13		0%		0%
Vermont	0		0%		0%
Virginia	0.37		59%		0%
West Virginia	1.17		87%		57%
Wisconsin	0.46		67%		0%

Furthermore, the emissions reductions necessary to reduce all states' contributions below a 0.15 $\mu g/m^3$ threshold would be well beyond what would be needed for all of the downwind areas to attain the standards. Likewise, if the threshold levels were increased to substantially higher levels (e.g., 0.5 $\mu g/m^3$, as seen in Table 2-1), while the consequence would be that fewer states would be required to make reductions (e.g., 12 states compared with 23 states at thresholds of 0.5 and 0.15, respectively), the emissions reductions required of those states would still be significant since several states have large air quality contributions to their maximally-impacted downwind monitors (Table 2-1).

One of the technical challenges of this approach is that there is not a linkage between the levels of emissions reductions for each upwind state and the air quality levels at each of the downwind monitors. This approach does not consider the cumulative air quality impact of emissions reductions in multiple upwind states. Consequently, depending on the threshold chosen (e.g., 0.15 $\mu g/m^3$), there could be substantial over-control compared with cumulative air quality improvements needed for all monitoring locations to meet the NAAQS standards.

b. Cumulative air quality threshold approach: This air quality-only approach recognizes the multi-state nature of the sources contributing to downwind air quality. It uses an air quality threshold to identify states making a significant contribution; all upwind states contributing above the threshold would be required to reduce their individual air quality contribution by an amount that is proportional to their contribution.

For example, consider a downwind monitoring location that is 1.2 $\mu g/m^3$ above the NAAQS standard and is receiving 4.8 $\mu g/m^3$ from all upwind states combined (states A, B, C, and D) which are contributing 2.4, 1.2, 0.8, and 0.4 $\mu g/m^3$, respectively. The cumulative air quality approach would guarantee that a downwind monitoring location would receive a defined air quality improvement or, alternatively, would not receive more than a defined contribution from all upwind states.

A requirement could be made that the location receive 1.2 $\mu g/m^3$ of relief from the upwind states, or alternatively, that the upwind states could contribute no more than 3.6 $\mu g/m^3$ to that location, with reductions made in proportion to the upwind state's individual contributions. Since the amount of relief is simply the remaining contribution subtracted from the original total contribution, these two cumulative approach variations produce identical results.

For both cumulative approaches, the result is that all states would be required to reduce their emissions by the same percentage (which would reduce their impact in direct proportion to their original contribution). Using the example contributions, with a 25% overall reduction in the upwind contribution (1.2 $\mu g/m^3$ out of 4.8 $\mu g/m^3$), the new contribution of states A, B, C, and D would be 75% of their original contributions (or 25% less than their original contributions) or 1.8, 0.9, 0.6, and 0.3 $\mu g/m^3$, respectively.

However, since all contributing states would be required to do the same percent reduction of existing emissions, states that had previously implemented stringent control programs might not be able to achieve the required reductions using existing control technologies, while others that had previously done little (and presumably have larger absolute contributions) would achieve their required reductions using significantly less than optimal control technologies.

There were two additional difficulties with the cumulative air quality approaches. First, it was not clear how to apportion the responsibility for air quality reductions required from upwind states under section 110(a)(2)(D)(i)(I) relative to the responsibility for the state containing the monitor. Second, while it is possible to determine an emission reduction percentage if there is a single downwind monitor, most upwind states contribute to multiple downwind monitors (in multiple states) and would have a different reduction percentage for each one. The technical difficulty lies in determining what percent emission reduction is appropriate for each upwind state. For example, if the "maximum" reductions were applied to each upwind state, the cumulative air quality result would be more than was needed for each area to meet the NAAQS since the maximum contribution for each upwind state is to a different monitor.

3. Cost per ton approach with uniform cost in all states.

Variations of a uniform cost per ton approach were evaluated. This type of approach has been successfully implemented before, with excellent environmental results (i.e., the NO_x Budget Trading Program).

