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Emissions Inventory Guidance

Course Overview

- 1:00 – 2:20 pm
  - Module 1: State Implementation Plan (SIP) Emissions Inventory Basics
- 2:30 – 3:10 pm
  - Module 2: Regional Haze SIPs – Emissions Inventory Uses
- 3:20 – 4:00 pm
  - Module 3: Ozone SIPs – Emissions Inventory Uses and Requirements
- 4:10 – 4:40pm
  - Module 4: $PM_{2.5}$ SIPs – Emissions Inventory Uses and Requirements

MODULE 1

SIP Emissions Inventory Basics

Module Outline

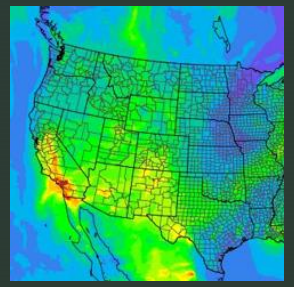
- Types of emissions inventories and their purposes
  - Planning inventories
  - Modeling inventories
- Emissions inventory steps for SIPs
  - Planning
  - Creating inventories
  - Preparing documentation
  - Public hearings
- Common sources of confusion

SIP Emissions Inventory Basics

Types of Inventories and Purposes

- Planning inventories
  - Nonattainment area emissions only
  - Detailed data considered a required part of the SIP

- Modeling inventories
  - Statewide and/or regional emissions (from other states)
  - Could include international emissions sources
  - For modeled attainment demonstrations for ozone (O_3) and $PM_{2.5}$
  - For modeling that may be done as part of Regional Haze planning
    - Screening of sources for consideration of emissions reductions
    - Assessing impacts of emissions reductions



SIP Emissions Inventory Basics – Types and Purposes

Planning Inventories (1 of 2)

- Base year nonattainment area inventory (O_3 | $PM_{2.5}$)
  - Provides a current, accurate, and comprehensive data source for emissions contributing to the air quality (AQ) problem addressed by the SIP
    - All sources
    - Within nonattainment area
    - Only certain pollutants, depending on AQ standard and other factors
  - Anthropogenic portion is the baseline for reasonable further progress requirements
- Periodic inventories (O_3 | Haze)
  - Provide periodic updates of emissions inventories to help assess progress
  - For ozone, consistent with base year nonattainment area inventory
  - For regional haze, statewide and called “recent year” inventory; is used to identify sources that could be controlled and for modeling

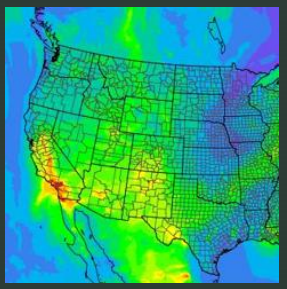
SIP Emissions Inventory Basics – Types and Purposes

Planning Inventories (2 of 2)

- Maintenance inventories (O_3 | $PM_{2.5}$)
  - Like a base year nonattainment area inventory
  - Reflects emissions conditions associated with a redesignation to attainment
  - Emissions from one of the three years for which monitoring data showed compliance with the AQ standard
- Attainment projected inventory for the nonattainment area (O_3 | $PM_{2.5}$)
  - Provides estimated future-year emissions in the year that the SIP models attainment
  - Can be used to show emissions reductions required for rate of progress and/or reasonable further progress
    - If so, motor vehicle part is the motor vehicle emissions budgets for purposes of transportation conformity
  - Will address this further in Modules for ozone and $PM_{2.5}$ SIPs

SIP Emissions Inventory Basics – Types and Purposes

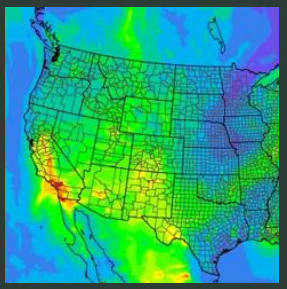
Modeling Inventories (1 of 2)



- Base year (baseline) modeling inventory
  - Like a base year nonattainment area inventory
    - Provides a current, accurate, and comprehensive data source for emissions contributing to the AQ problem addressed by the SIP
    - All sources
  - Unlike a nonattainment area inventory
    - Base year for modeling can differ from nonattainment area inventory
    - All areas within modeling domain
    - All emitted pollutants that are relevant for modeling the target ambient pollutant or haze
    - Hourly, chemical speciation, gridded, and 3-dimensional needed for AQ models
  - Purpose is to provide a point of comparison to the future-year modeling to demonstrate AQ or haze improvement as compared to a metric

SIP Emissions Inventory Basics

Modeling Inventories (2 of 2)



- Future-year projected inventory for modeling
  - Most similar to the base year inventory for modeling
  - With exceptions:
    - Emissions include control measures being established with the SIP
    - Emissions include other projection aspects for estimating future-year emissions
      - On-the-books control measures, both federal and state/local
      - Models run for future years to capture expected impacts of some controls (e.g., mobile sources, electric generating units)
      - Estimated changes in activity
  - Purpose is to estimate future AQ or visibility conditions, including impacts of SIP control measures

Emissions Inventory (EI) Steps for SIPs

Planning

Creating inventories

Preparing documentation

Planning (1 of 5)

Key Steps

- Review resources
- Understand requirements
- Inventory Preparation Plan (IPP)
- Quality Assurance Project Plan (QAPP)
- Discuss with EPA Regional Office

Planning (2 of 5)

- Start with “What do I need to do and why?”:
  - This training
  - Ozone SIP Checklist Guide and Implementation Training
  - PM SIP Checklist Guide and Implementation Training
  - Visibility Implementation Draft Guidance (in flux)
- Then find out “How am I supposed to do that?”
  - Emissions inventory guidance
  - Mobile source emissions inventory guidance
  - Transportation conformity guidance
  - Air quality modeling guidance

Planning (3 of 5)

Understand Requirements

- What is needed and when?
- Inventory year(s)
- Spatial extent (nonattainment area, State, region)
- Temporal extent (average day, average season day, annual)
- Pollutants to include
- Sources to include
  - Usually “all”
  - Sometimes only anthropogenic (man-made), such as for reasonable further progress
- Any extra steps and associated data needed for processing for AQ modeling

Planning (4 of 5)

Inventory Preparation Plan

- Is an IPP required?
  - No, and IPP is not required by the Clean Air Act or by any of the implementation rules, but is recommended by guidance
- Since it's not required, why would I do an IPP?
  - An IPP is a tool to help ensure a State can meet the inventory requirements to be *a comprehensive, current inventory of actual emissions from all sources of the relevant pollutant or pollutants*

    - Clean Air Act (CAA) § 172(c)(3)
- How does an IPP help me do that?
  - Provides a way to clearly communicate your inventory plans to the EPA Regional Office responsible for reviewing the SIP
  - Provides a roadmap for the inventory work and methods needed, including quality assurance steps

Planning (5 of 5)

Inventory Preparation Plan

- What should be included in an IPP?
  - Some EPA Regional Offices may want to see specific things, and specify that in their 105 grants
  - Otherwise, you can include whatever is needed to describe your EI plans effectively
  - Section 3.2, Table 9 of the EI Guidance provides some *suggested* content
  - It should include the emissions inventory QAPP, which can depends on:
    - Available inventory data (if any)
    - Inventory requirements that you are trying to make sure to meet
    - Sections 4.9 and 5.5 of the EI Guidance

Creating Inventories

Key Steps

- Assess available data on which to build (both base and future)
  - Public? Current and correct year? Correct pollutants? All sources?
- Identification of priority sources
- Emissions estimation and quality considerations
- Special adjustments for nonattainment area inventories
  - Partial counties
  - Average-day emissions

