

Frequently Asked Questions on Implementing the DRAFT 8-Hour Ozone Modeling Guidance to Support Attainment Demonstrations for Early Action Compact (EAC) ¹

Introduction

As State agencies move forward to develop the technical analysis in support of attainment demonstrations for EAC areas, scheduled for submittal by the end of 2004, several questions have been posed to the agency for clarification of the guidance and its application to EACs. The following questions have been reviewed and responses prepared by Regional Office and OAQPS modeling staff.

These responses reflect EPA's clarification on how the modeling guidance is applied in EAC SIPs due in 2004, and does not necessarily apply to 8-hour ozone State Implementation Plan/Tribal Implementation Plan (SIP/TIP) submittals due in 2007. Some responses do reflect proposed changes in the DRAFT modeling guidance, but do not represent a final decision by EPA. As EPA goes final on the modeling guidance, additional comments and recommendations will be taken into consideration. The final 8-hour ozone modeling guidance is expected to be available by the end of 2003.

March 26, 2003 - Initial Questions

1. Where are the EAC areas? And what are their current 8-hour ozone design values?

RESPONSE: The most recent 8-hour ozone design values (1999-2001) range from 85 to 98 parts per billion (ppb). They vary from year to year in many areas. Here is the website which lists EAC areas, <http://www.epa.gov/ttn/naaqs/ozone/eac/>

2. Some EAC protocols used May 31, 2003 as the deadline for completion of initial modeling inventories, conceptual modeling and base case modeling. The EPA/Texas protocol specifies that a 1999 or later, inventory should be used. Some states say a 1999 inventory will not be ready in time for the EAC attainment demonstrations. They plan to use an existing 1996/97 inventory. Does EPA have data from 1999 for states to use? Does data exist that the states do not have?

RESPONSE: The 1999 National Emissions Inventory (NEI) version 2 is the most recent available inventory from EPA. EAC modeling should use the 1999 or later inventory as the basis for their demonstrations. Projections need to be based on the 1999 or later inventory. EPA memorandum, February 27, 2003, "Extension for States and Tribes to Submit Air Quality Designation Recommendations for the 8-Hour Ozone NAAQS," indicates EPA will use data

¹ U.S. EPA, (May 1999), Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS, EPA-454/R-99-004, <http://www.epa.gov/scram001/guidance/guide/drafto3.pdf>

from the 2001-2003 ozone season for issuing designations. Ideally, the current year and most recent inventory would be 2002. The use of older emission inventories introduces more uncertainties as projections are made over longer time periods. Areas with 8-hour ozone SIPs due in 2007 are expected to use the 2002 inventory as mentioned in the policy memo, but for EAC SIPs submitted in 2004, EPA will accept the 1999 inventory as the basis for their demonstrations.

Use of the 1996/97 inventory conflicts with the emissions policy memo (EPA, February 2003), the DRAFT modeling guidance which recommends use of most recent inventory (EPA, May 1999), and the EPA/Texas protocol which is the foundation for the EAC protocols. EPA will work with State/Tribal/Local agencies to accommodate changes to schedules in EAC protocols that are internally set by these agencies (such as the May 31, 2003 date for completion of certain modeling activities); however, State/Tribal/Local agencies must adhere to schedules that were established by EPA guidance and the EAC Protocol.

3. Some states expect to use a base inventory which relied on MOBILE5. The inventory doesn't contain MOBILE6 estimates for mobile sources, and contains old estimates for the NONROAD models. States would like to wait to use SMOKE to run MOBILE6. Also, there will be a disconnect between base case which used MOBILE5 and projections which will use MOBILE6. Will this be acceptable?

