

**Summary Minutes of the  
U.S. Environmental Protection Agency (EPA)  
Science Advisory Board (SAB) Staff Office  
Clean Air Scientific Advisory Committee (CASAC)  
Oxides of Nitrogen Primary NAAQS Review Panel  
Public Teleconference  
October 22, 2008**

Committee Members: (See Roster – Attachment A)

Scheduled Date and Time: From 11:00 a.m. to 1:00 p.m. (Eastern Time) on October 22, 2008.  
(See Federal Register Notice, Attachment B)

Location: By Teleconference

Purpose: To review draft Chapter 8 of the Risk and Exposure Assessment (REA) to Support the Review of the NO<sub>2</sub> Primary National Ambient Air Quality Standard (NAAQS)

Participants:

Dr. Jonathan M. Samet, Chair  
Prof. Ed Avol  
Dr. John R Balmes  
Dr. Joseph Brain  
Dr. James Crapo  
Dr. Douglas Crawford-Brown  
Dr. H. Christopher Frey  
Dr. Terry Gordon  
Dr. Dale Hattis  
Dr. Rogene Henderson  
Dr. Timothy Larson  
Dr. Kent Pinkerton  
Dr. Edward Postlethwait  
Dr. Richard Schlesinger  
Dr. Christian Seigneur  
Dr. Elizabeth A. (Lianne) Sheppard  
Dr. Frank Speizer  
Dr. George Thurston  
Dr. James Ultman  
Dr. Ronald Wyzga

SAB Staff Office: Dr. Angela Nugent, EPA SAB Staff Office,  
Designated Federal Officer (DFO)  
Dr. Holly Stallworth, EPA SAB Staff Office, Designated  
Federal Officer (DFO) for the chartered CASAC

EPA Participants Listed on the Agenda

Ms. Lydia Wegman, (EPA OAR)  
Dr. Stephen Graham (EPA OAR)  
Dr. Scott Jenkins (EPA OAR)

## **Teleconference Summary – October 22, 2008**

The discussion addressed the topics included in the Proposed Meeting Agenda (See Meeting Agenda - Attachment C) and followed the sequence summarized below.

### **Opening of Public Teleconference**

Dr. Angela Nugent, Designated Federal Officer (DFO) for the CASAC Oxides of Nitrogen Primary NAAQS Review Panel, opened the public teleconference. She noted that the panel complied with the requirements of the Federal Advisory Committee Act. Dr. Samet welcomed new members of the chartered CASAC, Drs. Joseph Brain and Christopher Frey and acknowledged Dr. Rogene Henderson's continued participation on the panel. He spoke of the importance of the exposure chapter.

### **REA and NAAQS Update**

Drs. Stephen Graham of EPA's Office of Air and Radiation (OAR) provided a presentation describing the major findings in Chapter 8 and Dr. Scott Jenkins provided an overview of plans for Chapter 10 of the REA (Attachment D). In response to a question, Dr. Jenkins noted that EPA planned chapter 10 to review the scientific evidence from the Integrated Science Assessment and the REA as they pertained to possible revisions to different parts of the standards (i.e., the indicator, averaging time, form, and level). EPA did not plan to make recommendations regarding a proposed standard in Chapter 10.

Ms. Lydia Wegman provided an update on the NAAQS standard for NO<sub>x</sub>. She noted the tight timeframes between completion of the NO<sub>2</sub> REA on November 21st and CASAC review in early December and between the December CASAC review and publication of the Advance Notice of Proposed Rulemaking (ANPR) in mid-January. Dr. Samet noted that the compressed time frame was "not friendly" to CASAC's peer review of the completed REA, the foundation document for the NAAQS review, prior to development of the ANPR.

### **Public Comment**

Dr. Samet introduced two members of the public who requested the opportunity to provide public comment.

The first commenter was Mr. Robert Paine of ENSR Corporation, who presented public comments on behalf of the American Petroleum Institute (Attachment E). He noted concerns about "high over predictions" in chapter 8 for roadway modeling and the roll-up technique used.

