

# The New Era of National Ambient Air Quality Standards

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# Agenda

- NAAQS Background
- New NAAQS Summary
- NAAQS Implementation Process
- Example AERMOD Modeling
- PSD Permitting Considerations
- Conclusions and Recommendations

# NAAQS Background

- “Backdrop” of the Clean Air Act.
- States design their SIPs and enforce and implement their regulations to meet the NAAQS.
- Air quality construction permit programs are designed around NAAQS compliance:
  - PSD: Maintaining NAAQS attainment
  - NNSR: Getting into NAAQS attainment

# NAAQS History

- Nitrogen Dioxide (NO<sub>2</sub>)
  - Annual: 100 µg/m<sup>3</sup>
- Sulfur Dioxide (SO<sub>2</sub>)
  - Annual: 80 µg/m<sup>3</sup>
  - 24-Hour: 365 µg/m<sup>3</sup>
  - 3-Hour: 1,300 µg/m<sup>3</sup>
- NAAQS are often viewed as not having a direct impact on day-to-day permitting.

# New NAAQS

- Nitrogen Dioxide (NO<sub>2</sub>)
  - New 1-Hour NAAQS: 188 µg/m<sup>3</sup>
  - Annual NAAQS still in place
- Sulfur Dioxide (SO<sub>2</sub>)
  - New 1-Hour NAAQS: 196 µg/m<sup>3</sup>
  - Annual and 24-Hour NAAQS revoked
  - 3-Hour NAAQS still in place
- 1-Hour NAAQS levels are very stringent:
  - SO<sub>2</sub> 3-Hour to Annual Ratio: 16.25
  - SO<sub>2</sub> 1-Hour to Annual Ratio: 2.45

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# NAAQS Summary

Pollutant	Average Period	NAAQS (mg/m <sup>3</sup> )
CO	1-Hour	10,000
	8-Hour	40,000
PM <sub>10</sub>	24-Hour	150
PM <sub>2.5</sub>	24-Hour	35
	Annual	15
NO <sub>2</sub>	1-Hour	188
	Annual	100
SO <sub>2</sub>	1-Hour	196
	3-Hour	1,300