SIP Emissions Inventory Basics

Creating Inventories

Assess Available Data

- 2011 National Emissions Inventory (NEI), version 2
  - Via the Emissions Inventory System (EIS)
  - 2011 modeling platform, version 6.3
- 2014 NEI, version 2
  - EIS and 2014 modeling platform data files (via FTP only)
- 2016 Point source NEI
  - Through EIS, once finalized and released in ~July 2018
  - As part of 2016 modeling platform
- 2016 modeling platform
  - Collaborative efforts ongoing with States and MJOs
  - Alpha version emissions data available (via FTP only)
- Continuous Emissions Monitoring (CEM) data
  - Tab: “Prepackaged data” @ bottom, formatted for Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system

Creating Inventories

Identify Priority Sources

- EIs used for SIPs expected to be complete, with “all sources”
- No requirement that all parts of EI be completed with same rigor
- Which sources in an EI should get more review?
  - Use emissions summaries to show the largest contributors to pollutants of interest
  - Sources within the nonattainment area
  - Sources outside an area of interest contributing pollution to that area
  - Expected growth or retraction of a particular sector of the economy
  - Consider whether emissions levels will make impact on policy decisions
  - Where outdated methods or inaccurate data have been used

SIP Emissions Inventory Basics – EI Steps

Creating Inventories – Point Sources

Emissions Estimation and Quality Considerations

- Point sources of data
  - Continuous emissions monitors (CEMs)
  - Source tests and source-specific emissions factors
  - Average emissions factors
  - Engineering judgement

- Startup/shutdown emissions
  - Planned and predictable emissions should be included in SIP planning inventories
  - Malfunctions are not predictable
  - Challenging to estimate
- High Electricity Demand Day (HEDD) periods
  - May be relevant in some cases, or not representative in other case
  - Challenging to estimate

Creating Inventories – Other Sources (1 of 4)

Emissions Estimation and Quality Considerations

- Stationary sources that are not point sources and compiled on an areawide basis
  - Current updated methods are included as part of NEI tools on website and Sharepoint site
  - Basic survey work may be needed to augment default input data to tools
  - Need to assure no double counting between point and nonpoint sources
- On-road mobile sources
  - For all states except California, use Motor Vehicle Emissions System (MOVES)
  - Need to create Run Specification (RunSpec) files for MOVES inputs and local data including meteorology, fleet, activity, and control measure information
  - MOVES Guidance covers the details

Creating Inventories – Other Sources (2 of 4)

Emissions Estimation and Quality Considerations

- Nonroad mobile equipment
  - Also MOVES model
  - 260 specific types of nonroad equipment further stratified by horsepower ratings
  - Default data updates are coming soon
  - If agencies create their own inputs, these should be submitted to EPA as part of the emissions documentation, with description about why defaults changed
  - Overlap with inputs needed for on-road mobile sources (e.g., meteorology and fuels), which should be consistent
- Other nonroad mobile
  - Commercial marine, locomotives, and aircraft
  - Most updated approaches are provided with NEI
  - Some airports and rail yards are treated as point sources
  - Commercial marine methods include shapefiles for greater spatial resolution

Creating Inventories - Other Sources (3 of 4)

Emissions estimation and quality considerations

- Biogenic sources
  - No required model
  - Biogenic Emissions Inventory System (BEIS) is one option
  - Model of Emissions of Gases and Aerosols from Nature (MEGAN) is one option
- Geogenic sources
  - Oil or natural gas seeps, soil wind erosion, lightning, volcanos, fumaroles (vapor or gas vents in a volcanic region), and sea salt

Creating Inventories – Other Sources (4 of 4)

Emissions estimation and quality considerations

- Wildland fires
  - Wildfires, prescribed fires, and wildland fire use
  - NEI fires data will general suffice for *nonattainment area* inventories to provide a general idea of the level of contribution to the overall emissions within the NAA
  - Unique considerations
    - Prescribed fires can be used to prevent future wildfires
    - Wildfires are naturally occurring and not “controllable”
    - High plume rise and impacts across large distances
    - Fires can block sunlight and thus reduce ozone formation in some cases
  - Should not be removed from modeling inventories, even for exceptional events
    - Not appropriate for model performance evaluations
    - Not usually possible to know exactly which fire(s) caused the exceptional event

Special Adjustments for NAA EIs

Partial County Emissions (1 of 2)

- Many nonattainment areas do not follow county boundaries
- Many inventories and tools work at the county level, posing a challenge
- Point sources can be identified as within a nonattainment area based on their lat/lon and with a geographic information system (GIS)
- Nonpoint sources
  - Custom calculations, but can be labor intensive
  - Shapefile-based inventories
  - Using spatial allocation surrogates, such as road networks and census data
  - Using gridded modeling data from modeling
  - Expert judgement

Special Adjustments for NAA EIs

Partial County Emissions (2 of 2)

County totals (black lines)

Spatial surrogate or gridded emissions

Estimate of emissions in nonattainment area

Nonattainment area boundary

Special Adjustments for NAA EIs

Average-Day Emissions

- Select appropriate days for averaging
  - Months
  - Days of week
  - Representative of the days leading to National Ambient Air Quality Standards (NAAQS) standard exceedances
  - Consider intermittent sources if appropriate
- Different requirements for ozone vs. $PM_{2.5}$
  - Ozone: No annual data and ozone-season day presumed based on weekday
  - $PM_{2.5}$: May be annual and/or average-season day, and even episodic average
- Simple arithmetic average of the selected days

Preparing Documentation

Suggested Elements of an Emissions Inventory SIP Document

- Background
  - Source categories, pollutants, spatial extent, other key aspects (All)
  - Base year emissions summaries (O_3 | $PM_{2.5}$)
  - Projected attainment year emissions summaries (O_3 $^{\text{Moderate and above}}$ | $PM_{2.5}$)
  - Recent year emissions summaries (Haze)
- For each source category (point, area/nonpoint, on-road, nonroad, other)
  - Introduction with more detailed documentation
    - Data sources — "Subpart G" 40 Code of Federal Regulations (CFR) 51.114(a)
    - Models — 40 CFR 51.114(a)
    - Control and projection assumptions — 40 CFR 51.112 & 51.114(c)
    - Approaches to calculate temporal and spatial extent, if relevant
  - Summaries (base and future) — 40 CFR 51.114(c)

Preparing Documentation

Other Information for Emissions Inventory SIP Document

- Each implementation rule has its own specific requirements
- Relevant criteria for determining the completeness of emissions inventory information in SIPs 40 CFR 51 – Appendix V
  - 2.2 Technical Support:
    - (b) identification of the location of affected sources included in the EPA attainment/nonattainment designations…
    - (c) quantification of the changes in plan allowable emissions from the affected sources and estimates of changes in current actual emissions from affected sources
    - (e) modeling information required to support plan revisions (which includes emissions information)

Preparing Documentation

Emissions Summaries for SIP Background

- For SIPs that require AQ modeling
  - Background can include both summaries of the planning and modeling inventories
- See Section 3.10.3 of EI Guidance, for example for ozone:
  - Ozone-season day base year emissions for nonattainment area by data category
  - Same by data category and county
  - Same for projected attainment emissions (optionally)
  - Point source by facility
  - Nonpoint and mobile sources by emissions process groups (source classification code groups)

Preparing Documentation

Other Information

- Data availability requirements — 40 CFR 51.116

  (a) The State must retain all detailed data and calculations used in the preparation of each plan or each plan revision, and make them available for public inspection and submit them to the Administrator at his request.

  (b) The detailed data and calculations used in the preparation of plan revisions are not considered part of the plan.

  (c) Each plan must provide for public availability of emission data reported by source owners or operators or other obtained by State or local agency. Such emission data must be correlated with application emission limitations or other measures.

