

**Summary Minutes of the  
U.S. Environmental Protection Agency  
Clean Air Scientific Advisory Committee (CASAC) and CASAC Ozone Review Panel  
Public Meeting  
March 25 – 27, 2014  
Chapel Hill, NC**

CASAC Members<sup>1</sup>: Dr. Christopher Frey, Chair  
Dr. Helen Suh  
Dr. Ron Wyzga  
Mr. George Allen

CASAC Ozone  
Review Panel Members<sup>2</sup>: Dr. Michelle Bell  
Dr. Armistead (Ted) Russell  
Mr. Ed Avol  
Dr. Joseph D. Brain  
Dr. David Chock  
Dr. David Grantz  
Dr. Daniel Jacob  
Dr. Steven Kleeberger (March 26-27, 2014 only)  
Dr. Frederick J. Miller  
Dr. Howard Neufeld  
Dr. James Ultman  
Dr. Sverre Vedal  
Dr. Peter Woodbury

Purpose: To review the EPA's *Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards* (Second External Review Draft, February 2014), *Health Risk and Exposure Assessment for Ozone* (Second External Review Draft, February 2014) and *Welfare Risk and Exposure Assessment for Ozone* (Second External Review Draft, February 2014).

Designated Federal Officer: Dr. Holly Stallworth, Designated Federal Officer

Other EPA Staff: Christopher Zarba, Alison Davis, Amy Lamson, Ben Wells, Bryan Hubbell, Christine Sims, Connie Meacham, D.L. Murphy, David Orlin, Diana Wong, Erika Sasser, Heather Simon, James Brown, James Hamby, Jeff Herrich, Joann Rice, John Langstaff, John Vandenberg, Joseph Pinto, Karen Wesson, Kris Novak, Matthew Davis, Meredith Lassiter, Molly Zawacki, Pat Dolwick, Robin Langdon, Scott Jenkins, Stephen Graham, Steve Silounen, Susan Stone, Tom Long, Travis Smith, Vicki Sandiford, Zachary Pekar

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<sup>1</sup>/ For full CASAC roster, see [epa.gov/casac](http://epa.gov/casac).

<sup>2</sup>/ For full Ozone Review Panel roster, see [epa.gov/casac](http://epa.gov/casac) and click on Ozone Review Panel.

Public attending in Person: Allen Lefohn (ASL & Associates); Ammie Bachman (Exxon Mobil); Bruce Buckholt (no affiliation given); Bruce Copley (Exxon Mobil); Chris Emery (Environ Corporation); Cindy Langworthy (Hunton & Williams); Dave Pavlich (Phillips GG); David Baron (Earthjustice); Deborah Shprentz (American Lung Association); Gary Yoden (Clime Corporation); Gayatn Anhem (CAC); George Wolff (Air Improvement); Greg Bertelsen (National Association of Manufacturers); Jeff Holmstead (Bracewell & Giuliani); John Jansen (Southern Co.); John Norman (EMBSI); Josh Stebbins (Sierra Club); Kurt Blasé (Blasé Group); Leonard Trasande (NYU School of medicine); Lori Cherry (North Carolina Division of Air Quality); Lorraine Gershman (American Chemistry Council); Mary Martin (U.S. Chamber of Commerce); Milan Hazuchaf (University of North Carolina); Nick Moustacks (Health Effects Institute); Nicole Downey (Earth Systems Sciences); Paul Garbe (Center for Disease Control); Peter Campen (University of North Carolina); Raquel Silva (University of North Carolina); Richard Smith (University of North Carolina); Sally Shauer (Shauer Consulting); Sonja Sax (Gradient); Stewart Holms (American Forest and Paper Association); Ted Steichen (American Petroleum Institute); Tim Rensincke (Gradient); Tom Ballou (Virginia Department of Environmental Quality); V. Alreum (Fuel Tech.); William F. McDonnell (William F. McDonnell Consulting)

Public watching Webcast: David C. Reynolds (Liesch A Terracon Company); Jed Anderson (SIP Transformation Workgroup); Linda Wilson (New York Attorney General's Office); Tom Downs (Maine Department of Environmental Protection); David C. Ailor (National Oilseed Processors Association); Howard J. Feldman (American Petroleum Institute); Charlie Bennett (Marathon Petroleum Company LP); Linda Tombras Smith (California Environmental Protection Agency); \_Bojan Skerlak (Institute for Atmospheric and Climate Science, Zürich, Switzerland); Christopher Wilson (CivicaUSA); Vivian H. Aucoin (Louisiana Dept. of Environmental Quality); Judy Hess (Shell Oil Company); Sam Oltmans (University of Colorado, National Oceanic and Atmospheric Administration); Anya Caudill (Washington State Department of Ecology); Gayle M. Sweigert (California Air Resources Board); John Langstaff (U.S. EPA); Susan Stone (U.S. EPA); Lucy Fraiser (Zephyr Environmental Corporation); John Vandenberg (U.S. EPA); Roger Jerry (South Carolina Dept of Health and Environmental Control); Sunil Kumar (Metropolitan Washington Council of Governments); Charlie Bennett (Marathon Petroleum Company LP); Cathe Kalisz (American Petroleum Institute); Tim Jones (Samsung Austin Semiconductor); Stan Young (National Institute of Statistical Standards); Alison Davis (U.S. EPA); Jon Heuss (Air Improvement Resource, Inc.); Glenn M. Eurick (Kennecott Utah Copper); Steve Dutton (U.S. EPA); Will Ollison (American Petroleum Institute); Kurt Blasé (representing Kennecott Utah Copper); Tom Downs (Maine Department of Environmental Protection); Joanne Rice (U.S. EPA); Andy Holland (URS Corporation)

Meeting Materials and Meeting Webpage:

The materials listed below may be found on the meeting webpage at:  
<http://yosemite.epa.gov/sab/sabproduct.nsf/bf498bd32a1c7fdf85257242006dd6cb/84006d7423b29d9b85257b96004a8381!OpenDocument&Date=2014-03-25>

