

SOUTHEAST TEXAS PHOTOCHEMICAL MODELING TECHNICAL COMMITTEE

Meeting Summary
February 18, 2009

H-GAC Offices
3555 Timmons Avenue
Houston, Texas

Members and Guests Present:

Susan Moore, Dan Baker, Rohit Sharma, Jan Stavinocha, Judy Bigon, Jim Wilkinson, Graciela Lubertino, Shelley Whitworth, Ben Finley, Erik Snyder, Nathan Chenaux, Jim Smith, Ron Thomas, and Dick Karp, and Liz Hendler, and Will Vizuete via telephone.

SIP Planning and Implementation Update – Lola Brown (TCEQ)

(Note: Lola's presentation is available on the SETPMTTC Web site:

http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html.)

Lola was not able to attend the meeting but provided a written update that Dick read. In summary, the update covered recent activities of the Control Techniques Guidelines (CTGs) stakeholder group, the cost analysis of HRVOC controls on polymer plants and flares, the agency-wide Flare Task Force, and recent EPA related activities, such as the TCEQ commission approved recommendations for nonattainment areas pursuant to the 2008 ozone NAAQS.

Dick was asked about a TCEQ contact for the Flare Task Force. Subsequent to the meeting, Lola indicated that the TCEQ contact for the Flare Task Force is Ashley Forbes (aforbes@tceq.state.tx.us). For other questions or more information, please contact Lola at lbrown@tceq.state.tx.us.

H-GAC Update – Graciela Lubertino, Ph.D. (H-GAC)

(Note: Graciela's presentations are available on the SETPMTTC Web site:

http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html.)

Graciela presented the mobile source control strategies that will be part of the final short list and technical reports due to TCEQ by February 20, 2009. These strategies are comprised of TCMs and VMEP initiatives. In particular, the recommended on-road VMEP initiatives would reduce 2018 NO_x emissions by 4 tpd. Graciela, also, reported that the Port of Houston is proposing a plan, including many of the marine ports in the HGB coastal counties, that could result in up to a 15 tpd reduction in NO_x emissions.

Susan Moore indicated she has recently become aware of the number vehicles in the area that do not have inspection stickers or have counterfeit I/M stickers. Erik Snyder mentioned that in the DFW area, local constables have been delegated the responsibility of finding fraudulent I/M centers in an attempt to reduce the number of un-inspected vehicles.

Susan also mentioned that there is a proposed legislative bill in the current session that would require state agency motor pools to increase the mix of lower emitting vehicles. Graciela was

asked whether emission reductions that may arise from this legislation have been factored into the 2018 on-road emissions. Graciela indicated that no reductions have been assumed for this legislation.

Graciela also gave an update on H-GAC's development of the 2002, 2008, 2011, 2014, 2017 and 2018 RFP emission inventories for the HGB RFP SIP. H-GAC has completed the technical analyses, which involved running the EPA Mobile6.2 model numerous times.

Effects of HGB Emissions Controls and Improving Air Quality on EPA's 8-hr Ozone Attainment Test – Jim Wilkinson (Alpine Geophysics, Eight-Hour Coalition)

(Note: Jim Wilkinson's presentation is available on the SETPMTC Web site:

http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html.)

Jim's presentation covered:

- recent trends in ozone and ozone precursors (HRVOC and NO_x) concentrations,
- EPA's guidance for conducting the attainment test,
- use of the most recent (2008) monitored ozone values in the attainment test, and
- attainment test results using a 2006 baseline year and the most recent ozone values.

Jim showed graphics of concurrent decreases in ozone measures (design value, fourth high, number of days above 85 ppb) and annual average NO_x and HRVOC concentrations over the past few years.