SIP Emissions Inventory Basics – EI Steps

Public Hearings

- Public hearing requirement for SIPs

  The State must hold a public hearing or provide the public the opportunity to request a public hearing 40 CFR 51.102(a)

  - Possible no one requests a public hearing when offered
- For ozone and $PM_{2.5}$, emissions data and emissions summaries part of SIP
  - It is okay to have data summaries only at the hearing, so long as the detailed data are available to public in accordance with CAA and regulations
- For Regional Haze, emissions summaries only
- No longer a “de minimus” deferral policy for “regulatory significance”
- Must provide EPA verification that a public hearing was offered

Common Sources of Confusion (1 of 2)

- What parts of a SIP are *required* versus *recommended*?
  Required elements of a SIP are in the CAA and the implementation rules. Elements only in guidance are not required, but your SIP needs to pass public scrutiny and perhaps hold up in court. So, the recommendations in EPA guidance are there to help you ensure credibility and quality.
- Do the modeling inventories need to be the same as the planning inventories?
  No. While consistency is encouraged, modeling inventories must have more pollutants and a greater spatial extent, at least. Mobile source approaches for modeling inventories are often be more detailed, while the planning inventories can use simpler approaches given their role in transportation conformity. Consistency that can reasonably be achieved is encouraged.

Common Sources of Confusion (2 of 2)

- How does the Air Emissions Reporting Rule (AERR) relate to SIPs?
  While the AERR is the rule that requires States to submit data to EPA for use in the National Emissions Inventory (NEI), it also sets some inventory reporting requirements for ozone and $PM_{2.5}$ SIPs, such how to determine a point source and the data elements required for emission inventories.

  If states voluntarily report smaller sources as point sources, this does not impact their SIP requirements.

- Can the NEI be used to meet my ozone periodic inventory requirement?
  Yes, but not the annual submission, since the periodic inventory requirement is for nonattainment area inventories. See Table 10 of the EI SIP Guidance.

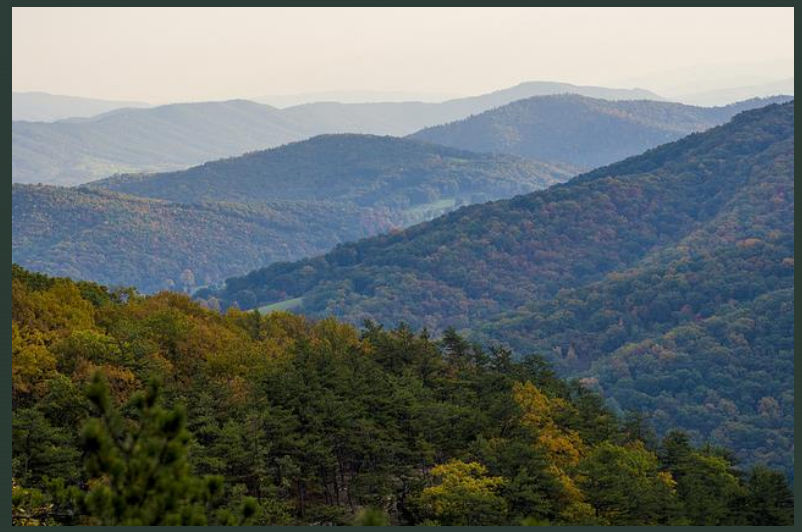
- Why does EPA require throughput or emissions factors data, when facilities in my state say that it's confidential business information (CBI)?
  It is a state decision about what is approved CBI. According to EPA, emissions data are not permitted to be CBI, and throughput and emissions factors are classified as emissions data because they are necessary to understand how emissions have been estimated.

MODULE 2

Regional Haze – Emissions Inventory Uses

Regional Haze

Module Outline



- Program background
- General emissions inventory details
- General emissions inventory uses for regional haze analyses
  - Contribution of international and wildland prescribed fires
  - Screening analysis
  - Modeling impacts of emissions reductions on regional haze
- EPA emissions data sources for supporting Regional Haze analyses

Regional Haze - Background

Statutory and Regulatory Basis

- CAA 169(A), via CAA 1977 Amendments
  - (a)(1): *Congress hereby declares as a national goal the prevent of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution.*
  - (b)(1): *Regulations … shall – provide guidelines to the States, taking into account the recommendations [from a mandated study] on appropriate techniques and methods for implementing this section…*
- CAA 169(B), via CAA 1990 Amendments: Studies, visibility transport regions and commissions
- Regional Haze Rule: 40 CFR 51.308 and 51.309 (a.k.a Subpart P) are the regulations developed to implement the Regional Haze program

Regional Haze - Background

Class I Areas

Regional Haze - Background

Regional Haze Rule, June 1999

- Core requirements for initial regional haze SIPs
  - States must address regional haze in 156 Class I Federal areas – both within State and outside the State in certain cases
  - Reasonable progress goal for each area
    - Uniform rate of progress (URP): baseline visibility conditions to natural visibility conditions
    - Emission reduction measures needed to achieve the rate
  - Long-term strategy: measures to achieve reasonable progress goals
  - Monitoring strategy and other requirements
- Best Available Retrofit Technology (BART) requirements
- Periodic comprehensive revisions of SIPs
- Periodic reports describing progress

Regional Haze - Background

Implementation to Date (1)

- First implementation period (2008 through 2018)
- Initial plans submitted between March 2008 and February 2012
- Analyses to date for regional haze improvements:
  - 2002 was generally used for baseline inventories for identifying emissions reductions
  - For modeling, States used base year inventories within year range 2000 to 2005
  - Modeling was done for a forecasted 2018 emissions year

Regional Haze - Background

Implementation to Date (2)

- Monitoring strategy and other implementation plan requirements 308(d)(4)(v)

  A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.

  - 2002 was generally used for baseline and “most recent year” requirements
  - 2018 was projected year for first implementation period

Regional Haze - Background

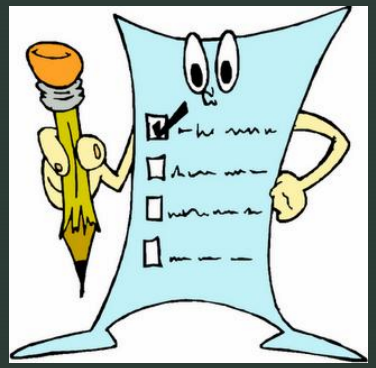
Regional Haze Rule Revisions, 2017

- Rule revisions finalized January 10, 2017
  - Petitions for review were filed in the D.C. Circuit as well as petitions for reconsideration
- January 2018: EPA announced plans to revisit aspects of 2017 rule

  EPA intends to commence a notice-and-comment rulemaking in which we will address portions of the rule … Furthermore, EPA plans to finalize one or more EPA guidance documents for regional haze SIP revisions due in 2021. Such guidance may also address some or all of the issues raised in the petitions for reconsideration.
- Judicial petitions and litigation on hold

Regional Haze

General Emissions Inventory Details



- Source categories: all sources are needed for AQ modeling
- Pollutants:
  - Pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area

    For first planning period – most approved SIPs included SO_2, NOx, and PM
- Statewide inventory
- Annual emissions
  - Derived from annual nature of the visibility program

Regional Haze Inventory as Compared to NAAQS

- The Regional Haze inventory needs are different from inventory requirements for ozone and $PM_{2.5}$ implementation rules
  - Statewide inventory, rather than an inventory for a smaller nonattainment area
  - Annual emission (as compared to seasonal for ozone or optionally for $PM_{2.5}$ hourly)
  - No submission requirement for the inventory as (or as part of) a SIP revision
  - Requires SIPs to “provide for” emissions inventories and summarize emissions information

Regional Haze

Emissions Inventory Uses

- Estimating impacts of international anthropogenic sources and/or the impacts of certain wildland prescribed fires to adjust natural conditions

1

- Identifying sources that matter most for visibility, which could include source apportionment modeling

2

- Photochemical modeling to understand visibility issues and potential emissions reductions that could help

3

Regional Haze

Impacts of International Emissions Sources

- Adjustment may be made to natural visibility conditions endpoint
- There is no specific method mentioned in the current rule
- Impacts from Canada and Mexico can be modeled more readily because of relatively better data availability
- For more distance sources of emissions, there are issues concerning appropriate modeling
- EPA is working to better quantify contribution of international anthropogenic emissions on visibility and AQ
- Consult with the EPA

