# Revised Draft Guidance for Ozone and Fine Particulate Permit Modeling

**Overview Webinar – October 14, 2021**

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# Bottom Line Up Front *(BLUF)*

- Upon consideration of comments received on the February 10, 2020, version of the Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling, and consistent with Executive Order 13990, EPA has revised an important aspect of that draft guidance and is seeking additional public review and comment.
  - In order to make the required demonstration that the allowable emissions increases from a source or modification would not cause or contribute to any NAAQS or PSD increment violation, sources should provide a **full accounting** of the combined impacts of their allowable precursor (and direct component, in the case of $PM_{2.5}$) emissions on ambient concentrations of the relevant NAAQS (*i.e.*, $O_3$ or $PM_{2.5}$) if any precursor(s) (or the direct component, in the case of $PM_{2.5}$) would be emitted in a significant amount.
- The Revised Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling was released on September 20, 2021, with a 60-day comment period that runs through **November 19th**.
- Additional info and how to submit comments are available via EPA's SCRAM website:
  - https://www.epa.gov/scram/revised-draft-guidance-ozone-and-fine-particulate-matter-permit-modeling

# Quick Review of How We Got Here…

- 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* as published as Appendix W to 40 CFR 51, and, as appropriate, incorporate new analytical techniques or models for $O_3$ 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.
- In 2014, the EPA "finalized" (released as a non-draft version) the Guidance on $PM_{2.5}$ Permit Modeling.

# Guidance on $PM_{2.5}$ Permit Modeling

- Released on May 20, 2014. (https://www.epa.gov/sites/production/files/2020-09/documents/guidance_for_pm25_permit_modeling.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 based on "Pollutant Applicability" 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 $PM_{2.5}$.

# Quick Review of How We Got Here *(Cont)*…

- In 2017, the EPA revised the *Guideline on Air Quality Models* with specific recommendations for quantitatively assessing $O_3$ and secondarily formed $PM_{2.5}$ using existing chemical transport modeling tools and techniques that had been previously used in the development of nonattainment State Implementation Plans (SIPs), NAAQS assessments, and various EPA rules.
- In association with the 2017 *Guideline* revisions, the EPA releases:
  - Guidance on the Development of Modeled Emissions Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program (MERPs Guidance),
  - Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and $PM_{2.5}$ (Single-Source Chemical Transport Modeling Guidance),
  - 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 (Single-Source Ozone and Secondary $PM_{2.5}$ Modeling Memorandum),
  - Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program (SILs Guidance), and
  - Committed to releasing a revision of the 2014 Guidance on $PM_{2.5}$ Permit Modeling that included appropriate accounting for both ozone and fine particulate matter and their respective precursors.

# All the Necessary Pieces Start Fitting Together

- The SILs Guidance provides a policy, legal, and technical basis for recommended 8-hour $O_3$ and daily/annual $PM_{2.5}$ SILs… an essential aspect of the NSR-PSD NAAQS and PSD Increments compliance program.
- The MERPs Guidance provides a framework that permit applicants may choose to use, in conjunction with the appropriate reviewing authority, to estimate single-source impacts on secondary pollutants using a "Tier 1" approach based on existing empirical relationships between precursors and secondary impacts established using state-of-the-science chemical transport models.
  - MERPs VIEW Qlik Application – Online application to access EPA's updated hypothetical single source inventory of modeled $O_3$ and $PM_{2.5}$ impacts to support appropriate PSD applications
- The Single-Source Chemical Transport Modeling Guidance and the Single-Source Ozone and Secondary $PM_{2.5}$ Modeling Memorandum provide the necessary basis and ability to use photochemical models to estimate the single-source impacts on chemically reactive pollutants for permit related program demonstrations and NAAQS attainment demonstrations, whether for a "Tier 2" approach or establishing Tier 1 empirical relationships.

# Initial Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling

- After lengthy and robust internal coordination (OAR, OAQPS-AQPD, OAQPS-AQMG, OGC, and the EPA Regional Offices) and an Administration change, the Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling was released on February 10, 2020, for public review and comment.
- This version of the draft guidance relied upon a "Pollutant Applicability" approach (described in Section II.2) that stated the PSD requirements for a compliance demonstration only applied to regulated NSR pollutants that would be emitted in a significant amount.
  - 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.
- The Feb 2020 draft guidance also included an expanded PSD Increments discussion (Section V) that provided a more complete explanation of the PSD Increments terminology / system and of both the Source and Cumulative Impact Assessments (SIA/CIA) for PSD Increments.

# Revised Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling

- Upon consideration of comments received on the February 10, 2020, version of the Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling, and consistent with Executive Order 13990, EPA has revised an important aspect of that draft guidance and is seeking additional public review and comment.
  - In order to make the required demonstration that the allowable emissions increases from a source or modification would not cause or contribute to any NAAQS or PSD increment violation, sources should provide a **full accounting** of the combined impacts of their allowable precursor (and direct component, in the case of $PM_{2.5}$) emissions on ambient concentrations of the relevant NAAQS (*i.e.*, $O_3$ or $PM_{2.5}$) if any precursor(s) (or the direct component, in the case of $PM_{2.5}$) would be emitted in a significant amount.
- This "Holistic Approach" is supported both scientifically and legally:
  - Scientifically – ensures that the source provides a full accounting of its projected air quality impacts for the relevant NAAQS, including all precursor (and direct component, in the case of PM2.5) emissions
  - Legally – needed to meet the requirements in the PSD regulations that the owner or operator of a proposed new major stationary source or major modification demonstrate that it will not cause or contribute to a NAAQS or PSD increment violation

# The 4 Assessment Case Table is OUT

- Just to be clear, the EPA is no longer recommending 4 $PM_{2.5}$ assessment cases.