- Agenda
- Federal Register Notice
- Charge Memos
- Review Documents
  - *Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards* (Second External Review Draft, February 2014),
  - *Health Risk and Exposure Assessment for Ozone* (Second External Review Draft, February 2014)
  - *Welfare Risk and Exposure Assessment for Ozone* (Second External Review Draft, February 2014).
- Agency Presentations
- Committee Members' Comments
- Registered Public Speakers
- Public Comments
  - American Forest and Paper Association Oral Statement by Kristin Zu
  - American Lung Association Oral Statement on Policy Assessment presented by Deborah Shprentz
  - American Lung Association Oral Statement on the Draft Risk and Exposure Assessment by Deborah Shprentz
  - Comments on the Health Risk & Exposure Assessment - Richard Smith
  - Comments on the Policy Assessment - Richard Smith
  - Oral Comments on the Health Risk and Exposure Assessment - Stewart Holm, on behalf of American Wood Council
  - Oral Comments on the Health Risk and Exposure Assessment - Stewart Holm, on behalf of the American Forest & Paper Association
  - Oral Comments on the Policy Assessment - Roger McClellan
  - Oral Comments on the Policy Assessment - Tim Verslycke, on behalf of the Utility Air Regulatory Group
  - Oral Comments on the Policy Assessment by Sonja Sax, funded by the American Petroleum Institute
  - Oral Comments on the Policy Assessment on behalf of the Treated Wood Council presented by Julie Goodman
  - Oral Comments on the Welfare Risk and Exposure Assessment - Tim Verslycke, on behalf of the Utility Air Regulatory Group
  - Oral statement from Greg Bertelson, National Association of Manufacturers
  - Oral Statement on Policy Assessment by Roger McClellan
  - Oral Statement on the Health Risk and Exposure Assessment by Sonja Sax, funded by the American Petroleum Institute
  - Oral Statement on the Health Risk and Exposure Assessment on behalf of the Treated Wood Council presented by Julie Goodman
  - Presentation on Background Surface Ozone in the Policy Assessment - Allen Lefohn
  - Presentation on Policy Assessment - Leonardo Trasande, NYU School of Medicine
  - Presentation on Policy Assessment - Stanley Young
  - Presentation Slides on the Policy Assessment by Samuel Oltmans
  - Samuel Oltmans' comments on Health Risk and Exposure Assessment
  - Slides on Health Risk and Exposure Assessment from George Wolff for the Alliance of Automobile Manufacturers
  - Utility Air Regulatory Group (UARG) Slides on the Policy Assessment submitted by Tim Verslycke
  - Comments from the Alliance of Automobile Manufacturers submitted by Giedrius Ambrozaitis
  - Comments on Background Ozone submitted by George Wolff for the Alliance of Automobile Manufacturers

- Comments on Policy Assessment - David Baron, on behalf of the American Lung Association
- Comments on the Health Risk & Exposure Assessment - Sonja Sax, funded by the American Petroleum Institute
- Comments on the Health Risk & Exposure Assessment - Alan Leston, Air Quality Research & Logistic, LLC
- Comments on the Health Risk & Exposure Assessment - Allen Lefohn and Samuel Oltmans
- Comments on the Health Risk & Exposure Assessment - Christopher Emery, on behalf of Environ
- Comments on the Health Risk & Exposure Assessment - Richard Hyde, Texas Commission on Environmental Quality
- Comments on the Health Risk & Exposure Assessment - William McDonnell
- Comments on the Health Risk & Exposure Assessment and the Policy Assessment - Josh Stebbins, Sierra Club
- Comments on the Health Risk & Exposure Assessment and the Policy Assessment - Timothy Hunt, American Forest & Paper Association and American Wood Council
- Comments on the Health Risk & Exposure Assessment and the Policy Assessment
- Comments on the Health Risk & Exposure Assessment from American Chemistry Council submitted by Lorraine Gershman
- Comments on the Health Risk & Exposure Assessment, Welfare Risk & Exposure Assessment, and the Policy Assessment - Nicole Downey, on behalf of Earth System Sciences, LLC
- Comments on the Health & Exposure Assessment - Anne Smith, on behalf of Utility Air Regulatory Group. (PDF, 7 pp., 710,227 bytes)
- Public comment submitted to the SAB Staff Office
- Comments on the Policy Assessment - Allen Lefohn and Samuel Oltmans
- Comments on the Policy Assessment - Andrea Jansa
- Comments on the Policy Assessment - Anne Smith, on behalf of Utility Air Regulatory Group
- Comments on the Policy Assessment - Barrett Smith
- Comments on the Policy Assessment - Center for Biological Diversity
- Comments on the Policy Assessment - David Bottoriff, Association of Indiana Counties, Inc.
- Comments on the Policy Assessment - David Wolkins, Indiana State Representative
- Comments on the Policy Assessment - Delegate Brenda Pogge of Virginia
- Comments on the Policy Assessment - Delegate Ed Scott of Virginia
- Comments on the Policy Assessment - Delegate Tim Hugo of Virginia
- Comments on the Policy Assessment - Dennis Simmers
- Comments on the Policy Assessment - Dewitt Peart, Greater Pittsburgh Chamber of Commerce
- Comments on the Policy Assessment - Edward Timmons
- Comments on the Policy Assessment - Elizabeth Kallas, Indiana Chamber
- Comments on the Policy Assessment - Gene Barr , Pennsylvania Chamber of Business and Industry
- Comments on the Policy Assessment - Georgia Murray, Appalachian Mountain Club
- Comments on the Policy Assessment - Greg Kohn
- Comments on the Policy Assessment - James Greco
- Comments on the Policy Assessment - Jeffrey Holmstead, Bracewell & Giuliani LLP
- Comments on the Policy Assessment - John Ramsey
- Comments on the Policy Assessment - Kelly Robbins, on behalf of the Arkansas Independent Producers & Royalty Owners Association
- Comments on the Policy Assessment - Kisha Hines, Scana Corporation
- Comments on the Policy Assessment - Mayor Chuck Fewell, Greenfield, IN.
- Comments on the Policy Assessment - Mayor Garth Nobles, Live Oak, Florida
- Comments on the Policy Assessment - Nathan Noland, Indiana Coal Council