Ms. Deborah Shprentz, speaking on behalf of the American Lung Association, noted that exposure estimates for average populations were not relevant to the requirement in the Clean Air Act to predict exposures for vulnerable populations, such as asthmatics or the elderly. She noted that the assumptions in draft chapter 8 appeared tenuous and the modeling outcome unrelated to exposures scenarios for vulnerable populations. She asked CASAC to scrutinize the modeling and assumptions in chapter 8 and its role in the NAAQS decision making.

## **Report from panel workgroup on exposure**

Dr. Elizabeth "Lianne" Sheppard reported on the draft advisory letter (Attachment F) prepared by the panel's exposure workgroup. The working group developed the letter to respond to the four charge questions posed by EPA (Attachment G). Dr. Sheppard noted that the draft letter focused on model inputs, assumptions and potential biases and the need for the chapter to include a conclusion integrating the overall findings.

## **CASAC Panel Discussion - Chapter 8**

Dr. Samet opened the discussion by noting the wide range of opinions and views in panel members' individual pre-meeting comments. He asked members to identify any changes that needed to be made to the draft panel letter during the teleconference, so that the panel and chartered CASAC could consider whether to accept the advisory letter, amended to include the changes discussed.

In regard to Charge Question 1, a panel member noted that EPA had included uniform distributions of exposures where panel members have suggested differential weightings. He recommended that EPA should use differential weightings or address why those weightings were inappropriate.

Another panel member recommended that AERMOD should be adjusted to provide a better fit with observed exposures. Dr. Christian Seigneur agreed to provide a sentence recommending that EPA should use this adjustment or explain why the adjustment was not done.

Yet another panelist did not see the justification for EPA's rolling-up health benchmark values. He called for a justification based on measurements or modeling. A fellow panelist noted that EPA assumes peak one-hour concentrations are independent of average NO<sub>2</sub> levels. He noted that the current method might be overestimating the number of exceedances. Dr. James Ultman agreed to provide a sentence addressing both of these "roll-up issues" for inclusion in the response to Charge Question 1.

In regard to charge question 2, panel members discussed several issues related to the representativeness of Atlanta for the NO<sub>2</sub> exposure assessment. Members questioned whether Atlanta's high rate of air conditioning use was typical of other cities and whether the Atlanta was typical in many other ways (e.g., air quality, commute time, percentage of pop within given distance of roadways, daily variations in exposure level, monitoring data). Dr. Sheppard noted a sentence in the draft report that called for EPA to address "typical features of the population behaviors and residential patterns that suggest similarities and differences from other major cities." Panel members asked that this sentence be strengthened, either to include a sensitivity analysis based on modeling or a table comparing major factors significant in the NO<sub>2</sub> analysis for Atlanta and other major cities. Dr. Lianne Sheppard agreed to draft text calling for a more systematic comparison of Atlanta and other cities, with EPA providing a table comparing key variables as a minimum approach.

In regard to Charge Question 3 concerning uncertainty and variability, one panel member noted that the document does a "great job of listing uncertainties but doesn't prioritize them." Other panel members agreed that the document should give policy makers a sense of the significant uncertainties in the analysis and should include explicitly statements prioritizing uncertainties, identifying their order of magnitude and direction of bias. Dr. Sheppard agreed to provide text for Charge Question 3 on this point. Other panel members noted that non-quantitative models existed for providing structured, non-quantitative analysis of uncertainties. Drs. Douglas Crawford Brown and Christopher Frey agreed to provide references for qualitative analyses of uncertainty assessments.

In regard to Charge Question 4, panel members agreed that Chapter 8 should have a conclusion. Several members also suggested that the introduction to the chapter should explain that the "Health Risk Assessment" undertaken in the chapter did not involve a classic risk assessment, but instead involved analyses of exceedances of benchmark levels, levels which were based on controlled human exposure levels. A panel member noted that the method of presentation of cumulative distributions in the draft chapter did not give readers an understanding of differences among curves and recommended the use of tables to supplement curves. Dr. Lianne Sheppard agreed to provide text making these points in response to Question 4.