Jim went over the EPA attainment test which involves predicting future year eight-hour ozone design values (DV_f) using the formula: $DV_f = RRF * DV_b$, where the relative response factor (RRF) and the baseline design value (DV_b) are calculated using modeling results (baseline and future case), and monitored eight-hour ozone concentrations, respectively. Jim indicated that the EPA offers various methods for calculating the RRF and DV_b . However, the EPA guidance does recommend a preferred method for the RRF and DV_b . Erik indicated that deviations from the preferred method should be justified scientifically and include a basis for why the preferred method does not work. Jim agreed that no one wants to cherry pick the answer, so any deviations should be justified. As Erik indicated, EPA's intent was to develop an attainment test that combines monitored information with modeled results, which are used in a relative sense, rather than the deterministic approach of using the modeled results that was used in the one-hour ozone attainment test. Dick suggested that the formula implies a consistent proportionality between the current (baseline) monitored information (DV_b) to modeled results and the future monitored information (DV_f) to modeled results, since the RRF is the ratio of the future modeled results to the baseline modeled results. Therefore, it may be more appropriate to interpret the DV_f similar to the DV_b , i.e., as a weighted average of future design values and not specifically the 2018 design value.

Jim suggested that using a 2006 baseline year would allow for incorporating the more recent ambient trends, in particular the 2008 eight-hour ozone design values, in the attainment test. Asked about the impact on the RRF of transitioning from a 2005 baseline to a 2006 baseline, Jim responded that although the RRF is expected to increase somewhat due to the slight reduction expected in the 2006 baseline modeling resulting from NO_x reductions (approximately 45 tpd), the decrease in the DV_b is expected to be much greater, so he expected the projected DV_f using a

2006 baseline would be notably less than using the 2005 baseline. Erik noted that hurricane Ike may have perturbed the eight-hour ozone concentrations for 2008 since it hit in the middle of the core ozone season for Houston and resulted in impacts in the emission inventory for the rest of the ozone season. The atypical meteorology coupled with the plant shut-downs, as well as shut-downs at the monitoring sites (incomplete data) make 2008 eight-hour ozone design values suspect. Erik reported that EPA has conducted a preliminary analysis of the 2008 meteorology prior to Hurricane Ike and found the PBLs to be notably higher than normal and average morning and early afternoon wind speeds were significantly above normal in several areas of Region 6 in the early summer period, including Houston. In addition, Erik reported that lower eight-hour ozone was monitored in a number of other areas (e.g., DFW, Beaumont, Baton Rouge) further suggesting a notable meteorological influence to the 2008 eight-hour ozone design values.

In response to a question from Liz Hendler about what criteria should be used to decide whether 2005 or 2006 is the better year to use as the baseline, Erik indicated that it depended on which year's episodes (being modeled) best represent the types of conditions most conducive to ozone formation and which days are being more utilized in the RRF calculations. Erik also indicated that the evaluation should be done comparing the periods to the conceptual model for ozone exceedances in the HGB area. Dick commented that although the June 2006 episode had many days with high and widespread ozone exceedances, the 2006 episodes within the intensive field portion of TexAQS II (i.e., August 1 to October 15) have very few high and widespread ozone exceedances.

Jim presented a graphic comparing the 2005 – 2018 RRFs and the estimated 2006 – 2018 RRFs for various monitoring sites, including Deer Park and Bayland Park, two of the monitors with the highest 2005 DV_bs. In response to a question about the estimation technique, Jim indicated he used the TCEQ matrix modeling results from the “Initial 2018 Modeling and Future Design Value” presentation (October 7, 2008, SETPMTM Meeting) to calculate a set of “change in modeled ozone concentration” to “change in NO_x emissions” rates. Then multiplying the estimated NO_x emission reduction (approximately 45 tpd) from the 2005 to 2006 baseline by the rates, Jim determined an estimated change in modeled ozone concentration for 2006 and the estimated 2006 – 2018 RRFs for various monitoring sites. Although this estimation technique (i.e., using the matrix modeling) yields rates applicable to the 2108 NO_x emission level (i.e., 364 tpd) rather than the 2005 NO_x emission level (i.e., 600 tpd), the rates are probably higher and provide a more conservative estimate.