| 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<br>$NO_X$ 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<br>$NO_X$ 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<br>$NO_X$ 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.<br>• **Tier 1 Approach** (*e.g.*, MERPs)<br>• **Tier 2 Approach** (*e.g.*, Chemical Transport Modeling) |
| Case 4*: Secondary Air Quality Impacts Only | Direct $PM_{2.5}$ emissions < 10 tpy SER<br>$NO_X$ 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.<br>• **Tier 1 Approach** (*e.g.*, MERPs)<br>• **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 – $O_3$ Assessments

- Table III-1. EPA Recommended Approaches for Assessing $O_3$ Impacts by Assessment Case
  - There is not a primary impacts approach for $O_3$. Only the secondary formation from NOx and 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 or VOC emissions ≥ 40 tpy SER | | Include both precursors of $O_3$, see Section II.2.<br>• **Tier 1 Approach** (*e.g.*, MERPs)<br>• **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
  - Essentially identical to Table III-1 for $O_3$ with the exception of the assessment of Direct $PM_{2.5}$.
  - 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 and $NO_X$ emissions and $SO_2$ emissions < 40 tpy SER | N/A | N/A |
| Case 2*: Primary and Secondary Air Quality Impacts | Direct $PM_{2.5}$ emissions ≥ 10 tpy SER or $NO_X$ emissions or $SO_2$ emissions ≥ 40 tpy SER | **Appendix W preferred or approved alternative dispersion model** | Include both precursors of $PM_{2.5}$, see Section II.2.<br>• **Tier 1 Approach** (*e.g.*, MERPs)<br>• **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.

# Don't Stress Precursor Assessment… MERPs to the Rescue

- 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

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

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

# Single Impact Assessment (SIA)

- For an $O_3$ SIA, one would add the MERP calculated modeled impact for each precursor ($NO_X$ and VOC).
  - If the combined $O_3$ impact for both precursors is less than the $O_3$ SIL, then you have an adequate $O_3$ compliance demonstration… otherwise an $O_3$ CIA is required.

- For a $PM_{2.5}$ SIA, 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 precursor ($NO_X$ and $SO_2$).
  - If the combined $PM_{2.5}$ impact for the direct and both precursors 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.

- *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.*

# Cumulative Impact Assessment (CIA)

- For an $O_3$ CIA, the secondary impacts from the modified MERP equation for each precursor ($NO_X$ and VOC) would be combined with background.
  - If the combined value is less than the NAAQS or PSD Increment, then an adequate $O_3$ 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.
- In a $PM_{2.5}$ CIA, the secondary impacts from the modified MERP equation for each precursor ($NO_X$ and $SO_2$) would be added to the background monitoring that is then included with the traditional AERMOD modeling of the direct $PM_{2.5}$ 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.
- *Note: 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.*

# Implications of Assessment Approach Revision (1)

- The first and most notable impact of the change in recommendations for a holistic single-source assessments of $PM_{2.5}$ is that direct $PM_{2.5}$ will be modeled with Appendix W preferred or approved alternative dispersion model in all situations that the primary or a secondary component of $PM_{2.5}$ component is above the SER.
  - Yes, this means that a less than 10 ton direct $PM_{2.5}$ source will need to be modeled with AERMOD, if the $NO_X$ or $SO_2$ precursor emissions increase from that new or modifying source is above 40 tons per year.
  - Low-level, fugitive PM emissions sources potentially will be of more concern.
  - Accurate/appropriate source and emissions characterizations will become increasing important!
  - Reliance upon old or overly conservative emissions factors could easily cause compliance demonstration issues.
  - AERMOD modeling will already be necessary for the 1-hour $NO_2$ or $SO_2$ sources that are above the respective SERs, so only marginal increase in computational costs.

# Implications of Assessment Approach Revision (2)

- The second notable impact of the change in recommendations for a holistic single-source assessments of $PM_{2.5}$ is that the secondary air quality impact from both $NO_X$ and $SO_2$ will need to be assessed using a Tier 1 or 2 approach in all situations that the primary or a secondary component of $PM_{2.5}$ component is above the SER.
  - Yes, this means that a 25 ton $NO_X$ source will need to have $NO_X$ assessed from a $PM_{2.5}$ perspective, if the $SO_2$ precursor emissions increase from that new or modifying source is above 40 tons per year… and visa-versa.
  - This also means that a sub-40 ton $NO_X$ and $SO_2$ source will need both of the precursors assessed from a $PM_{2.5}$ perspective, if the direct $PM_{2.5}$ is at or above 10 tons per year.
  - Leveraging off of existing information for the secondary impact assessments should make the additional "lift" here not as substantial as it might appear.
- The take-away is that if you trigger for the primary or either secondary component of $PM_{2.5}$, then you are assessing $PM_{2.5}$ for everything no matter the emissions level of the components compared to the respective SERs.

# Continued 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.

# Final Thoughts

- The September 20, 2021, Revised Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling fully replaces the previous February 10, 2020, draft guidance and the recommendations contained within that draft guidance.

- Until a final version of the guidance is released, the EPA continues to recommend that permit applicants engage early with the appropriate reviewing authority and that the co-regulatory agencies consult with the appropriate EPA Regional Office regarding all $O_3$ and $PM_{2.5}$ compliance demonstrations.

# Review and Comment Logistics

- Public comments are due by **Friday, November 19, 2021**.
- Comments on the Revised Draft Guidance for Ozone and Fine Particulate Matter 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 with any additional amendments and revisions.
- The guidance is still considered "significant" by OMB and must go through formal interagency review (60-90 days) prior to being released as "final."
- A final version of the guidance is currently projected for release no earlier than late Spring 2022.