### **CASAC Panel Discussion - Chapter 10**

In response to EPA's slide presentation on plans for Chapter 10, individual panel members made the following points:

- If EPA plans to evaluate causality judgments in the Integrated Science Assessment in terms of averaging times, there may be few, but important, scientific studies to justify long term averaging important to protect growth of lung function in children.
- EPA's plans for Chapter 10 seem principally organized by discipline. A synthesis across disciplines is needed.
- EPA does not detail "different approaches for integrating evidences." EPA must be systematic; informal or ad hoc procedures will not be sufficient.
- Chapter 10 should include all the information previously included in the staff paper

Panel members generally voiced concern about the tight timetable for EPA's development of Chapter 10, the most important part of the REA, and the tight schedule for CASAC review. The panel agreed to note that CASAC's ability to review the science underlying the NAAQS was constrained by the schedule for developing the ANPR and the proposed rule.

### **CASAC Review/Acceptance of panel report and identification of next steps**

The panel, including chartered CASAC Members, accepted the draft report with the changes discussed during the teleconference. The Chair noted that a revised draft would be circulated to panel members with the goal of receiving panel editorial changes early in the week of October 27th, so that the letter could be finalized by October 28th.

At the chair's request, the Designated Federal Officer adjourned the meeting at 1:00 a.m.

Action items

1. Dr. Christian Seigneur agreed to provide a sentence recommending that EPA should use this adjustment or explain why the adjustment was not done. Dale's concerns about distributions only partially captured
2. Dr. James Ultman agreed to provide a sentence on two "health benchmark roll-up issues" for inclusion in the response to Charge Question 1: a) the need for EPA to justify its approach based on measurements or modeling, and b) CASAC's concern that EPA's assumptions that peak one-hour concentrations are independent of average NO<sub>2</sub> levels might overestimate the number of exceedances
3. Dr. Lianne Sheppard agreed to draft text calling for a more systematic comparison of Atlanta and other cities, to evaluate the generalizability of EPA's exposure assessment. The Panel would advise EPA to provide a table comparing key variables as a minimum approach; a more time demanding approach would be to re-run models with changes of values for other cities.
4. Dr. Lianne Sheppard agreed to provide text for Charge Question 3 recommending that Chapter 8 should give policy makers a sense of the significant uncertainties in the analysis and should include explicitly statements prioritizing uncertainties, identifying their order of magnitude and direction of bias
5. Drs. Douglas Crawford Brown and Christopher Frey agreed to provide references for qualitative analyses of uncertainty assessments.-
6. Dr. Lianne Sheppard agreed to provide text for Charge Question 4 recommending that the introduction to chapter 8 should explain that the "Health Risk Assessment" undertaken in the chapter did not involve a classic risk assessment, but instead involved analyses of exceedances of benchmark levels, levels which were based on controlled human exposure levels. She will also note that the Panel recommends that EPA provide results in tabular format as well as curves
7. Dr. Lianne Sheppard agreed to develop text the tight timetable for EPA's development of Chapter 10, the most important part of the REA, and the tight schedule for CASAC review. CASAC's ability to review the science underlying the NAAQS was constrained by the schedule for developing the ANPR and the proposed rule.

Respectfully Submitted:

/s/

Angela Nugent  
Designated Federal Officer

Certified as True:

/s/

Jonathan M. Samet  
Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

## Attachments

Attachment A	Roster
Attachment B	Federal Register Notice
Attachment C	Meeting Agenda
Attachment D	Presentation: REA and NAAQS Update
Attachment E	Presentation by Mr. Robert Paine on behalf of the American Petroleum Institute
Attachment F	Draft Advisory Letter prepared by Panel Workgroup

## **Attachment A: Roster**

### **U.S. Environmental Protection Agency Clean Air Scientific Advisory Committee (CASAC) Oxides of Nitrogen Primary NAAQS Review Panel**

#### **CHAIR**

**Dr. Jonathan M. Samet**, Professor and Chair of the Department of Epidemiology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD

#### **CASAC MEMBERS**

**Dr. Joseph Brain**, Philip Drinker Professor of Environmental Physiology, Department of Environmental Health, Harvard School of Public Health, Harvard University, Boston, MA

**Dr. Ellis B. Cowling**, University Distinguished Professor At-Large, Emeritus, Colleges of Natural Resources and Agriculture and Life Sciences, North Carolina State University, Raleigh, NC

