

**Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Clean Air Scientific Advisory Committee (CASAC)
Ozone Review Panel
Public Meeting
September 11-13, 2012**

Date and Time: Tuesday, September 11, 2012, 9:00 AM – 5:00 PM ET; Wednesday, September 12, 2012, 8:30 AM – 5:30 PM ET; Thursday, September 13, 2012, 8:30 AM – 1:00 PM ET

Location: Marriott City Center, 500 Fayetteville Street, Raleigh, North Carolina 27601

Purpose: The purpose of the meeting was to conduct a peer review of EPA's *Integrated Science Assessment for Ozone and Related Photochemical Oxidants (Third External Review Draft, June 2012)*, *Health Risk and Exposure Assessment for Ozone (First External Review Draft, July 2012)*, *Welfare Risk and Exposure Assessment for Ozone (First External Review Draft, July 2012)*, and *Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards (First External Review Draft, August 2012)*.

Participants: Ozone Review Panel (for full panel, see roster¹)

Dr. Jonathan Samet, CASAC Chair
Mr. George Allen
Mr. Ed Avol
Dr. Michelle Bell
Dr. Joseph Brain
Dr. David Chock
Dr. Ana Diez-Roux
Dr. W. Michael Foster
Dr. H. Christopher Frey
Dr. David Grantz
Dr. Jack Harkema
Dr. Daniel Jacob
Dr. Steven Kleeberger
Dr. Frederick Miller
Dr. Howard Neufeld
Dr. Armistead (Ted) Russell
Dr. Helen Suh
Dr. James Ultman
Dr. Sverre Vedal
Dr. Kathleen Weathers (09/12/12 - 09/13/12)
Dr. Peter Woodbury

Dr. Angela Nugent, Designated Federal Office (DFO)
Dr. Vanessa Vu, EPA Science Advisory Board Staff Office
Mr. Aaron Yeow, DFO (via teleconference)

Dr. John Vandenberg, EPA National Center for Environmental Assessment (NCEA)
Dr. Mary Ross, EPA NCEA
Dr. James Brown, EPA NCEA
Ms. Lydia Wegman, EPA Office of Air Quality and Planning Standards (OAQPS)
Dr. Karen Martin, EPA OAQPS
Dr. Bryan Hubbell, EPA OAQPS
Mr. John Langstaff, EPA OAQPS
Dr. Zachary Pekar, EPA OAQPS
Ms. Karen Wesson, EPA OAQPS
Dr. Travis Smith, EPA OAQPS
Ms. Susan Stone, EPA OAQPS
Dr. Scott Jenkins, EPA OAQPS
Ms. Vicki Sandiford, EPA OAQPS

Other Attendees (See Attachment A)

Tuesday, September 11, 2012

Opening Remarks

Dr. Angela Nugent, DFO, opened the meeting. She noted that as required under the Federal Advisory Committee Act (FACA), the Panel's deliberations are held in public with advanced notice given in the Federal Register², and the meeting minutes will be made publicly available after the meeting. She noted that the Panel received several sets of written public comments, that there were four public comment periods where the speakers have pre-registered, as well as two additional opportunities for the public to provide clarifying comments. She also noted that the SAB Staff Office reviewed information provided by the panel to determine if there were any issues with conflict-of-interest or appearance of a lack of impartiality. As a result of this review, Dr. Michelle Bell and Dr. Jonathan Samet were asked to not comment on the use of their studies as the basis of the Health Risk and Exposure Assessment (HREA) and its implications for the Policy Assessment (PA). She then turned the meeting over to Dr. Vanessa Vu, the Director of the SAB Staff Office, who welcomed the Panel members and thanked them for their public service. She indicated that the purpose of the meeting was for the CASAC, augmented with invited experts, hereafter referred to as the CASAC Ozone Review Panel, to review four draft technical documents as part of the Agency review of the National Ambient Air Quality Standards (NAAQS) for Ozone. She indicated that public input is very critical for the advisory process, thanked the public for their comments, and asked the Panel to take them into consideration during their deliberations. She then turned the meeting over to Dr. Jonathan Samet, Chair of the CASAC.

Dr. Samet welcomed everyone and gave an overview of the Agenda³. He had the panel introduce themselves, and then introduced Dr. John Vandenberg, from EPA's National Center for Environmental Assessment (NCEA) for his presentation.