Jim showed a graphic comparing 2018 DV_fs at various monitoring sites determined by multiplying the estimated 2006 RRFs by various alternatives used to calculate the 2006 DV_bs. The various alternative 2006 DV_bs included the “straddle” method, which is the method of averaging the design values for the overlapping three-year periods that include the baseline year, and the “New Jersey” method of averaging the fourth highest eight-hour ozone for the five-year period, for which the middle year is the baseline year. Erik responded that the use of the 2008 ozone data is problematic at this time. Erik seemed amenable to using the straddle method to calculate the 2006 DV_b s, but not use the 2008 fourth highest eight-hour ozone. Erik caveated that an analysis of which base DV period better represents the conceptual model (including how many days are being used in the RRF) should be done to determine whether 2005 or 2006 should be the base DV and EI. Erik indicated that the guidance allows for calculating an ozone design

value on just two years of data (e.g, 2006 and 2007 for 2008). Erik said that initially it seemed like more of the RRF days are from 2005 and that it appeared that the more days from the 2005 episodes may match with the HGB conceptual model than 2006 and if further analysis concludes the same that the 2005 could remain the base DV and EI for the attainment demonstration but that a 2006 analysis could still be done as a Weight of Evidence component.

Erik was asked whether the New Jersey method was acceptable to EPA. Erik indicated that the New Jersey method was not supported with valid scientific reasoning to explain why the EPA guidance method was inappropriate. EPA had reviewed the overall New Jersey package and determined that it did not show attainment and EPA signed a federal register notice in January disapproving the New Jersey plan but due to the new administration's review of all non-published federal register notices, the notice has not been published in the Code of Federal Regulations. Erik clarified that the new administration is, in part, requiring a re-review of some of the controversial eight-hour ozone SIPs such as the DFW and NJ/NY, with a focus on national consistency. It was pointed out that the new EPA Administrator, Lisa Jackson, was the commissioner for the New Jersey Department of Environmental Protection who signed the New Jersey SIP.

EPA SIP Related Update – Erik Snyder (EPA)

Erik Snyder gave a verbal update of current SIP related issues. For questions or more information, please contact Erik at snyder.erik@epa.gov.

Erik indicated that in light of the court's reconsideration of the CAIR program and subsequent remanding, TCEQ should continue to use the CAIR levels for SIP modeling purposes.

Asked about the status of the DFW SIP, Erik indicated that the DFW SIP had passed the final review stage and was published in the Federal Register on January 16, 2009, but with the recent memo from Rahm Emanuel, the White House Chief of Staff (January 20, 2009), the final approval action on the DFW SIP is being reviewed by the EPA administrator. Region 6 is currently working on getting briefing materials to the administrator for her review. Update March 8, 2009 from Erik – No action to resend the DFW SIP was given, so the final approval of the SIP is still in place.

Erik again noted that 2008 monitoring showed much lower ozone concentrations in the DFW, Beaumont, and Baton Rouge areas, although they did not have as notable emissions reductions as the HGB area, suggesting a meteorological influence. A further concern EPA has with the potentially abnormal meteorology in 2008 is that the 75 ppb NAAQS designations would usually rely in part on the 2008 monitored ozone data.

In response to a question about the status of the 75 ppb implementation, Erik indicated EPA still hopes to post the proposed rule in the Federal Register in the summer of 2009, and that it will most likely include the classification scheme used for the 85 ppb standard and alternative classification scheme(s). Erik stated the schedule for designations is as follows:

- States submit recommendations to EPA in March 2009,
- EPA responds to the recommendations in November 2009,
- Public hearings are held in January 2010, and

- EPA makes final designations in March 2010.