Regional Haze

Impacts of Wildland Prescribed Fires

- Expect prescribed fires to continue or increase
- Wildland prescribed fires to consider are those:
  - Conducted with one of the objectives:
    - To establish, restore and/or maintain sustainable and resilient wildland ecosystems
    - To reduce the risk of catastrophic wildfires, and/or
    - To preserve endangered or threatened species
  - During which appropriate basic smoke management practices were applied
- Current rule does not require a specific method
- Consult with the EPA

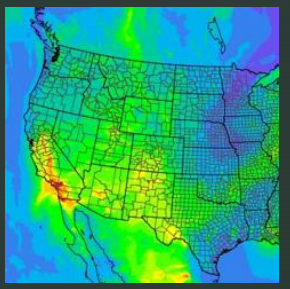
Regional Haze

Source Screening Analysis

- A screening could answer the question:
  - Which sources should the state consider including in a control strategy to reduce haze?
- States have used a variety of screening metrics, such as:
  - Annual emissions of a source / distance to affected Class I area (Q/d)
  - Emissions-weighted back trajectory analysis
  - Source contribution modeling
- All of these approaches would need emissions data
  - Makes sense to use projected emissions for the end of a given planning period

Regional Haze

Emissions for AQ Modeling Analyses (1 of 4)

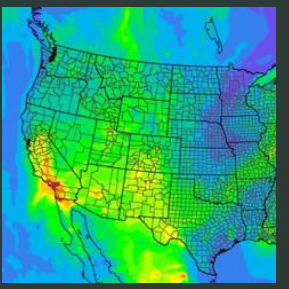


- Prepare/obtain baseline emissions
  - 2011 data and modeling platforms readily available
  - 2016 ongoing work (more later)
  - Other choices as appropriate
- Project emissions to relevant future year (e.g., end of planning period)
  - Emissions limits that have been adopted and enforceable (“on the books”)
  - Activity growth and available source-specific information
  - Any controls that are needed to address regulatory requirements

Regional Haze

Emissions for AQ Modeling Analyses (2 of 4)

Base Year Modeling Inventory

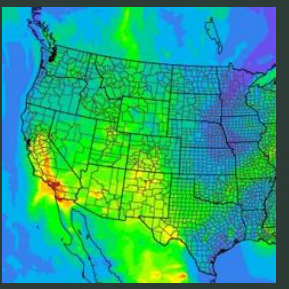


- Base year modeling inventories are needed for:
  - Modeling to compare with observations (model performance evaluation)
  - Source screening approaches
- Key attributes of modeling inventories for regional haze analyses
  - All source categories
  - Multi-State emissions within modeling domain
  - Pollutants: CO, NOx, VOC, SO_2, PM_{10}, $PM_{2.5}$, NH_3
  - NOx, VOC, and $PM_{2.5}$ require additional speciation during emissions modeling
  - Where available, hour-specific, day-specific, and month-specific emissions should be used as part of scientifically credible approaches (e.g., EGUs, biogenic, fires, on-road mobile)
  - Could include international emissions sources

Regional Haze

Emissions for AQ Modeling Analyses (3 of 4)

Projected Modeling Inventory

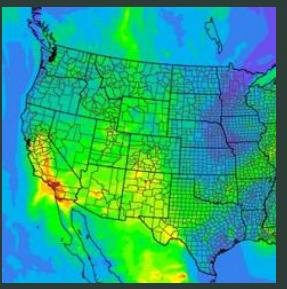


- Projected modeling inventories could be used to show progress towards remedying visibility impairment
- Summaries (not detailed data) included with any plan submitted
- Differences compared to base year modeling inventory
  - Projection year is end of planning period (e.g., 2028)
  - Anthropogenic sources projected to future year
  - Temporal approach for sub-annual sectors may be different (EGU, fires)
- Biogenic emissions typically held constant
- Future-year international emissions can be a challenge

Regional Haze

Emissions for AQ Modeling Analyses (4 of 4)

Control Strategy Considerations



- States can consider various sources of information for estimating future-year emissions:
  - Emissions reductions from ongoing air pollution control programs ("on-the-books") from both Federal and State programs
  - Future BART compliance, known fuel switches
  - Mitigation of impacts of construction activities
  - Source retirement and replacement schedules
  - New sources under construction
  - Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management

Regional Haze

Sources of Uncertainty in Projections

- Energy usage
- Vehicle miles travelled
- Population changes including migration
- Uncertainties associated with State plans from the first planning period under judicial review and/or not yet completed
- SIPs for ozone, $PM_{2.5}$, and other sources of State emissions reductions
- Future market-driven fuel switches
- Future (but unknown) planned closures
- Changes to federal regulations

Regional Haze

EPA Modeling Platforms

Background

- Provide a comprehensive AQ modeling system that uses the most recent science tools available
- EPA uses modeling platforms to support EPA regulations and other analyses
- Major components of a modeling platform:
  - Meteorological models
  - Boundary conditions
  - Emissions and associated factors/tools for projections and emissions processing to support modeling
  - AQ models

Regional Haze

EPA Emissions Modeling Platforms

Background

- Platform contents:
  - Starting point is a version of the National Emissions Inventory
  - Related data sets needed for processing
  - Software and scripts to process inventories into AQ model inputs
  - Base year and one or more future years
- Historic platform development process:
  - Base and future inventories and met data developed by EPA
  - Other data and software developed by EPA to process emissions
  - Platform released for public comment
  - EPA incorporates comments into new version of platform

Slide courtesy of Alison Eyth, US EPA

Regional Haze

EPA Emissions Modeling Platforms

Recent and Upcoming Platforms

- Recent platforms:
  - 2011 v6.3 platform based on 2011 NEI version 2
    - 2011, 2017, 2023, and 2028
  - 2014 v7.0 platform for draft modeling for National Air Toxics Assessment (NATA)
- A “case” is a specific set of emissions and other data within a platform and is named with an abbreviation (e.g., 2011el or 2028el)
- Upcoming:
  - 2014 v7.2 platform will be used for 2014 NATA
    - No future years
  - Collaborative effort for 2016 platform is ongoing, but 2016 is not a triennial NEI year

Regional Haze

2016 Emissions Modeling Platform

- 2014 NEI v2 is the starting point
- Collaborative effort at request of Multi-Jurisdictional Organizations (MJOs) and States
- Several versions of a 2016 platform will be developed:
  - Alpha (February 2018) – Preliminary 2016 emissions for some sectors
  - Beta (Summer/Fall 2018) – Improved version of 2016 emissions for most sectors and preliminary projected emissions
  - V1.0 (Winter, 2019) – Fully updated 2016 emissions and complete projected emissions

For further questions

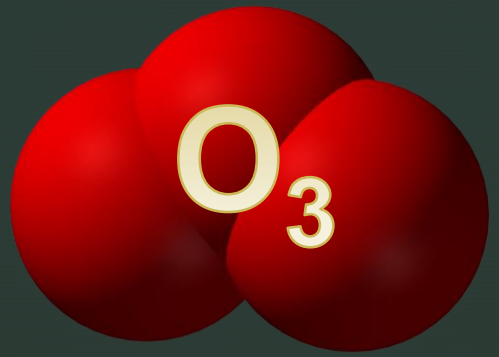
- Regional Haze
  - Regional office regional haze expert
  - Phil Lorang, OAQPS, lorang.phil@epa.gov
  - Melinda Beaver, OAQPS, beaver.melinda@epa.gov
- EPA Modeling Platforms
  - Alison Eyth, OAQPS, eyth.alison@epa.gov

MODULE 3

Ozone - Emissions Inventory Uses and Requirements

Ozone SIPs

Module Outline



- Background
- Base year emissions inventory data
- Source emission statements
- Projected emissions inventories
  - Rate of progress
  - Reasonable further progress
  - Modeling inventory
- Periodic nonattainment area inventory requirement
- Public hearings