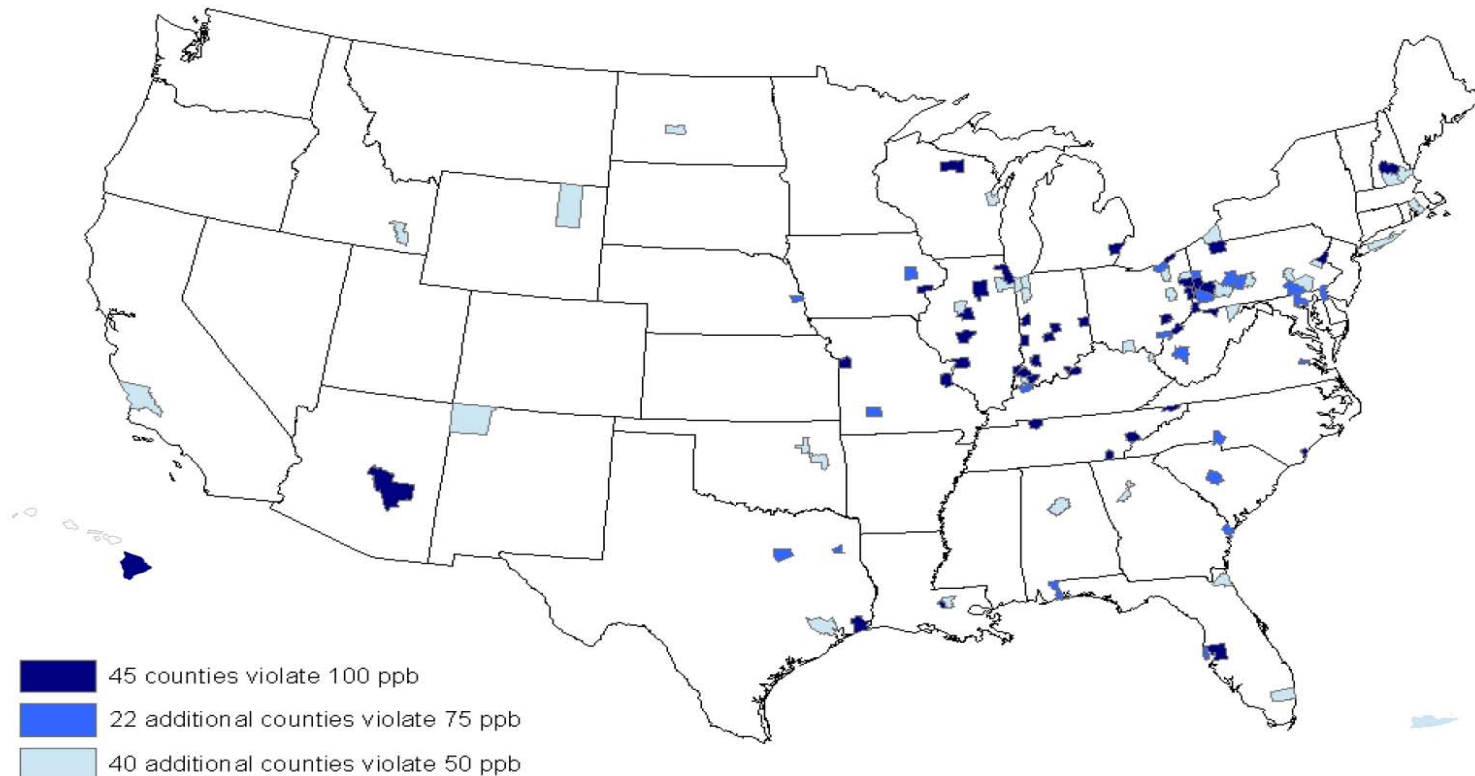
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# Interacting with the NAAQS

- Situations that call for facility-specific NAAQS evaluations:
  - Attainment/Nonattainment Designations (under the current U.S. EPA administration).
  - Major air permitting projects (PSD vs. NNSR).
  - Discretionary requests by a state agency.
- More stringent NAAQS levels will result in more stringent state developed emission limits, monitoring, etc.

# Attainment/Nonattainment Designations

Counties with Monitors Currently Violating Proposed Range for 1-hour Sulfur Dioxide Standard, 50 – 100 parts per billion



**Notes:**

<sup>1</sup>Based on the most recent air monitoring data (2006 – 2008).

<sup>2</sup>EPA will not designate areas as nonattainment on these data but likely using 2009 – 2011 data.

<sup>3</sup>Data are shown for monitors that met the following criteria: 75% of the day has valid hourly values, 75% of the days in a quarter are valid, and all 4 quarters for each of the three years are valid.

# Attainment/Nonattainment Designations

- U.S. EPA philosophy on the SO<sub>2</sub> NAAQS implementation process:
  - Proposed NAAQS rule: designations based on ambient monitoring data
  - Final NAAQS rule: designations based primarily on air quality modeling data
- Shift to reliance on air quality modeling will become a critical issue for individual facilities.

# SO<sub>2</sub> NAAQS Implementation

- NAAQS Implementation Schedule:
  - June 2011: Initial state nonattainment recommendations to U.S. EPA (most counties will be “unclassifiable”).
  - June 2013: State SIP submittals to achieve compliance with the NAAQS (including air quality modeling for individual facilities).
  - 2017: Full NAAQS compliance in all areas.

# SO<sub>2</sub> NAAQS SIP Submittals

- U.S. EPA: Revising PSD/NNSR programs to include new NAAQS is not sufficient.

