DRAFT Guidance on Ozone and $PM_{2.5}$ Permit Modeling

Draft Guidance Overview Webinar

March 12, 2020

Webinar Logistics

- EPA Skype Meeting: https://meet.lync.com/usepa/bridgers.george/RCFFWM07

- Audio should be available via computer speakers,
  but there is a dial-in number available: +1 (984) 444-7480,,96606139#
  - Find a local number (https://dialin.lync.com/556a4b78-4afd-4fe6-b721-1d903e8cdaa6?id=96606139)

- Please submit questions via chat window or hold them until the end of the webinar when there will be a Q&A session.

Webinar Outline

- Webinar Logistics
- Quick Background / History Lesson
- 2017 *Guideline on Air Quality Models* Revisions
- Supporting Guidance and Clarifications
- *DRAFT Guidance on Ozone and $PM_{2.5}$ Permit Modeling*
- Review and Comment Logistics
- 2020 Regional, State, and Local Modelers' Workshop
- Questions

Quick History Lesson – The Early Years

- The EPA granted a petition by the Sierra Club in 2010 and committed to engage in rulemaking to evaluate updates to the *Guideline on Air Quality Models* ("Appendix W" to 40 CFR Part 51), and, as appropriate, incorporate new analytical techniques or models for ozone and secondary $PM_{2.5}$.
- EPA's PM_{10} Surrogate Policy officially ended in 2011.
- The $PM_{2.5}$ NAAQS (annual and daily form) was revised in 2012.
- In 2013, the U.S. Court of Appeals for the District of Columbia Circuit vacated the SMC for $PM_{2.5}$ and two provisions in EPA's PSD regulations containing SILs for $PM_{2.5}$.
- During this while, the EPA embarked on a multi-year effort to develop guidance on assessing single-source $PM_{2.5}$ impacts for the purposes of NSR-PSD permitting, which included co-regulator involvement and informal stakeholder comment/feedback.

Quick History Lesson – Adolescences

- On May 20, 2014, the EPA "finalized" (*released as a non-draft version*) the *Guidance on $PM_{2.5}$ Permit Modeling*.
  - https://www.epa.gov/sites/production/files/2015-07/documents/pm25guid2.pdf
- Provided clarity and additional legal basis for the appropriate use of $PM_{2.5}$ SILs in light of the January 22, 2013 Court of Appeals Decision.
- Established 4 recommended scenarios or assessment cases that defined what air quality analysis, *if any*, that an applicant would follow for compliance demonstrations of the $PM_{2.5}$ NAAQS or PSD Increments.
- The recommended scenarios included a combination of modeling with the Appendix W preferred or approved alternative dispersion model for direct $PM_{2.5}$ and qualitative/hybrid/quantitative approaches for adequately assessing secondarily formed $PM_{2.5}$.

2017 *Guideline on Air Quality Models* Revisions

- In January 2017, the EPA revised the *Guideline on Air Quality Models.*
  - Editorial improvements, language clarifications, and restructuring throughout to improve the understanding of the "requirements" and recommendations for the EPA's preferred models and their appropriate application.
  - Enhanced the formulation and application of the agency's AERMOD dispersion model.
  - Included specific recommendations for quantitatively assessing ozone and secondarily formed $PM_{2.5}$ from single sources through a two-tiered approach using existing Chemical Transport Model (CTM) tools and techniques. (*See Section 5*)
  - In association with the *Guideline* revisions, the EPA committed to updating the 2014 *Guidance on $PM_{2.5}$ Permit Modeling* to include ozone and have subsequently released several supportive guidance documents to assist with regulatory ozone and $PM_{2.5}$ permit compliance demonstrations.
  - 2017 Appendix W Final Rule Supporting Information and Docket Website: https://www3.epa.gov/ttn/scram/appendix_w-2016.htm

Supporting Guidance and Clarifications

- December 2016 – *Guidance on the use of models for assessing the impacts of emissions from single sources on the secondarily formed pollutants ozone and $PM_{2.5}$.*
  - Provides detailed procedures for applying CTMs to estimate single source impacts for chemically reactive pollutants.
  - https://www3.epa.gov/ttn/scram/appendix_w/2016/EPA-454_R-16-005.pdf