For the uniform cost per ton approaches evaluated, if a state's air quality impact to a nonattainment/maintenance monitor in a downwind state was larger than a specified air quality threshold, EPA evaluated that state's contribution further to determine what, if any, of that state's contribution was "significant". The "significant" portion of a state's contribution is defined as the portion that could be eliminated through the application of "cost-effective" controls. "Cost-effective" would be defined using the cost to reduce a ton of emissions of pollutant, and would be set at a particular dollar per ton value. Sources in covered states would then need to apply all available controls (calculated using the IPM model) to that particular value. Following the model of the successful NO_x Budget Program approach, a single cost per ton value for all states in the region would be identified through analysis of the cost effectiveness of other recent control actions. For this approach, the results of the emissions reductions from each prospective cost per ton value in the cost analysis would be assessed using air quality modeling.

Compared with the way that a uniform cost methodology was applied in the past, which focused on the cost-effectiveness of controls compared with other rules and programs, EPA believes that a better approach to define significant contribution and interference with maintenance is to jointly consider both cost and air quality factors.

4. Cost per air quality impact (e.g., \$ per $\mu g/m^3$ or ppb removed).

Two "cost per air quality impact" approaches were evaluated. These approaches attempt to balance the cost and air quality impacts of emission reductions from upwind states affecting a particular downwind monitor such that each dollar spent to reduce upwind emissions results in the same downwind impact. This means that more reductions would be required in locations where the reductions will have a greater air quality impact on the downwind monitor and fewer reductions would be required where they will have less impact. When air quality problems are regionally widespread (i.e., there are a lot of monitors, each requiring substantial air quality improvements to attain the air quality targets), most upwind areas end up being close to some downwind area with an air quality problem. Even though the upwind state would not be required to reduce a great deal for monitoring sites that are farther away, it would still have larger reduction requirements for monitors that are closer. Therefore, with a larger number of geographically distributed monitors with air quality problems, the results of such an approach lead to reduction requirements similar to those of a uniform cost approach.

The first approach examined the incremental cost-effectiveness of emissions reductions (using marginal cost per ton) on air quality contributions from each upwind state to each downwind nonattainment/maintenance monitor. Each downwind monitoring location was impacted by a different amount from each upwind state. Each nonattainment/maintenance monitor also required different levels of reductions in air quality impact to attain the NAAQS. This approach used the effectiveness of emissions reductions on an air quality impact per ton of pollutant emissions. Furthermore, the cost per ton of emissions reductions from each upwind state was included in the assessment. The objective of this analysis was to require each upwind state (including the state containing the monitor) to make all emissions reductions necessary so that all states were paying the same cost per unit of air quality improvement (i.e., dollars per $\mu g/m^3$ reduced). This was done by dividing the ratio of the marginal cost per ton of emissions reductions by the air quality impact per ton of emissions for each state. All states would be required to achieve all emissions reductions necessary for the cumulative air quality impact to equal the cumulative air quality improvement needed for the monitor to reach attainment/maintenance. In other words, the total air quality impact reduction required equaled the sum (across all states) of each state's air quality impact per ton of emissions multiplied by the number of tons it reduced.

As an illustrative example of the first cost per air quality impact approach, we could consider a particular monitor that is being impacted by five states (A, B, C, D, and E). The hypothetical contributions of sulfate from each state are 2.4, 1.2, 0.8, 0.4, and 0.3 $\mu g/m^3$, respectively. The hypothetical emissions of SO_2 from each state are 2,000; 100,000; 8,000; 10,000; and 150,000 tons, respectively. On a state-by-state basis, if the sulfate contribution is divided by the number of tons of emissions, the number of $\mu g/m^3$ per ton of emissions equals 0.0012, 0.000012, 0.0001, 0.00004, and 0.000002 for states A, B, C, D, and E. The cost-effectiveness of emissions reductions from each state (on a cost per ton per $\mu g/m^3$ per ton basis) can be evaluated. For this particular monitor, state A has the largest impact per ton of emissions. It is most cost-effective to have state A implement the costliest controls, while the other states implement less expensive controls.

