Single-Source Ozone and PM2.5 Demonstrations for PSD: Overview

October 2019

Single-Source Impacts on Ozone and Secondary $PM_{2.5}$

- EPA's 2017 revisions to the *Guideline on Air Quality Models* includes the following two-tiered demonstration approach for addressing single-source impacts on ozone and secondary $PM_{2.5}$ (as detailed in Section 5):
  - **Tier 1 demonstrations** involve use of technically credible relationships between emissions and ambient impacts based on existing modeling results or studies deemed sufficient for evaluating a project source's impacts.
  - **Tier 2 demonstrations** would involve case-specific application of chemical transport modeling (e.g., with an Eulerian grid or Lagrangian model).
  - Section 5 does not provide a requirement for chemical transport modeling
- The EPA believes photochemical grid models are generally most appropriate for addressing ozone and secondary $PM_{2.5}$ because they provide a spatially and temporally dynamic realistic chemical and physical environment for plume growth and chemical transformation.
- Lagrangian models (e.g. SCICHEM) applied with a realistic 3-dimensional field of chemical species could also be used for single source O_3 or $PM_{2.5}$ assessments.

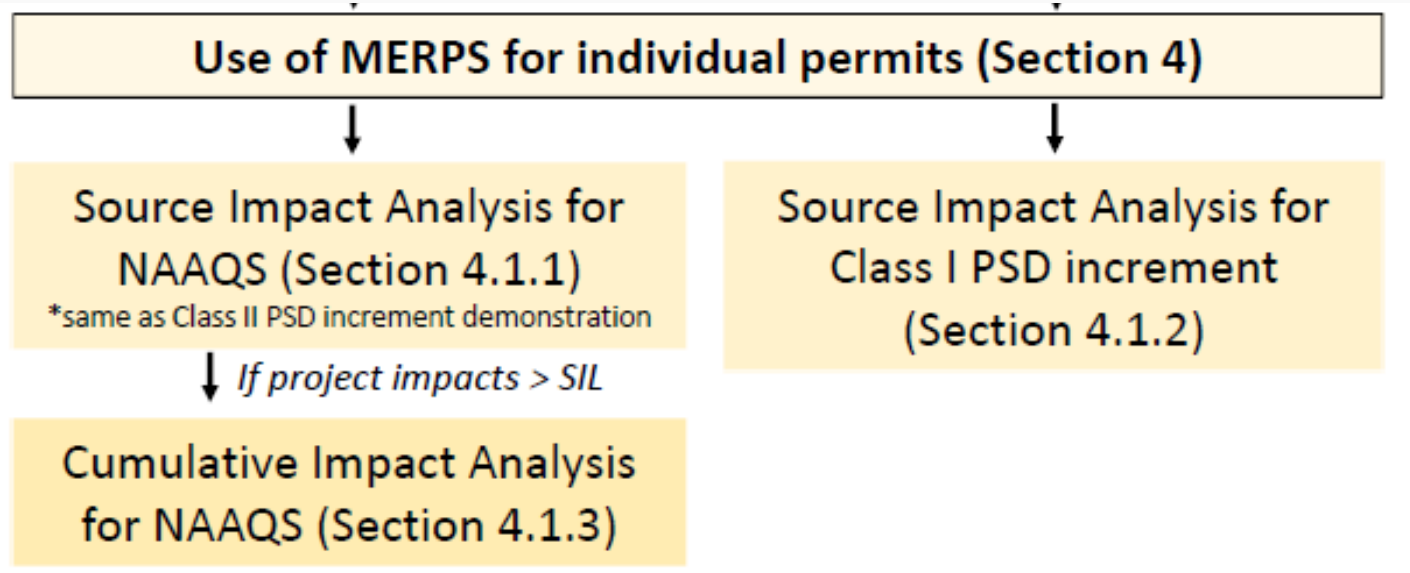
Tier 1 Demonstrations for O3 & Secondary PM2.5

- For Tier 1 assessments, EPA generally expects that applicants would use existing empirical relationships between precursors and secondary impacts based on modeling systems appropriate for this purpose.
- Modeled Emission Rates for Precursors (MERPs) can be viewed as a type of Tier 1 demonstration tool under the PSD permitting program that provides a simple way to relate maximum downwind impacts with a critical air quality threshold.
- For PSD, separate MERPs could be developed to relate:
  - volatile organic compounds (VOCs) and/or nitrogen oxides (NO_x) to O_3
  - sulfur dioxide (SO_2) and/or NO_X to secondary $PM_{2.5}$