Five components are required:

- “Attainment Emissions Inventory”
- Maintenance Demonstration
- Control Strategy
- Contingency Plan
- Verification of Continued Attainment

# SO<sub>2</sub> NAAQS Implementation

- State SIPS will be based on AERMOD dispersion modeling for the following individual facilities (by order of priority):
  - SO<sub>2</sub> Actual Emissions > 100 tpy
  - SO<sub>2</sub> PTE > 100 tpy
  - Smaller facilities “with a potential to cause or contribute” to a NAAQS violation
- Minor facilities will still have trouble.

# Facility Specific NAAQS Evaluation

- ❑ Modeling is based on potential-to-emit emission rates (not actual emissions).
- ❑ Hourly emission rates must be used (many permits do not have true 1-hour limits).
- ❑ Modeling must account for operating scenarios/loads that result in worst-case plume dispersion.
- ❑ Must use representative meteorological data.

# Example AERMOD Exercise

- ❑ Coal fired CFB: 1,000 MMBtu/hr
- ❑ Stack Height: 350 feet
- ❑ Stack Diameter: 10 feet
- ❑ Exhaust Flowrate: 300,000 acfm
- ❑ Exhaust Temperature: 400 °F
- ❑ Combination of simple and complex terrain
- ❑ No building downwash
- ❑ NO<sub>x</sub> and SO<sub>2</sub> Emission Rate: 0.1 lb/MMBtu

