The 2010 SO$_2$ NAAQS, Special Inventory Request, and Preliminary Modeling Plan

Ron Thomas
Air Quality Division

Presented to:
Southeast Texas Photochemical Modeling Technical Committee
August 23, 2011
Overview

- EPA’s new one-hour primary SO₂ NAAQS
- Texas’ Recommended Attainment Designations to EPA
- SO₂ Special Inventory request
  - Why, what, who, how, when
- Preliminary modeling plan
- EPA modeling guidance documents
- Questions
Texas’ Recommended Area Designations

- On June 2, 2011, the governor submitted the State’s recommendation* to the EPA for area designations under the 2010 primary SO$_2$ NAAQS.
  - **Nonattainment:** Jefferson County
  - **Attainment:** Dallas, Ellis, El Paso, Galveston, Gregg, Harris, Kaufman, McLennan, and Nueces Counties
  - **Unclassifiable:** All other Texas counties
- Final area designations based on 2010 design values (2008 through 2010 monitoring data) are expected from EPA by June 2012.

* based on 2009 design values (2007 through 2009 monitoring data) only (no modeling analysis).
Why were data requested?

- To support the development of a State Implementation Plan (SIP) revision
- States must adopt SIP revisions that demonstrate attainment and maintenance of the standard.
- The EPA-recommended tool for doing this is the dispersion modeling system AERMOD.
- The purpose is to demonstrate that any source or group of sources that has the potential to cause or contribute to an exceedance of the standard will be sufficiently controlled so the standard is attained and maintained.
SO₂ Special Inventory Request

What sources?

- What sources will be considered?

- EPA expects the SIP analysis to include:
  - any individual source with permit allowable emissions of 100 or more tons per year (tpy);
  - and
  - other sources that may cause or contribute to violations of the NAAQS, e.g.,
    - smaller point sources,
    - area sources, and
    - non-road mobile sources (especially ships).
SO\textsubscript{2} Special Inventory Request

Who was surveyed?

- Who received the survey?
- The TCEQ requested information from sites with reported emissions of 10 tpy or more, as reported in 2009:
  - 100 tpy allowable vs. 10 tpy reported/actual;
  - cause or contribute; and
  - year to year variability of emissions.
What data were requested?

- For all existing sources of SO$_2$ at the site, and any new sources of SO$_2$ at the site:
  - one-hour and annual permit allowable emission rates, including certified emission limits;
  - de-flexed or pre-flexed emission rates;
  - any registered or unregistered Permit by Rule actual emissions data; and
  - any modeling parameter updates.
How were the data requested?

- Excel spreadsheets were pre-populated with readily-available company-specific information:
  - 2009 reported emissions;
  - permit allowable emission rates from PSDB; and
  - modeling data.
- Companies were asked to update allowable emissions and modeling data.
- Companies were asked to provide comments and explanations.
When were the data due to the TCEQ?

- Surveys were mailed June 15.
- Responses were requested within 30 days of receipt of the letter and CD.
- A few extensions were granted.

Survey Response

- All but two of the 254 sites acknowledged receipt of the survey.
- As of August 19, less than 10 surveys remain outstanding.
SO₂ Special Inventory Request

How are the data being used?

• How is the TCEQ using the requested data?

• First, quality control standards are being applied.
  – This is currently about 50% complete.

• The data will be used in the TCEQ preliminary SO₂ SIP modeling plan.
  – The plan incorporates multiple phases.
Preliminary $\text{SO}_2$ SIP Modeling Plan

Overview

• Multiple phases
  – Coarse (statewide screening)
  – Intermediate (refined analysis of high concentration areas)
  – Fine (refined AERMOD with downwash)
  – CAMx-AERMOD model evaluation study
  – Nonattainment area modeling
  – SIP control strategy modeling

• Modeling Protocol
Preliminary SO₂ SIP Modeling Plan
Statewide Screening with CAMx

- Run CAMx without chemistry
- Run CAMx with and without an SO₂ decay coefficient to simulate what is advised by EPA guidance (four-hour decay coefficient) for AERMOD SO₂
- Gather a full year of meteorology data valid for the whole state (difficult)
- Use EPA coarse national modeling scenarios:
  - Regional Haze SIP
    - 2002 36-km gridded EI
    - Full year of 36-km gridded 2002 meteorology (MM5)
    - Flexi-nest TX to 4 km
Preliminary SO$_2$ SIP Modeling Plan

Statewide Screening with CAMx cont’d.