**Dr. James Crapo**, Professor of Medicine, Department of Medicine, National Jewish Medical and Research Center, Denver, CO

**Dr. H. Christopher Frey**, Professor, Department of Civil, Construction and Environmental Engineering, College of Engineering, North Carolina State University, Raleigh, NC, USA

**Dr. Donna Kenski**, Data Analyst, Lake Michigan Air Directors Consortium, Des Plaines, IL

**Dr. Armistead (Ted) Russell**, Professor, Department of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA

#### **CONSULTANTS**

**Professor Ed Avol**, Professor, Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA

**Dr. John R. Balmes**, Professor, Department of Medicine, Division of Occupational and Environmental Medicine, University of California, San Francisco, CA

**Dr. Douglas Crawford-Brown**, Professor and Director, Department of Environmental Sciences and Engineering, Carolina Environmental Program, University of North Carolina at Chapel Hill, Chapel Hill, NC

**Dr. Terry Gordon**, Professor, Environmental Medicine, NYU School of Medicine, Tuxedo, NY

**Dr. Dale Hattis**, Research Professor, Center for Technology, Environment, and Development, George Perkins Marsh Institute, Clark University, Worcester, MA

**Dr. Rogene Henderson**, Scientist Emeritus, Lovelace Respiratory Research Institute, Albuquerque, NM

**Dr. Patrick Kinney**, Associate Professor, Department of Environmental Health Sciences, Mailman School of Public Health, Columbia University, New York, NY

**Dr. Steven Kleeberger**, Professor, Lab Chief, Laboratory of Respiratory Biology, National Institute of Environmental Health Sciences, National Institutes of Health, Research Triangle Park, NC

**Dr. Timothy V. Larson**, Professor, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA, USA

**Dr. Kent Pinkerton**, Professor, Regents of the University of California, Center for Health and the Environment, University of California, Davis, CA

**Dr. Edward Postlethwait**, Professor and Chair, Department of Environmental Health Sciences, School of Public Health, University of Alabama at Birmingham, Birmingham, AL

**Dr. Richard Schlesinger**, Associate Dean, Department of Biology, Dyson College, Pace University, New York, NY

**Dr. Christian Seigneur**, Director, Atmospheric Environment Center, Université Paris-Est, Champs-sur-Marne, France

**Dr. Elizabeth A. (Lianne) Sheppard**, Research Professor, Biostatistics and Environmental & Occupational Health Sciences, Public Health and Community Medicine, University of Washington, Seattle, WA

**Dr. Frank Speizer**, Edward Kass Professor of Medicine, Channing Laboratory, Harvard Medical School, Boston, MA

**Dr. George Thurston**, Professor, Environmental Medicine, NYU School of Medicine, New York University, Tuxedo, NY

**Dr. James Ultman**, Professor, Chemical Engineering, Bioengineering Program, Pennsylvania State University, University Park, PA

**Dr. Ronald Wyzga**, Technical Executive, Air Quality Health and Risk, Electric Power Research Institute, Palo Alto, CA

**SCIENCE ADVISORY BOARD STAFF**

**Dr. Angela Nugent**, Designated Federal Officer, 1200 Pennsylvania Avenue, NW 1400F, Washington, DC, Phone: 202-343-9981, Fax: 202-233-0643, ([nugent.angela@epa.gov](mailto:nugent.angela@epa.gov))

**Attachment B:Federal Register Notice**

Science Advisory Board Staff Office Clean Air Scientific Advisory Committee (CASAC);  
Notification of a Public Advisory Committee Teleconference of the  
CASAC Oxides of Nitrogen Primary NAAQS Review Panel

[Federal Register: September 24, 2008 (Volume 73, Number 186)]

[Notices]

[Page 55074-55075]

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ENVIRONMENTAL PROTECTION AGENCY

[FRL-8719-8]

Science Advisory Board Staff Office Clean Air Scientific Advisory  
Committee (CASAC); Notification of a Public Advisory Committee  
Teleconference of the CASAC Oxides of Nitrogen Primary NAAQS Review Panel

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

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SUMMARY: The Environmental Protection Agency (EPA) Science Advisory  
Board (SAB) Staff Office announces a public teleconference of the Clean  
Air Scientific Advisory Committee's (CASAC) Oxides of Nitrogen Primary  
NAAQS Review Panel (Panel) to conduct a peer review of the draft  
Exposure and Health Risk Characterization chapter for EPA's Risk and  
Exposure Assessment to Support the Review of the NO<sub>2</sub> Primary National  
Ambient Air Quality Standard: Second Draft.