EPA Presentation on the Integrated Science Assessment

Dr. John Vandenberg, EPA NCEA, made a presentation⁴ to the Panel. He thanked the Panel members and the public for their comments on the 2nd draft Ozone Integrated Science Assessment (ISA) and highlighted some of the changes made in the 3rd draft ISA, particularly with respect to integration and background ozone concentrations. He then turned it over to Dr. James Brown, who continued with the

presentation, going over the charge questions and highlighting some of the key issues. These included: human health causal determinations, background ozone concentrations, human averting behavior in response to high ozone concentrations, mode of action/possible pathways, controlled human exposure studies decrements in lung function, and a new causality refinement in the environmental effects chapter.

One panel member noted that information regarding background ozone concentration calculations in section 3.9 was incorrect and NCEA agreed that it would be deleted. Another member asked whether ISAs of other criteria pollutants would maintain a similar structure to this ISA. NCEA indicated that the front chapters would be carried forward to other ISAs, but the later chapters would be tailored for each specific pollutant being assessed.

Public Comments on the ISA

There were 9 registered public speakers to comment on the ISA and they presented according to the order in the List of Registered Public Speakers⁵. Sonja Sax spoke on behalf of the American Petroleum Institute and she presented her oral statement⁶, which focused on the plausibility of a causal association between adverse respiratory and cardiovascular effects, and short and long term ozone exposures below the current standard. Will Morgan presented comments on behalf of the Sierra Club and recommended that CASAC approve the ISA and recommend that the EPA move forward producing a new ozone standard sufficient to protect human health and welfare. Stephanie Shirley made oral comments on behalf of the Texas Commission on Environmental Quality (TCEQ) and encouraged a more rigorous and transparent weight of evidence approach that devotes more attention to the limitations of the existing studies and that the TCEQ questions the need for a separate secondary standard that is different in form and level from the primary standard. Nicole Downey, Earth System Sciences, presented slides⁷ which focused on background ozone, human health, and addressing background in implementation. Samuel Oltmans presented slides⁸ that emphasized the importance of considering observations as well as the models in discussing background ozone. Allen Lefohn presented slides⁹ that focused on the stratosphere as an important contributor to surface background ozone and that underestimates in ozone background for models are due to, in part, difficulties in characterizing the contribution from the stratosphere. Christopher Emery, ENVIRON, presented oral comments¹⁰ that focused on the comparison of recent background ozone estimates from two models: a high-resolution version of the GEOS-Chem global chemical transport model and the CAMx regional chemical transport model. Julie Goodman presented her oral statement¹¹ on behalf of the American Forest and Paper Association, which focused on EPA's weight-of-evidence approach and its evaluation of controlled human exposure studies. Deborah Shprentz, on behalf of the American Lung Association, summarized her written comments¹², which focused on urging EPA to include a flow diagram illustrating the cascade of respiratory health effects induced by ozone exposures so that lung decrements are not viewed in isolation from other health endpoints.

Panel Discussion of the ISA

Preamble, Chapter 1 (Summary), and Chapter 2(Integrative Overview)

Overall the Panel found these chapters to be an improvement over previous drafts and that are useful components for ISAs going forward. There was some discussion about how to improve Figure I to more accurately portray the NAAQS review process as well as the need for an accurate and consistent description of the legislative and historical background of the Ozone NAAQS.

Chapter 3 - Atmospheric Chemistry

The Panel found that the revised chapter has been substantially improved and was responsive to prior CASAC comments. There was some discussion about the ISA's overemphasis of the importance of the stratospheric ozone, which is not reflective of the level of understanding in the atmospheric chemistry community. There was also discussion about defining ozone background concentrations.

Chapter 4 - Exposure

Overall the Panel found that revisions made to Chapter 4 were an improvement over previous drafts.

Chapter 5 - Dosimetry

The Panel found that the chapter was improved. There was discussion that the upper respiratory tract should not be treated simplistically and that the term "species homology" be added to the chapter title.

Chapters 6-7 - Health Effects

The Panel found that the revisions to the chapter were an improvement. They found that further work was needed on separating out the definitions of long and short term exposures as well as separating our effects from short and long term exposures. The Panel recommended that the ISA combine the discussions on interaction and effect modification because they are not usually thought of as different things. There was some discussion about the causal determination for cardiovascular effects and the Panel still recommended that the designation should be "likely to be causal."

Chapter 8 - Populations at Risk

Although the Panel found the chapter to be improved and has moved in the right direction, they found that there was still some conflation of the discussion of factors that cause certain groups to be exposed to higher levels versus factors that modify the effect of the exposure on the health outcomes.