Erik also mentioned that in preparation for reviewing the states' recommendations on nonattainment area designations, EPA is conducting CAMx modeling using source apportionment (e.g., APCA) to determine the influence of likely adjoining counties. Asked about the emissions used in this modeling, Erik indicated he would have to find that out. In addition to the modeling, EPA will review other information as indicated in a memorandum issued December 5, 2009.

Erik was also asked about the monitoring requirements associated with the 75 ppb standard, in particular, the need to monitor in micro-metropolitan area and whether this would require monitoring in Sugar Land in Fort Bend County. Erik responded that since Fort Bend County was already included in the HGB nonattainment designated area, the micro-metropolitan monitoring requirement would probably not apply. The monitoring requirement is more for micro-metropolitan areas that are not apart of a current nonattainment designation. It was pointed out that monitor siting could be a very important feature in micro-metropolitan areas, such as Temple-Killeen, where there is a substantial amount of rural area.

Erik indicated that the revised lead (Pb) NAAQS, which is 10 times lower than the previous standard, requires monitoring in areas with sources emitting 1tpy or more of Pb. Current monitoring of Pb in the Frisco area of Collin County is showing it to be nonattainment, presumably due to a lead-battery recycling facility.

SIP Modeling Update: Evaluation of EPA's MATS – Jim Smith, Ph.D. (TCEQ)

Jim presented an evaluation of EPA's Modeling Attainment Test Software (MATS) focusing on the future design value calculations (DV_{fs}) for the initial HGB 2018 projections (DV_{18s}). (Note: Jim's presentation is available on the SETPMTC Web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html.)

As Jim indicated, this evaluation has been conducted in response to some stakeholders and modeling researchers who have raised concerns that the TCEQ is not using MATS, but instead uses a Perl scripting procedure providing operating system compatibility with our Linux cluster for post-processing the CAMx modeling output.

Jim briefly went over the attainment test procedure, in particular the procedures used to calculate the relative response factor (RRF) and the baseline ozone design value. Dick interjected that in the initial 2018 modeling, the RRFs for the various monitoring sites were based on the averages of all modeled days for which the 2005 baseline modeled peak daily eight-hour ozone concentrations were greater than or equal to 80 ppb. This is not exactly EPA's recommended procedure for calculating RRFs, but as Dick explained, this was done for expediency in the initial 2018 modeling, since a threshold of 80 ppb, ensured that the RRF calculated for each monitor was based on an average of at least 10 days, also an EPA recommendation. Dick indicated that for subsequent 2018 modeling the TCEQ will be adhering to the EPA recommended procedure for calculating RRFs to the extent possible.

Jim showed that the MATS can be configured to run using the same assumptions as the Perl scripting, and the resulting RRFs and DV_{18s} are almost the same for all sites. However, at some sites the differences, although small (e.g., maximum DV_{18} difference = 0.2 ppb), are more than

can be attributed to round off error. Since MATS is a “black-box,” Jim indicated it would take substantial effort to definitively ascertain the reason for the differences. However, Jim suggested the most likely cause is due to the requirement to use a latitude and longitude for the geographical projection (Lat/Long) in MATS, whereas CAMx and Perl use a Lambert Conformal geographical projection (LCP). In converting from LCP to Lat/Long, differences can occur in the locations of monitors and grid cell boundaries.

Jim concluded that although there are a few advantages to using MATS, such as its ease of use, especially for states with staff more familiar with Windows-based PCs, for the TCEQ there are a number of disadvantages, one being that MATS is Windows-based. Other disadvantages include the extra processing of modeled output to MATS input and potential for errors introduced in converting from LCP to Lat/Long geographical coordinates.

Erik indicated he would be checking with EPA headquarters, but since the Perl scripting routine and MATS provide consistent results and since the Perl is available, he did not think there would be a problem with using the current approach. However, Erik did indicate that MATS also includes a procedure for conducting the “unmonitored area” analysis, which would need to be considered for the HGB attainment test.