- Proposed Clean Air Transport Rule (CATR) modeling
  - 2005 36-km gridded EI
  - Full year of 36-km gridded 2005 meteorology (MM5)
  - Flexi-nest TX to 4km
- Updated Cross-State Air Pollution Rule (CSAPR) modeling
  - Full year of 2005 12-km met and EI
  - Likely to include higher resolution SO$_2$ for TX

- TCEQ higher-resolution modeling for Texas and adjacent states
  - EPA coarse grid files used for boundary conditions
  - TCEQ-developed EI for TX and adjacent states
  - Perhaps TCEQ-developed 3-5 years of finer-grid-scale (4 km?) MM5/WRF
Composite of TCEQ CAMx runs of EPA’s 2005 CATR files

99th percentile of daily max so2 concentration

Min (1, 1) = 0, Max (285, 204) = 352.

Air Quality Division  •  2010 SO2 NAAQS, Special Inventory & Modeling  •  RT  •  August 23, 2011  •  Page 16
Preliminary SO$_2$ SIP Modeling Plan
Refinement of Some Areas

• Model high concentration areas with refined CAMx and/or coarse (no downwash) AERMOD
  - Focus on areas (multi-counties) of the state that do not screen out (some fraction of the NAAQS).
  - Use refined combinations of the above.
  - This modeling will not include downwash or ambient air overlap analyses.
  - Will likely test CAMx Plume-in-Grid Sampling Grid tracking options, for even finer resolution plumes.
Preliminary $SO_2$ SIP Modeling Plan

**Refined AERMOD with Downwash**

- Model individual sites with AERMOD (likely)
  - Focus on high concentration areas that do not screen out in earlier steps.
  - Use refined AERMOD options.
  - Must include downwash, ambient air definitions, and background concentrations.
  - Will likely include analyses of operating scenarios.
  - Will define the sites that may require additional controls to not exceed the NAAQS.
Preliminary SO₂ SIP Modeling Plan
CAMx-AERMOD Model Evaluation

• CAMx vs. AERMOD model performance evaluation in Beaumont-Port Arthur area (BPA)
  – Compare modeling results to monitored values
  – EPA acknowledges that AERMOD results are within a factor of 2
  – Evaluate CAMx and AERMOD model performance at BPA monitors
    ▪ Beaumont Downtown (CAMS 2)
      • Design Value exceedance in 2009 and 2010
    ▪ Port Arthur West (CAMS 28)
      • Design Value exceedance in 2009, but not in 2010
    ▪ Beaumont Mary (CAMS 1050), perhaps
      • New in second half of 2010
Preliminary $\text{SO}_2$ SIP Modeling Plan

BPA Area Modeling

Texas $\text{SO}_2$ Modeling Project - CAMS $\text{SO}_2$ Monitoring Sites in Texas

Beaumont Mary
Beaumont Downtown
Port Arthur West
Preliminary SO₂ SIP Modeling Plan
Nonattainment Area Modeling

• For areas/sites that exceed the new SO₂ NAAQS with modeling or monitoring
• To demonstrate how the nonattainment area can reach attainment by the attainment date in June 2017
• Development of a 2017 scenario using new CSAPR, refinery initiatives, negative SO₂ EI trends, etc.
• Transport analyses, data analyses, and weight-of-evidence analyses
• Only Jefferson county has been recommended by Texas to be designated nonattainment
• Maintenance SIP revisions due June 2013; attainment demonstration SIP revisions due February 2014
• For all areas/sites that model exceedances of the NAAQS

• Demonstrate how the area/county/site can reach attainment by the attainment date in June 2017

• Develop potential control strategies
  – Reduce permit allowables, or
  – New operating scenarios, or
  – Add-on controls (scrubbers, etc.), or
  – Curtailment of some operations?
Preliminary SO$_2$ SIP Modeling Plan

Modeling Protocol

- Being developed in conjunction with TCEQ Air Permits Division
- Evaluating Lake Michigan Air Directors Consortium (LADCO) protocol they submitted to EPA Region 5
- Will be revised as screening scenarios are tested
• Guidance Memorandum, March 24, 2011:
  – Area Designations for the 2010 Revised Primary Sulfur Dioxide NAAQS
    ▪ Attachment 1: Time line for 2010 Primary SO2 NAAQS Designation Process
    ▪ Attachment 2: Determining Designations and Appropriate Area Boundaries for the 1-hour, 75 ppb SO2 NAAQS
    ▪ Attachment 3: Modeling Guidance for SO2 NAAQS Designations
EPA Guidance Documents
Implementation

- Not yet available

- EPA plans to take comment on the guidance before it is finalized 60 days later.
EPA Guidance Documents
Clarification Memos, Permitting

- Guidance Concerning the Implementation of the 1-hour SO₂ NAAQS for the Prevention of Significant Deterioration Program
- Additional Clarification Regarding Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ NAAQS (PDF) (3-1-2011)
- Applicability of Appendix W Modeling Guidance for the 1-hour SO₂ NAAQS (PDF)
SO₂ NAAQS Information Sources