RESPONSE: For consistency, the base, current and future inventories should use MOBILE6. MOBILE6 is available and use of MOBILE6 is critical to the demonstration. The version of SMOKE with MOBILE6 in it (that is MOBILE6.2 which supports toxics as well as criteria pollutants) has been released. SMOKE version 1.5 Beta was released on March 14, 2003. All comments or questions in regard to the status of SMOKE should go through the Environmental Modeling Center (EMC) Community Modeling and Analysis System (CMAS) website (<http://www.cmascenter.org/smoke/>). For information on running MOBILE6 outside of SMOKE, contact Georgia Environmental Protection Division (GA EPD),

The latest NONROAD model (Lockdown version C, May 2002) is available to states and may be used. The official release is expected when the NONROAD regulation is published this year. However, since there has not been an official release of the new NONROAD model States/Tribes may use old non-road model estimates. Inconsistencies introduced by the use of different versions of the NONROAD model should be investigated and documented in coordination with the appropriate EPA Regional Office(s) and the Office of Transportation and Air Quality (OTAQ).

4. States identified the need to update inventories but do not believe they will be able to accomplish this for all surrounding states in time for EAC modeling needs. Would it be acceptable to only update inventories for the EAC states? What data should be used to get emissions for outlining states?

RESPONSE: The 1999 version 2, or later EPA National Emissions Inventory (NEI) should be

used in EAC modeling. This inventory will contain emissions for areas outside of the State. The 1999 NEI was developed with MOBILE6 and the latest NONROAD model (Lockdown version C, May 2002). Where available, more current emissions information should be incorporated. Methods for deriving updates need to be documented. Close communications with the appropriate EPA Regional Office(s) is encouraged. See response to question 9 for more similar information.

5. How do we assess attainment for an area when two separate states model the same area with different modeling systems? How could a consistent strategy be developed when different models, chemistry, episodes, model performance results, radii of influence around a monitor, nested grids and grid resolutions are used?

RESPONSE: An attainment strategy based on different assumptions and modeling systems will be acceptable provided each modeling exercise is developed according to guidance, acceptable model performance is achieved, and the same control strategy is modeled. Model results should be considered in a holistic approach. Modeling systems can be different but still present plausible assumptions and provide a consistent review of the strategy. For example, a consistent strategy would be implied if attainment or substantial air quality improvement is predicted by both applications. Ideally, both applications would predict attainment. If not, the strengths and weaknesses of the different modeling assumptions should be reviewed. If both are plausible sets of assumptions, it may be necessary to identify additional controls such that both applications predict attainment. Any inconsistencies must be reviewed, documented and discussed in the SIP submittal from the states. Close coordination between both states and appropriate EPA Regional Office(s) is encouraged.

Many of the differences described could be considered as sensitivity tests. These tests are important for determining how well the modeling system is simulating the problem and whether or not the model is responding as anticipated based on our understanding of the underlying factors contributing to formation and transport of ozone. In this case two independent model applications for the same area of interest could provide some understanding and quantification of model uncertainty introduced by selection of input assumptions. When evaluating the impacts of the control strategy, both sets of results must be considered in a holistic approach along with other weight of evidence analysis performed.

6. If states use different domains for an interstate area, should attainment be demonstrated in only that portion of the domain that is in common to both states or over the entire domain (both)? How should local transport be addressed or demonstrated?

RESPONSE: For clarification, if a multi-state regional domain cut into 12 km grid cells is used to provide boundary conditions to a local nested domain cut into 4 km grid cells, the boundaries of the local nested domain should be such that they encompass the nonattainment area and its appropriate surrounding counties. If the purpose of the nested domain is to focus on the area of interest for the modeling, it is reasonable to expect the final control strategy to demonstrate attainment throughout the local nested domain. Ideally, both sets of model results for the

nonattainment area and appropriate surrounding counties would predict attainment. The area for which attainment is demonstrated to some degree needs to be made on a case by case basis. States should work closely with the appropriate EPA Regional Office(s).

