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April 25, 2008

VIA FIRST CLASS MAIL AND EMAIL

Ms. Angela King
Environmental Planner
MARAMA
8600 LaSalle Road
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Towson, MD 21286

Comments on MANE-VU's 2018 Visibility Projections Draft Report

Dear Ms. King:

These comments are submitted on behalf of the Utility Air Regulatory Group ("UARG")[1] in response to the April 4, 2008 email invitation from the Mid-Atlantic/Northeast Visibility Union ("MANE-VU"), asking stakeholders to comment on its "2018 Visibility Projections" Draft Report (hereinafter "2018 Visibility Projections Draft Report"). As explained in that email invitation, the 2018 Visibility Projections Draft Report provides information on MANE-VU's efforts to quantify the "visibility impacts of those measures that are being actively considered by MANE-VU states as a result of the regional haze consultation process . . . [and] will be useful to the MANE-VU states as they establish reasonable progress goals and develop their long-term emissions management strategies for Class I areas under the federal Regional Haze Rule."

[1] UARG is an unincorporated association of individual electric utility companies and trade associations. UARG participates in federal and precedential state proceedings arising under the federal Clean Air Act and having an impact on UARG members. UARG has participated in the planning processes of Regional Planning Organizations ("RPOs") as they guide states in the preparation of regional haze plans to be submitted to EPA.

MANE-VU's 2018 Visibility Projections Draft Report attempts to describe the complicated process that MANE-VU followed to evaluate what the impact on visibility would be in 2018 if, by that year (1) electric generating units ("EGUs") in the states in MANE-VU, VISTAS and the Midwest Regional Planning Organization ("MRPO") implement the emission reductions required by the Clean Air Interstate Rule ("CAIR") (as projected by IPM version 2.1.9 modeling); (2) those states also implement certain additional emission reductions from non-EGU sectors (including best available retrofit technology ("BART") emission controls at a limited number of non-EGU sources); and (3) certain emission reductions (described below) occur from EGUs in Ontario. Given the very summary description of the MANE-VU analysis provided in the draft report, some aspects of the analysis are unclear and should be explained in more detail in the final version of the report.[2]

Most important, however, is the conclusion provided in the draft report, *i.e.*, that under the emission reduction scenario used in the analysis "[a]ll MANE-VU [Class I area] sites are projected to meet or exceed the uniform rate of progress goal for 2018 on the 20 percent worst days." 2018 Visibility Projections Draft Report, Section 3. In addition, the draft report concludes that, under that scenario, there is no projected worsening of visibility on the 20 percent best days. *Id.*

Given these conclusions -- and findings by other RPOs that, in general, Class I areas in the eastern half of the country for the most part will meet or exceed their uniform rates of progress for 2018 -- we believe it is appropriate for states in the affected RPOs to continue to develop regional haze state implementation plans ("SIPs") for the first planning period that (1) reflect the emission reduction levels for EGUs that result from compliance with CAIR, and (2) do not

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[2] For example, the draft report fails to explain why the analysis (1) subtracted 75,809 tons from "one hypothetical stack in the [MANE-VU] region" to satisfy the "shortfall" between projected 2018 EGU emissions at those MANE-VU EGU stacks that are among the "167 top EGU stacks" and MANE-VU's 90-percent reduction target for those stacks, but then (2) added back that same number of tons at the same hypothetical MANE-VU stack. Why was that procedure used for EGUs in the MANE-VU region while another procedure was used for EGUs in VISTAS and MRPO states (where the analysis apparently used information related to actual stacks and actual EGUs and applied a somewhat more geographically refined emission "add-back")? 2018 Visibility Projections Draft Report, Section 2.1.

include additional emission reduction requirements for EGUs. We also believe that EPA would be justified in approving any such SIPs.