For this example, let's assume that the emissions reductions for all states lead to a cumulative air quality benefit such that the downwind monitor achieves the air quality improvement required. Let's further assume that this occurs when state A is implementing all SO_2 emissions reductions up to $10,000 a ton. If state A had to pay $10,000 to reduce a ton of emissions, the cost per $\mu g/m^3$ of that ton would be $ 8,333,333 per $\mu g/m^3$. This is calculated by dividing $10,000 by the number of $\mu g/m^3$ per ton of emissions (i.e., 0.0012 in this example). The cost per $\mu g/m^3$ of this particular ton of reductions from state A is high, but removing this ton has a large impact on the air quality at the monitor. For the other states, the same cost per $\mu g/m^3$ value ($8,333,333 per $\mu g/m^3$) is reached at much lower marginal cost of reduction levels: $100, $833.33, $333.33, and $16.67 per ton for states B, C, D, and E, respectively. These relatively low marginal cost levels mean that these states make few emissions reductions, since they are only making all emission reductions available at or below the marginal cost levels applicable to their state. The reason is that, even though the tons are relatively cheap to reduce, they are not very effective at reducing pollution levels downwind (the air quality impact per ton values are small), because the monitor being assessed is farther away.

So far, this procedure has assumed that we identified the "right" cost per impact level (i.e., \$10,000 per ton for state A, leading to a cost per air quality impact value of \$8,333,333 per $\mu g/m^3$). How was this cost per air quality impact value identified? The procedure requires an iterative approach, where a particular cost per air quality impact value is identified, and the result translated to a state-specific marginal cost of reduction level which, in turn, leads to a particular emission reduction for each state. The emissions reductions are then translated to air quality improvements by multiplying the emissions reductions by the air quality improvement per ton of reductions. The total air quality benefit at the downwind monitor is the sum of the number of tons each state reduced multiplied by its air quality impact per ton. There is a particular cost per air quality impact value where the cumulative benefit of reduction from all upwind states will equal the total benefit required for the monitor to reach the attainment/maintenance target level.

For a particular monitor, the result of this approach is to ensure that all of the emissions reductions required for bringing the monitor into attainment/maintenance are below a particular cost per impact value. Thus, this approach should theoretically yield a relatively cost-effective strategy for attainment/maintenance for a particular monitor.

Assessed across all states that impact a particular monitor, the costs and emission reduction requirements varied widely between states (i.e., the marginal cost levels would be very different from each other for different states). For a particular state impacting a number of different monitors, the marginal cost levels and emission reduction requirements varied widely from monitor to monitor. One of the conclusions of the analysis for this approach was that it appeared that, as part of the cost-effective method for many locations to reach attainment, the state containing the monitor needed to implement all available (e.g., up through expensive) control technologies. This was because the air quality impact per ton of emissions for the state on its own local monitor was high. In contrast, states located far from the monitor had much smaller impacts per ton of emissions. Consequently, only extremely low-cost controls would be required for those upwind states.

On a single monitor basis, this approach is effective and logical. However, it relies on an extremely high level of accuracy in both the emissions modeling (estimating the magnitude and location of the emissions reductions) and the air quality modeling (estimating the downwind effects of the emissions reductions). EPA concluded that finer-scale emissions data from all sectors (not just the EGU sector) up to very high marginal costs and fine-scale air quality modeling could be needed to resolve differences in cost per air quality impact on the downwind monitor from all emissions sources in the surrounding area. EPA concluded that these data and modeling techniques do not exist and/or are too computationally demanding to be operationally implemented.

Such an approach is particularly challenging in larger states. The air quality impact of a power plant on a downwind site can be dependent on where it is geographically situated. Accounting for any such impacts further increases the complexities described above.

When this approach variation was set aside due to the air quality and emissions modeling technical challenges, significant additional challenges had been identified and remained unresolved. One of the remaining challenges was determining a method to identify a single reduction requirement for each upwind state from the myriad disparate reduction requirements from individual monitors that it was affecting in downwind states, without leading to over or under control when the cumulative air quality benefits of reductions from all other upwind states were assessed across the region. EPA also concluded that it is not sufficient to select a particular cost per air quality impact value (i.e., a particular dollar per μg/m^3 value), since this value is determined based on a particular air quality impact value ascribed to a particular downwind monitor. The unique critical dollar per μg/m^3 values associated with each individual monitor can be used to back-calculate unique critical marginal costs for each state, for each monitor. Consequently, as with the "fixed air quality threshold limit" air quality only approach, each state would have many different possible emission reduction levels (one associated with each downwind monitor). EPA concluded that it would be difficult to determine each state's reduction requirement, since the cumulative air quality improvement at each downwind monitor was not considered in this step. In the illustrative example, state A's critical marginal cost was $10,000 per ton. For a different monitor, located far away from state A, state A's critical marginal cost would likely be lower (perhaps $200 per ton), while state B's critical marginal cost could be $15,000 per ton (state B is located close to the monitor). What reductions should state