DATES: The teleconference will be held on October 22, 2008 from 11 a.m.  
to 1 p.m. (Eastern Daylight Time).

ADDRESSES: The public teleconference will be conducted by telephone only.

FOR FURTHER INFORMATION CONTACT: Members of the public who wish to  
obtain the call-in number and access code to participate in the  
teleconference may contact Dr. Angela Nugent, Designated Federal  
Officer (DFO), EPA Science Advisory Board (1400F), U.S. Environmental  
Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460;  
via telephone/voice mail (202) 343-9981; fax (202) 233-0643; or e-mail  
at [nugent.angela@epa.gov](mailto:nugent.angela@epa.gov). General information concerning the CASAC and

the CASAC documents cited below can be found on the EPA Web site at <http://www.epa.gov/casac>.

#### SUPPLEMENTARY INFORMATION:

Background: The Clean Air Scientific Advisory Committee (CASAC) was established under section 109(d)(2) of the Clean Air Act (CAA or Act) (42 U.S.C. 7409) as an independent scientific advisory committee. CASAC provides advice, information and recommendations on the scientific and technical aspects of air quality criteria and national ambient air quality standards (NAAQS) under sections 108 and 109 of the Act. The CASAC is a Federal advisory committee chartered under the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C., App. The Panel will comply with the provisions of FACA and all appropriate SAB Staff Office procedural policies.

Section 109(d)(1) of the CAA requires that the Agency periodically review and revise, as appropriate, the air quality criteria and the NAAQS for the six "criteria" air pollutants, including oxides of nitrogen (NOX). EPA is in the process of reviewing the primary NAAQS for nitrogen dioxide (NO<sub>2</sub>), an indicator for NOX. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

As part of its scientific advice to support EPA's review of the primary NAAQS for nitrogen dioxide (NO<sub>2</sub>), CASAC met on September 9-10, 2008 to

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conduct a peer review of the Risk and Exposure Assessment to Support the Review of the NO<sub>2</sub> Primary National Ambient Air Quality Standard: Second Draft (73 FR 43444-43445). At that time, EPA had not completed chapter eight of the draft assessment entitled "Exposure and Health Risk Characterization." The purpose of the teleconference is for CASAC to conduct a peer review of the draft Chapter 8. The public may access completed CASAC advisory reports related to the primary NAAQS NO<sub>2</sub>, including the CASAC report on the Risk and Exposure Assessment to Support the Review of the NO<sub>2</sub> Primary National Ambient Air Quality Standard: Second Draft reviewed at the September 9-10 meeting, on the EPA Web site at <http://www.epa.gov/casac>.

Technical Contact: Any questions concerning Chapter 8 for EPA's Risk and Exposure Assessment to Support the Review of the NO<sub>2</sub> Primary National Ambient Air Quality Standard: Second Draft should be directed to Dr. Scott Jenkins, OAR (by telephone (919) 541-1167, or e-mail [jenkins.scott@epa.gov](mailto:jenkins.scott@epa.gov)).

Availability of Meeting Materials: Chapter 8 for EPA's Risk and Exposure Assessment to Support the Review of the NO<sub>2</sub> Primary National Ambient Air Quality Standard: Second Draft will be accessible via the

Agency's Office of Air Quality Planning and Standards Web site at [http://www.epa.gov/ttn/naaqs/standards/nox/s\\_nox\\_cr\\_rea.html](http://www.epa.gov/ttn/naaqs/standards/nox/s_nox_cr_rea.html) on or about October 3, 2008. Agendas and materials supporting the teleconference will be placed on the EPA Web site at <http://www.epa.gov/casac> before the meeting.