- Comments on the Policy Assessment - Patrick Kiely, Indiana Manufacturers Association
- Comments on the Policy Assessment - Phil Towles
- Comments on the Policy Assessment - Phillip Puckett, Senate of Virginia
- Comments on the Policy Assessment - Randy Power
- Comments on the Policy Assessment - Randy Zook, Arkansas State Chamber
- Comments on the Policy Assessment - Ray McCarty, Associated Industries of Missouri
- Comments on the Policy Assessment - Richard Hyde, Texas Commission on Environmental Quality
- Comments on the Policy Assessment - Rick Clifton, Covington County Economic Development Commission
- Comments on the Policy Assessment - Rick Wajda, Indiana Builders Association
- Comments on the Policy Assessment - Senator Eddie Joe Williams, Arkansas Senate
- Comments on the Policy Assessment - Senator Elder Vogel, Jr, Senate of Pennsylvania
- Comments on the Policy Assessment - Senator Frank Ruff, Senate of Virginia
- Comments on the Policy Assessment - Senator Gene Yaw, Pennsylvania State Senate
- Comments on the Policy Assessment - Senator John Yudichak, Pennsylvania Senate Environmental Resources and Energy Committee
- Comments on the Policy Assessment - Sonja Sax, funded by the American Petroleum Institute
- Comments on the Policy Assessment - State Senator Scott Hutchinson, Senate of Pennsylvania
- Comments on the Policy Assessment - Steve Bisenius, Lee County Economic Development
- Comments on the Policy Assessment - Steven Ferren, Arkansas Oil Marketers Association, Inc.
- Comments on the Policy Assessment - Wayne Vardaman Sr., Selma & Dallas County Economic Development Authority
- Comments on the Policy Assessment - William Parker
- Comments on the Welfare Risk and Exposure Assessment - Georgia Murray, Appalachian Mountain Club
- Kennecott Utah Copper comments on Policy Assessment
- Northeast States for Coordinated Air Use Management (NESCAUM) comments on Policy Assessment submitted by Arthur Marin
- Public comment from National Association of Manufacturers
- Public Comments on the Policy Assessment from the Lone Star Chapter of the Sierra Club
- Utility Air Regulatory Group and Alliance of Automobile Manufacturers comments on Policy Assessment
- Utility Air Regulatory Group (UARG) comments on the Welfare Risk and Exposure Assessment submitted by Tim Verslycke
- U.S. Chamber of Commerce oral statement by Mary Martin

### Meeting Summary

The discussion followed the plan presented in the meeting agenda.

### **TUESDAY, MARCH 25, 2014**

Dr. Stallworth convened the meeting and explained that CASAC operates under the Federal Advisory Committee Act. 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 Register, and the meeting minutes will be made publicly available after the meeting. She noted that the Panel received over 60 written public

comments and that there were 39 public speakers slated to give oral comments. Mr. Christopher Zarba, Director of the Science Advisory Board Staff Office and Dr. Frey, Chair of the Clean Air Scientific Advisory Committee (CASAC), welcomed the panel and audience.

Dr. Erika Sasser, Acting Director of the Health and Environmental Impacts Division in EPA's Office of Air Quality Planning and Standards (OAQPS) presented an overview of EPA's regulatory schedule and process for the review of the Ozone National Ambient Air Quality Standards (NAAQS). Dr. Sasser presented dates for proposed and final rules that EPA has proposed to the Court. Dr. Sasser's detailed presentation may be found posted on the meeting webpage shown above. Mr. Steve Silverman, EPA attorney in the Office of General Counsel made a short statement in which he said it would be illegal for EPA to consider attainability or feasibility in setting the standard.

Representatives from OAQPS (Dr. Bryan Hubbell, Dr. Travis Smith, Ms. Christine Davis, Dr. Heather Simon and Mr. Ben Wells) presented an overview of the *Welfare Risk and Exposure Assessment* (Second External Review Draft, February 2014), stressing the changes that have been made since CASAC reviewed the first draft in September of 2012. Their detailed presentation may be found on the meeting webpage shown above.

### **Public Comments on the Welfare Risk and Exposure Assessment<sup>3</sup>**

There were three persons who provided oral comments on the second draft Welfare Risk and Exposure Assessment (WREA). After each public commenter spoke, Dr. Frey provided panel members with the opportunity to ask clarification questions.

Following the order in the List of Public Speakers (posted on the meeting webpage), the first of three speakers on the WREA was Tim Versylcke on behalf of the Utility Air Regulatory Group (UARG). Dr. Versylcke presented graphs showing that uncertainties in Relative Biomass Loss (RBL) increase at lower levels of W126 (the seasonal standard expressed as a sum of weighted hourly concentrations, cumulated over the 12-hour daylight period during the consecutive 3-month period within the ozone monitoring season). Dr. Versylcke said EPA has not demonstrated that adopting a W126 index presents any greater protection than just meeting the current 75 ppb standard. Dr. Versylcke recommended no change to the current standards.

Georgia Murray, on behalf of the Appalachian Mountain Club, presented information to show that a full 24 hour summing period is more appropriate than the 12-hour daytime metric because of the stomatal conductance at nighttime and that early morning may be a particularly sensitive time for some plants.

Nicole Downey, on behalf of Earth System Sciences, focused on significant overlap between peak background ozone and W126 in excess of 7 ppm hours in the Western United States. Dr. Downey focused on peak background concentrations and their correlation with areas with a high W126 reading. Dr. Downey said EPA should evaluate

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<sup>3</sup>/ Written comments from all speakers may be found posted on the meeting webpage.

the contribution of background ozone to the proposed secondary standard, and evaluate whether that standard is attainable with contemporary background ozone.