In presenting its analysis, MANE-VU refers (in Section 2 of the 2018 Visibility Projections Draft Report) to "a number of additional potentially reasonable control measures," including "additional SO_2 emissions reductions at electric generating units (EGUs)." Presumably, this is a reference to MANE-VU's "top 167 stacks" scenario. For the reasons described above, it is neither necessary nor appropriate, as part of the current regional haze SIP development process, to impose -- or to ask other states to impose -- additional control measures on EGUs. The above-described MANE-VU modeling projections show that no such additional control measures are needed to meet or exceed the uniform rate of progress for 2018 at MANE-VU Class I areas.

Any effort to evaluate what visibility improvements may be needed or appropriate should take into account, in a much more systematic way than the draft report does, the impact of non-U.S. anthropogenic emissions. MANE-VU appropriately considers in its analysis the impact of SO_2 emission reductions that are expected to occur from six coal-burning EGUs in Ontario that are scheduled to be shut down and replaced with nine natural gas turbine units with NOx controls. *See* 2018 Visibility Projections Draft Report, Section 2.4. As MANE-VU recognizes by its consideration of this factor, emissions from Canadian sources plainly can have significant effects on visibility in the MANE-VU states. SO_2 emissions from the six Ontario EGUs considered by MANE-VU in its analysis, however, are merely a subset of non-U.S. anthropogenic emissions of visibility-impairing pollutants that likely contribute to visibility impairment in MANE-VU Class I areas. UARG believes that if MANE-VU (and the other RPOs) address the effects of such emissions in a more systematic way in their 2018 visibility projections,[3] that would further demonstrate the sufficiency of current and planned emission controls to achieve reasonable progress goals.

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[3] Attached is a copy of a paper by the Electric Power Research Institute ("EPRI") concerning a method for taking the effect of these emissions into account in visibility analyses. Also attached is a white paper providing further information on the method described by EPRI. UARG urges MANE-VU to apply the approach described by EPRI, or a similar technically justified approach, to assess in a comprehensive way the impact of emissions from non-U.S. anthropogenic sources on projected 2018 visibility in MANE-VU Class I areas. UARG encourages MANE-VU to present that assessment in the final version of its report.

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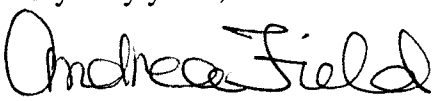
UARG appreciates this opportunity to comment on the draft MANE-VU report and looks forward to participating as appropriate in other proceedings by RPOs to address implementation of the Clean Air Act's visibility improvement provisions.

Very truly yours,



Andrea Bear Field

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Effect of Transboundary Pollution on Visibility A Case Study for Northern Class I Areas

Technical Brief

Introduction

The Regional Haze Rule (RHR) was promulgated by the U.S. Environmental Protection Agency (EPA) in 1999 to address mitigation of regional haze in the United States. The RHR calls for states to establish reasonable goals and emission reduction strategies for improving visibility in mandatory Class I areas (national parks and wilderness areas), striving to achieve "natural visibility conditions" by 2064. The RHR requires that the visibility at these Class I areas on the 20% worst haze days (expressed in deciviews) should improve along a "uniform rate of progress" (URP). EPA has prescribed that the URP be calculated exclusively from the difference between the 20% worst haze conditions in the 2000–2004 baseline period and under natural conditions in 2064. The URP serves as a reference in determining a state's progress toward achieving the 2064 goal. States are required to develop plans every 10 years to meet the reasonable progress goals (RPG) based on the URP. The plans for the first implementation period that call for meeting the RPG in 2018 are due in 2008.

EPA defines natural conditions as those that would exist "in the absence of human caused impairment." From a practical point of view, reaching this goal of natural conditions in the United States is impossible because air pollution from other countries gets transported across the border and increases the U.S. pollutant concentrations above the natural level. According to EPA, a contribution from transboundary transport is not to be considered when setting the 2064 natural conditions goal, even though a major fraction of the actual visibility impairment at some near-border Class I areas may be due to transboundary transport of pollution. However, if a state has difficulty achieving visibility improvement progress along the URP line, it may present transboundary transport as a mitigating reason, if appropriate. A state has to first estimate the impact of transboundary pollution on the visibility impairment at a Class I area of interest.