**Procedures for Providing Public Input:** Interested members of the public may submit relevant written or oral information for the CASAC Panel to consider during the advisory process. **Oral Statements:** Interested members of the public may submit relevant written or oral information for the SAB Panel to consider during the advisory process. **Oral Statements:** In general, individuals or groups requesting an oral presentation at a public teleconference will be limited to three minutes per speaker, with no more than a total of 30 minutes for all speakers. Interested parties should contact Dr. Angela Nugent, DFO, in writing (preferably via e-mail) by October 15, 2008 at the contact information noted above to be placed on the public speaker list for this meeting.

**Written Statements:** Written statements for the public meeting should be received by Dr. Angela Nugent at the contact information above by October 15, 2008, so that the information may be made available to the Panel for their consideration prior to the teleconference. Written statements should be supplied to the DFO in the following formats: one hard copy with original signature (optional), and one electronic copy via e-mail (acceptable file format: Adobe Acrobat PDF, MS Word, MS PowerPoint, or Rich Text files in IBM-PC/Windows 98/2000/XP format).

**Accessibility:** For information on access or services for individuals with disabilities, please contact Dr. Nugent at the phone number or e-mail address noted above, preferably at least ten days prior to the teleconference, to give EPA as much time as possible to process your request.

Dated: September 17, 2008.  
Anthony F. Maciorowski,  
Deputy Director, EPA Science Advisory Board Staff Office.  
[FR Doc. E8-22456 Filed 9-23-08; 8:45 am]

## Attachment C: Teleconference Agenda

**U.S. Environmental Protection Agency – Science Advisory Board (SAB) Staff Office  
Clean Air Scientific Advisory Committee (CASAC)  
Oxides of Nitrogen (NO<sub>x</sub>) Primary Review Panel  
Public Teleconference  
October 22, 2008  
11:00 a.m. to 1:00 p.m. Eastern time  
Agenda**

**Purpose:** to review draft Chapter 8 of the Risk and Exposure Assessment (REA) to Support the Review of the NO<sub>2</sub> Primary National Ambient Air Quality Standard (NAAQS)

11:00 a.m.	Convene the planning teleconference; take roll	Dr. Angela Nugent, EPA SAB Staff Office, Designated Federal Officer
11:05 a.m.	Agenda review	Dr. Jonathan Samet, Chair
11:10 a.m.	REA and NAAQS Update	Dr. Scott Jenkins, EPA OAR Dr. Stephen Graham, EPA OAR Ms. Lydia Wegman, EPA OAR
11:40 a.m.	Public Comments	TBA
11:45 a.m.	Report from panel workgroup on exposure	Dr. Lianne Sheppard, Workgroup chair
11:55 a.m.	Panel discussion	CASAC Panel
12:45 a.m.	CASAC Review/Acceptance of panel report and identification of next steps	Dr. Jonathan Samet
1:00 p.m.	Adjourn	Dr. Angela Nugent

# Attachment D

## Presentation: REA and NAAQS Update

### Risk and Exposure Assessment to Support the Review of the NO<sub>2</sub> Primary NAAQS

Presentation to CASAC  
October 22, 2008

### Organization of Presentation

- Exposure Assessment (Chapter 8)
  - Key observations
- Integration of scientific evidence and risk/exposure information (Chapter 10)
  - Planned approach
- Update on the schedule

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### Key Observations from NO<sub>2</sub> Exposure Assessment

- Modeled concentrations are reasonable given comparisons to available data
  - AERMOD predicted upper percentile NO<sub>2</sub> concentrations are about 10-50% (or 10 to 30 ppb) higher than ambient measurements at three monitors
  - APEX modeled daily mean NO<sub>2</sub> exposures in Atlanta (medians 3-24 ppb) are comparable to personal exposure measurements in Atlanta (median 3-14 ppb)
  - APEX modeled annual average NO<sub>2</sub> exposures using APEX, expressed as a percent of the ambient NO<sub>2</sub> concentration (40-70%), are consistent with findings reported in the ISA (30-60%)
- Estimated exposures above 1-hour health effect benchmark levels using APEX were due largely to roadway-related exposures (>99%)
  - When included, indoor sources contribute to the occurrence of NO<sub>2</sub> exposures at or above 100 ppb (61%), but little to the occurrence of higher exposures (i.e., above 200, 300 ppb)