- August 2017 – "Use of Photochemical Grid Models for Single-Source Ozone and secondary $PM_{2.5}$ impacts for Permit Program Related Assessments and for NAAQS Attainment Demonstrations for Ozone, $PM_{2.5}$ and Regional Haze" clarification memo.
  - Demonstrated that CMAQ and CAMx photochemical models are appropriate to use for the purposes of estimating ozone and $PM_{2.5}$ for permit related program demonstrations and NAAQS attainment demonstrations.
  - https://www3.epa.gov/ttn/scram/guidance/clarification/20170804-Photochemical_Grid_Model_Clarification_Memo.pdf

Supporting Guidance and Clarifications *(cont.)*

- April 2018 – The *Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program*.
  - Provides a policy, legal, and technical basis for recommended 8-hour ozone and daily/annual $PM_{2.5}$ SILs.
  - https://www.epa.gov/nsr/significant-impact-levels-ozone-and-fine-particles

Table 1. Recommended SIL Values for Ozone and $PM_{2.5}$ NAAQS

Criteria Pollutant (NAAQS level)	NAAQS SIL concentration
Ozone 8-hour (70 ppb)	1.0 ppb
$PM_{2.5}$ 24-hour (35 µg/m^3)	1.2 µg/m^3*
$PM_{2.5}$ annual (12 µg/m^3 or 15 µg/m^3)	0.2 µg/m^3

* The table accounts for the significance level for the 24-hour $PM_{2.5}$ NAAQS in 40 CFR 51.165(b)(2). Refer to the guidance discussion for details.

- April 2019 – *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier I Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program*.
  - Provides a detailed framework to estimate single source impacts on secondary pollutants under the first tier (or Tier 1) approach based on existing empirical relationships between precursors and secondary impacts established using state-of-the-science CTMs.
  - https://www3.epa.gov/ttn/scram/guidance/guide/EPA-454_R-19-003.pdf

Supporting Guidance and Clarifications *(cont.)*

- November 2019 – The EPA released the MERPs VIEW Qlik application.
  - Provides easy access to EPA's hypothetical single source modeled impacts of O_3 and $PM_{2.5}$ to support appropriate PSD applications.
    - 1) Class II NAAQS Tier 1 demonstrations for PSD permits, illustrative hypothetical single source modeled impacts for annual and daily maximum average $PM_{2.5}$ and annual maximum daily 8-hr O_3 (*information provided as MERPs*)
    - 2) Class I PSD increment Tier 1 demonstration for PSD permits, illustrative hypothetical single source modeled impacts of maximum daily average $PM_{2.5}$ concentrations provided by distance from the source.
  - https://www.epa.gov/scram/merps-view-qlik

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Upfront Caveats

- Thank you for that venture down memory lane… the journey has been longer than desired and, at times, quite convoluted, but we have reached a point that all the necessary pieces are in place for a robust replacement to the 2014 *Guidance on $PM_{2.5}$ Permit Modeling*.
- While presentations and comments were made at the 2018 and 2019 RSL Modelers' Workshops and also at the 12th Conference on Air Quality Models regarding the direction of the impending draft guidance, these older caveated pieces are now replaced by the actual draft guidance that was released on February 10th.
- The draft guidance has undergone significant internal coordination between OAR, OAQPS-AQPD, OAQPS-AQMG, OGC, and the EPA Regional Offices.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – What's New?

- So what's new… what's the skinny… where should I focus my attention for review and comment? I mean, that's why we're all on this webinar anyway.
- Short answer is…

  Wait for it…

  The whole draft guidance!
- We really need a thorough review of everything, including the Appendices.
- Our efforts since 2016 have focused on updating the 2014 *Guidance on $PM_{2.5}$ Permit Modeling* to incorporate ozone, update aspects of the $PM_{2.5}$ increment section, reflect the 2017 *Guideline* revisions and 2018 "SILs Guidance," and revise based on ongoing feedback and knowledge gained from practical application in compliance demonstrations.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Applicability