Ozone SIPs - Background

2008 Ozone Implementation Rule

- In 2008, revised 8-hour standard to 75 parts per billion
- In 2012, 46 initial nonattainment areas designated (marginal, moderate, serious, severe, extreme)
- In 2015, finalized Ozone Implementation Rule
  - Subpart AA replaces Subpart X

40 CFR 51.1100 – 51.1119

- Inventory due dates from July 20, 2014 through July 20, 2016
- Serious and above with continued rate-of-progress updates
- Continued periodic inventory requirements
- See also Ozone Implementation Training

Ozone SIPs - Background

2008 Ozone Nonattainment Areas

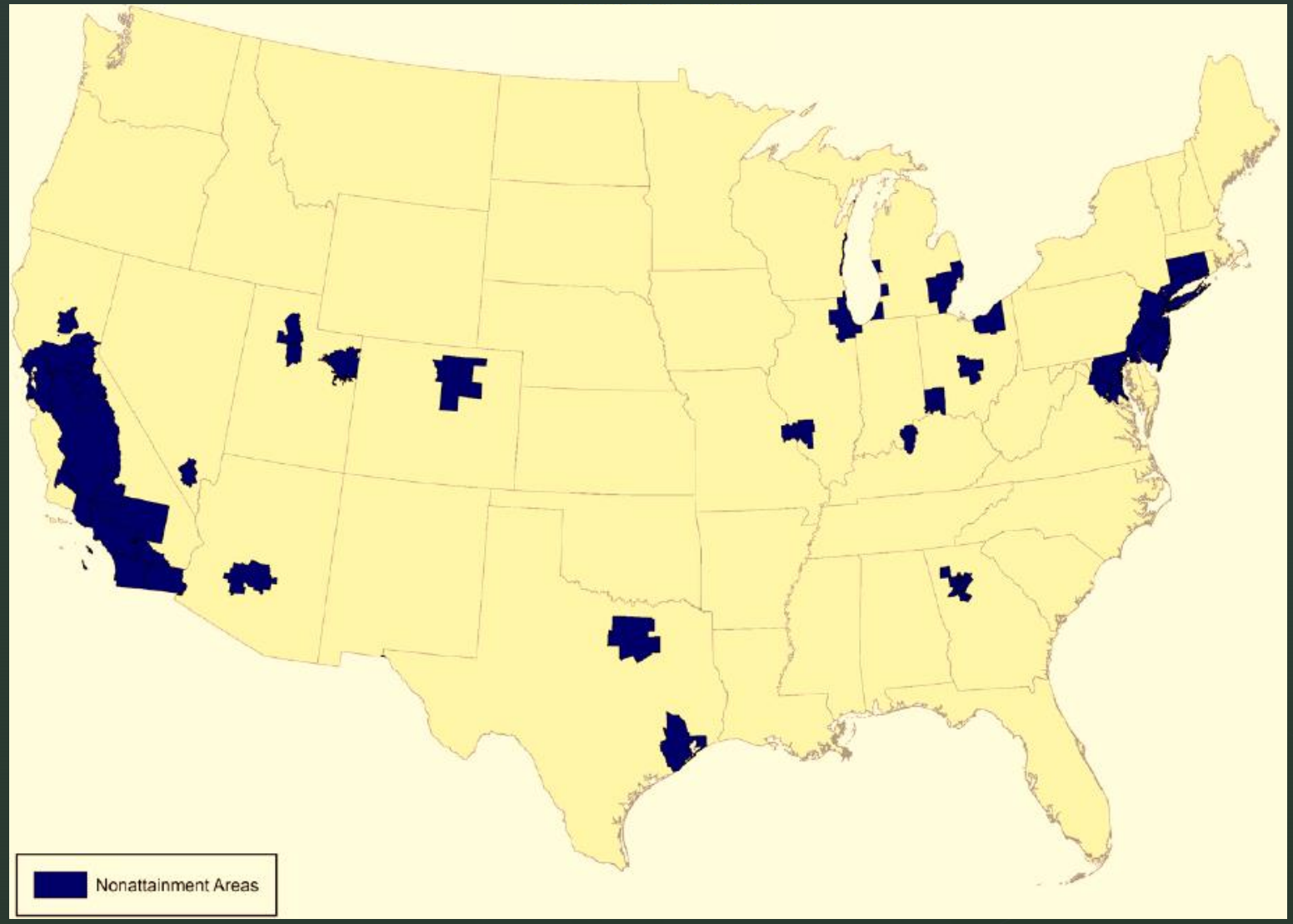
Ozone SIPs - Background

2015 Ozone Implementation

- 2015 Ozone NAAQS revised to 70 parts per billion
- SIP Requirements Rule is between proposal and final rule as of May 2018
- Proposal contains 3 main parts:
  - Nonattainment area classification thresholds and timing of attainment dates
  - Options to revoke the 2008 ozone NAAQS and provide anti-backsliding requirements
  - SIP requirements for States with nonattainment areas and States in ozone transport regions
- Final nonattainment area designations (excluding San Antonio TX) April 2018
- EPA is considering how best to address the recent *South Coast II* court ruling
- Final rule signature targeted for summer 2018