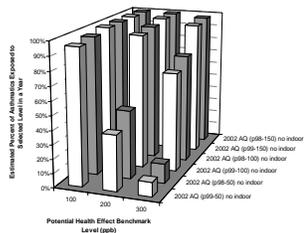
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### Key Observations from NO<sub>2</sub> Exposure Assessment (Continued)

- The estimated impact of air quality on benchmark exceedances differs by benchmark level
  - 100 ppb: For all air quality scenarios considered, more than 90% of asthmatics in Atlanta are estimated to be exposed at least one time per year
    - Of the standard levels evaluated, 50 ppb was the only level estimated to reduce repeat exposures to NO<sub>2</sub> concentrations above 100 ppb
  - 200 ppb: Of all the air quality scenarios considered, only a standard of 50 ppb is estimated to reduce the percent of asthmatics exposed at least one time (by approximately 40-50%)
  - 300 ppb: Of all the air quality scenarios considered, only standards of 50 ppb or 100 ppb are estimated to reduce the percent of asthmatics exposed at least one time (by approximately 80% and 15% respectively)
- When air quality was adjusted to simulate just meeting the current annual standard, virtually all asthmatics in Atlanta are estimated to experience 6 or more exposures per year to NO<sub>2</sub> concentrations above the highest benchmark level evaluated (300 ppb)
- Using a 98<sup>th</sup> versus a 99<sup>th</sup> percentile form made a difference of approximately 5-10% on the number of benchmark exceedances

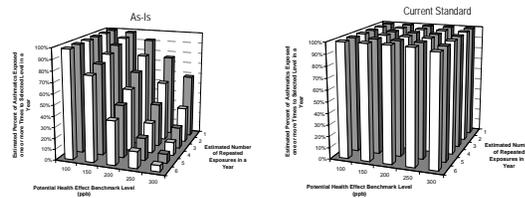
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### Percent of Atlanta Asthmatics Estimated to Experience One or More 1-h Daily Maximum NO<sub>2</sub> Exposure Per Year Above Benchmarks

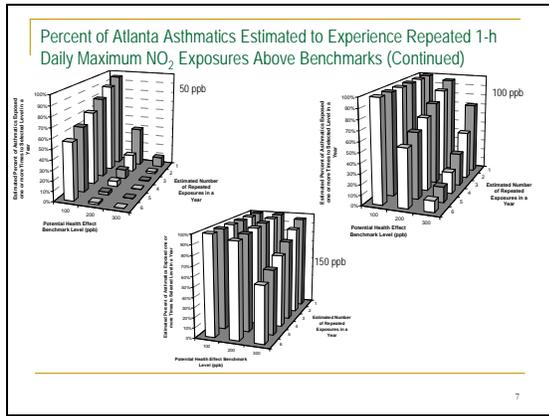


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### Percent of Atlanta Asthmatics Estimated to Experience Repeated 1-h Daily Maximum NO<sub>2</sub> Exposures Above Benchmarks



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### Integration of Scientific Evidence and Exposure/Risk Information (Chapter 10)

- Scientific evidence and exposure/risk-based information will be integrated in order to inform judgments regarding the need to retain or revise the current annual standard
- Integration will not include recommendations
- Rather, it will discuss key evidence and information and will present different approaches to integrating that evidence and information to inform decisions about the current and potential alternative standards
  - For example, one approach to integration could place more emphasis on the scientific evidence and less emphasis on the exposure/risk information while another approach could place more emphasis on the exposure/risk information
    - Each of these approaches could result in different conclusions regarding the adequacy of the current and alternative standards
- For each approach, the potential implications will be discussed for decisions regarding the current and potential alternative standards

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### Evidence-Based Considerations for Integration

- Causality judgments made in the ISA will be discussed in terms of their ability to...
  - Inform decisions regarding short-term and long-term averaging times
  - Inform decisions about the studies and health endpoints on which to focus when considering standard levels
- Results of epidemiologic studies conducted in different locations and associated with different NO<sub>2</sub> air quality will be discussed in terms of their ability to...
  - Inform decisions regarding specific averaging times
    - For example, the level of support could be discussed for 1-h and 24-h averaging times
  - Inform decisions regarding standard levels
    - NO<sub>2</sub> concentrations in studies will be considered relative to the current and potential alternative standards in order to provide information about the level of public health protection associated with different standard options