Tier 1 Demonstrations for O3 & Secondary PM2.5 (cont)

- EPA has provided technical guidance to provide a framework for development of Tier 1 demonstration tools under Appendix W for PSD permitting
  - Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program or MERPs Guidance (EPA-454/R-10-003 April 2019)
  - Distributed on SCRAM with a separate Excel spreadsheet containing MERP values for all of the hypothetical sources presented in the final guidance document
    - Spreadsheet not intended to be static but periodically updated with newer information
  - https://www.epa.gov/scram/clean-air-act-permit-modeling-guidance
- Notable changes from the draft (December 2016) version:
  - Additional hypothetical single source impact modeling included
  - More details on how to use existing modeling for NAAQS demonstrations (SIL and cumulative tests) and a PM2.5 PSD increment demonstration

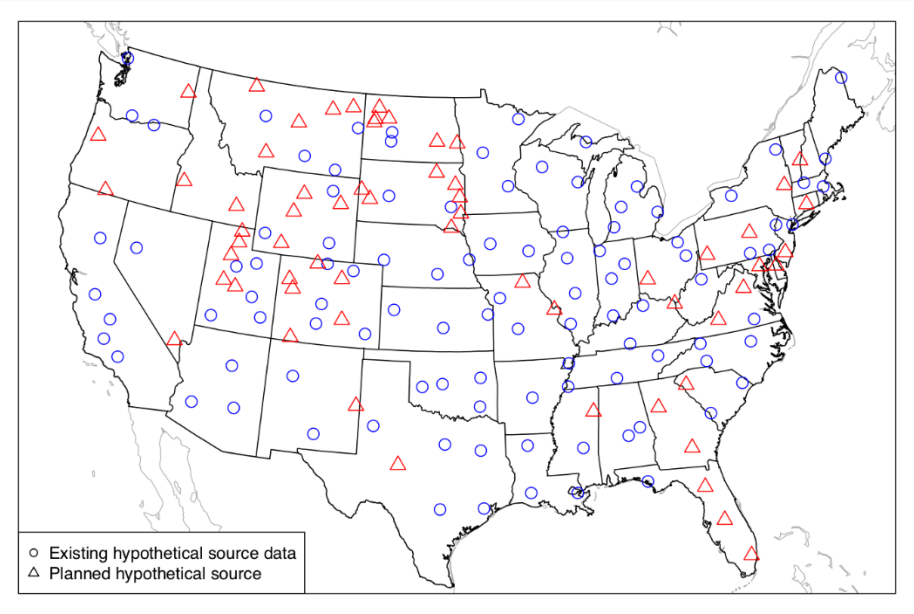
Tier 1 PSD Demonstration Flow Chart



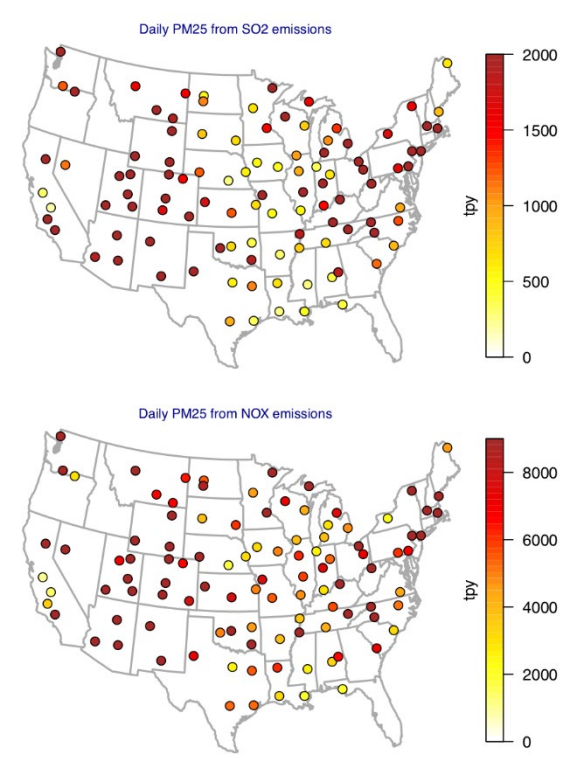
EPA's Illustrative Single Source Modeling