### **Panel Discussion of the Welfare Risk and Exposure Assessment**

Panelists then turned their attention to discussion of the charge questions. Panelists generally found the WREA to be a marked improvement over the prior draft, describing it as “useful” and “appropriate.” Some offered suggestions for minor edits, as captured in their written comments posted on the meeting webpage. A panelist requested clarification of the rollback methodologies. In particular, the panelist expressed concern that the use of across-the-board national reductions in precursor emissions is not the same as an actual control strategy that would be developed at a more local scale. Because of this, scenarios related to meeting a particular W126 level based on across-the-board national emission reductions should not be interpreted as providing protection equivalent to that of a health-based standard.

In discussing air quality, concern was expressed that the across-the-board cuts might cause these two scenarios (the current standard of 75 ppb and a secondary standard of 15 ppm-hours on the W126 index) to merge. Another panelist said that simulating reductions in a subset of monitors would violate CASAC’s previous advice to simulate consistent reductions geographically. Concern was expressed about the conclusion in the WREA that a standard of 15 ppm-hours does not show significant benefits compared to meeting the current standard and whether that result stemmed from EPA’s rollback methodology. One panelist asked for EPA to do the quantitative uncertainty analysis (propagating standard errors) while another panelist expressed the opinion that uncertainty was emphasized too much in the WREA. Uncertainty analysis, said another panelist, would not be possible everywhere because of the data. An EPA scientist pointed to the Appendices in the WREA on model performance and uncertainties associated with the use of the models. The Panel was asked whether quantitative uncertainty analysis was needed for the final draft of the WREA.

With respect to ecosystem services, panelists said the analyses of ecosystem services was well done. One panelist asked the Agency to distinguish between potential and evidential loss. EPA was applauded for monetizing some ecosystem services. One panelist warned that more caution might be needed in implying a causal relationship between bark beetle attacks and ozone levels. A couple of panelists thought the uncertainty discussions should be consolidated so that the messages throughout the document are not unduly diluted with too much repetitive discussion of uncertainty.

Panelists said it was valid to bring “anticipated effects” based on professional judgement into the WREA while clearly labelling these effects as such. Some important “anticipated effects” are not yet shown in the peer-reviewed literature. Panelists cautioned EPA not to confuse the size of a threatened resource with the size of potential loss.

After lunch, panelists turned their attention to biomass loss. Comments were quite positive on this chapter and support was offered to EPA for its continued emphasis on Class 1 areas, its emphasis on exposure-response data and the documented reconciliation of open-top chamber studies found in WREA. Some caution was offered on the comparison of seedling and adult tree biomass loss given the substantial divergence at higher W126 levels. A panelist complimented the Agency on its comparison between foregone carbon sequestration from ozone and automobile emissions. Panelists supported the decision to focus on a 2% biomass loss for trees. Caution was offered on the emphasis placed on the cottonwood data which was described as an outlier. Another panelist said that without a statistical test to show that the cottonwood data is an outlier, the cottonwood study should not be removed. Panelists debated the advantages and disadvantages of including the cottonwood study, described as a natural ozone gradient study, or simply explaining the WREA's reliance on a study that had not yet been replicated.

One panelist cautioned against EPA's default assumption of no ozone effect on species for which data are lacking.

On the subject of foliar injury, a panelist asked EPA to explain the concept of the biosite index and how it is used to analyze foliar injury responses to ozone and soil moisture. While panelists supported the "censored" regression approach, they asked for clarification on the seemingly contradictory statements on the relationship between ozone and foliar injury. An EPA scientist said they wanted to acknowledge the biosites where no relationship was found between biomass loss and ozone.

Panelists reaffirmed the W126 index as a major step forward. They also supported EPA's relating visible foliar injury to a welfare value. An EPA scientist asked for feedback on benchmark values for foliar injury such as the 1 – 2% biomass loss used for vegetation. A panelist alluded to the studies that showed the public concern about foliar injury due to ozone.

With respect to Chapter 8, the synthesis chapter in the WREA, panelists said the synthesis should focus on results and point out how the primary standard relates to the secondary standard. Again, panelists said too much is made of uncertainty in this chapter. An EPA scientist asked whether Chapter 8 should include both summary and synthesis. One panelist said too much summary material detracted from the take-home message. Another person commented that Chapter 8 could be both summary and synthesis.

On key points, a panelist asked EPA to avoid conflating correlation with causation. Panelists applauded the Executive Summary. One panelist emphasized the need to emphasize what is known as well as what is unknown. One panelist said the letter should specifically voice support for all of the approaches and topics included in the WREA, specifically the ecosystem services approach, the visible foliar injury approach, the use of exposure-response functions for both biomass loss and crops. It was then suggested that the letter should reinforce CASAC's endorsement of the W126 metric in light of its

biological plausibility as well as its advantages over the current European metric. The suggestion was made to revisit CASAC's letter on the first draft WREA where detailed support for the W126 was offered.

The suggestion was made that the most important question was answering the degree to which welfare protection can be provided with the primary standard, both the current standard and proposed alternative standards.

One panelist strongly suggested the primary standard cannot provide the same level of protection as the biologically relevant W126 standard. According to this panelist, just because two rollbacks look similar using assumptions that are not intended to represent a control scenario, this should not be used as evidence that a primary standard can substitute for a W126 standard. Panelists said EPA should emphasize the science that indicates a different form is required for welfare effects.

### **WEDNESDAY, MARCH 26, 2014**

Representatives from EPA Office of Air Quality Planning and Standards (OAQPS) (Dr. Bryan Hubbell, Dr. Stephen Graham, Dr. John Langstaff, Dr. Zachary Pekar, Dr. Heather Simon, and Mr. Ben Wells) presented an overview of the *Health Risk and Exposure Assessment* (Second External Review Draft, February 2014). Their presentation may be found on the meeting webpage shown above.

### **Public Comments on the Health Risk and Exposure Assessment<sup>4</sup>**

Dr. Frey informed the Panel and the meeting attendees that the SABSO had received 14 requests from the public to make oral comments at the meeting. Each speaker had 5 minutes to present to the Panel. Dr. Frey invited panel members to ask questions of clarification after each public commenter finished their remarks.