Ozone SIPs - Background

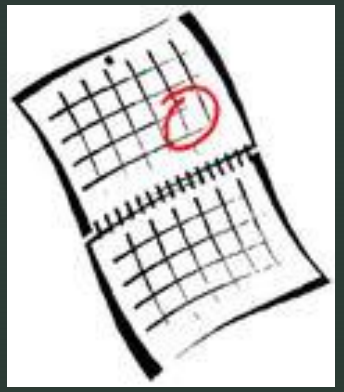
2015 Ozone Nonattainment Areas

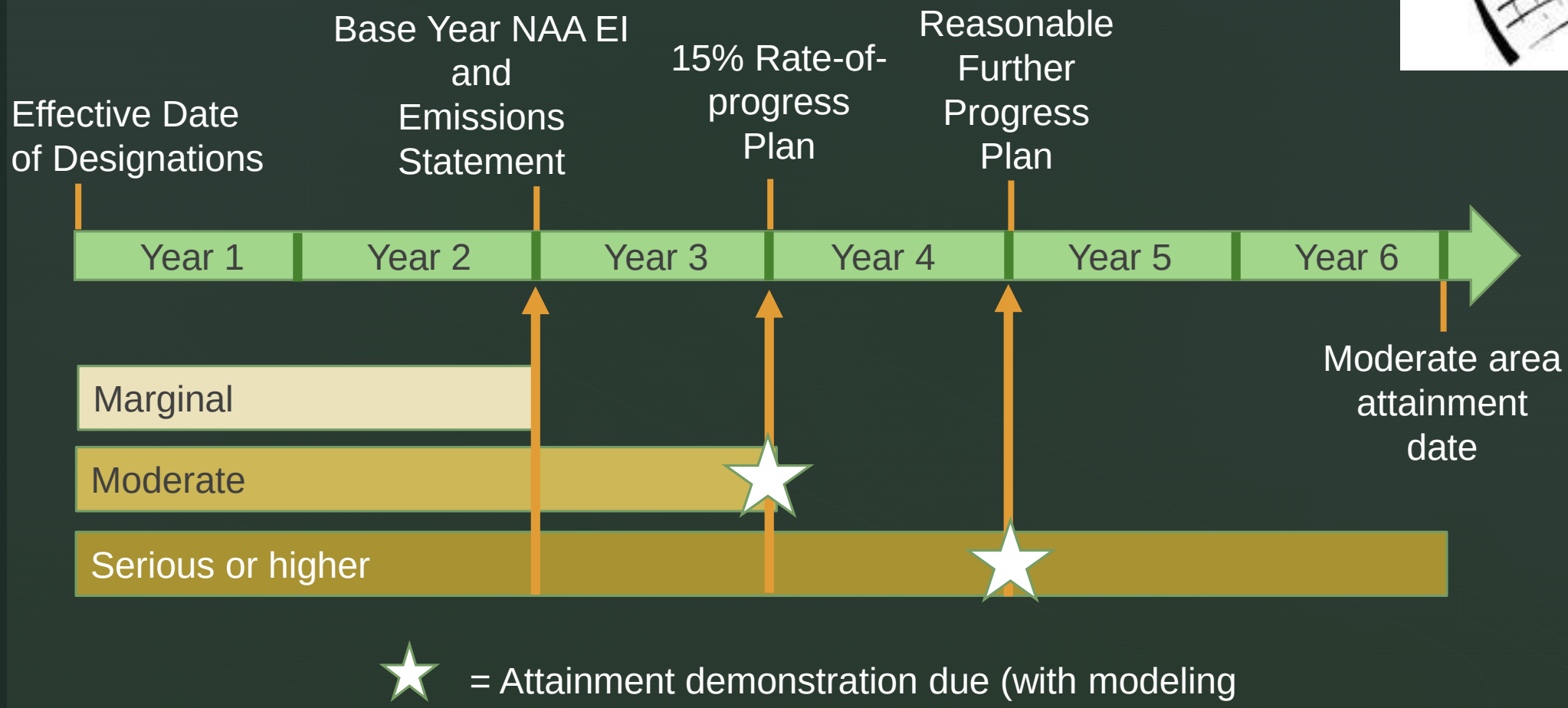


Ozone SIPs

General Emissions Inventory Details

Timing





★ = Attainment demonstration due (with modeling inventory summaries)

Ozone SIPs

General Emissions Inventory Details

Planning Inventories

- Source categories: CAA 182(a)(1)
  Comprehensive, accurate, current inventory of actual emissions of all sources
- Emissions base year
  - *Inventory year shall be selected consistent with the baseline year for the RFP plan* 40 CFR 51.1115(a)
  - *Baseline emissions inventory shall be the emissions inventory for the most recently available triennial emission inventory…* (available before designation) 51.1110(b)
  - Recent *South Coast II* decision - what's okay for sure?
    - For 2008 NAAQS: 2011
    - For 2015 NAAQS: 2014
- Pollutants: VOC and NOx 51.1100(bb)
- Within boundaries of nonattainment area 51.1100(bb)
- Ozone season day emissions 51.1115(c)

Ozone SIPs

General Emissions Inventory Details

Ozone-Season Day

- State must select the representative months and work week days
  - General expectation that emissions are higher on weekdays
  - In event weekend emissions were to be higher, would want to consider this in making decisions in coordination with Regional Office
  - High Electricity Demand Days (HEDD) could be considered
- Arithmetic average of emissions on days selected by source
  - Some sources have very specific emissions per day, such as CEM sources and fires
  - Other source types may need to reply on temporal profiles or other methods
- Considerations for on-road mobile sources
  - Averaging a modeling inventory that uses gridded, hourly meteorology is difficult
  - Using MOVES with representative daily temperature information is expected for planning inventories - more easily repeated for transportation conformity

Ozone SIPs

Base Year Inventory Data (1 of 5)

Planning inventory

- Due 24 months after the effective date of nonattainment designations
- For recent designations: 60 days from publication of designations in the Federal Register + 2 years
- Point sources reported according to the Type B point source potential-to-emit thresholds in the AERR (Appendix A, Table 1)

	Point sources thresholds (tons/yr PTE)
VOC	≥ 100
	Serious ≥ 50
	Severe ≥ 25
	Extreme ≥ 10
NOx	≥ 100

Ozone SIPs

Base Year Inventory Data (2 of 5)

Planning inventory

- Point source "facility" data elements reported according to the AERR (Appendix A, Table 2a)
- Called "Facility Inventory"

State/Co FIPS[1] code or tribal code	
Facility ID	Facility-level info (e.g., name, latitude/longitude, street address, NAICS[2])
Unit ID	Unit type, unit capacity
Emission Process ID	Source classification code (SCC)
Release Point ID	Release point characteristics
	Control measure, affected pollutant(s), percentage reductions

[1] Federal Information Processing Standards

[2] North American Industry Classification System

Ozone SIPs

Base Year Inventory Data (3 of 5)

Planning Inventory

- Select emissions data elements reported according to the AERR (Appendix A, Table 2b)

Data element	Point	Nonpoint	Onroad	Nonroad
State/Co FIPS Code	X	X	X	X
SCC		X	X	X
Emission factor	X	X		
Throughput (value, material, unit of measure)	X	X	X	
Pollutant code	X	X	X	X
Emissions and units of measure	X	X	X	X
Reporting period type (annual, average day…)	X	X	X	X
Emissions calculation method code	X	X		

Ozone SIPs

Base Year Inventory Data (4 of 5)

Planning Inventory

- Aren't the "Emission factor" and "Throughput" considered CBI?
  No, these are not considered confidential data by default or by EPA. A facility would need to claim CBI and have that claim be approved by the State. Emission factor and throughput help to document the way in which the emissions have been calculated.
- What is the point of the "Reporting period types" data?
  While the AERR requires States to report annual emissions every third year, States may report season-day emissions to meet some of their SIP requirements, so long as certain conditions are met.
- What is the importance of the "Emissions calculation method code"?
  This code indicates the way in which the emissions have been estimated, and along with the emission factor and throughput, provides documentation that is useful in understanding the quality of the data.

Ozone SIPs

Base Year Inventory Data (5 of 5)

Modeling Inventory

- Base year modeling inventories are needed for modeled attainment demonstrations (Moderate and above)
- Summaries (not detailed data) included with the attainment demonstration
- Differences compared to base year inventory for the nonattainment area inventory
  - Base year may be different
  - In addition to NOx and VOC, should include CO
  - Multi-State emissions within modeling domain
  - Could include international emissions sources
  - More temporal and spatial detail for EGUs, biogenic, fires, on-road mobile
  - Method for on-road mobile may be different

Ozone SIPs

Emissions Statements

- What are they?
  - A regulation by which a State requires stationary sources to report VOC and NOx
  - Says how facilities must report these emissions to the State air agency
- Why do I have to do this?
  - CAA 182(3)(B)
  - It's part of the SIP and therefore, the public hearing requirement applies
- What needs to be included in a SIP, and when?
  - The regulation itself is what is submitted. Needs to be submitted with 2 years of the effective date of designations (usually sent with the EI SIP)

Ozone SIPs

Projected Emissions Inventories

Rate of Progress

- Purpose is to assure that States take steps to make steady and incremental progress towards attaining the NAAQS
- Anthropogenic portion of the base year inventory for the nonattainment area serves as the baseline
- Moderate areas and above must submit plan that: CAA 182(b)(1)(A) & 40 CFR 51.1110(a)
  - Ensures 15% VOC reduction (accounting for growth) by 6 years after designation
  - NOx reduction can be substituted for VOC
  - Is submitted within 3 years after designations
- Summarizing differences between base and projected inventory is most common way to demonstrate 15%
  - Same characteristics as baseline RFP inventory
  - Moderate areas: Projected inventory for ROP and attainment projected emissions are same
  - Serious and above: Multiple projected inventories (different years)

Ozone SIPs

Projected Emissions Inventories

Reasonable Further Progress

- Purpose is to assure that States take steps to make steady and incremental progress towards attaining a NAAQS
- Anthropogenic portion of the base year inventory for the nonattainment area serves as the baseline
- Serious and above nonattainment areas must submit a plan to achieve 3% annual reduction in VOC after the initial 6 years (until attainment) CAA 182(c)(2)(B)
  - NOx reduction can be substituted for VOC CAA 182(c)(2)(C)
  - Due within 4 years of area's nonattainment designation
- Summarizing differences between base and projected inventory is most common way to demonstrate 3% per year
  - Same characteristics as baseline RFP inventory