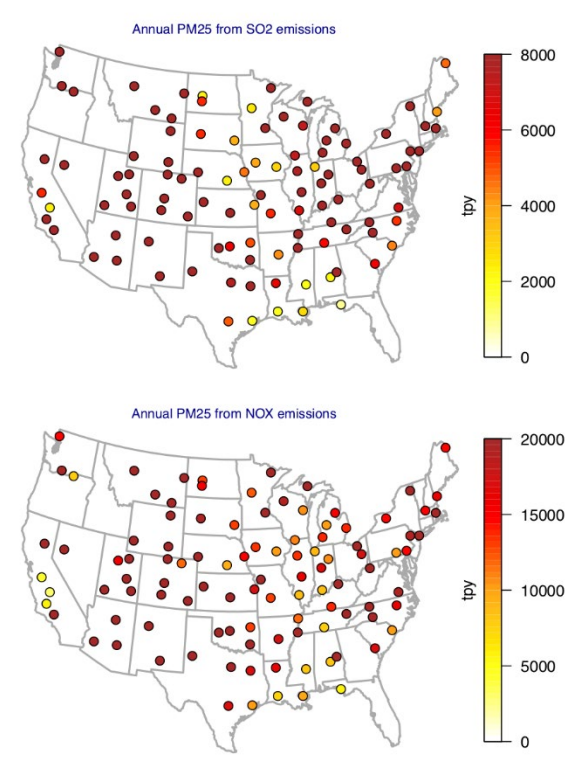
- Tier 1 demonstration guidance provides impacts estimated with a photochemical model for hypothetical sources
- Not intended to represent specific sources or types of industry
- Intended to provide context toward understanding secondary pollutant impacts from specific sources
  - Modeled multiple emission rates and a low and tall stack release height
- In some situations this information could be used to support a Tier 1 demonstration

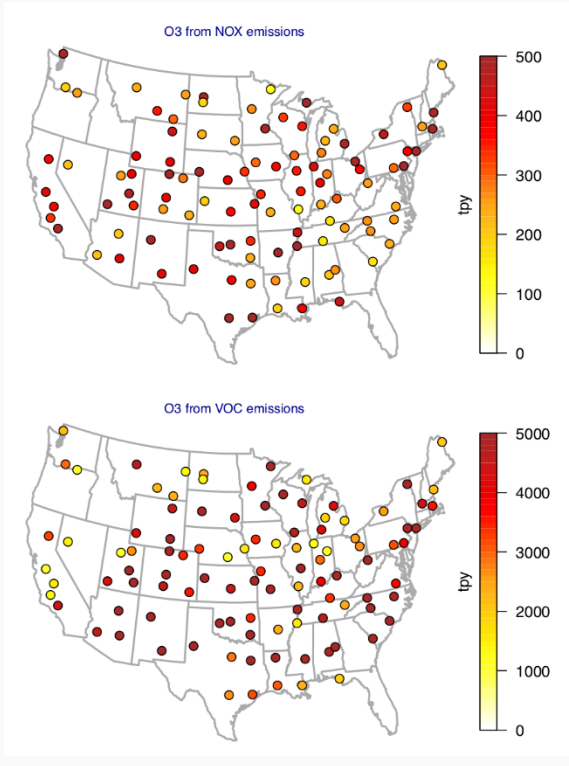
Hypothetical sources modeled as part of EPA assessment