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### Evidence-Based Considerations for Integration (Continued)

- Results from controlled human exposure and toxicological studies will be considered in terms of their ability to...
  - Inform decisions regarding averaging times
    - For example, these studies will be discussed with regard to the level of support they provide for averaging times around 1-h
  - Inform decisions regarding standard levels through discussion of exposure levels shown to cause adverse effects
    - Discussion will include consideration of the broader implications of experimental studies for setting an ambient standard
- Size and composition of at-risk populations
  - Consideration can inform judgments about the potential public health implications of different standard options
- Comparisons and correlations between hourly, 24-h, and annual NO<sub>2</sub> air quality
  - For example, these comparisons will be discussed in terms of the ability of a 1-h standard to control longer-term NO<sub>2</sub> concentrations

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### Exposure- and Risk-Based Considerations for Integration

- Air quality analyses
  - For different combinations of standard forms and levels, we will consider the occurrence of ambient and near-road NO<sub>2</sub> concentrations that exceed benchmark levels in 18 locations across the U.S.
  - We will consider results across locations to inform decisions about the appropriateness of generalizing exposure and risk results from Atlanta to the rest of the U.S.
- Exposure analyses in Atlanta
  - For different combinations of standard forms and levels, we will consider the occurrence in Atlanta of NO<sub>2</sub> exposures to asthmatics that exceed benchmark levels
  - In interpreting exposure results, we will consider comparisons of modeled exposures to personal exposure monitoring results in Atlanta
  - We will consider the relative contributions of indoor versus outdoor sources to NO<sub>2</sub> exposure concentrations that exceed benchmarks
  - We will consider the appropriateness of generalizing exposure results in Atlanta to the rest of the U.S.
- Risk assessment in Atlanta
  - For different combinations of standard forms and levels, we will consider the prevalence of NO<sub>2</sub>-related respiratory emergency department visits in Atlanta
  - This will include consideration of estimates based on both single-pollutant and multi-pollutant models
  - We will consider the appropriateness of generalizing risk results in Atlanta to the rest of the U.S.

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### Key Uncertainties to be Considered

- Scientific evidence
  - Difficulty quantifying the NO<sub>2</sub> specific contribution to adverse health effects evaluated in epidemiologic studies; public health significance of endpoints evaluated in experimental studies; contribution of NO<sub>2</sub> to health effects other than respiratory effects associated with short-term exposures; use of experimental studies to inform review of an ambient standard
- Health benchmarks
  - Response in severe asthmatics; magnitude of response; percent of asthmatics who would respond; clinical-significance of NO<sub>2</sub>-related increases in the airway response
- Air quality analysis
  - Quality of air quality database; ambient measurement technique; temporal/spatial representation; approach to adjusting air quality; approach to on-road simulations
- Exposure analysis
  - Human activity patterns in APEX modeling (population commuting and daily activity diaries); meteorological data; AERMOD outputs; air exchange rates; use of air conditioners; indoor source estimates; approach to adjusting air quality; generalization of Atlanta results
- Risk analysis
  - Causality judgment; concentration-response relationship; role of co-pollutants; use of ambient concentrations as surrogate for population exposure; approach to adjusting air quality; baseline incidence data; generalization of Atlanta results

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## Revised Schedule for NO<sub>2</sub>

- **November 21, 2008:** Final NO<sub>2</sub> REA
- **Early December, 2008:** CASAC teleconference to discuss final document
- **Early January, 2009:** ANPR signed
- **Mid February, 2009:** CASAC review of ANPR
- **May 28, 2009:** Current date for proposal
  - Internal discussions are underway regarding the possibility of requesting additional time from the plaintiffs
- **December 18, 2009:** Current date for final
  - Internal discussions are underway regarding the possibility of requesting additional time from the plaintiffs
- **Also note that possible revisions to the SO<sub>2</sub> schedule are being discussed internally**