• EPA SO₂ Web page:
  http://www.epa.gov/air/sulfurdioxide

• TCEQ SO₂ SIP Planning Web page:
  http://www.tceq.state.tx.us/implementation/air/sip/texas-sip/criteria-pollutants/sip-so2

• Air quality updates from TCEQ e-mail list serve:
  www.tceq.state.tx.us/implementation/air/sip/sipcontact.html

To receive e-mail notification of updates on SIP revisions and SIP-related news items:
  – Go to http://www.tceq.state.tx.us
  – Select “Sign up for e-mail updates”
  – Enter and confirm your e-mail address
  – Select “SIP Hot Topics”
TCEQ SIP Team Contacts

SIP Planner for SO$_2$:

**Mary Ann P. Cook**
Phone: 512-239-6739
Email: MaryAnn.Cook@tceq.texas.gov

SIP Team Leader:

**Walker Williamson**
Phone: 512-239-3181
Email: Walker.Williamson@tceq.texas.gov
TCEQ Technical SO$_2$ Contacts

Modeling Technical Lead for SO$_2$:

**Ron Thomas**
Phone:  512-239-1923
Email:  Ron.Thomas@tceq.texas.gov

SIP Modeling Team Leader:

**Zarena Post**
Phone:  512-239-1332
Email:  Zarena.Post@tceq.texas.gov
Questions?
The 2010 one-hour primary SO$_2$ NAAQS

- Imposes a new one-hour primary SO$_2$ standard.
  - The design value, or three-year average of the 99th percentile of the annual distribution of daily maximum one-hour average concentrations (all monitors) must not exceed 75 ppb.
- Existing primary SO$_2$ standards (24-hour and annual) were revoked effective one year after EPA finalizes area designations.
- The secondary SO$_2$ standard was not changed.
New Monitoring Network Requirements

• SO$_2$ monitors are required operational by January 1, 2013, in specific metropolitan areas (Core Based Statistical Areas, or CBSAs) based on a population-weighted emissions index.
  - Regulatory requirements for SO$_2$ monitoring in several of the seven CBSAs, including Houston-Sugar Land-Baytown (two required) and Beaumont-Port Arthur are satisfied with current sites, with more than the required number of monitors in some areas.

• 2010 monitored design values indicate Jefferson County is the only Texas area violating the standard.
A “Hybrid” Implementation Approach

• EPA introduced a combination monitoring/modeling “hybrid” approach for assessing and demonstrating compliance.
  – Refined source-oriented air dispersion modeling (AERMOD) will be required for medium/large sources.
  – Monitoring may be sufficient for groups of smaller sources and sources not conducive to modeling.

• Implications for area designations:
  – Both monitoring and refined modeling results showing no violations are required for attainment designations.
  – Any monitored or modeled violation will result in a nonattainment designation.
  – Areas will be determined unclassifiable if supporting dispersion modeling analysis data are not provided.
EPA’s Implementation Timeline

- **June 2010**: EPA issued final revised primary SO₂ NAAQS.
- **January 2011**: Public information meetings held by TCEQ.
- **April 2011**: The commission adopted executive director’s recommendation for Texas area attainment status designations.
- **June 2011**: State’s recommendation for area designations was submitted to EPA.
- **June 2012**: EPA is to finalize area designations.
- **June 2013**: Section 110(a)(1) infrastructure SIP revisions (to include attainment and maintenance plans for areas designated attainment and unclassifiable) are due to EPA.
- **February 2014**: Attainment demonstration SIP revisions for areas designated nonattainment are due to EPA.
- **August 2017**: Attainment deadline for all areas.
Attainment And Unclassifiable Area SIPs

- Infrastructure SIPs for the new primary SO$_2$ NAAQS, due by June 2, 2013, including:
  - attainment emissions inventories,
  - demonstration of maintenance through 2017,
  - new controls to meet and maintain the standard, if necessary,
  - contingency plans,
  - verification of continued maintenance, and
  - attainment demonstrations for areas designated unclassifiable.
Nonattainment Area SIPs

- Attainment demonstration plans for nonattainment areas, due February 2014, must:
  - demonstrate through dispersion modeling analysis that the area will attain the standard by August 2017;
  - include refined air modeling showing all sources with a potential to contribute are sufficiently controlled;
  - include enforceable emissions limitations, timetables, and appropriate testing/reporting to assure compliance; and
  - meet other statutory requirements, including reasonable further progress and contingency plan.
What is TCEQ Doing?

- Watching litigation
- Assess information obtained through the Special Inventory request.
- Update SO$_2$ emissions inventory and 2010 Design Value
- Conduct modeling activities.
- Evaluate and submit comments on implementation guidance to be proposed by EPA in June/July/August??? 2011 (and finalized after a 60 day comment period).
- Plan and develop the SO$_2$ SIPs due in June 2013.