Erik also commented on the selection of the grid cell array used in the procedure for determining the RRFs. In the EPA guidance various grid cell arrays (e.g., 3x3, 5x5, 7x7) are associated with various modeling domain grid cell sizes. For example, typically for a modeling domain grid cell size of 4 km, a 7x7 grid cell array around a monitoring site is recommended. As Erik explained, this recommendation for grid cell size versus grid cell array coupling derives from monitor siting recommendations which assume that selected monitoring locations should provide for about a 15 mile diameter of representation. Of course due to logistics, this siting requirement is not always met, which as Erik suggested may be the case for a number of monitors in the HGB area, where the diameter of representation may be smaller than 15 miles, which in turn would suggest that a smaller grid cell array may be more appropriate.

SIP Modeling Update: 2005 Baseline Emissions – Ron Thomas (TCEQ)

Ron’s presentation detailed the development of the 2005 baseline modeling emissions, providing explanations of where there are differences between the 2005 baseline and the more episode-specific base case modeling emissions. As Ron was describing the development of the 2005 baseline modeling emissions for the various source categories, he presented emission tile plots showing the geographical distribution of the emission rates, as well as a display of the diurnal profile of the emission rates. (Note: Ron’s presentation is available on the SETPMTTC Web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html.)

As Ron explained, for many of the emission source categories, there is no difference between the modeling emissions used in the 2005 baseline and the base cases, because the emissions are developed as typical ozone season day emissions. This is the case for the area sources, as well as the non- and off-road mobile sources.

Ron further explained that the source category with the biggest differences between the 2005 baseline and the base cases is the point sources. In particular, point sources for which there are

hourly emissions data, such as electrical generating units (EGUs) exhibit the largest differences. Whereas the episode-specific hourly data are used to develop the base case modeling emissions, the 2005 baseline emissions were derived from averages of the 2005 third quarter hourly emissions data. The averages of the third quarter of the year (July 1 through September 30) are expected to provide emissions reflective of the ozone season, similar to the ozone season day emissions developed for other source categories. Average emissions and average diurnal profiles were calculated for each EGU. Ron received a comment about providing tile plots comparing the baseline and base case modeling emissions for the EGUs, and Ron responded that difference plots for the various episode days could be developed.

Tank landing loss emissions, as Ron described, were also developed from hourly data and the 2005 baseline emissions, similar to the EGUs, are derived by averaging. However, for the tank landing loss emissions, the averaging is over the episode days in the 2005 base cases for which there were reported non-zero tank landing loss emissions.

In regards to the emission tile plots for the low-level point source NO_x emissions, Ron was asked about the diurnal profile, which shows a notable increase in the emission rate for the hours corresponding to 11 PM and midnight. Ron responded that while the diurnal profile is rather constant otherwise, and the increase in the emission rate for those two hours represents only about a 20 percent increase, he surmised that this may be due to the default assignment of midnight as the starting hour for entities reporting the number of operating hours but not the starting hour for the emissions, but he would have to look into which point sources were responsible for this feature.

SIP Modeling Update: MM5 Modeling with Grell– Dick Karp (TCEQ)

Dick presented an update for the meteorological modeling, which uses the Grell cumulus scheme in the 4 km modeling domain. (Note: Dick's presentation is available on the SETPMTTC Web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html.)

As Dick explained, cumulus parameterization schemes, such as Grell, are typically used in modeling domains with relatively large grid cell sizes (e.g., 108 km, 36 km, 12 km), since clouds are generally smaller in size than these grid cells. Generally for modeling domains with smaller grid cell sizes (i.e., 4 km and smaller) a cumulus parameterization is not needed, since at these smaller scales, MM5 should be able to resolve the clouds. However, as Dick showed in a series of graphics, one for each of several episode days with high and widespread monitored eight-hour ozone concentrations, there appears to be an issue resolving clouds in the 4 km modeling domain. In consultation with other researchers modeling the HGB area (e.g., John Nielsen-Gammon), use of the Grell cumulus scheme in the 4 km modeling domain was suggested.

