

12<sup>th</sup> Conference on Air Quality Modeling

# Permit Modification Modeling Challenges with PM<sub>2.5</sub> Primary and Secondary Emissions

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## Outline of Presentation

- Updated Modeling Guidance
  - Appendix W
  - 2018 Permit Modeling Guidance
  - 2019 MERP Guidance
- Issues for Typical PSD Project
  - Project-affected vs. contemporaneous sources
  - Combustion vs. fugitive/non-combustion sources
  - MERP calculations for Class I and II areas
- Special concerns for Class I areas well beyond 50 km
- Tier 1 vs. Tier 2 Implications
- Recommendations

## Updated Modeling Guidance

- Appendix W guidance requires inclusion of secondary  $PM_{2.5}$  from  $NO_x$  and  $SO_2$
- Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and  $PM_{2.5}$  under the PSD Permitting Program released April 2019
- Secondary  $PM_{2.5}$  forms in the atmosphere well downwind of the release of precursor emissions, max not in same location as primary  $PM_{2.5}$  often at/near fence line
- Distance dependent secondary  $PM_{2.5}$  concentrations not readily available (only by request to EPA Regional Office)

## Typical Permit Modification Project Issues

- Facility has had PSD review for precursor pollutants, but not PM<sub>2.5</sub>
- Class I area impacts need to be modeled
- Complex emission changes with retirements, new sources, debottlenecking, etc.
- Several minor permitting projects in last few years add contemporaneous emissions/additional sources for modeling (5 year look back period)
- Examples in April 2019 MERP Guidance are helpful but don't address contemporaneous/non-project source emissions specifically

## Complications of Assessing Primary/Secondary PM<sub>2.5</sub>

- Project increases on past actual to future potential emissions basis due to higher throughput in combustion sources and cooling towers, additional materials used, paved road traffic but permitted emission rates NOT increasing for existing sources
- Some fugitive sources are near fenceline and don't create secondary PM<sub>2.5</sub> emissions, modeled hotspots different than combustion sources
- EPA's April 2018 "Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program" has no mention of contemporaneous sources/emissions
- Still waiting for updated Guidance for Ozone and PM<sub>2.5</sub> Permit Modeling

## Complications of Assessing Primary/Secondary PM<sub>2.5</sub> (cont'd)

- Lack of guidance leaves question as to which sources should be modeled
  - Project-affected only vs. project-affected plus contemporaneous sources – what if contemporaneous sources are different for primary vs. precursor emissions?
  - Are contemporaneous increases already accounted for in background monitor concentration since emissions increases have already occurred at the facility?
- Different modeling approaches yield different outcomes
  - Project-affected sources only
  - Project-affected and contemporaneous sources
  - Project-affected sources with secondary PM<sub>2.5</sub> from MERP tables added
  - Addition of non-combustion PM<sub>2.5</sub> sources (roads, cooling towers)

## PM<sub>2.5</sub> Concentrations for Class I Areas

- SILs for Class I areas are very low, so modeling approach needs to have reasonable refinements, such as distance-dependent secondary PM<sub>2.5</sub> impacts
- For Class I areas far beyond 50 km, need to have more reasonable direct PM<sub>2.5</sub> impacts for those distances instead of just AERMOD at 50 km
- CALPUFF vs. CAMx (from Tier 1 results) for primary impacts – is either approach OK to use instead of AERMOD at 50 km?
- Need to have CAMx modeled values tabulated as a function of distance, especially for distant Class I areas

## Tier 1 (AERMOD + MERPs) vs. Tier 2 (PGM)

### Tier 1

- Cumulative analysis requires additional data gathering
- Can be time-consuming, but if other pollutants already require cumulative analysis, additional pollutant not as difficult
- Easier to determine source culpability and make refinements
- Compliance issues:
  - NAAQS compliance likely, but agency review time would negatively impact project schedule
  - Revised emissions calculations to past actual to future actual to avoid PSD review

### Tier 2

- Requires additional modeling protocol and protocol review
- Time-consuming (2-3 months)
- Formation of secondary PM<sub>2.5</sub> very low within few kilometers
- Limited resolution to determine very near-field concentration pattern without additional fine-grid modeling
- No guarantee results will be better than AERMOD
- Could require cumulative analysis anyway



## Recommendations for forthcoming permitting guidance

- Provide additional guidance regarding inclusion or exclusion of contemporaneous sources/emissions in secondary PM<sub>2.5</sub> calculations
- Make data for addition of the peak primary and secondary PM<sub>2.5</sub> impacts with consideration of distance dependence easier to obtain (post on same github server as Tier 2 tools?)
- Update modeling guidance to include a Tier 2 example (if one exists)
- Current guidance is incomplete and should not be implemented until it is subject to public review and comment