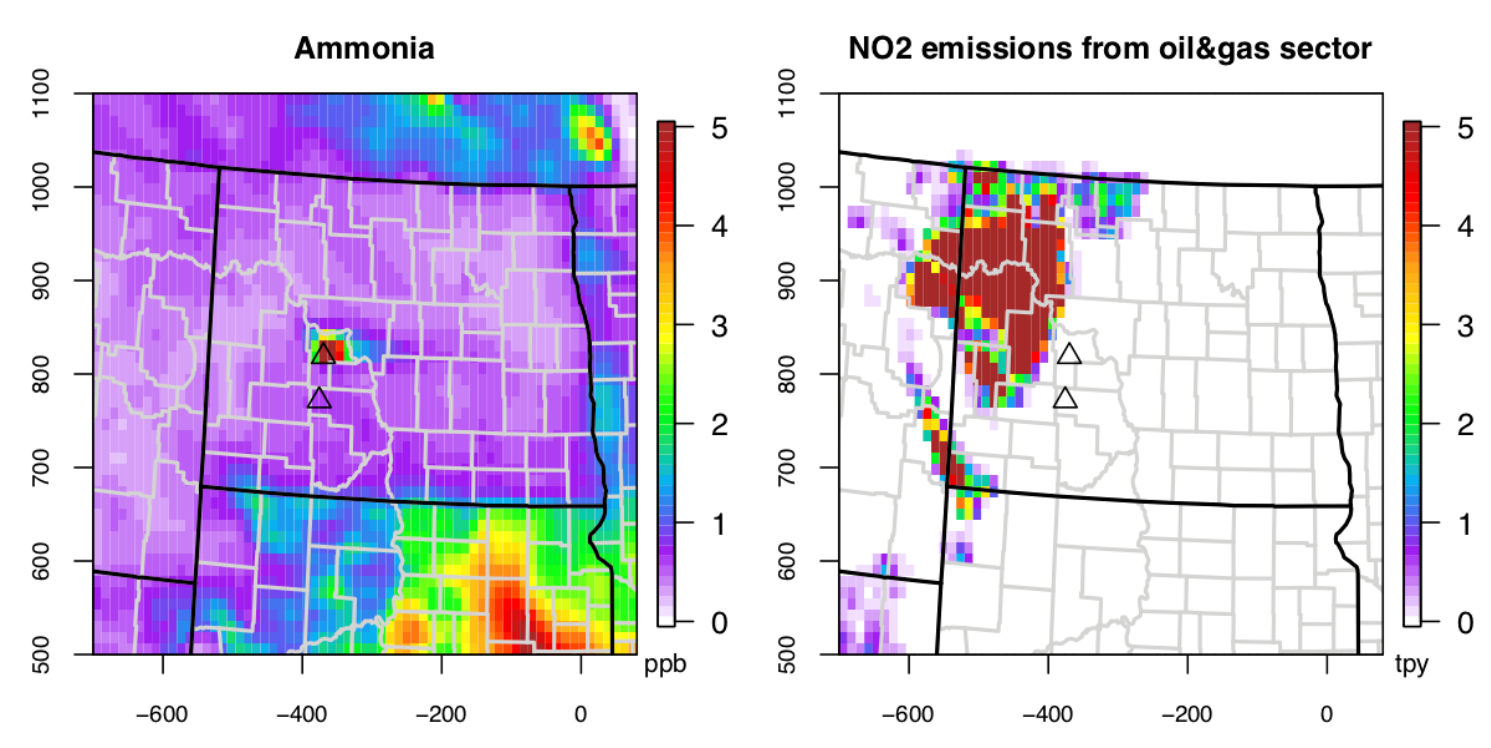
Illustrative MERPs for PM2.5 and O3







Physical and Chemical Variability for Hypothetical Sources



Tier 2 Demonstrations for O3 & Secondary PM2.5

- A Tier 1 demonstration is not a requirement before performing a Tier 2 demonstration
- EPA anticipates few situations where a Tier 2 demonstration would be necessary, we expect most situations could be demonstrated under Tier 1
- For second tier assessments when necessary, EPA technical guidance is provided on the air quality models, inputs, run time options, receptor placement, and application approach for the purposes of estimating the impacts on ozone and secondarily formed PM2.5 from single project sources
  - Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5 (EPA-454/R-16-005 December 2016)
- Within the second tier described the revised Guideline, the EPA's guidance provides applicants with flexibility in terms of the complexity of model application for comparison to both the SIL and NAAQS
- This flexibility allows for simpler approaches to be compared conservatively to the SIL and NAAQS and more sophisticated approaches could be applied to provide a more representative impact for a source's impact

Applicable Guidance

- Guidance for PM2.5 Permit Modeling (EPA–454/B–14–001; May 2014)
- Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5 (EPA-454/R-16-005; December 2016)
- Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program (April 2018)
- Technical Guidance for Demonstration of Inter-Precursor Trading (IPT) for Ozone in the Nonattainment New Source Review Program (EPA-454/R-18-004; May 2018)
- Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program (EPA-454/R-19-003; April 2019)
- Ozone and PM2.5 Permit Modeling Guidance (*in preparation*)