Chapters 9 - 10 - Environmental Effects

The Panel found Chapters 9 and 10 to be improved over previous versions and provided a good summary of vegetation effects. They stated that it was important for Chapter 9 to reaffirm the validity of the open-top chamber studies. They found that the ISA does a good job summarizing agricultural crop data but noted that this gets dropped in the PA and stressed the importance of recognizing the effect of ozone on crop yields.

EPA Presentation on the Health Risk and Exposure Assessment

Ms. Lydia Wegman, EPA OAQPS, presented slides¹³ that covered the anticipated NAAQS review schedule and process. Dr. Bryan Hubbell presented an overview of the REA and PA¹⁴ documents. They focused on the role of the REA and PA documents in the NAAQS review process as well as overarching issues such as interpreting epidemiological evidence and the role of background ozone. There was some discussion by the Panel members and the EPA regarding background ozone as well as the remaining review schedule. Ms. Karen Wesson, EPA OAQPS, then proceeded with EPA's presentation on the HREA¹⁵. She focused on Chapter 4 (Air Quality Considerations), Mr. John Langstaff, EPA OAQS, focused on Chapters 5 (Characterization of Population Exposure) and 6 (Controlled Human Exposure)

Studies), and Dr. Zachary Pekar focused on Chapters 7 (Epidemiological Studies) and 8 (National Scale Assessment).

Public Comments on the HREA

There were 9 registered public speakers to comment on the HREA and they presented according to the order in the List of Registered Public Speakers⁵. Sonja Sax, representing the American Petroleum Institute, presented her oral statement¹⁶, which focused on the general approach that's used in the REA for estimating health effects associated with short term ozone exposures based on the epidemiology evidence. John Heuss presented his oral statement¹⁷ on behalf of the Alliance for Automobile Manufacturers, which focused on 8 of the goals stated in the HREA. Richard Smith gave oral comments¹⁸ on epidemiological/statistical aspects of the risk assessment. Samuel Oltmans presented slides¹⁹ that focused on the role of background in characterizing the diurnal variations that are used in the risk assessment. Allen Lefohn presented slides²⁰ focused on background ozone being important for assessing risk. Christopher Emery, ENVIRON International Corporation, summarized his written comments²¹, which focused on the approach to project urban air quality data for the purposes of calculating city/population-specific health risks. Julie Goodman presented her oral statement²² on behalf of the American Forest and Paper Association, which focused on the characterization of health risks based on controlled human exposure studies in the first draft REA. Anne Smith presented slides²³ on behalf of the Utility Air Regulatory Group, which focused on the HDDM rollback method. Deborah Sphrentz presented her oral statement²⁴ on behalf of the American Lung Association, which focused on population excluded from the HREA, air quality scenarios, health endpoints examined, and communication of results.

Panel Discussion on the HREA

Chapters 1-3 - Introduction, Conceptual Model, and Scope

The Panel recommended that the CASAC's deliberations and communications from the previous NAAQs review cycle be reflected more accurately in Chapter 1. They did not find that a conceptual model or framework was adequately presented in Chapter 2.

Chapter 4 - Air Quality

The Panel had some discussion on the two overlapping time periods and agreed that they were appropriate. The Panel had some discussion about the advantages and disadvantages of using the HDDM method over the quadratic rollback approach. The Panel agreed that the HDDM method is preferable over the quadratic rollback approach.

Chapter 5 - Population Exposure

The Panel found that the description of the Air Pollution Exposure (APEX) model could be improved, particularly with regards to model performance and validation. The Panel recommended that the representativeness of the Consolidated Human Activity Database (CHAD) be examined.

The meeting was recessed for the day at 5:00 pm.

Wednesday, September 12, 2012

The meeting was reconvened at 8:30 am. Dr. Nugent called attention to the public comment period at the end of the day for additional clarifying comments from the public.

Panel Discussion on the HREA (cont'd.)

Chapter 5 - Population Exposure (cont'd.)

The Panel members recapped what was discussed the previous day regarding Chapter 5 and the importance of re-examining the representatives of CHAD with other time-activity data was discussed.

Chapter 6 - Controlled Human Exposure

The Panel agreed that the forced expiratory volume in one second (FEV₁) seems to be the best respiratory response indicator, but that the EPA should provide a stronger justification and rationale for using it over other indicators.

Chapter 7 - Epidemiology

The Panel found that the selection of studies was appropriate and that the uncertainty and variability discussion was rigorous. They recommended that the presentation of results could be improved by reducing repetition, prioritizing, and consolidating results. There was some discussion about how background ozone was taken into account in the risk estimates.

