

Modeling for the New NAAQS

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Introduction

- $\text{PM}_{2.5}$
- NO_2 1-hour standard
- SO_2 1-hour standard

PM_{2.5}



7/18/97

- New annual and 24-hour standards for PM_{2.5}
- PM₁₀ NAAQS modified

10/23/97

- PM₁₀ surrogate policy established

9/21/06

- Revised 24-hour NAAQS for PM_{2.5}
- Revoked PM₁₀ annual standard
- Effective 12/18/06

4/25/07

- Promulgated non-NSR part of the implementation rule

5/16/08

- Promulgated final rules for NSR
- Grandfathering provision
- SER of 10 tpy for direct PM_{2.5} emissions (40 tpy NO_x or SO₂)

8/12/09

- EPA Administrative Order (Louisville Gas and Electric) requires appropriateness demonstration for PM₁₀ surrogacy

2/11/10

- Proposal to repeal grandfathering published

3/23/10

- OAQPS issues “Modeling Procedures for Demonstrating Compliance with PM_{2.5} NAAQS”

9/29/10

- EPA establishes SILs, SMC, and increments
- Published 10/20/10

PM_{2.5} Increments

Averaging Period	NAAQS (µg/m ³)	Increments		
		Class I	Class II	Class III
Annual	15	1	4	8
24-hour	35	2	9	18

PM_{2.5} Significant Impact Levels

Averaging Period	NAAQS (µg/m ³)	SIL (µg/m ³)		
		Class I	Class II	Class III
Annual	15	0.06	0.3	0.3
24-hour	35	0.07	1.2	1.2

Points to Note

- Annual PM_{10} increment still effective
- SMC for $PM_{2.5} = 4 \mu\text{g}/\text{m}^3$ (24-hour average)
- Increment used the percentage-of-NAAQS approach
- SILs scaled by $PM_{2.5}$ -to- PM_{10} NAAQS ratio
- Initially - condensable PM not required; estimating techniques being developed
- $PM_{2.5}$ viewed as new pollutant so new dates

Dates of Interest

- Major Source Baseline Date = 10/20/10
- SILs and SMC effective date = 12/20/10
- Minor Source Baseline Date = date first complete application for a PSD permit is submitted
- Trigger Date (for increments) = 10/20/11

Increment Modeling

Prior to the trigger date, increment modeling does not need to be included with an application for it to be considered complete.

However an increment analysis will be required before the permit is issued if the date of issuance will occur after the trigger date.

(No Grandfathering)

Modeling PM_{2.5}

- 24-hour
 - Monitored: average of the 98th percentile 24-hour values over 3 years
 - Modeled (NAAQS): average of the max 24-hour averages over 5 years
 - Modeled (Increment): one exceedance per year
- Annual
 - Monitored: average of the annual mean concentration over 3 years
 - Modeled (NAAQS): average of the modeled annual averages over 5 years
 - Modeled (Increment): highest modeled annual average
- SILs may be used for NAAQS analysis once effective

Modeling PM_{2.5}

- Background = monitor design value
- Monitored data should account for the contribution of secondary PM_{2.5} formation
- Presently, based on modeling only direct PM_{2.5} emissions
- Second tier analysis - combine monitored and modeled concentrations seasonally/quarterly
- Significant contribution - comparison of the 5 year average of the modeled concentrations at the receptor location showing the violation

Looking Ahead

- Additional details on second tier analysis
- Interpreting the SILs for increment analysis
- Development of emission inventories
- Representative background concentrations
- Secondary formation

1-hour NO₂



Background

- January 22, 2010 – new hourly NO₂ standard announced
- February 9, 2010 – final rule published
- April 12, 2010 – standard effective
- Include in all PSD permits on/after April 12, 2010

“100 ppb ($\sim 189 \mu\text{g}/\text{m}^3$) based on the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations”

Guidance

- Available on SCRAM website:
<http://www.epa.gov/ttn/scram>
- 2/25 /10 - Notice Regarding Modeling for New Hourly NO₂ NAAQS (Updated)
- 6/29/10 – Stephen Page Implementation Memo
 - 6/28/10 – Tyler Fox Memo on Applicability of GAQM
 - 6/28/10 – Anna Marie Wood Memo on General PSD Implementation and interim SIL

1-hour NO₂ Modeling

- AERMOD still preferred model
- 40 tpy SER
- Interim SIL = 4 ppb ($\sim 7.5 \mu\text{g}/\text{m}^3$)
- Use max lb/hr
- Must still model five years
- Average over all met years
- Rolling 3-year averages not required

Comparison to the 1-hour NAAQS

- Run AERMOD, retaining hourly concentrations at each receptor for each hour
- For each receptor:
 - Determine max 1-hour concentration each day
 - Determine 8th-highest daily 1-hour max concentration from the 365/366 daily 1-hour max concentrations
 - Average the 8th-highest daily 1-hour max concentrations across the years
- Compare highest receptor (+background) to NAAQS
- For significance analysis use 5-year average of the max 1-hour NO₂ concentration