For transport, first the model setup has to be such that the area impacted by transport is included in the domain along with emission sources contributing to the problem. To address transport describe the air quality benefit predicted downwind to other nonattainment areas. Model additional reasonable measures and describe the additional air quality benefit downwind. At a minimum, EPA recommends states consider all reasonably available control measures to provide for attainment in the local area and relief to downwind nonattainment areas.

States should strive to bring the nonattainment area into attainment and eliminate any significant contribution to other nonattainment areas. There are several ways to determine what impact a state or county is having on other nonattainment areas, such as EPA's zero-out modeling used in support of the NO_x SIP Call (EPA, <http://www.epa.gov/ttn/oarpg/otag/aqtsd/>). These methods should be applied and their results reviewed with the appropriate EPA Regional Office(s).

7. What is the minimal number of days that is acceptable for use in a Relative Reduction Factor (RRF) for use in the modeled attainment test? Can this be less than the 10 days recommended in the guidance. Some studies try to maximize resources and choose a multi-day episode that has days with exceedances for a large number of urban areas but few for each individual area. This is chosen for various reasons, as opposed to using several multi-day episodes to maximize the number of days for an individual area in the modeled attainment test.

RESPONSE: Episode selection should include time periods in which meteorological conditions are conducive to ozone formation and transport. There is no steadfast minimal number of days required. However, using a few days may not provide a reliable RRF. The appropriate number of days depends on the number of days needed to simulate the most frequent meteorological regimes. For example, if three different meteorological regimes are representative of elevated levels of ozone, then episodes from each regime should be modeled. EPA is currently developing guidance on how to determine the length of the meteorological regime. Current scientific research suggest time periods on the order of full synoptic cycles are needed to verify the model is properly simulating the factors involved in the build up and removal of ozone in the area. See response to question 12 for more information.

8. A state has three multi-day episodes from 1995, 1996 and 1998. The base case modeling used emission inventories that were developed with MOBILE5. They do not have time to re-evaluate the base case model performance for all three episodes with MOBILE6 emissions before the end of this year. The state proposes to re-assess the base case for at least one episode with MOBILE6 emissions to assess the changes and review model performance. Is this acceptable?

RESPONSE: For consistency the base, current and future inventories should use MOBILE6. However, since at least one of the episodes is being re-evaluated using MOBILE6 this would be

acceptable, provided any bias in model performance and its implication for the other episodes is taken into consideration. The more critical issue is that the current and future year emissions must both use MOBILE6 and other consistent assumptions. If they do not, there will be an inconsistency in the RRF which would provide unreliable future design value predictions.

9. What constitutes a current year in the RRF analysis? Should it be something recent to coordinate with the years used in the designation process? The state does not have time to develop a 2002 emissions inventory as the current year in the attainment test. They do plan to develop a current inventory based on 2000 and run the 2000 emissions with the meteorology for three multi-day episodes. These emissions would then be projected to 2007. The model results for the current inventory 2000 and the projected 2007 would be used to calculate the RRF in the attainment test. Is this acceptable?

RESPONSE: Yes. Provided projections to 2000 are based on the 1999 inventory and additional more up to date local information is included (i.e., this is a real 2000 inventory, not projections alone and not projected from an old inventory, like the 1996 inventory).

EPA modeling guidance recommends use of emissions and episodes from the time period used in the designations. EPA Memorandum, February 27, 2003, "Extension for States and Tribes to Submit Air Quality Designation Recommendations for the 8-Hour Ozone NAAQS", indicates EPA will use data from the 2001-2003 ozone season for issuing designations. Therefore, ideally the current year would be 2002. However, as indicated in response to question 2, 2004 submittal may rely on the 1999 NEI.