Chapter 8 - National Scale Risk Assessment

The Panel's discussion focused on the need for a better explanation and rationale of how the lowest measured levels (LMLs) were being used in the risk estimates. The Panel also recommended that the EPA quantify the correlation between exposure metrics.

Chapter 9 - Synthesis

The Panel found that the chapter was more of a summary than a true synthesis. They recommended that the chapter should focus on integrating the key points from the other chapters and on how the findings relate to each other.

EPA Presentation on Additional Analyses under Consideration for Inclusion in the Second Draft Ozone HREA

EPA presented a document²⁵ that outlined additional analyses they were considering for inclusion in the Second Draft Ozone HREA. The Panel then went through the document and prioritized²⁶ the analyses.

EPA Presentation on the Welfare Risk and Exposure Analysis

Dr. Travis Smith, EPA OAQPS, presented slides²⁷ which presented the WREA and focused on the following issues: the W126 national scale "fused surface", ecological effects, relative biomass loss, abundance-weighted biomass loss, national park case study areas, visible foliar injury, ecosystem

services assessment, national scale assessment, urban case studies, and potential updates for the second draft.

The Panel was ahead of schedule so proceeded with the Panel discussion on the WREA.

Panel Discussion on the WREA

Chapters 1-3 - Introduction, Conceptual Model, and Scope

The Panel found the conceptual model to be useful, but that greater distinction be made between well-known vegetation effects and vegetation effects that are less well-known. The Panel discussed the need for the scope of the WREA to provide greater focus on crop yield losses.

Public Comments on the WREA

There were 2 registered public speakers to comment on the WREA as indicated on the List of Registered Public Speakers⁵. Christopher Emery, ENVIRON, withdrew his request to provide an oral comment, and Jacqueline Patterson, NAACP, did not respond when called upon to present her oral comment.

Panel Discussion on the WREA (cont'd.)

Chapter 4 - Air Quality

The Panel found that the overall approach for developing a national scale surface of W126 to be appropriate. They stated that there is a need to be more transparent about which exposure estimates are based primarily on measurements and which are based on modeling. They recommended that the HDDM also be used in the WREA, as it is used in the HREA.

Chapter 5 - Ecological Effects and Chapter 6 - Ecosystem Services

The Panel found that ecological effects were adequately presented as was the broad range of ecosystem services affected. The Panel recommended that the EPA consider consolidating the two chapters so that the underlying ecological impacts could be more directly linked to the services they provide. The Panel strongly recommended that greater attention needs to be given to crop yield losses.

Chapter 7 - Synthesis

Similar to the HREA, the Panel found the chapter to be more of a summary rather than a synthesis. They recommended that the summaries be placed at the end of each chapter and to integrate each of the risk sections to provide a comprehensive and synthetic analysis.

Opportunity for Clarifying Remarks from Members of the Public

The public was offered an opportunity to provide clarifying remarks. Sonja Sax, on behalf of the American Petroleum Institute, presented slides²⁸ that focused on BenMAP analyses and confidence intervals. Christopher Emery, ENVIRON, provided clarifying remarks pertaining to how HDDM is going to be used in the risk and exposure assessments. Nicole Downey, Earth System Sciences, presented a slide²⁹ that focused on a comparison of HDDM with quadratic rollback.

Further Panel Discussion

The Panel had further discussion on background ozone and how background is taken into account in the risk and exposure assessments.

The meeting was recessed for the day at 4:39 pm.

Thursday, September 13, 2012

The meeting was reconvened at 8:30 am.

EPA Presentation on the Policy Assessment

Dr. Karen Martin, EPA OAQPS, presented slides³⁰ that provided an overview of the PA. She focused on the history of how background is taken into consideration in the NAAQS. Ms. Susan Stone, EPA OAQPS, continued the presentation and focused on Chapter 2 – weight of evidence conclusions, controlled human exposure studies, epidemiologic studies, and public health considerations. Dr. Scott Jenkins focused on Chapters 3 and 4 – exposure and risk results, staff preliminary conclusions on adequacy of current primary Ozone NAAQS, preliminary conclusions regarding additional analyses for 2nd draft HREA, and considerations in translating epidemiologic evidence. Ms. Vicki Sandiford focused on Chapters 5 – 7: environmental effects evidence, welfare risk and exposure, staff preliminary conclusions on adequacy of current secondary Ozone NAAQS, preliminary conclusions regarding additional analyses for 2nd draft WREA.