Combining Monitors and Modeling

- Modeled portion should be in the form of standard
- Monitor “first tier” assumption –overall highest hourly background NO₂ concentration
- Additional refinements to this “first tier”, i.e. temporal pairing, will be handled case-by-case

Emergency Equipment/Startups

- EPA policy – NO_x emissions can't be excluded from the source impact analysis
- No exemption during periods of emergency operation or startups
- Permits may include enforceable conditions that specifically limit the testing/maintenance of emergency equipment to certain periods of time (i.e. when other equipment is down)

Modeling the Annual Standard

- Section 5.2.4 of Appendix W – three-tiered screening approach for annual NO_2 modeling:
 - Tier 1 – full conversion of NO to NO_2
 - Tier 2 – ARM – multiply Tier 1 result by 0.75 (default NO_2/NO_x ratio)
 - Tier 3 – detailed screening methods
 - Ozone Limiting Method (OLM)
 - Site-specific ambient NO_2/NO_x ratios

Modeling the 1-Hour Standard

- Appendix W for annual applies to 1-hour, generally
- Don't assume defaults
- Tier 1- OK
- Tier 2 - may be OK, but additional consideration needed for appropriate ambient ratio
 - Current default considered to be representative of “area wide quasi-equilibrium conditions” not short-term
 - OK for now?

Modeling the 1-Hour Standard

- Tier 3 - OK
 - Still case-by-case
 - Needs EPA Regional Office approval
 - Includes
 - Ozone Limiting Method (OLM)
 - Plume Volume Molar Ratio Method (PVMRM)
 - Site-specific ambient ratio for NO_2/NO_x

OLM/PVMRM Considerations

- In-stack ratios of NO_2/NO_x
 - No “default”
 - Become more important and need better justification
 - Potential variability under different operating conditions
- Background ozone concentrations
 - Single “representative” background ozone likely to produce conservative results
 - Hourly ozone data must be concurrent with modeling met data
 - Missing data substitution methods will be heavily scrutinized

Looking Ahead

- Rulemaking to develop SIL
- Generic AERMOD post-processor
- Limited AERMOD interim use NO₂ postprocessor
- Additional guidance on culpability analysis for modeled violations

1-hour SO₂



Background

- June 2, 2010 – new hourly NO₂ standard announced
- June 22, 2010 – final rule published
- August 23, 2010 – standard effective
- Include in all PSD permits on/after August 23, 2010

“75 ppb ($\sim 195 \mu\text{g}/\text{m}^3$) based on the 3-year average of the 99th-percentile of the annual distribution of daily maximum 1-hour concentrations”

Guidance

- Available on SCRAM website:
<http://www.epa.gov/ttn/scram>
- 8/23/10 – Stephen Page Implementation Memo
 - 8/23/10 – Tyler Fox Memo on Applicability of GAQM
 - 8/23/10 – Anna Marie Wood Memo on General PSD Implementation and interim SIL

1-hour SO₂ Modeling

- AERMOD still preferred model
- 40 tpy SER
- Interim SIL = 3 ppb ($\sim 8 \mu\text{g}/\text{m}^3$)
- Use max lb/hr
- Must still model five years
- Average over all met years
- Rolling 3-year averages not required

Additionally...

- Revocation of 24-hour and annual SO₂ standards
- But wait! Transition Period (~3 years)
- Existing SO₂ increments not revoked
- No provisions for exempting emissions occurring during equipment start-up/shutdown
- Permits may include enforceable conditions that specifically limit the testing/maintenance of emergency equipment to certain periods of time (i.e. when other equipment is down)

Comparison to the 1-hour NAAQS

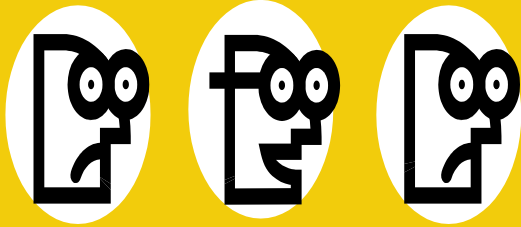
- Run AERMOD, retaining hourly concentrations at each receptor for each hour
- For each receptor:
 - Determine max 1-hour concentration each day
 - Determine 4th-highest daily 1-hour max concentration from the 365/366 daily 1-hour max concentrations
 - Average the 4th-highest daily 1-hour max concentrations across the years
- Compare highest receptor (+background) to NAAQS
- For significance analysis use 5-year average of the max 1-hour SO₂ concentration

Combining Monitors and Modeling

- Modeled portion should be in the form of standard
- Monitor “first tier” assumption –overall highest hourly background SO₂ concentration
- Additional refinements to this “first tier”, i.e. temporal pairing, will be handled case-by-case

Looking Ahead

- Rulemaking to develop SIL
- Evaluation of SMC
- Additional guidance on culpability analysis for modeled violations
- New increment (?)



It's QUESTION TIME!!

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