Figure 1 illustrates a conceptual method to quantify the effect of transboundary pollution when determining whether an RPG has been met for a particular site. Point "A" represents the 2018 progress goal calculated via the URP "glide slope" and point "X" represents the estimated 2018 design value (that is, the model estimated value accounting for emissions reductions by 2018). If transboundary pollution can explain the difference between values at points, A and X, a state can still show it has made "reasonable" progress toward meeting the EPA-prescribed URP.

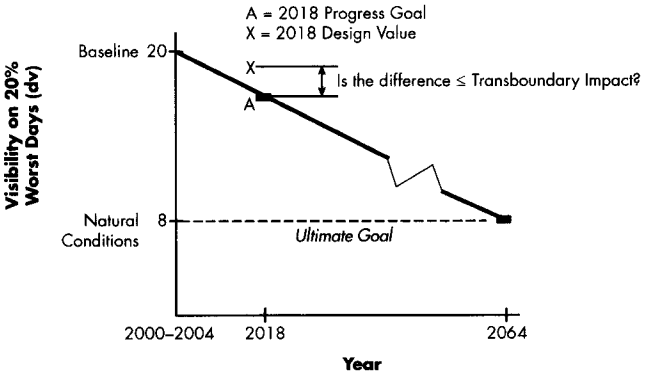

Figure 1. Illustration of a Way to Account for Transboundary Pollution.

Estimating Transboundary Pollution

Global chemical transport modeling offers a means of estimating the contributions of transboundary pollution. With EPRI support, Harvard University used a global chemical transport model, GEOS-Chem, to assess the amount of transported pollutants coming from outside the United States and their impact on meeting the RHR. An important finding from that work was that the current transboundary transport of ammonium sulfate is significantly higher than the default natural concentrations. This transport is mostly from Canada and Mexico, but there is also a non-negligible contribution from Asia. Other haze-causing pollutants whose transboundary influence was significant included organic carbon, dust, and ammonium nitrate (at the northern Class I areas in the upper Midwest).

The Harvard simulations were performed for 2001, whereas most states are using 2002 as the base year for modeling for developing their implementation plans for the RHR. Using the same principles as used by Harvard, VISTAS (Visibility Improvement State and Tribal Association of the Southeast) has estimated transboundary pollution at all Class I areas in the United States for 2002 using the EPA's CMAQ (Community Multiscale Air Quality) model. The model was run for three configurations by VISTAS:

- Run 1: Base case with all emissions
- Run 2: Simulation with no U.S. anthropogenic emissions
- Run 3: Simulation with no global anthropogenic emissions

For each of these simulations, boundary conditions were provided by the GEOS-Chem model that was also run separately for each scenario. The transboundary anthropogenic impact was calculated by subtracting concentrations obtained using Run 3 from those obtained using Run 2.

Effect of Transboundary Pollution at Northern Class I Areas

Four Class I areas (Voyagers National Park, MN; Seney National Wildlife Refuge, MI; Boundary Waters Canoe Area Wilderness, MN; and Isle Royale National Park, MI) were chosen to examine the effect of transboundary pollution on meeting the RPG for 2018. This was done by first calculating the URP for each site and then estimating points "A" and "X" (as shown in Figure 1). The data for calculating the base case (2000–2004) visibility conditions, 2064 natural conditions, and the 2018 design values were obtained from the Midwest Regional Planning Organization (MRPO). For each site, MRPO provided the observed conditions (species concentrations) for all the 20% worst haze days occurring from 2000 to 2004, average natural visibility conditions for the 20% worst haze days, and the 2018 relative reduction factors (RRFs) for each species for the corresponding 20% worst haze days in 2002.

The following steps were undertaken to estimate the effect of transboundary pollution at these sites:

1. The base case visibility in deciviews was calculated by averaging the deciviews for the 20% worst haze days occurring from 2000 to 2004. The new IMPROVE equation was used to convert species concentrations to light extinction.