On behalf of the Utility Air Regulatory Group, Anne Smith pointed out that population inputs to EPA's BenMap-based risk estimates in the HREA had errors. The errors seemed to come from a bug in EPA's BenMap model. In addition, she pointed out that Jerrett et al. (2009) found that a threshold model (with a threshold of 56 ppb) had the best fit to the long-term respiratory mortality risk data. As part of clarification discussion in response to the public comment, EPA staff acknowledged the errors reported by the public commenter and explained that they would be corrected. A member of the CASAC panel pointed out that this exchange was a good example of the role of public comments.

On behalf of the American Lung Association, Deborah Shprentz stated that the current standard of 75 ppb is inadequate to protect public health. Ms. Shprentz suggested several ways in which the HREA could be improved. First, since children 0-5 years old are one of the most susceptible population, the HREA should include infants and children in the analysis. Second, additional health endpoints for a larger spectrum of cities should be incorporated. Third, alternative standards of 55 ppb or lower must be considered to

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<sup>4</sup>/ Written comments from all speakers may be found posted on the meeting webpage.

protect health of children and people with lung disease. Alternative forms of the standard should be considered to provide increased protection of human health.

On behalf of the Treated Wood Council, Julie Goodman stated (by phone) that the current standard of 75 ppb is health protective, and evidence does not indicate lowering the standard will lead to additional health benefits. This is due to the layers of conservatism compounded in EPA's analysis. In addition, EPA has not shown statistically any benefits from lowering the current ozone standard.

Richard Smith, consultant to American Petroleum Institute, commented that in the revised HREA, EPA has only used a small part of his paper, Smith et al. (2009). For Chapter 7, he concluded more work is needed to quantify uncertainty when combining the epidemiological and air quality parts of the analysis. For Chapter 8, he commented that the results still need a lot of work, and questioned its value in setting a new ozone standard.

On behalf of the American Petroleum Institute, Sonja Sax commented that EPA should only evaluate risks above ozone threshold levels instead of evaluating mortality and respiratory morbidity risks down to zero ozone concentration. She also commented that when risk estimates are presented together with confidence bounds, it is clear that any reductions in mortality from the current ozone standard to alternative levels of the standard are not only very small, but well within the confidence bounds. This indicates that there is likely no statistical difference in risks, and no identified benefit from reducing the level of ozone standard. She urged CASAC to suggest that EPA retain the current level of the standard.

Samuel Oltmans stated (on the phone) that there is substantial contribution of North American background ozone on observed ozone levels in western U.S, particularly in spring and early summer when background ozone is elevated. He commented North American background should be recognized as the primary contributor in these locations and seasons to measured ozone, and that background ozone accounts prominently for health risk from ozone exposure.

Allen Lefohn commented that with respect to changes in the distribution of ozone concentrations as a function of emission reductions, the risk metrics used in the HREA were influenced by how the distribution of ozone concentrations change. He noted that as ozone levels improved due to reduced emissions, both the high end and the low end of the distributions of ozone concentrations shifted toward the mid-level values. The distribution of risk tended to be more centered in the range of 25 – 55 ppb for 8 hour average concentrations. Background concentrations contribute to large percentages (>50%) of total observed ozone for current condition, current standard (75 ppb) and alternative standard (70 ppb) scenarios. He concluded that background ozone concentrations in the 25-55 ppb range are not controllable.

On behalf of the Portland Cement Association, Tyrone Wilson commented by phone that EPA concluded in 2013 Integrated Science Assessment that available evidence supported

a likely causal relationship between long-term ozone exposure and respiratory effects, including respiratory mortality. In addition, EPA concluded that mortality from short-term ozone exposure was also likely to be causal. However, Gradient has evaluated the long-term and short-term exposure studies that EPA cited in support of its conclusion, and found that the evidence does not support a causal or likely causal association at ozone levels at or below the current National Ambient Air Quality Standards. Thus, these endpoints should not be included in HREA, and should not be used to inform policy decision in the PA.

On behalf of the American Forest and Paper Association (AF&PA), Stewart Holm said EPA's current ozone NAAQS of 75 ppb provides sufficient protection for public health. He commented that in the 2013 *Integrated Science Assessment*, EPA's conclusion of a "likely causal" relationship for total mortality from short-term exposure to ozone was not supported by the evidence.

On behalf of the American Wood Council, Stewart Holm commented that EPA concluded in the 2013 ISA that the association with respiratory mortality was likely to be causal, whereas evidence for all-cause and cardiovascular mortality were deemed to be suggestive of causation. He commented that EPA appeared to base its likely causal conclusion for respiratory mortality only on Jerrett et al. (2009). He stated the findings by Jerrett et al. (2009) were not supported by two other epidemiology studies. Thus, respiratory mortality risks from long-term ozone exposure should not be evaluated and quantified in the HREA.

On behalf of Earth System Sciences, Nicole Downey used figures to show results developed by Chris Emery of ENVIRON from Higher-Order Direct Decoupled Model (HDDM) using CAMx for 2006 data. She showed results for Philadelphia that indicated: a) different responses between urban and suburban sites to reduction in emissions; b) uncertainty in EPA's evaluation of risk over the ozone season; and c) composite monitor averaging is not appropriate over the wide city areas that EPA used in the risk analysis.

On behalf of Alliance of Automobile Manufacturers, George Wolff commented that effects seen in controlled human studies have a threshold. These effects are transient and are observed only with strenuous exercise. He stated that the full pattern of associations in literature are not consistent with ozone causing acute or chronic mortality. Consequently, EPA's extrapolation of risk to low ozone levels is not justified and should not be used to set regulatory standards.

On behalf of ENVIRON, Chris Emery commented on EPA's model-based projection of air quality for 5 years. He believed there is large uncertainty, and he strongly disagreed that five years represents a "small window" (as stated in the HREA) relative to modeling 8 months of 2007. He commented that comparisons of regression projections to brute force modeling should be determined and resulting error ranges added to the discussion of uncertainty.

On behalf of the American Chemistry Council, Lorraine Gershman commented on the controlled human exposure studies. EPA concluded that controlled human ozone exposure studies indicate adverse lung function decrements can occur with ozone exposure as low as 60 ppb. She pointed out a recent review by Goodman et al. (2013) which shows that ozone effects are statistically significant only above 70 ppb, and potentially adverse only at or above 80 ppb. Therefore, based on the results of the controlled human exposure studies, lowering the ozone standard will not result in additional public health benefits compared to the current level of the standard.

