



Changes in Dispersion Modeling Policies and Tools – Case Study with 1-Hour Standards

Tony Colombari
November 9, 2011



trinityconsultants.com

Presentation Outline

1. Where can I find these policy changes?
2. Brief review of 1-hour standards (NO₂/SO₂)
3. Review of March 1 guidance memo
4. 1-hour NO₂ modeling case study

Where can I find information on policy and technical changes?

- EPA Support Center for Regulatory Atmospheric Modeling (“SCRAM”) <http://www.epa.gov/scram001/>
 - ◆ Clarification Memos (**Policy** Updates found here) http://www.epa.gov/ttn/scram/guidance_clarificationmemos.htm
 - ◆ Preferred/Regulatory Models (**Technical** Updates found here) http://www.epa.gov/ttn/scram/dispersion_prefrec.htm



Overview of 1-Hour NO_2 and SO_2 NAAQS

1-hour NO₂ NAAQS

- Published in FR on February 9, 2010
- Added a 1-hour form of the standard to the existing annual standard effective on April 12, 2010
- NO₂ standard is 3-year average of 98th percentile of annual distribution of daily maximum 1-hour concentrations
- As part of this rulemaking, USEPA did not propose any guidance on how to analyze this new standard in permitting, interim guidance came later

Nitrogen Dioxide NAAQS

Pollutant	Primary Standards			Secondary Standards	
	Level, ppm	Level, ug/m ³	Averaging Time	Level	Averaging Time
Nitrogen Dioxide	0.053	100	Annual	Same as Primary Standard	
	0.1	188	1-hour	Under Review with SO ₂	

1-hour NO₂ NAAQS

- Implications of form of the standard
 - ◆ For 365 highest 1-hour values this would be the 8th highest value each year
 - ◆ Average this value over a 3-year period
 - ◆ For modeling, EPA allows consideration of 5-year average, given a standard 5-year meteorological data set
 - ◆ Conservative surrogate is the high-8th high (H8H)
- Was very difficult to obtain an output in this form prior to AERMOD Version 11103, as we'll see

Revised NO₂ NAAQS - Implications

- New NO₂ monitors, likely near major roadways in urban areas
 - ◆ To be operational by January 2013
- NO₂ 1-hour standard problematic for sources required to model compliance with NAAQS, especially for emergency engines (as case study will show)

1-hour SO₂ NAAQS

- Published in FR on June 22, 2010
- Added a 1-hour form of the standard effective on August 23, 2010
- Revoked both annual and 24-hour standards
- SO₂ standard is 3-year average of 99th percentile of annual distribution of daily maximum 1-hour concentrations
- As part of this rulemaking, USEPA did not propose any guidance on how to analyze this new standard in permitting, interim guidance came later

Sulfur Dioxide AQS

Pollutant	Primary Standards			Secondary Standards		
	Level, ppb	Level, ug/m ³	Averaging Time	Level, ppm	Level, ug/m ³	Averaging Time
Sulfur Dioxide				0.5	1,300	3-hour
	0.075	196	1-hour	Under Review with NO ₂		

June 22, 2010 U.S. EPA:

- Strengthened the NAAQS standard for SO₂ to include a 1-hour standard of 75 ppb (effective August 23, 2010) and revoked the existing annual and 24-hour primary SO₂ standards.
- 24-hour and Annual average periods still valid for 1 year after initial attainment designations (June 2013 or later).
- 24-hour and Annual increments will remain in effect until formally revoked.

Revised SO₂ NAAQS - Implications

- Nonattainment areas will be defined based on BOTH monitoring and modeling
- New 1-hour standard problematic for sources required to model compliance with NAAQS
 - ◆ New standards are being challenged by both industry groups and states



**March 1, 2011 Guidance
Memorandum for 1-Hour NO₂
and SO₂ Modeling**

March 1, 2011 Memo – General Guidance

- Clarified procedure for comparing results to the significant impact level (SIL) (for cumulative impacts analysis)
- Specified that the default 1-hour ambient NO_2/NO_x ratio for Tier 2 and 3 should be 0.8 (not 0.75 as accepted for annual)
- Provided recommended default values for some OLM and PVMRM inputs (Tier 3)