2. The 2018 RPG (in deciviews) was calculated assuming a linear progression from the base case visibility in 2004 (calculated in Step 1) to the natural visibility in 2064.

3. The 2018 design value was calculated by first multiplying the 2018 RRFs for each species with the corresponding concentration of that species from 2000 to 2004 to estimate the future concentrations of those species. The new IMPROVE equation was then used to convert the species concentrations to light extinction. The deciviews were calculated for each day (corresponding to the 20% worst haze days from 2000 to 2004) and then averaged to calculate the 2018 design value.

4. The transboundary concentrations (obtained from VISTAS) corresponding to the 20% worst haze days in 2002 were averaged to get an average value for each species. These concentrations were subtracted from the corresponding concentrations calculated for the future year (2018) in Step 3. The resulting concentrations for each species for each of those days were converted to light extinction using the new IMPROVE equation and then converted to a revised design value for 2018.

If the design value calculated in Step 3 is below the URP, then the state has achieved the RPG for that Class I area. However, if the design value is above the URP, then the revised design value calculated in Step 4 can be examined. If the revised design value is below the URP, the argument can be made that transboundary pollution is responsible for that Class I area not meeting its URP, and the state can cite that as a mitigating reason.

Results

Figure 2 shows the glide slope calculation and the 2018 design values for the Boundary Waters Class I area. The solid blue line denotes the URP with the solid diamond in 2018 showing the RPG. The light blue open rectangle shows the 2018 design value. In this case, the design value is above the URP line; therefore, it fails to meet the RPG for 2018. However, the red open triangle shows that the revised 2018 design value (removing the effect of transboundary pollution) is below the URP line; thus, the state is able to meet the "reasonable" progress goal.

Figures 3, 4, and 5 show similar plots for Isle Royale, Voyagers, and Seney. As the data show, in each case, removing the effect of the transboundary pollution allows each of these Class I areas to achieve the 2018 RPG (although it is still slightly above the URP at Voyagers).