### **Panel Discussion on Health Risk and Exposure Assessment**

Comments on the HREA were generally very positive, noting substantial improvements over the previous draft.

For Chapter 1 (Introduction) the panel found the chapter to be short but did an excellent job of describing the history of ozone standard. One panelist said what is missing is the history of ozone concentrations and exceedance in the last 50 years.

For Chapter 2 (Conceptual Model) panelists said the flowchart was clear and helpful. A panelist commented that what is missing in Chapter 2 and 3 was the issue of background, how it was used, how it was measured, and how it was addressed in the analysis of risk and exposure. Kudos were offered for Chapter 3 (Scope) although some concern was expressed as to why changes in Forced Expiratory Volume (FEV<sub>1</sub>) were singled out at the bottom of Figure 3-3 as the exclusive outcome while other outcomes were ignored. Panelists were more concerned with chronic inflammatory changes.

One panel member commented on the issue of estimation of emission. EPA used 2007 emissions data in the HREA. EPA does emission inventories every 3 years. The 2011 emission inventory is most recently released one. With significant decreases in emissions of NO<sub>x</sub> and VOC expected, he asked how the emission reduction was addressed in the calculation of risk under alternative scenarios.

An EPA scientist responded that the 2007 baseline is based on 2008 emission inventory which is the most recent data EPA has. EPA is currently working on the 2011 platform, but not yet finished. EPA has a fair amount of confidence in model response.

One panel member explained that independent of the emission inventory, the science determines the exposure level that is considered adverse. Analysis with more recent emissions inventory would just indicate where ozone concentrations are, and has nothing to do with determining the ozone level of public health concern.

An EPA scientist clarified that they do not characterize background itself. Background concentration is not relevant to calculating risk estimate.

For Chapter 4 (Air Quality Considerations), the lead discussants commented that this chapter was well written and improved tremendously in scientific content. Replacement

of the quadratic Rollback method with the HDDM procedure was described as a great achievement. It was noted that the HDDM procedure does not require separate estimates of background ozone, as sources of background ozone are incorporated in the modeling. Another major improvement is the use of the Downscaler approach to estimate the national mortality risk burden. These approaches were thought to improve precision tremendously.

In the HDDM approach, EPA used NO<sub>x</sub> emission reductions almost exclusively to estimate the ozone distributions in areas attaining certain levels of the standard. A panelist commented that it would be helpful if EPA provided some analyses or examples to indicate that perhaps other pathways such as the VOC-only reduction may be less desirable in most urban locations.

The panel found that uncertainties were well described but the panel disagreed with EPA's description of uncertainty in the Community Multi-Scale Air Quality (CMAQ) model as "low to medium," instead preferring a designation such as "to be determined" or, potentially, "medium".

For Chapter 5 (Human Exposure to Ozone), the panel found the chapter to be well organized, showing great improvement. The methods were well presented. Model outputs were generally clear, but difficult to follow, and the figures were poorly annotated and formatted.

The panel found APEX input to be appropriate. However, geographic variability for activity patterns may be important and should be discussed.

The panel found the discussion of uncertainty and variability comprehensive. Although most of sources of uncertainty were low or low-to-moderate, the joint effect of these individual sources of uncertainty on the overall uncertain of model output may differ and should be discussed.

For Chapter 6 (Health Risk Based on Controlled Human Exposure Studies), the panel found the updated lung function risk analysis to be technically sound, showing great improvement. The McDonnell-Stewart-Smith (MSS) model was found to be scientifically and biologically defensible.

One panelist commented that intra-subject variability can effect outcome and that more discussion is needed with respect to intra-subject variability between healthy individuals.

One panelist said FEV<sub>1</sub> is a symbol of what is going on in the lung. There can be no change in lung function but tremendous change in pathology. EPA explained that FEV<sub>1</sub> is a focus of modeling because of available data.

Comments were quite positive on Chapter 7 (Health Risk Based on Epidemiological Studies). The panel was reminded that the decision made to estimate risk down to zero exposure is based on its previous recommendation. Panelists agreed the decision is still

justifiable because they were interested in total risk due to ozone regardless of where the ozone comes from. The question of background is secondary.

The panel found the substitution of Smith et al. (2009) for Bell et al. (2004) paper to be acceptable and the sensitivity analysis well done.<sup>5</sup> The discussion of spatial variability in concentrations does not include the fine-scale spatial variability due to near-roadway O<sub>3</sub> gradients. It was noted that near roadway ozone concentrations are considerably lower than city average values due to local NO<sub>x</sub> titration chemistry.

Some panelists thought better exposure estimates for chronic obstructive pulmonary disease (COPD) from long-term exposure were needed. The estimate of 15-20% of COPD deaths attributed to ozone based on the Jerrett C-R function seemed high to some panelists. The conclusion in the ISA was that there is “limited evidence” for an association between long term exposure and respiratory mortality. Therefore, taking into account both the effect estimate and the previous judgment regarding causality, some panelists thought it was overly confident to conclude that there is a “reasonable degree of confidence” for these long-term exposure mortality estimates.

Calculation of ozone risk in Chapter 7 was thought to be well laid out and easy to follow. Panelists found that the use of NO<sub>x</sub> as driver for modeling ambient levels for possible alternative standards was a reasonable approach. Regarding the issue of a threshold vs non-threshold model, one panelist commented that model selection for the C-R function was not adequately discussed in Chapter 7. One panelist explained that it is a typical hypothesis in epidemiological studies that there is no threshold and recommended that it is not necessary for a new analysis.

An EPA scientist explained that the threshold discussion for long-term exposure is in a supplemental appendix (on Jerrett et al., 2009) and that the threshold study does not account for particulate matter.