When deciding what data to use in calculating the Relative Reduction Factor (RRF) and applying the modeled attainment test, two things need to be considered. First, consider how recent and reliable are the 2000 emissions. In this case they are pretty recent, within a couple of years of the anticipated designation time period and the emission estimates are the best available. Therefore, the RRF would be calculated as the ratio of averages for the future 2007 controlled and current 2000 conditions, respectively. Then second is the choice of the design value to use in the calculation. According to the draft modeling guidance, page 35, "Choosing the "current period" to use in the attainment test," states should seek some assurance that "current design values" used in the attainment test do not reflect a period in which conditions for high ozone were unfavorable at the monitoring site. Accordingly, states should review monitored data from (a) periods including the year represented by the most recent available emissions inventory (in this case, 1999-2001), and (b) the 3-year period used to designate the area "nonattainment" (which according to the latest memo will be 2001-2003). The current design value used in the modeled attainment and screening tests is the higher of the two estimates obtained from (a) and (b). This choice should be made on a monitor by monitor basis.

10. A state has questions about how economic incentives, voluntary mobile sources, voluntary fixed sources and weight of evidence fit into the EAC modeling demonstration. Apparently, each specific proposal submitted to EPA as part of EAC will be classified as one of these and used in modeling in a certain way. Is there written guidance by EPA on how these voluntary

measures will be modeled? If so, is that information available to the public now?

RESPONSE: Voluntary control measures for use in attainment plans (i.e., economic incentives, mobile and/or stationary voluntary programs) are encouraged by EPA. Documentation of the assumptions and procedures used to derive the level of precursor reductions and the associated impact on ozone formation is required. Current EPA guidance limits the amount of reductions that can be used with these programs to 3% of the mobile portion and 3% of the stationary portion of the attainment budget. Once the ozone precursor(s) reductions associated with the voluntary measures are identified, they can be modeled along with other control measures in the strategy.

The draft guidance provides detailed discussions on the use of weight of evidence (WOE). The modeling is the basis of the attainment demonstration and is the major part of the WOE. Other recommended WOE analyses are discussed in the draft guidance.

11. Currently a state is modeling one episode (8/15/99-8/26/99). This episode was picked based on an analysis of data from a three year period (1999-2002). The state plans to perform additional analysis of the most recent 10 years to determine whether or not additional episodes will be needed. If these analyses show that this episode encompasses the major meteorological regimes, no additional modeling is being proposed. Will more modeling be needed for either a Mid-Course Review (MCR) or maintenance plan?

RESPONSE: Additional modeling will not be needed for either scenario. A MCR is not needed for EAC areas because the process outlined in the EAC Protocol and the November 14, 2002 Holmstead guidance serves a similar function. EAC guidance provides for corrective action in the event an EAC area misses a key milestone or fails to submit an approvable plan or other submission. For example, if EPA's review of the December 2004 SIP submission indicates that the attainment demonstration is not adequate, EPA will remove the deferred effective date of the nonattainment designation in 40 CFR Part 81, which will trigger a nonattainment designation and all applicable requirements. Maintenance plans for the 8-hour standard will not be required for EAC areas once the area attains the standard in 2007.

12. The selection of the episode was based on several things including a build-up of ozone in the area and a high pressure zone moved through the area. A wind trajectory analysis was done for each day of the potential episodes. This episode includes transport from the south primarily, with some periods of mild winds. Should the EACs choose episodes to model based only on synoptic cycle or should the analysis use both the 1-hour episode selection and the synoptic cycle analysis? Does EPA have any guidance on the synoptic cycle definition?

RESPONSE: EPA modeling guidance describes the recommended procedures and things to consider when selecting episodes for analysis of the 8-hour ozone NAAQS. Guidance on meteorological classification and definition of synoptic cycles is under development and will make use of methods applied to 1-hour ozone, as outlined in the following two papers.