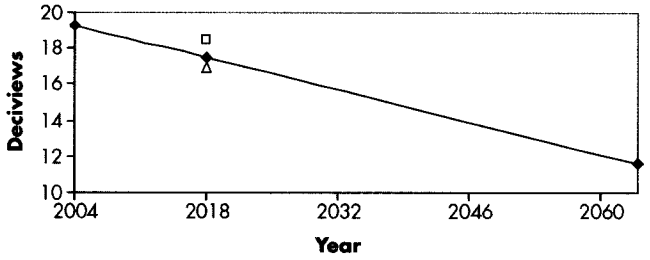

Figure 2. Glide Slope Calculation for Boundary Waters Canoe Area Wilderness

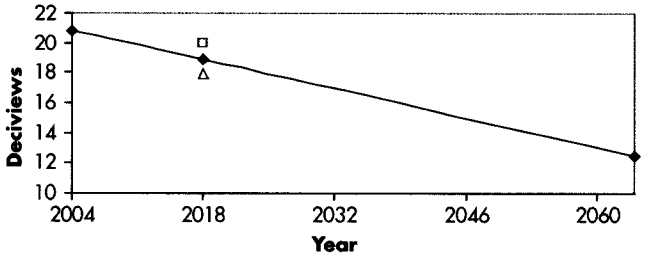

Figure 3. Glide Slope Calculation for Isle Royale National Park

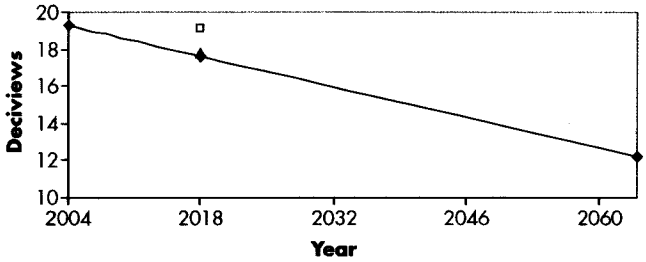

Figure 4. Glide Slope Calculation for Voyagers National Park

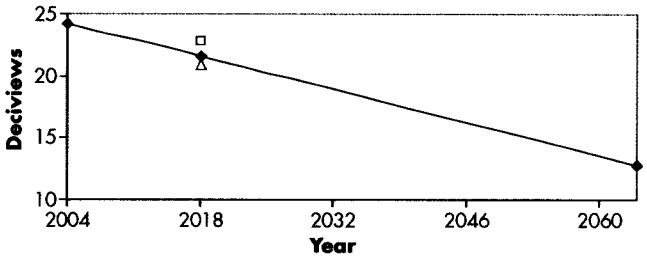

Figure 5. Glide Slope Calculation for Seney National Wildlife Refuge

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October 2007

ASSESSING VISIBILITY EFFECTS OF INTERNATIONAL EMISSIONS UNDER THE CLEAN AIR ACT REGIONAL HAZE PROGRAM

A recurring issue in implementation of the Clean Air Act regional haze program concerns how to account for effects of international emissions, particularly man-made emissions, on visibility in the United States. This issue has generated discussion recently among federal and state officials and others addressing regional haze implementation. This paper summarizes an approach that many states (including states in the VISTAS and CENRAP regional planning organizations (RPOs)) are using to account appropriately for effects of non-U.S. emissions. As discussed below, that approach is consistent with EPA's regional haze rules and, contrary to some recent suggestions, does not "redraw" the uniform rate-of-progress "glidepath" for visibility improvement.

Accounting for Foreign-Source Manmade Emissions

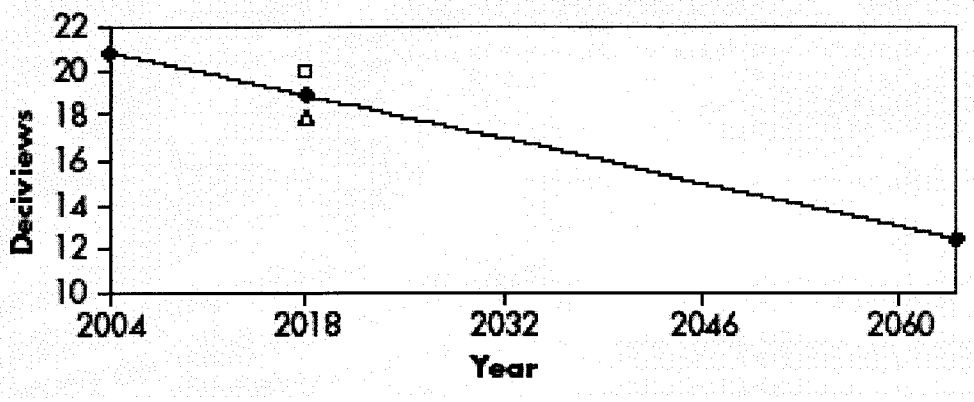
The regional haze program's overarching "national goal" is "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution." (Clean Air Act § 169A(a)(1).) States must develop, and submit by December 17, 2007, state implementation plans (SIPs) to make "reasonable progress" toward that goal. These SIPs must state, and explain, reasonable progress goals (RPGs) for 2018 for relevant Class I areas.

EPA has long recognized the obvious fact that states have no power to control emissions from sources located outside the United States, and states cannot be expected to offset the visibility effects of foreign-source manmade, or anthropogenic, emissions through additional emission reductions at domestic sources. In developing their SIPs, however, states need some reasonable way to account for those effects. A method to do so is described in a May 2007 report by the Electric Power Research Institute (EPRI).[1] This method relies on available data and models, such as the GEOS-Chem model, to assess visibility-impairing emissions from non-U.S. sources and the effects of those emissions on the ability to meet RPGs for Class I areas. As the report discusses, this method also has been used in VISTAS, the southeastern states' RPO, which used EPA's Community Multiscale Air Quality (CMAQ) model in its analysis.

[1] The report is available at http://my.epri.com/portal/server.pt?Abstract_id=000000000001015251.