Ozone SIPs

Projected Emissions Inventories

Modeling Inventories

- Projected modeling inventories are needed for modeled attainment demonstrations (Moderate and above)
- Summaries (not detailed data) included with the attainment demonstration SIP
- Differences compared to base year modeling inventory
  - Projection year is attainment year
  - Anthropogenic sources projected to future year, including any emission reduction measures devised for attaining the NAAQS
  - Temporal approach for sub-annual sectors may be different (EGU, fires)
- Biogenic emissions typically held constant
- Future-year international emissions can be a challenge

Ozone SIPs

Periodic Nonattainment Area Inventory (1 of 2)

- Periodic inventory required to be submitted no later than each 3-year period after the submission of the base year EI CAA 182(a)(3)(A)
- Same details as as base year EI
- Periodic inventories are a SIP revision, and subject to public review *notice* requirement
- Requirement can be met at least 3 ways:
  - If an updated RFP/ROP plan is submitted for any reason, this would need a new baseline inventory that could serve as periodic inventory
  - Inventory can be submitted to the regional office in some form
  - AERR triennial submission can be used under certain conditions…

Ozone SIPs

Periodic Nonattainment Area Inventory (2 of 2)

- AERR submission can be used to meet period requirement, if…
  - Public hearing has been offered
  - Ozone season day emissions submitted
  - Submit mobile emissions (*not* inputs as now required by AERR)
  - Complete – all sectors
  - Submitted within 3 years or less since base year inventory submitted
  - Partial county emissions are used where appropriate, and approach coordinated with regional office
- There are some hurdles here and only mild interest so far from States in using AERR submissions in this way

For further questions

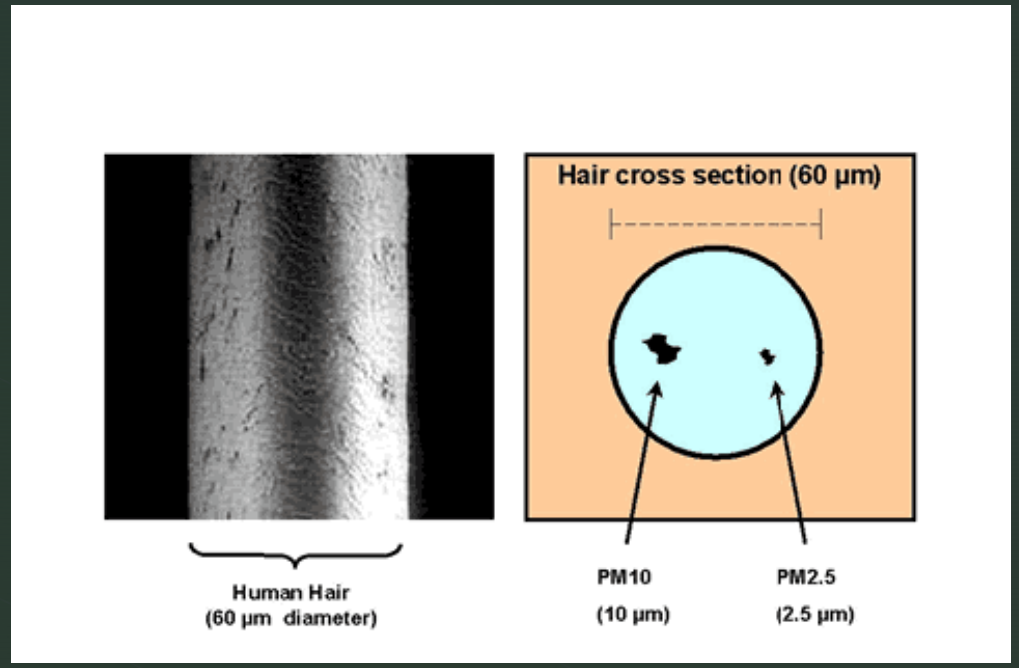
- Regional office ozone planning lead
- Robert Lingard, Lingard.Bob@epa.gov

MODULE 4

$PM_{2.5}$ - Emissions Inventory Uses and Requirements

Module Outline

- Background
- Emissions general details
- Base year emissions inventory data
- Optional precursor demonstration
- Projected emissions inventories
  - Projected attainment year inventory for the nonattainment area
  - Reasonable further progress
  - Modeling inventory



$PM_{2.5}$ SIPs - Background

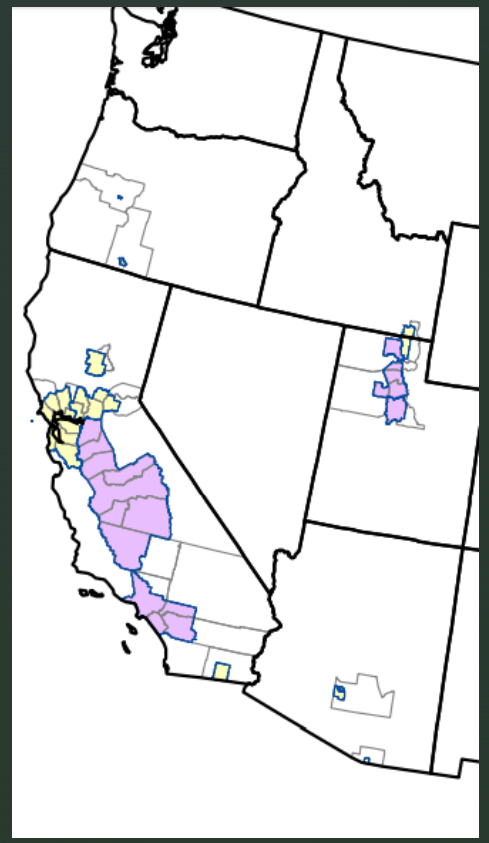
2016 $PM_{2.5}$ Implementation Rule

- In 2006, the EPA set the 24-hour primary $PM_{2.5}$ standard to 35 $\mu g/m^3$
- In 2012, the EPA revised the primary annual $PM_{2.5}$ standard from 15 micrograms per cubic meter ($\mu g/m_3$) to 12 $\mu g/m^3$
- Designations occurred starting after the 1997 $PM_{2.5}$ standard up through 2015 for the 2012 NAAQS
- In 2013, the courts remanded the original implementation rules because they did not include the CAA requirements specific to PM_{10} nonattainment areas
- In 2016 finalized the $PM_{2.5}$ SIP Requirements Rule 40 CFR 51.1000 – 51.1016
- Inventory due dates 18 months from effective date of designation
  - Depends on area (effective designations starting ~4/15/15 through 6/19/17)
- See also $PM_{2.5}$ Implementation Training

$PM_{2.5}$ SIPs – Background

Nonattainment areas

2006 (24-hr) Standard
(+ small areas in PA and AK)

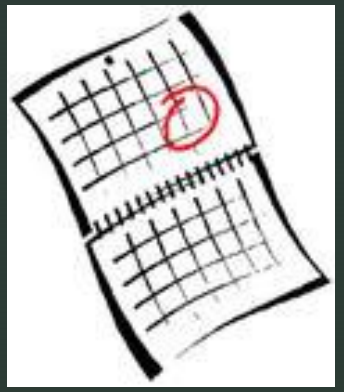


2012 (Annual) Standard

$PM_{2.5}$ SIPs

General Emissions Inventory Details

Timing



★ = Attainment demonstration due (with modeling inventory summaries)

$PM_{2.5}$ SIPs

General Emissions Inventory Details

Planning Inventories

- Source categories: *Actual emissions of direct $PM_{2.5}$ and all $PM_{2.5}$ precursors from all sources within the boundaries of a nonattainment area…* 40 CFR 51.1000
- Emissions base year
  - *…in one of the 3 years used for purposes of designations or another technically appropriate year* 51.1000
- Pollutants: $PM_{2.5}$ (total, condensable, and filterable) SO_2, NOx, VOC, and NH_3
  - $PM_{2.5}$ precursors: SO_2, NOx, VOC, and NH_3 51.1000
  - Direct $PM_{2.5}$: *… include filterable and condensable $PM_{2.5}$ emissions…* 51.1000
- Annual, average season-day, or both
  - If annual standard: annual
  - If 24-hour standard: annual or average season-day (with rationale) 51.1008(a)(iii)