- Section II.2 (PSD Pollutant Applicability for O_3 and $PM_{2.5}$) deserves a very considerate review and overall understanding.
  - It's short… "pager," but the discussion is fundamental to the assessment approaches for O_3 and $PM_{2.5}$ throughout the remainder of the draft guidance.
  - This subsection resolves the varying assessment approaches previously discussed at the 2018 and 2019 RSL Modelers' Workshops.
- In a nutshell, the PSD requirements for a compliance demonstration only apply to regulated NSR pollutants that would be emitted in a significant amount.
  - This may seem obvious, but the devils are in the details throughout the discussion in Section II.2.
  - The emissions of individual O_3 and $PM_{2.5}$ precursors/pollutants (i.e., NO_X, VOC, SO_2, and direct $PM_{2.5}$) are not summed when determining a significant emissions increase for either criteria pollutant.
  - Only the component of O_3 and $PM_{2.5}$ that would by themselves be emitted by a new or modifying source in a significant amount would be included in the air quality analysis.

DRAFT $O_3/PM_{2.5}$ Modeling Guidance – O_3 Assessments

- Table III-1. EPA Recommended Approaches for Assessing O_3 Impacts by Assessment Case
  - There is not a primary impacts approach for ozone. Only the secondary formation from NOx and/or VOC is considered.
  - Given the reasonable particularity for which quantitative assessments of secondarily formed O_3 can be made (e.g., MERPs), qualitative assessments are no longer recommended in most situations.

Assessment Case	Description of Assessment Case		Secondary Impacts Approach*
Case 1: No Air Quality Analysis	NO_X emissions and VOC emissions < 40 tpy SER		N/A
Case 2*: Secondary Air Quality Impacts	NO_X emissions and/or VOC emissions ≥ 40 tpy SER		Include each precursor of O_3 emitted in a significant amount, see Section II.2. • **Tier 1 Approach** (*e.g.*, MERPs) • **Tier 2 Approach** (*e.g.*, Chemical Transport Modeling)

* In unique situations (*e.g.*, in parts of Alaska where photochemistry is not possible for portions of the year), it may be acceptable for the applicant to rely upon a qualitative approach to assess the secondary impacts. Any qualitative assessments should be justified on a case-by-case basis in consultation with the appropriate permitting authority and the appropriate EPA Regional Office.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – $PM_{2.5}$ Assessments

- Table III-2. EPA Recommended Approaches for Assessing Primary and Secondary $PM_{2.5}$ Impacts by Assessment Case
  - Very similar to the 2014 *Guidance on $PM_{2.5}$ Permit Modeling*.
  - Given the reasonable particularity for which quantitative assessments of secondarily formed $PM_{2.5}$ can be made (e.g., MERPs), qualitative assessments are no longer recommended in most situations.

Assessment Case	Description of Assessment Case		Primary Impacts Approach	Secondary Impacts Approach*
Case 1: No Air Quality Analysis	Direct $PM_{2.5}$ emissions < 10 tpy SER NO_X emissions and SO_2 emissions < 40 tpy SER		N/A	N/A
Case 2: Primary Air Quality Impacts Only	Direct $PM_{2.5}$ emissions ≥ 10 tpy SER NO_X emissions and SO_2 emissions < 40 tpy SER		**Appendix W preferred or approved alternative dispersion model**	N/A
Case 3*: Primary and Secondary Air Quality Impacts	Direct $PM_{2.5}$ emissions ≥ 10 tpy SER NO_X emissions and/or SO_2 emissions ≥ 40 tpy SER		**Appendix W preferred or approved alternative dispersion model**	Include each precursor of $PM_{2.5}$ emitted in a significant amount, see Section II.2. • **Tier 1 Approach** (*e.g.*, MERPs) • **Tier 2 Approach** (*e.g.*, Chemical Transport Modeling)
Case 4*: Secondary Air Quality Impacts Only	Direct $PM_{2.5}$ emissions < 10 tpy SER NO_X emissions and/or SO_2 emissions ≥ 40 tpy SER		N/A	Include each precursor of $PM_{2.5}$ emitted in a significant amount, see Section II.2. • **Tier 1 Approach** (*e.g.*, MERPs) • **Tier 2 Approach** (*e.g.*, Chemical Transport Modeling)