This method allows a comparison between: (1) projected visibility conditions (in deciviews) at a given Class I area in 2018 reflecting the modeled effects of all emissions regardless of type or location of source (*i.e.*, U.S. anthropogenic emissions, non-U.S. anthropogenic emissions, and emissions from natural sources both inside and outside the U.S); and (2) the visibility conditions that would be projected to exist at that area in 2018 if non-U.S. anthropogenic emissions were removed from the emission inventory. The modeled visibility values for 2018 can be plotted on a graph that also displays the "uniform rate of progress" (URP) glidepath for the area in question. (The URP, which states must consider under the regional haze rules, is a steady rate of visibility improvement at the Class I area from the 2000-2004 baseline period to the 2064 "natural conditions" target date described in the rules.)

Shown below is an example, from the EPRI report, of a graphic presentation of the results of this kind of assessment. This example shows projected values for Isle Royale National Park in Michigan.[2] The straight blue line shows the URP for that Class I area. The blue square shows the projected 2018 deciview level reflecting the effects of all emissions, including non-U.S. anthropogenic emissions. The red triangle shows the projected 2018 deciview level if non-U.S. anthropogenic emissions are removed. In this example, the projected deciview level with all emissions included (the blue square) is above the URP, meaning that projected visibility is worse than the visibility represented by the URP. But the projected deciview level with non-U.S. anthropogenic emissions excluded (the red triangle) is lower than the URP, meaning that projected visibility would be better than the URP if non-U.S. anthropogenic emissions were removed.



[2] The report describes results of analyses showing significant transboundary impact in four Class I areas in the Northern Midwest (Seney National Wildlife Refuge, Boundary Waters Canoe Area Wilderness, and Voyageurs National Park, in addition to Isle Royale). Though not discussed in the report, EPRI and VISTAS modeling results also show that transboundary emissions can have significant effects on visibility impairment in Class I areas near the Mexican border.

Consistency with EPA's Rules and Guidance

As can be seen from the illustration on the preceding page, this approach does *not* modify the URP glidepath. Instead, it shows projected deciview levels -- both levels with and levels without the visibility effects of non-U.S. anthropogenic emissions -- in 2018. That is important because the regional haze rules indicate, and EPA has reiterated in guidance, that the URP is to be set using only baseline conditions and projected natural conditions in 2064. Thus, it seems clear that states may not *change* the URP by, for instance, increasing the 2064 "natural conditions" deciview level to account for the effects of non-U.S. anthropogenic emissions (which would in turn increase the 2018 point on the "adjusted" URP).

The approach discussed in the EPRI report is consistent with EPA's statements about how states may account for international emissions' effects on Class I area visibility. For example, in the preamble to its final regional haze rules, EPA responded to commenters' "concerns that EPA should take into account that States are not able to control international sources in reviewing a State's proposal for a reasonable progress target":

> EPA agrees that the projected emissions from international sources will in some cases affect the ability of States to meet reasonable progress goals. The EPA *does not expect States to restrict emissions from domestic sources to offset the impacts of international transport* of pollution. We believe that States *should evaluate the impacts of current and projected emissions from international sources* in their regional haze programs, particularly in cases where it has already been well documented that such sources are important. At the same time, EPA will work with the governments of Canada and Mexico to seek cooperative solutions on transboundary pollution problems.

64 Fed. Reg. 35714, 35736 col. 3 (July 1, 1999) (emphasis added). In informal guidance issued in 2006, EPA elaborated on states' authority to evaluate and take into account the effects of foreign emissions. For example, EPA stated:

> Both in explaining RPGs and in assessing whether current implementation plan strategies are achieving them, States can take into account the nature of international emissions. For instance, after having applied the four statutory factors [that states must consider in determining reasonable progress] and calculated their RPGs, states can at their discretion, quantify the effects of international emissions

> on their ability to reach RPGs. However, States should not directly consider the effects of international emissions when calculating their uniform rates of progress by either adding the effects of international emissions to their estimates of natural conditions, or by subtracting international emissions from current conditions. Either of these approaches conflicts with the basic definition of "current conditions" (baseline conditions for the first SIP) and "natural conditions," as described in the 1999 [regional haze rules].