Regarding the causality determination of endpoints, an EPA scientist explained that they only model endpoints that are causal or likely causal. Dr. Frey commented that CASAC has discussed causality determinations previously. While there are public comments on causality for this review, the panel members acknowledged the issue of causality has been discussed three times previously when they reviewed three different drafts of the ISA, and need not be discussed again at this stage.

For Chapter 8 (National Scale Mortality Risk Burden), a panelist commented that Chapter 8 is easy to follow. Methods are clear and technically sound. The chapter clearly communicates the representativeness of urban study area and national context by examining the major determinants of ozone effect estimates, namely demographics, baseline health conditions, climate and air quality.

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<sup>5</sup>/ In keeping with her prior recusal from discussion of her Bell et al. (2004) paper, Dr. Bell did not participate in discussion of EPA’s decision to substitute Smith et al. (2009) for Bell et al. (2004).

Dr. Frey asked the panel to address the population estimate error raised by one public commenter. However, the panel did not want to weigh in at the moment, and would like to see the analysis done correctly. An EPA representative clarified that they have a study template for different counties. The BenMap software has an error that pulls in extra counties. EPA staff expressed the opinion that the error would not have produced any significant error in rate-based estimates (e.g., number of premature deaths per 100,000 population) and that it would not have produced a substantial error in the magnitude of total estimated premature deaths. Nonetheless, EPA agreed to provide corrected estimates a month before the next teleconference.

For Chapter 9 (Synthesis), one panelist thought the chapter could be more concise, e.g. by presenting key points in summary form. One panelist commented that the chapter was dominated by summary rather than synthesis, and suggested that the chapter should be revised to focus on synthesis. The synthesis should focus on risk assessment of health endpoints, and findings across different methods.

For uncertainty analysis, a panelist commented that it would be nice to identify the major parts of uncertainties that may impact overall findings (e.g. data gap, and concentration response function). These important uncertainties should be targeted for further reduction in future work.

Panelists were quite laudatory of the Executive Summary. Suggestions for improvement included: more discussion of uncertainties, a map of ozone distribution and areas meeting current and alternative standards; and exporting the discussion of data gaps to an appendix.

Dr. Frey led the panel in a discussion of key points for the letter to the Administrator as follows:

- The analysis presented shows the current standard is not protective of public health. Scientific evidence in controlled human studies shows adverse effects.
- The assessment is generally well done, laying a strong foundation for the policy assessment.
- The HDDM approach should be highlighted. It is a relatively new technique, and is adequate in HREA. EPA should continue to consider how best to use it for the next HREA.
- It is important to tell the Administrator what is new since the last 7 years. Firmer data and tools are available to justify recommendations than 7 years ago e.g. CMAQ and FEV<sub>1</sub>.
- The HREA focused on 4 at-risk study groups because data is available for exposure assessment.
- The staff has been responsive to CASAC comments, and made major improvement.
- The panel agrees with analytical methods used by EPA. The panel also agrees with the selection of endpoints (short-term mortality and morbidity, and long-term mortality), and EPA's conclusion.

The panel decided they do not need to see a third draft of the HREA. This was because major findings were not going to be affected by the BenMap error.

Following the break, EPA representatives presented an overview of the *Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards* (PA) as shown in their presentation slides (posted on the meeting webpage) and emphasized exposure concentrations at which effects occur, total mortality from short-term exposure and evidence about at-risk populations.

Following EPA's presentation, Dr. Frey pointed out the PA may be written somewhat differently in order to serve as a stand-alone document for the rulemaking. One panelist asked the EPA scientists why they are seeking the maximum range.

### **Public Comments on the Policy Assessment<sup>6</sup>**

Public commenters followed the order presented in the List of Public Speakers posted at the meeting webpage. After each public comment, Dr. Frey invited panel members to ask questions of clarification.

On behalf of the Utility Air Regulatory Group (UARG), Anne Smith spoke about the need to specify what percent reductions were needed to achieve both the current standard and alternative standard. Dr. Smith displayed a graph showing the unresponsiveness of exposures to emissions reductions.

On behalf of the American Lung Association, Deborah Shprentz said the Clean Air Act prohibits consideration of feasibility and attainability in setting the standards. Ms. Shprentz said the new science available since the last review (which was based on 2005 science) no longer supported CASAC's previous recommendation of 60 – 70 ppb as the appropriate level. Based on chamber studies showing respiratory deficits in adults at 60 ppb, Ms. Shprentz requested consideration of a standard between 55 – 60 ppb.

On behalf of the Chamber of Commerce, Mary Martin stressed the employment impacts that could accrue from tightening the current standard. Ms. Martin also presented information on air pollution coming to the U.S. from Asia, Mexico, Canada and Africa. Ms. Martin said some areas would be in attainment except for emissions emanating outside the U.S.

On behalf of the National Association of Manufacturers, Greg Bertelson urged CASAC to ask EPA to retain the current standard of 75 ppb and to consider the economic impact of attaining a stricter standard.

In response to both Ms. Martin and Mr. Bertelson, Dr. Frey clarified that EPA may not consider costs in setting the standard in view of the Supreme Court decision in *Whitman v. American Trucking*.

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<sup>6</sup> Written comments from all speakers may be found posted on the meeting webpage.

On behalf of Earthjustice, David Baron offered some advice to CASAC on how it should couch its recommendations in response to the U.S. Court of Appeals' comments in *Mississippi v. EPA*. Mr. Baron said CASAC should clearly distinguish between its scientific conclusions from advice on levels that are appropriate to provide a margin of safety, which is apparently considered a policy judgement. Mr. Baron reminded the Panel that absolute certainty is not required to apply scientific judgement.

Shelly Green of California's Office of Environmental Health Hazard Assessment (OEHHA) said OEHHA concurs that the current federal standard needs to be strengthened, especially in view of the additional clinical and epidemiology studies which point to effects lower than 70 ppb. Dr. Green said a standard of 60 ppb would save 60,000 premature deaths as compared to 75 ppb. Dr. Green said that although California had an 8-hour 70 ppb standard, they allowed only one exceedance per year. By contrast, EPA's proposal was based on the average of the fourth highest measured 8-hour concentration over three years (MDA8). Accordingly OEHHA's analysis shows that applying the federal form to a 60 ppb level was equivalent to California's standard of 70 ppb where only one exceedance was allowed per year.