The Panel had further discussion and clarifying questions for EPA regarding how background is considered in calculating total risk and how it is considered when simulating just meeting the standard.

Public Comments on the PA

There were 3 registered public speakers to comment on the PA as listed on the List of Registered Public Speakers⁵. Deborah Sphrentz had previously withdrawn her request to provide oral comments on the PA. George Wolff was not available and Jon Heuss, AIR Improvement Resource, Inc., spoke in his place. He presented slides that focused on background ozone, consistency of epidemiologic associations being overstated in the PA, and dose-plausibility not being rigorously evaluated in the PA. Roger McClellan summarized his written comments³¹ to the Panel, which focused on the NAAQS process being cumbersome, the challenge of using science to inform public policy judgments, consensus masquerading as science, science and personal preferences, public availability of raw data, the 1st draft PA being a placeholder, background ozone, and multi-pollutant orientation.

Panel Discussion on the PA

Chapter 1 - Introduction

The Panel recommended that Chapter 1 provide a clear description and definition of ozone background and how it is considered in the developing risk estimates as well as in developing the standards. The Panel also recommended that the metric of the secondary standard needs to be discussed in this chapter.

Chapter 2 - Overview of Health Evidence and Chapter 3 - Health Exposure and Risk Assessments

The Panel found that the weight of the evidence conclusions of the ISA were appropriately reflected in the PA. They recommended that studies in the ISA that contributed the most to the causal determinations be clearly highlighted in the PA. The CASAC was supportive of the information contained in Chapter 3, but recommended that the presentation of findings be refined, focusing only on the key points.

Chapter 4 - Preliminary Conclusions on the Primary NAAQS

The Panel found that the discussion on the primary ozone standard could be strengthened by focusing on the key points that lead to the conclusion that the existing standard needs to be reconsidered. The Panel found that the PA provided a scientific basis for consideration of a range of 60 to 70 ppb and that 80 ppb should not be considered.

Chapter 5 - Welfare Evidence

The Panel found that the consideration of welfare impacts was not appropriately balanced. There is abundant scientific evidence regarding ozone impacts on crop species and this was not adequately reflected in the PA. There should be more discussion of these substantial impacts on crop yield in the PA.

Chapter 6 - Welfare Exposure and Risk Assessments

The Panel found that the chapter nicely summarized the WREA. They recommended that the scope of the PA should be expanded to include regional yield losses of sensitive species of annual and perennial crops.

Chapter 7 - Preliminary Conclusions on the Secondary NAAQS

The Panel concurred with the EPA's conclusion that the current secondary standard is inadequate to protect vegetation and ecosystems, but found that the foundation for the conclusion is too narrow because the analysis focuses on just Class I areas and on trees. They recommended that effects on sensitive crops, trees in regions outside of Class I areas, and additional ecosystem impacts should be included. There needs to be a better justification of the proposed level, or range of levels, to consider for a secondary standard, such as a predicted 5% loss of crop yield and a predicted 1-2% loss for trees. Greater emphasis should be placed on analyzing yield losses for a number of crops.

Opportunity for Clarifying Remarks from Members of the Public

The public was offered an opportunity to provide clarifying remarks. Mr. Ted Steichen, American Petroleum Institute, presented clarifying remarks³², which focused on the schedule of the NAAQS review, and on the CASAC's charter.

Dr. Samet discussed next steps and the meeting was adjourned by Dr. Nugent at 11:30 am.

Respectfully Submitted:

Certified as Accurate:

/Signed/

/Signed/

Mr. Aaron Yeow
Designated Federal Officer
EPA SAB Staff Office

Dr. Jonathan M. Samet
Chair
CASAC

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by Panel members during the course of deliberations within the meeting. Such ideas, suggestions and deliberations do not necessarily reflect 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, commentaries, letters or reports prepared and transmitted to the EPA Administrator following the public meetings.