A and B make? If both are required to do the maximum, the cumulative air quality benefit would go well beyond what would have been needed at either downwind monitor.

The second variation of the “cost per air quality impact” approach assessed the cumulative cost per total air quality impact, rather than the incremental benefit at particular marginal cost levels. The total cost per total air quality benefit was calculated for each state, monitor linkage, and several modeled emission levels and marginal cost levels. The total cost was calculated as the sum of the emissions reductions multiplied by the marginal cost per ton of each emission reduction. For example, if the cost was evaluated at a maximum marginal cost level of $2,400 per ton for SO_2 emissions, the incremental costs of all marginal cost levels below $2,400 per ton were summed to get the total cost (cost per ton multiplied by the tons of emissions reduced at each marginal cost level). The total air quality benefit was calculated as the $\mu g/m^3$ or ppb concentration reduction at the maximum marginal cost[2]. The total cost per total air quality benefit was found by dividing the total cost by the total air quality benefit.

After the cost per air quality benefit was calculated, a “critical” cost per air quality value was identified. This is the cost per air quality level below which all cost per air quality linkages are deemed to be “cost effective”. For example, one critical value that was used in the analysis was the median cost per $\mu g/m^3$ value for all state-downwind linkages above the air quality threshold (1% of the relevant NAAQS), assuming the maximally-modeled emissions reductions and costs (at a marginal cost of $2,400/ton) were applied to each upwind state. For each upwind state, the receptor with the lowest cost per $\mu g/m^3$ downwind air quality impact was identified at the maximum marginal cost evaluated ($2,400/ton in this example). This is the maximally impacted downwind receptor. The cost per $\mu g/m^3$ for the lowest cost per air quality benefit linkage was compared with the critical cost per air quality value (i.e., the median of the linkages across all states and monitors). States would be required to make all reductions at or below the critical cost per air quality value. If the lowest cost per air quality linkage was at or below the median cost per $\mu g/m^3$ value of all linkages at $2,400/ton, then the upwind state would be required to reduce all emissions up to the maximum marginal cost level ($2,400/ton). However, if the lowest cost per air quality linkage at $2,400/ton was higher than the median of all linkages, then the analysis determined the next highest marginal cost level at which the lowest cost per air

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[2] The air quality benefit for each receptor for a particular cost level was calculated using the Air Quality Assessment Tool.

quality linkage was at or below the median. This might result in a different marginal cost requirement for some states. As a result, some states would be required to reduce emissions up to the maximum marginal cost level of $2,400/ton and some states where the cost per air quality benefit is high would be required to reduce emissions up to a lower marginal cost level.

There were several technical challenges with this approach, most related to setting particular levels for the different parameters. For example, it was not clear how to specify the critical cost per air quality value (i.e., is the median of all the linkages the appropriate cost per air quality impact value? Should all linkages count in calculating the median if there are multiple receptors in a downwind area?). As a second example, it was not clear what "maximally-modeled" marginal cost emission level to use (i.e., $2,400/ton was the example stated above, but this could have been any number of other marginal cost levels). The final cost per air quality answer depends strongly on the choice of the maximum marginal cost level. Also, the cost per air quality benefit varies considerably for SO_2 and NO_x. Therefore, the cost per air quality could be calculated independently for SO_2 and NO_x. Combined with separate calculations for annual and daily $PM_{2.5}$, and decisions that need to be made at several points in the calculations, the analysis becomes quite complicated. Ultimately, we were not able to generate adequate justifications for the decision points that needed to be made to support the methodology.

5. "Binning" of states based on air quality impact (i.e., subject states with higher contribution to greater $ per ton reduction requirement).