$PM_{2.5}$ SIPs

General Emissions Inventory Details

Average-Season Day

- State must select the representative months and days
  - 24-hour NAAQS designed to protect against peak exposures
  - Violations of ambient standard must occur during an identifying season
  - State should coordinate with Regional Office in selecting season since the rationale for a seasonal approach will be reviewed for approval by EPA
- Arithmetic average of emissions on days selected by source
  - Some sources have very specific emissions per day, such as CEM sources and fires
- Considerations for on-road mobile sources
  - Averaging a modeling inventory that uses gridded, hourly meteorology is difficult
  - Using MOVES with average temperatures is expected for planning inventories so that approach can be more easily repeated for transportation conformity

$PM_{2.5}$ SIPs

Base Year Inventory Data (1 of 5)

Planning inventory

- Due 18 months after the effective date of nonattainment designations
- Point sources reported according to the Type B point source potential-to-emit thresholds in the AERR (Appendix A, Table 1)

Pollutant	Point sources thresholds (tons/yr)
SO_2	≥ 100 Serious ≥ 70
VOC	
NOx	
$PM_{2.5}$	
NH_3	

PM$_{2.5}$ SIPs

Base Year Inventory Data (2 of 5)

Planning inventory

- Point source "facility" data elements reported according to the AERR (Appendix A, Table 2a)
- Called "Facility Inventory"

State/Co FIPS[1] code or tribal code	
Facility ID	Facility-level info (e.g., name, latitude/longitude, street address, NAICS[2])
Unit ID	Unit type, unit capacity
Emission Process ID	Source classification code (SCC)
Release Point ID	Release point characteristics
	Control measure, affected pollutant(s), percentage reductions

[1] Federal Information Processing Standards

[2] North American Industry Classification System

$PM_{2.5}$ SIPs

Base Year Inventory Data (3 of 5)

Planning Inventory

- Select emissions data elements reported according to the AERR (Appendix A, Table 2b)

Data element	Point	Nonpoint	Onroad	Nonroad
State/Co FIPS Code	X	X	X	X
SCC		X	X	X
Emission factor	X	X		
Throughput (value, material, unit of measure)	X	X	X	
Pollutant code	X	X	X	X
Emissions and units of measure	X	X	X	X
Reporting period type (annual, average day…)	X	X	X	X
Emissions calculation method code	X	X		

$PM_{2.5}$ SIPs

Base Year Inventory Data (4 of 5)

Planning Inventory

- Why can't I submit only my "Plan precursors" as part of my inventories?
  - An emission inventory is needed for a $PM_{2.5}$ SIP (optionally) to demonstrate which $PM_{2.5}$ precursors are not significant in a NAA
  - The EPA needs to see this inventory to evaluate the precursor demonstration
- NH3 data are so uncertain, how can we use that for decision making?
  - The CAA does not give an "out" for uncertain data
  - EPA and states continue to improve the data available
  - $PM_{2.5}$ modeled attainment demonstrations have been successful in the past at improving AQ, despite similar (or greater) uncertainties
  - Ongoing work at EPA and elsewhere continues to improve these data

$PM_{2.5}$ SIPs

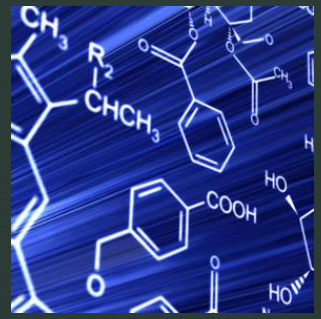
Base Year Inventory Data (5 of 5)

Modeling Inventory

- Base year modeling inventories are needed for modeled attainment demonstrations
- Emissions summaries included with the attainment demonstration
- Differences compared to base year inventory for the nonattainment area inventory
  - Base year may be different
  - In addition to $PM_{2.5}$ precursors, need CO and PM_{10}
  - Multi-State emissions within modeling domain
  - Could include international emissions sources
  - More temporal and spatial detail for EGUs, biogenic, fires, on-road mobile
  - Method for on-road mobile may be different

$PM_{2.5}$ SIPs

Optional Precursor Demonstration



- *An optional set of analyses provided by a State that are designed to show that emissions of a particular PM2.5 precursor do not contribute significantly to $PM_{2.5}$* levels that exceed the relevant $PM_{2.5}$ standard 40 CFR 51.1000
- Rule does require a particular approach, but it may use modeling and emissions data
  - Concentration-based – contribution of a precursor to ambient $PM_{2.5}$ levels is not significant
  - Sensitivity-based - decrease in emissions does not have significant impact on $PM_{2.5}$
- No specific emissions inventory requirements for the precursor demonstration, but data would be needed to do it

PM$_{2.5}$ SIPs

Projected Emissions Inventories

Planning Inventories

- Attainment projected emissions inventory for the nonattainment area: the PM$_{2.5}$ rule requires the *data* to be reported 40 CFR 51.1008(2)
- Year: most expeditious year for which … show modeled PM$_{2.5}$ concentrations below the level of the NAAQS
- Same sources as base year and only within nonattainment area
- Same temporal period (annual, average-season, or both) as base year
- Same pollutants (all precursors and PM$_{2.5}$ split for filterable and condensable)
- Same sources are point vs. nonpoint as base year
- Same detail as base year (i.e., consistent with AERR)

$PM_{2.5}$ SIPs

Projected Emissions Inventories

Reasonable Further Progress (1 of 2)

- $PM_{2.5}$ SIPs must meet RFP provisions in general — CAA 172(c)(2)
- $PM_{2.5}$ SIPs must contain quantitative milestones — CAA 189(c)(1)
  - Moderate area: no later than 4.5 and 7.5 years after effective date of designation
  - Serious area: no later than 7.5 years and 10.5 years
- Requirement to include RFP projected emissions by *sector and precursor pollutant* for each quantitative milestone year
- Show either linear progress to projected attainment date or stepwise progress
- RFP baseline is the base year inventory for the nonattainment area

$PM_{2.5}$ SIPs

Projected Emissions Inventories

Reasonable Further Progress (1 of 2)

- $PM_{2.5}$ SIPs must meet RFP provisions in general — CAA 172(c)(2)
- $PM_{2.5}$ SIPs must contain quantitative milestones — CAA 189(c)(1)
  - Moderate area: no later than 4.5 and 7.5 years after effective date of designation
  - Serious area: no later than 7.5 years and 10.5 years
- RFP baseline is the base year inventory for the nonattainment area
- Requirement to include RFP emissions reductions for each quantitative milestone year — 40 CFR 51.1012(a)
  - Can be met with emissions summaries by sector and pollutant
  - Show either linear progress to projected attainment date or stepwise progress
- Requirement to provide on-road mobile source emissions summaries for each milestone year

PM$_{2.5}$ SIPs

Projected Emissions Inventories

Reasonable Further Progress (2 of 2)

- To create a milestone inventory for RFP, it is not necessary to do a full emissions projection approach
- Interpolation between the base year and projected attainment inventory for the nonattainment area may be acceptable
  - State would need to explain why that makes sense
  - Example: residential wood combustion changes due to percent-per-year phase in of new woodstoves would give a linear rate, for which linear interpolation makes sense
- Closures and control measures can all be set to occur in a specific year, which can take a step-wise approach and occur before or on the milestone year to help demonstrate reasonable progress

For further questions

- Regional office $PM_{2.5}$ planning lead
- Patrick Lessard, Lessard.patrick@epa.gov
- Rich Damberg, Damberg.rich@epa.gov