March 1, 2011 Memo – Intermittent Emissions

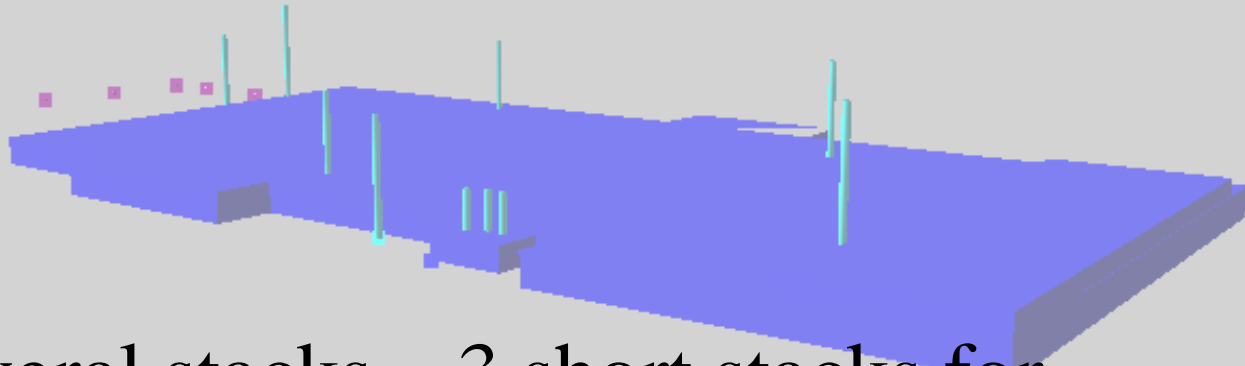
- Several Scenarios Discussed
 1. Ignore emergency units (intermittent, unscheduled and minimal normal of hours of operation)
 2. Annualize emission rate (large degree of uncertainty, pairs worst case meteorological conditions with probability of operation)
 3. Limit hour of day (intermittent but regular scheduled operation, such as daily testing)
- MPCA anticipates approving a modified scenario 1

March 1, 2011 Memo – Background Concentrations

- Monitored value to use (highest vs 98th %tile)
- Pairing modeled and monitored values temporally
 - ◆ Hourly
 - ◆ Seasonally
 - ◆ Season and hour of day
- MPCA a leader on paired sums

Case Study – NO₂ Modeling

- Very large building footprint



- Several stacks – 3 short stacks for generators
- High Background Concentration (149 $\mu\text{g}/\text{m}^3$)

Case Study – Run 1, The Conservative Run

- Generators modeled at full emission rate for every hour of day
- Tier 2 – Ambient Ratio Method (0.8)
- High background concentration added to modeled impacts

Case Study – Run 1, The Conservative Run

Source Group	Post-ARM Impacts
Generator 1	108
Generator 2	118
Generator 3	99
All Generators	323
Non-Generators	32
ALL	323
Background	149
Total Impacts	472
NAAQS	188
% of NAAQS	251%



Case Study – Run 2, Annualized Emissions

- All three generators are assumed to have intermittent, unscheduled emissions
- Generators emission rates are annualized

Case Study – Run 2, Annualized Emissions

Source Group	Post-ARM Impacts
Generator 1	6
Generator 2	7
Generator 3	6
All Generators	18
Non-Generators	32
ALL	41
Background	149
Total Impacts	190
NAAQS	188
% of NAAQS	101%

Case Study – Run 3, Restricted Operation

- All three generators are assumed to have intermittent, **scheduled** emissions
- Generators 1, 2, and 3 may operate every day, from 8:00-9:00, 9:00-10:00, and 10:00-11:00 am, *respectively*

Case Study – Run 3, Restricted Operation

Source Group	Post-ARM Impacts
Generator 1	57
Generator 2	58
Generator 3	50
All Generators	68
Non-Generators	32
ALL	70
Background	149
Total Impacts	219
NAAQS	188
% of NAAQS	117%

Case Study – Run 4, Restricted Operation + Temporal Pairing

- Generators are assumed to have scheduled operation as in Run 3
- Background concentrations are paired with modeled concentrations hourly

Case Study – Run 4, Restricted Operation + Temporal Pairing

Source Group	Pre-ARM Impacts
Generator 1	145
Generator 2	148
Generator 3	137
All Generators	155
Non-Generators	130
ALL	160
Total Impacts	160
NAAQS	188
% of NAAQS	79%

Conclusions

- As with model formulation changes, policy changes capable of producing significantly different results
- March 1 guidance establishes several options for complying with 1-hour standards
 - ◆ Intermittent Emissions
 - ◆ Background Concentrations



Any Questions