* In unique situations (*e.g.*, in parts of Alaska where photochemistry is not possible for portions of the year), it may be acceptable for the applicant to rely upon a qualitative approach to assess the secondary impacts. Any qualitative assessments should be justified on a case-by-case basis in consultation with the appropriate EPA Regional Office or other applicable permitting authority.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – MERPs to the Rescue

- How Can the "MERPs Guidance" Assist?
- The empirical relationship that is established in the development of a MERP for a particular precursor in a region/area can be used to reasonably estimate the impact of that precursor from other sources in that region/area when the equation is rewritten to solve for the "modeled air quality impact."
  - Original MERPs equation as presented in the MERPs Guidance

$$\text{MERP} = \text{Critical Air Quality Threshold} * \left(\frac{\text{Modeled emission rate from hypothetical source}}{\text{Modeled air quality impact from hypothetical source}} \right)$$

  - Modified MERPs equation to solve for modeled air quality impact

$$\text{Modeled air quality Impact from hypothetical source} = \text{Critical Air Quality Threshold} * \left(\frac{\text{Modeled emission rate from hypothetical source}}{\text{MERP}} \right)$$

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – MERPs = "KISS"

- Is It Just that Simple?
- Can it be just that simple to modify the MERP equation and then use it to solve for the respective air quality impacts for each precursor species based on the MERP relationship already established for a region or area?
- Yes and no… modifying the MERP equation is straight forward and running the numbers for each precursor isn't a huge lift, but combining everything requires some additional thought.

- *Note: Permit authorities are free to develop other Tier 1 approaches, but MERPs are our current recommendation.*

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Single Impact Assessment (SIA)

- For an Ozone SIA, one would add the MERP calculated modeled impact for each applicable precursor (NO_X and/or VOC).
  - If the combined Ozone impact for the applicable precursor(s) is less than the Ozone SIL, then you have an adequate Ozone compliance demonstration… otherwise a Ozone CIA is required.
- For a $PM_{2.5}$ SIA, if applicable for direct $PM_{2.5}$, one would run AERMOD (or approved alternative) for the direct $PM_{2.5}$ sources at the new or modifying facility. Add the high-first-high (H1H) value from AERMOD to the MERP calculated modeled impact for each applicable precursor (NO_X and/or SO_2).
  - If the combined $PM_{2.5}$ impact for the applicable direct and/or precursor(s) is less than the appropriate $PM_{2.5}$ SIL, then you have an adequate $PM_{2.5}$ compliance demonstration… otherwise a $PM_{2.5}$ CIA is required.
- For a $PM_{2.5}$ SIA, if not applicable for direct $PM_{2.5}$, then mimic the Ozone SIA process.
- *Note: It is strongly encouraged that the most representative MERP relationship for the region/area is used and not the most conservative relationships for the entire country.*

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Cumulative Impact Assessment (CIA)

- A misconception has been that cumulative modeling meant that a Tier 2 assessment and the need for chemical transport modeling (*e.g.*, CMAQ or CAMx). This is not the case... one can continue using a Tier 1 approach with the modified MERP equation, even in situation when the SIL is exceeded and/or the precursor pollutant emissions rate is above the MERP threshold for that region/area.

- For an Ozone CIA, the secondary impacts from the modified MERP equation for each applicable precursor would be combined with background.
  - If the combined value is less than the NAAQS or PSD Increment, the an adequate Ozone compliance demonstration has been made.
  - If violations are found, then a Tier 2 analysis would be required. Please contact the EPA Regional Office and OAQPS through the appropriate permit review authority.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Cumulative Impact Assessment (CIA)

- In a $PM_{2.5}$ CIA, the secondary impacts from the modified MERP equation for each applicable precursor would be added to the background that is included with the traditional AERMOD modeling of the direct $PM_{2.5}$ (*if also applicable, otherwise direct $PM_{2.5}$ source can be excluded from the AERMOD run*) from the new or modifying source and any nearby sources.
  - If no violations of the NAAQS or PSD Increment are found in the domain, then an adequate $PM_{2.5}$ compliance demonstration has been made.
  - If violations are found, then the traditional culpability analysis would ensue.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – $PM_{2.5}$ Increment