Materials Cited

The following meeting materials are available on the CASAC website: <http://www.epa.gov/casac>, at the [September 11-13, 2012 CASAC Ozone Review Panel Meeting page](#):

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- ¹ Roster
 - ² Federal Register Notice Announcing the Meeting
 - ³ Agenda for September 11-13, 2012 Public Meeting
 - ⁴ Agency Presentation on Integrated Science Assessment
 - ⁵ Registered Public Speakers
 - ⁶ Public Comments on the Integrated Science Assessment from the American Petroleum Institute
 - ⁷ Public Comments on the Integrated Science Assessment from Nicole Downey on behalf of Earth System Sciences - Slides
 - ⁸ Public Comments on the Integrated Science Assessment from Samuel Oltmans - Slides
 - ⁹ Public Comments on the Integrated Science Assessment from Allen Lefohn - Slides
 - ¹⁰ Public Comments on the Integrated Science Assessment from ENVIRON
 - ¹¹ Public Comments on the Integrated Science Assessment from the American Forest and Paper Association
 - ¹² Public Comments on the Integrated Science Assessment from Deborah Shprentz, American Lung Association
 - ¹³ Review of the O3 NAAQS: Schedule and Process
 - ¹⁴ Review of the O3 NAAQS: Overview of First Drafts of Risk and Exposure Assessments (REAs) and Policy Assessment (PA)
 - ¹⁵ Review of the O3 NAAQS: First Draft Health Risk and Exposure Assessment (REA)
 - ¹⁶ Public Comments on the Health Risk and Exposure Assessment from the American Petroleum Institute
 - ¹⁷ Public Comments on the Health Risk and Exposure Assessment from John Heuss, Air Improvement Resource, Inc.
 - ¹⁸ Public Comments on the Health Risk and Exposure Assessment from Richard Smith - oral statement
 - ¹⁹ Public Comments on the Health Risk and Exposure Assessment from Samuel Oltmans - Slides
 - ²⁰ Public Comments on the Health Risk and Exposure Assessment from Allen Lefohn - Slides
 - ²¹ Public Comments on the Health Risk and Exposure Assessment from ENVIRON
 - ²² Public Comments on the Health Risk and Exposure Assessment from the American Forest and Paper Association
 - ²³ Public Comments on the Health Risk and Exposure Assessment from Anne Smith, on behalf of the Utility Air Regulatory Group
 - ²⁴ Public Comments on the Health Risk and Exposure Assessment from Deborah Shprentz, American Lung Association
 - ²⁵ Additional Analyses under Consideration by EPA for Inclusion in the Second Draft Ozone Health Risk and Exposure Assessment
 - ²⁶ CASAC Ozone Review Panel Assignment of Priorities (Red Text) Additional Analyses under Consideration by EPA for Inclusion in the Second Draft Ozone Health Risk and Exposure Assessment
 - ²⁷ Review of the O3 NAAQS: First Draft Welfare Risk and Exposure Assessment (REA)
 - ²⁸ Public comments on the Health Risk and Exposure Assessment from Sonja Sax, on behalf of the American Petroleum Institute - clarifying comments (9/12/12)
 - ²⁹ Public comments on the Health Risk and Exposure Assessment from Nicole Downey, on behalf of Earth System Sciences - clarifying comments (9/12/12)
 - ³⁰ Review of the O3 NAAQS: First Draft Policy Assessment
 - ³¹ Public Comments on the Policy Assessment from Roger McClellan
 - ³² Public Comments on the Policy Assessment from Ted Steichen, on behalf of the American Petroleum Institute - clarifying comments.

**ATTACHMENT A – Other Attendees
CASAC Ozone Panel Public Meeting**

Name	Affiliation
Anenberg, Susan	EPA
Davis, Christine	EPA
Downey, Nicole	Earth System Sciences
Drechsler, Deborah*	California Air Resources Board
Dube, Eric*	CF Industries
Emery, Christopher	ENVIRON International Corporation
Gephart, Larry*	ExxonMobil Biomedical Sciences, Inc.
Goodman, Julie	Gradient
Gouze, Steve*	California Air Resources Board
Herrick, Jeff	EPA
Heuss, Jon*	Alliance of Automobile Manufacturers
Hopkinson, Jenny*	InsideEPA
Lamson, Amy	EPA
Lefohn, Allen	A.S.L. & Associates
McClellan, Roger	Toxicology and Human Health Risk Analysis
Morgan, Will	Sierra Club
Moustakas, Nicholas*	Health Effects Institute
Novack, Kris	EPA
Oltmans, Samuel	University of Colorado
Sax, Sonja	Gradient
Shirley, Stephanie	Texas Commission on Environmental Quality
Shprentz, Deborah	Consultant to the American Lung Association
Simon, Heather	EPA
Smith, Anne	Utility Air Regulatory Group
Smith, Richard	University of North Carolina
Steichen, Ted	American Petroleum Institute
Wells, Ben	EPA
Wolff, George*	Air Improvement Resources
Woods, Clint*	U.S. House of Representatives
Zhang, Yuquan	RTI International

*via teleconference