EPA, "Additional Regional Haze Questions" (Sept. 27, 2006 Revision) at 19.

The approach that is described in the EPRI report and that is being used by a number of states to account for non-U.S. anthropogenic emissions does not change the definition or calculation of current or natural visibility conditions. Thus, it does not change the deciview values used in determining the URP and does not change the URP itself. Rather, that approach is simply a tool to use in "explaining [the] RPGs" that states select and in "quantify[ing] the effects of international emissions on their ability to reach RPGs," consistent with EPA guidance.[3]

Recently, certain statements have been made by staff members in EPA regional offices and at Federal land manager (FLM) agencies, among others, regarding the approach described in the EPRI report that appear to reflect a misunderstanding of that approach. For example, responding to a VISTAS state's presentation in a September 2007 inter-RPO conference call about that state's evaluation of international-emission effects (conducted along the lines of the approach described in EPRI's report), one EPA-region staff member initially said that that approach appeared to involve redrawing the URP. A similar comment was made later by another EPA-region staff member, who suggested the approach seems to involve setting a new glidepath. And an FLM analyst indicated he

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[3] It is important to note that EPA's rules do not require a state to determine that the URP is the RPG for a given area; states may, for example, properly determine that the RPG should be less ambitious than the URP. 40 C.F.R. § 51.308(d)(1)(ii); 64 Fed. Reg. at 35732 cols. 2-3; EPA, Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program, at p. 1-3 (June 1, 2007) ("The glidepath is not a presumptive target, and States may establish a RPG that provides for greater, lesser, or equivalent visibility improvement as that described by the glidepath."). Because EPA does not require or expect states to restrict domestic sources' emissions to offset the impacts of international transport, it would seem that states have discretion to consider effects of non-U.S. manmade emissions as a "relevant factor[ ]"in "determin[ing] what additional control measures would be reasonable," which is one of the steps in the state's selection of the rate of progress that is reasonable. *Id.* at p. 2-3. Doing so would not change the URP but may result in establishing an RPG that is less ambitious than the URP.

thought this approach reflected an inappropriate technique for accounting for non-U.S. emissions.

For the reasons discussed above, it seems clear that these criticisms reflect a fundamental misunderstanding of this approach, which does not call for any redrawing or other adjustment of the glidepath. The following points should be kept in mind -- and articulated -- in any discussion of this issue:

- **The approach described by EPRI does not recalculate the Uniform Rate of Progress (URP) glidepath. Calculation of the glidepath is based only on the 2000-2004 observed conditions (the "current," or baseline, conditions) and the 2064 natural conditions. The 2018 URP is calculated from the glidepath.**

- **This approach does not add transboundary impact (*i.e.*, visibility impact from non-U.S. anthropogenic sources) to either the baseline or the 2064 "natural conditions" end point.**

- **This approach is consistent with and, in fact, uses transboundary contribution estimates from VISTAS.**

- **The 2018 Reasonable Progress Goal (RPG) for a given Class I area is calculated as the visibility conditions (in deciviews) that an area is projected to achieve in 2018 from implementation of a reasonable set of emission controls selected by the state, based on the state's consideration of the statutory "reasonable progress" factors.**

- **Assessing transboundary impact may be particularly important if the 2018 RPG selected by the state is at a higher deciview level than the 2018 URP level. In such cases, this approach can be useful for the state in understanding and explaining: (1) the extent to which the deciview difference between the 2018 RPG and the 2018 URP may be accounted for by transboundary impact on the Class I area at issue; (2) why, for that area, meeting the URP would require unreasonably rapid progress; and (3) why the progress goal selected by the state is reasonable.**

- **For the Northern Midwest Class I areas, an EPRI analysis using this approach showed that the transboundary impact is significant. EPRI and VISTAS modeling results also show that the transboundary impact can be significant for Class I areas near Mexico.**