This approach classified states into distinct groups depending on their maximum air quality contribution to a downwind nonattainment/maintenance monitor (see Table 2-1 for a list of each state's maximum downwind contribution for annual $PM_{2.5}$). The groups, or bins, were defined based on different air quality threshold levels (e.g., 1%, 3%, and 5% of the NAAQS). Using these threshold percentages and the annual $PM_{2.5}$ standard as an example, the threshold values would be 0.15, 0.45, and 0.75 $\mu g/m^3$, respectively. Thus, one bin would be for states whose maximum contributions are less than 0.15, a second bin would be for states whose contributions are between 0.15 and 0.45, a third bin for states between 0.45 and 0.75, and a final bin for states whose contributions are larger than 0.75 $\mu g/m^3$. The bins are labeled A through D, respectively (see Table 5-1). States with large downwind contributions (e.g., Illinois) would be in a different group from states with smaller downwind contributions (e.g., Nebraska). The emissions reductions required from each group of states (i.e., each bin) would be related to the threshold levels. Consequently, states that had larger maximum air quality contributions would be binned in a group that would be required to apply more controls and achieve deeper reductions than states in a group for a bin defined by a lower threshold level.

Table 5-1. Maximum downwind air quality contributions to nonattainment or maintenance for annual $PM_{2.5}$ ($\mu g/m^3$) and resulting “bins”, or groups of states (Group A, B, C, and D), based on three threshold levels (1, 3, and 5%), whether a state is contributing less than 0.15, between 0.15 and 0.45, between 0.45 and 0.75, or greater than 0.75 $\mu g/m^3$, respectively.

Upwind State	Maximum Downwind Contribution to Nonattainment or Maintenance for Annual $PM_{2.5}$ ($\mu g/m^3$)		Bin
Alabama	0.46		Group C
Arkansas	0.09		Group A
Connecticut	0.09		Group A
Delaware	0.20		Group B
Florida	0.29		Group B
Georgia	0.63		Group C
Illinois	1.01		Group D
Indiana	2.09		Group D
Iowa	0.31		Group B
Kansas	0.09		Group A
Kentucky	1.68		Group D
Louisiana	0.34		Group B
Maine	0.02		Group A
Maryland	0.62		Group C
Massachusetts	0.13		Group A
Michigan	0.72		Group C
Minnesota	0.19		Group B
Mississippi	0.07		Group A
Missouri	1.38		Group D
Nebraska	0.08		Group A
New Hampshire	0.02		Group A
New Jersey	0.68		Group C
New York	0.49		Group C
North Carolina	0.19		Group B
North Dakota	0.05		Group A
Ohio	2.03		Group D
Oklahoma	0.08		Group A
Pennsylvania	1.60		Group D
Rhode Island	0.01		Group A
South Carolina	0.26		Group B
South Dakota	0.02		Group A
Tennessee	0.68		Group C
Texas	0.13		Group A

Vermont	0		Group A
Virginia	0.37		Group B
West Virginia	1.17		Group D
Wisconsin	0.46		Group C

As a particular variation of the approach evaluated by EPA, two threshold levels (rather than three) were considered (e.g., 1% and 4% of the respective NAAQS[3]). States were included in one of three groups based on each state's air quality contribution to their maximally-impacted downwind monitor: states below both thresholds, which would not be included in the program; states above the 1% threshold, but below the second threshold (4%), which would be subject to some "basic" reductions; and a third "advanced" group for states above both threshold levels (above 4%), which would be subject to large emission reduction requirements.

For the magnitude of the reductions from different groups of states, different levels of "cost-effective" controls would be applied. As an illustrative example, the "advanced" group might need to make all reductions possible for less than $2,000 per ton, while the less stringent "basic" group might need to make all reductions possible for less than $500 per ton.

EPA believes there are a number of questions that need to be asked with the "binning" of states based on air quality approach. First, it would be necessary to pick the number of different threshold levels (and, thus, the number of groups of states as well as their composition). For example, why two threshold levels, and not three or more? Second, it would be necessary to pick the cost threshold for each different group.

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[3] This particular set of bins was specifically recommended by a stakeholder group in a letter to EPA ("LADCO Recommendations to EPA on a CAIR Replacement Rule").