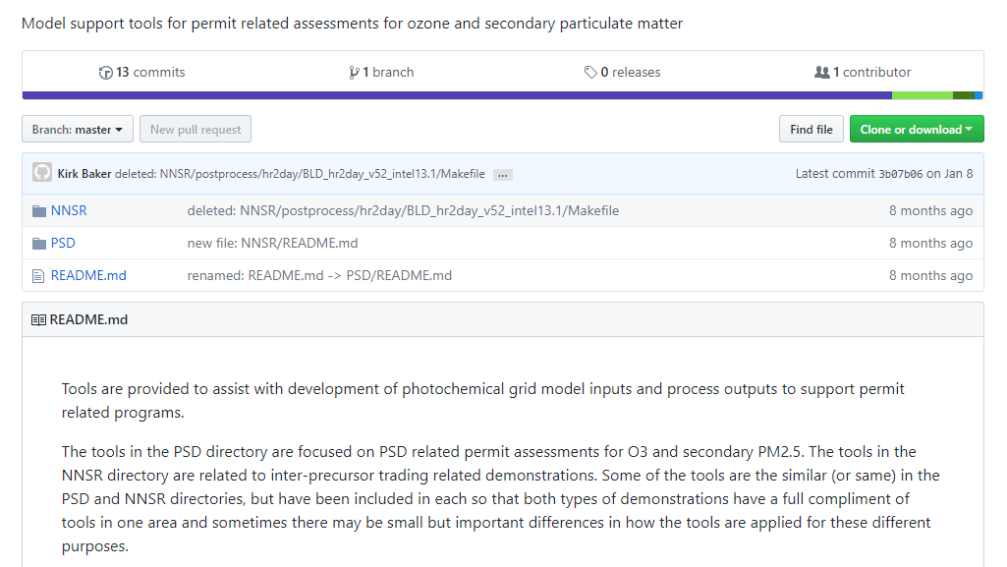
Photochemical Grid Models for Regulatory Assessments

- EPA prepared a memorandum that shows CMAQ and CAMx photochemical models are appropriate to use for the purposes of estimating O3 and PM2.5 for permit related program demonstrations and NAAQS attainment demonstrations

  https://www3.epa.gov/ttn/scram/guidance/clarification/20170804-Photochemical_Grid_Model_Clarification_Memo.pdf
- The *Guideline* outlines elements needed for an alternative model demonstration where no preferred model exists for a particular situation so this memorandum documents that CMAQ and CAMx meet these criteria
- This does not replace the need to provide project specific evaluations that focus on model performance near the project source and key receptors, but does provide a “fit for purpose” basis so that all applicants do not need to provide such a demonstration for each project

PSD Tier 1 & 2 Demonstration Support Tools

- EPA is working toward making tools available that add sources to existing model inputs and post-process outputs for Tier 2 demonstrations and those interested in developing new Tier 1 demonstration tools
- https://github.com/epa-kpc/O3PM-PSDNSR



Model Input/Output Data Availability

- The availability of model inputs and outputs of photochemical models (i.e., model platform data) allows for their application as a Tier 2 demonstration to be streamlined
- EPA and other organizations have made such model platform data freely available to interested users. For instance, model-ready inputs for both CAMx and CMAQ for the entire year of 2011 & 2016 are available at http://views.cira.colostate.edu/tsdw/
- Multi-jurisdictional organizations typically either have existing photochemical grid model inputs or can direct those interested to other groups/organizations in the same region that may have suitable data

Multi-Jurisdictional Organizations

Organization	Region of the country	Internet site
CENSARA	Central U.S.	http://www.censara.org/
LADCO	Upper Midwest	www.ladco.org
MARAMA	Mid-Atlantic	http://www.marama.org/
NESCAUM	Northeast U.S.	http://www.nescaum.org/
NW-AIRQUEST	Northwestern U.S.	http://lar.wsu.edu/airpact/
SESARM	Southeast U.S.	http://www.metro4-sesarm.org/content/metro-4sesarm-partnership
WRAP	Western U.S.	https://www.wrapair2.org/