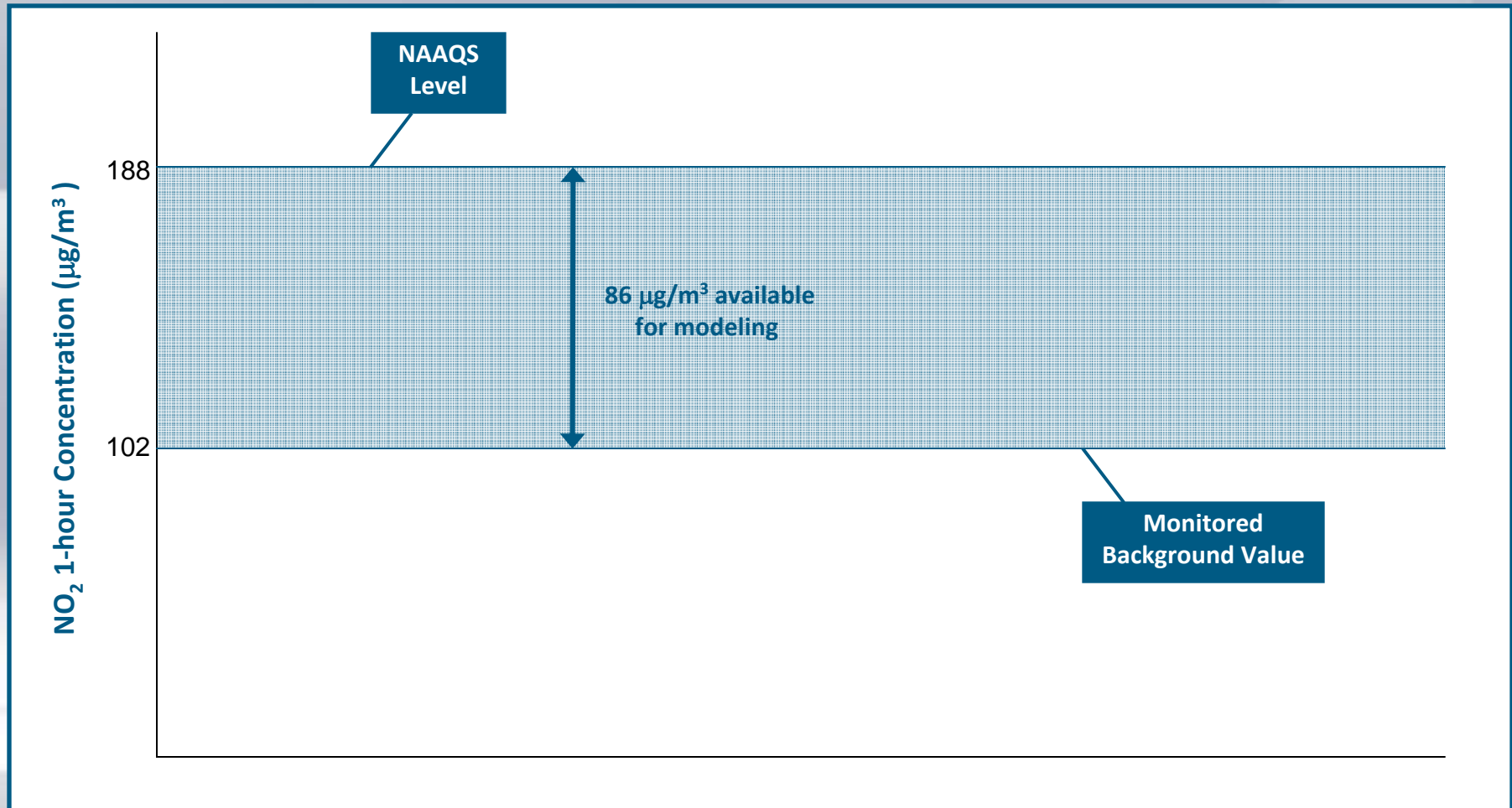
# AERMOD Results

- Ambient concentrations at 1,000 MMBtu/hr and a 0.1 lb/MMBtu emission rate:
  - Peak 1-Hour Concentration: 132  $\mu\text{g}/\text{m}^3$
  - 99<sup>th</sup> Percentile of Daily 1-Hour Peak: 98  $\mu\text{g}/\text{m}^3$
  - 98<sup>th</sup> Percentile of Daily 1-Hour Peak: 77  $\mu\text{g}/\text{m}^3$
- Results underscore the stringency of the 1-hour NAAQS.

# Ambient Background Concentrations

- NAAQS evaluation requires background concentrations to be added to modeled concentrations.
- Average 1-hour attainment concentrations across selected PA monitors in 2008:
  - NO<sub>2</sub>: 102 µg/m<sup>3</sup> (NAAQS: 188)
  - SO<sub>2</sub>: 134 µg/m<sup>3</sup> (NAAQS: 196)
- Little room available for modeled concentrations, temporal pairing is an option.

# Ambient Background Considerations



# Other NAAQS Considerations

- Atmospheric chemistry of  $\text{NO}_2$ , all emissions emitted as  $\text{NO}$  but convert to  $\text{NO}_2$  in the presence of background ozone. Three tiered approach to address chemistry:
  - Tier 1: Assume  $\text{NO}_x = \text{NO}_2$
  - Tier 2: Assume  $\text{NO}_x (0.75) = \text{NO}_2$
  - Tier 3: Use another conversion ratio on a case-by-case basis

# PSD Permitting Considerations

- Step 1 of a PSD NAAQS assessment is a significant impact analysis.
- Exceedance of the SILs will trigger a facility-wide NAAQS evaluation.
- U.S. EPA has established interim SILs:
  - 1-Hour NO<sub>2</sub> SIL: 7.5 µg/m<sup>3</sup>
  - 1-Hour SO<sub>2</sub> SIL: 7.9 µg/m<sup>3</sup>
- Guidance on NAAQS process leans toward the most conservative approaches.

# Conclusions

- The new 1-hour NAAQS levels are so stringent that they will drive project feasibility and project design.
- NAAQS will replace BACT as the most critical PSD permitting issue.
- We are approaching a regulatory climate where individual emission units have emission limits that are based on AERMOD air dispersion modeling.

# Recommendations

- Plan ahead, don't be surprised by a state request for modeling information:
  - Review existing modeling results, if available.
  - Consider exploratory modeling.
- Strategic approaches to permitting/modeling:
  - Look for emission reductions where they are available (to either avoid major source permitting or to decrease modeled impacts).
  - Consider stack height modifications.
  - Tighten emission limits where cushion is available.
  - Evaluate suitability of AERMOD to evaluate 1-hour concentrations (mixing heights, transport times, etc.).

# Questions?

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