- Section V (PSD Compliance Demonstration for the $PM_{2.5}$ Increments) also deserves a very considerate review and overall understanding.
- This section underwent a fairly major overhaul.
  - The increment discussion in Section V of the 2014 *Guidance on $PM_{2.5}$ Permit Modeling* was fairly brief and had gaps, especially with cumulative assessments and PSD Increment violations.
  - Revisions provide a more full understanding of PSD Increments terminology / system.
  - Revisions provide a full explanation of both the Source and Cumulative Impact Assessments (SIA/CIA) and determining whether proposed source causes or contributes to modeled violations.
- Many of the concepts from the SIA and CIA for the Class II $PM_{2.5}$ NAAQS assessments (Sections III and IV) are referenced and brought forward, as appropriate.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Cautionary Statements

- Hourly Pairing of Background is Still Out
  - Considering the spatial and temporal variability throughout a typical modeling domain on an hourly basis and the complexities and limitations of hourly observations from the current $PM_{2.5}$ ambient monitoring network, we do not recommend a "paired sums" approach on an hour-by-hour basis.
  - The pairing of daily monitored background and 24-hour average modeled concentrations is not recommended except in rare cases of relatively isolated sources where the available 1-in-1 day FRM/FEM monitor can be shown to be representative of the ambient concentration levels in the areas of maximum impact from the proposed new source.
- The EPA also does not endorse or recommend any 'scaling' techniques for the assessment of primary $PM_{2.5}$.
  - If one needs to or is required to assess primary $PM_{2.5}$, then it should be done with the EPA recommended screening model, AERSCREEN, or the EPA preferred model, AERMOD, as described in Section 4.2.3.5 of Appendix W.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Final Thoughts

- The EPA continues to recommend that applicants engage early with the appropriate reviewing authority and the co-regulatory agencies consult with the appropriate EPA Regional Office for compliance demonstrations assessing ozone or secondary $PM_{2.5}$ impacts.

- Again, the EPA is currently recommending in the draft guidance an "applicability approach" (*See Section II.2*) for determining which pollutants or pollutant precursors that should be assessed in a compliance demonstration, but there will not be adverse comments by the agency should a permit applicant or co-regulatory agency consider/present a holistic assessment of ozone or $PM_{2.5}$.

DRAFT O_3/$PM_{2.5}$ Modeling Guidance – Review and Comment Logistics

- Comments are due by **Friday, March 27, 2020**.
- Comments on the *DRAFT Guidance on Ozone and $PM_{2.5}$ Permit Modeling* should be electronically submitted to George Bridgers, Bridgers.George@epa.gov.
- The EPA will take into consideration all the feedback and comments submitted and will further engage with the regulatory air quality modeling community at the 2020 Regional, State, and Local Modelers' Workshop.
- A final version of the guidance is projected for release in late 2020.

2020 Regional, State, and Local Modelers' Workshop

- Currently scheduled for Tuesday, May 5th through Thursday, May 7th, 2020 at the Minneapolis Central Library in Minneapolis, MN.
- Stakeholders and external partners are invited to participate along with the co-regulatory agencies on the first day of the Workshop, Tuesday, May 5th.
- More workshop logistical information, a draft agenda, and the link to the online registration are available at: https://www.epa.gov/scram/2020-regional-state-and-local-modelers-workshop

- *We are currently monitoring the situation with the COVID-19 coronavirus very closely and evaluating concerns at the venue location and with travel to/from. We have not made any decisions that would otherwise cancel/postpone the workshop thus far. Stay tuned!*

Questions?

- We will entertain a few questions at this time.
  - You are welcome to use the chat/conversation window to send us questions. These questions are logged, and we will follow-up with all questions that are not answered during the webinar.
  - You can also use the dial-in to ask your questions.
    - +1 (984) 444-7480,,96606139#

- Reminder: Comments are due by **Friday, March 27, 2020**.

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