The graphics display modeled surface winds overlaid with observed winds, modeled cloud optical depth and GOES satellite-observed cloud cover fraction, for both MM5 modeling with and without the Grell cumulus scheme applied in the 4 km modeling domain. These graphics suggest that for MM5 modeling without Grell, extensive modeled cloud optical depth not reflected in the observed cloud cover fraction (GOES) can be associated with "star-burst" surface wind patterns (presumably due to down drafts) not reflected in the observed winds. As Dick

indicated, there was concern that these star-bursts could propagate turbulence in the winds which may affect the transport and diffusion of ozone and precursor concentrations.

For a number of these episode days with high and wide-spread monitored eight-hour ozone concentrations, MM5 modeling with Grell appears to reduce the modeled cloud optical depth providing a more favorable comparison with the observed cloud cover fraction and alleviating the associated star-burst surface wind patterns. However, as Dick indicated, while the use of Grell seems to have improved the modeling of clouds and surface winds for these particular days and the hours considered, the MM5 modeling with Grell needed to be assessed to ensure the overall meteorological modeling performance was not degraded.

Dick explained that the assessment of the MM5 modeling with Grell focused on all days with high and widespread eight-hour ozone concentrations in the 2005 episodes and the June 2006 episode for selected groupings of monitoring sites representative of a common distance from the Gulf using graphical and statistical measures. In particular, the graphical (plume trajectory plots) and statistical measures (wind speed and wind direction metrics) involved comparing modeled versus monitored winds using MM5 modeling with and without Grell. From the graphical and statistical measures presented, Dick concluded that the MM5 modeling with Grell used in the 4 km domain does not compromise the overall meteorological modeling performance.

Concluding Discussion

After the conclusion of the presentations, there were a few questions and comments including:

- What modeling sensitivities does the TCEQ plan on running?
- Does or will the EI reconciliation address other VOCs as well as HRVOCs?
- Since every year has its peculiar meteorological features, what features make the use of 2008 ozone data so questionable?

Dick answered the question about sensitivity modeling, responding that the TCEQ plans to use the Higher-order Decoupled Direct Method (HDDM) to determine the sensitivity of the DV_{18s} to emissions from the various source categories. The HDDM sensitivities will, in part, replace the matrix modeling used for this purpose in the past. With specific reference to on-road mobile emission sensitivities, Dick indicated that since the revised 2018 on-road mobile emissions for the HGB area will not be ready until the end of March 2009, sensitivity modeling for on-road mobile emissions will not be available until some time in April 2009.

Jim Smith answered the question about the EI reconciliation, responding that it only addresses the HRVOCs. Jim indicated that he had applied the potential source contribution function (PSCF) analysis to butane, which is an “other VOC,” and found the results to be somewhat problematic. The EI reconciliation factors suggested by the PSCF for butane were not only very high, but they were almost domain-wide. Dick indicated he thought that for low reactive chemical species like butane the PSCF analysis might not be appropriate in determining likely locations of under- or un-reported emissions. Since butane has such a long life time, it can be widely dispersed and thereby appear to be coming from all around.

Erik Snyder responded to the comment/question about the meteorological features of 2008, which bring the use of the ozone data into question. Erik reiterated a number of the concerns he

had voiced earlier, including the influence of hurricane Ike and how that impacted both monitoring downtime and emissions in the HGB area for the rest of the ozone season.

It was pointed out that the next SETPMTC meeting (March 19, 2009) is scheduled during spring-break and a number of the attendees indicated they would not be able to attend. Dick indicated he would work with Graciela to see if the meeting could be rescheduled to the following week. There was also discussion about moving the meeting time to start at 9 AM and go through 12:30 PM, which seemed to be generally acceptable. (Note: subsequent to this meeting, the March meeting has been re-scheduled to March 26, 2009, between 9 AM and 12:30 PM).