1. Eder, B. K., J. M. Davis, and P. Bloomfield, 1993: "A Characterization of the Spatiotemporal Variability of Mom-urban ozone concentrations over the Eastern United States." *Atmos. Env.*, **27A**, No. 16, 2645-2668
2. Eder, B. K., J. M. Davis, and P. Bloomfield, 1993: "An automated Classification Scheme Designed to Better Elucidate the Dependence of Ozone on Meteorology." *J. Applied Met.*, **33**, 1182-1198

13. How do we decide if the base case modeling is acceptable? Do we use the 1-hour statistical performance measures on the 1-hour or 8-hour ozone values? How many days of the episode need to meet these parameters? In the RRF calculation, are days weighed with higher or less value based on the response to control measures (i.e., are some days more important than others)?

RESPONSE: EPA modeling guidance describes recommended methods and metrics for evaluating model performance, both 1-hour and 8-hour metrics are recommended. Review the performance results for the entire episode in a holistic approach. For example, if among a series of days, which pass all performance metrics and graphical reviews, there is a single day which barely fails one of the metrics but passes all others, that day is probably acceptable for use in the demonstration. Review reasons for why the performance metric was not passed and what impact use of the day will have on the demonstration. Once a day or series of days performance is determined to be adequate, i.e., the model does not have a bias to over or under predict, that day or series of days is acceptable for use in the modeled attainment test. There are no criteria for weighing days in the RRF calculation.

14. The area has requested to use 2002 emissions and 2001-2003 design value instead of 1999 emissions and 1998-2000 design value, as current conditions for calculating the relative reduction factor (RRF). It is expected that 2001-2003 design values will be much lower than the 1998-2000 design values. Preliminary analysis indicates that the resulting 2007 future design values are significantly different, by as much as 10 ppb. This approach would be consistent with EPA DRAFT 8-hour ozone modeling guidance and the EPA emissions policy Memorandum (EPA, February 27, 2003). Control measures at some utilities in the area did go in place during 2001. These reductions most likely contribute to lower design values in 2001-2003. However, it is documented that the meteorology in 1998-2000 was more ozone conducive than meteorology observed so far in 2001-2003. Should the state consider the possibility that the use of 2001-2003 design values may have a bias to under predict the future 2007 design value?

RESPONSE: See response to question 9 for discussion on how to select the appropriate emissions inventory and ambient design value for use in the RRF calculation (draft guidance, page 35, "Choosing the "current period" to use in the attainment test", and page 47, item 3, discussion on "current" emissions). If the current emissions inventory is 2002, the modeling emissions for the entire modeling domain should reflect actual 2002 emissions. Draft modeling guidance, page 35, indicates that the 3-years of ambient data "straddling" the most recent available emissions inventory should be used to determine the current design value. This would

be 2001-2003, in this example. Also, in this case there is no higher more recent design value to chose from, as mentioned in footnote 5 of page 35 of the guidance.

However, since there is concern that the meteorology for the designation time period may not be as ozone conducive as more typically seen in the area, EPA encourages the area to assess the meteorological influence on the ambient design value and evaluate whether the control strategy would provide for attainment if the more frequent (ozone conducive) meteorology occurs in 2007. See MCR guidance for how to assess fluctuations in design values due to meteorology ².

Also, the state presents a unique set of modeling which allows the opportunity to perform a retrospective analysis as discussed on page 135 of the draft modeling guidance. For example, if there are model results for 1999 and 2001, use model predictions to calculate a RRF, multiply the RRF times the 1999 design value to predict a 2001 design value. Then compare the predicted design value to the observed design value for 2000-2002 time period. If the emissions are accurately estimated for 1999 and 2001 and the meteorology is the same in both model runs, then the difference between the design values observed and predicted for 2001, is due to some uncertainty in the analyses but also, due to observed changes in meteorology between 1999 and 2001. Further investigation is encouraged.

² EPA, March 28, 2002, Memorandum from Lydia N. Wegman and J. David Mobley, “Mid-Course Review Guidance for the 1-Hour Ozone Nonattainment Areas that Rely on Weight-of-Evidence for Attainment Demonstration.”, <http://www.epa.gov/scram001/guidance/guide/policymem33d.pdf>