On behalf of UARG, Tim Versylcke showed a graph that displayed overlap between the current 75 ppb primary standard and EPA's proposed W126 standard. Dr. Versylcke said EPA had not demonstrated that adopting the new W126 level would provide significant reductions in welfare risks at a level below 15 ppm-hours. According to Dr. Versylcke, EPA has not discussed whether the current monitoring network provides sufficient information to implement the cumulative W126 standard.

On behalf of the Alliance of Automobile Manufacturers and UARG, Dr. George Wolff said EPA had not addressed how much ozone in a given area is due to background contributions. Dr. Wolff said EPA's use of CAMx was both underestimating background contributions and the contribution of foreign sources to background. Dr. Wolff criticized EPA for ignoring background and estimating risk down to zero ozone both in the HREA and WREA.

On behalf of the American Petroleum Institute, Sonja Sax criticized EPA's conservative assumptions in the risk assessment, particularly at the lowest exposures and for the smallest decrements in forced expiratory volume in one second (FEV<sub>1</sub>). Dr. Sax said it would be preferable to bound the exposure and risk estimates and lung function decrements with uncertainty bounds.

On behalf of the Treated Wood Council, Julie Goodman cited her systematic "weight of evidence" analysis of the available data that indicates that the results of recent studies do not provide stronger evidence of a causal relationship. Dr. Goodman said the consideration of the evidence for total mortality associated with short-term ozone exposure in the PA does not consider the numerous inconsistencies across recent multi-city studies, including those that use similar datasets and modeling assumptions. Overall, the available data do not support a causal relationship between short-term ozone exposure

and mortality at exposures equal to or below the current National Ambient Air Quality Standards for ozone, and this should be reflected in the PA.

Dr. Roger McClellan, on behalf of himself, said former Administrator Lisa Jackson had noted the choice of NAAQS was inherently a blend of science and policy. Dr. McClellan said there was no bright line dictated by the science and cited Justice Breyer's advice in *Whitman v. American Trucking*.

Stan Young, on behalf of himself, said policy needs to satisfy the basic rules of science, meaning all data should be publicly available. Mr. Young showed a graph from Smith et. al. (2009) showing no effect of ozone on mortality. Mr. Young also showed data showing no correlation between ozone and PM<sub>2.5</sub> levels and hospital admissions for asthma. Mr. Young said he requested and did not receive air pollution data sets.

Samuel Oltmans, from the University of Colorado on behalf of himself, said background levels should be an important component in determining both the risk and attainability of a revised ozone standard. Dr. Oltmans cited recent work that reinforces the important contribution of North American background ozone on 8-hour maximum daily average ozone at or near current air quality standards. Dr. Oltman presented information on three areas in the U.S. where background concentrations constitute a large portion of observed ozone levels. In response to a question from Dr. Frey, Dr. Oltmans clarified that he was showing North American background or what used to be called "policy-relevant background."

Allen Lefohn, from ASL Associates on behalf of himself, presented information that showed background ozone concentrations are in the 25 – 55 ppb range and that the distributions of MDA8 levels shrink so that ozone levels occur within a narrow range as emissions decline with both the high end and low end moving towards the center. Dr. Lefohn emphasized the contribution of stratospheric intrusion.

In response to Dr. Lefohn's presentation, a panelist pointed out that background ozone contributions could be reduced with global emissions control strategies.

Deborah Dreschler of the California Air Resources Board said the current ozone standard does not adequately protect public health. Dr. Dreschler said CARB supported a standard of 60 – 70 ppb and cited information on reduced health care costs that would result from lower ozone levels.

On behalf of the American Forest and Paper Association, Kirsten Zu cited a study co-authored with Julie Goodman that applied a weight-of-evidence evaluation which showed selection bias, exposure measurement error, outcome misclassification and residual and unmeasured confounding were present in EPA's analysis of the cardiovascular effects of ozone. Dr. Zu did not agree that the evidence showed a causal relationship between short-term exposure to ozone and cardiovascular effects.

On behalf of the Appalachian Mountain Club, Georgia Murray voiced concern over the W126 standard that she said was diluted in each step of the calculation. The use of a 12-hour window in mountain areas would exclude areas with increased ozone; therefore AMC supported a 24-hour summing window. Moreover AMC did not support EPA's use of a 3-month seasonal period over which to measure ozone or EPA's use of a 3-year averaging window. Ms. Murray said AMC was troubled that EPA had discounted CASAC's advice (on the first draft WREA) against averaging W126 over 3 years. To limit biomass loss to the 1 – 2% recommended by CASAC in its last letter, Ms. Murray said EPA should be considering a 7 – 9 ppm-hour range for the level of the W126 standard.

Joshua Stebbins, on behalf of Sierra Club, referred the Panel to his written comments citing the history of industry's claims over air bag standards and other rules. Mr. Stebbins said further NOx reductions in coal-fired electricity plants could be achieved. Mr. Stebbins counseled CASAC to provide EPA with a very narrow range and to cite the science specifically in its recommendations.

Bruce Buckheit, environmental consultant on behalf of himself, explained that he was a former manager in EPA's Air Enforcement Division. He said Congress reserved unto itself the authority to decide what to do if emissions reductions are unaffordable and that CASAC's job was to decide what's safe. Mr. Buckheit said there was an enormous potential to reduce NOx emissions at low cost or no cost.

Leonardo Trasande of New York University's School of Medicine said there was an urgent need to protect children's health by recommending an 8-hour standard of 60 ppb or below. Dr. Trasande said children were particularly vulnerable to the effects of air pollution due to their developing lungs. Dr. Trasande cited the economic benefits of pollution prevention from reduced health care costs.

Mr. Jeffrey Holmstead of Bracewell & Giuliani emphasized a portion of Section 109 of the Clean Air Act which says CASAC will "advise the Administrator of any adverse public health, welfare, social, economic, or energy effects which may result from various strategies for attainment and maintenance of such national ambient air quality standards." (Section 109(d)(2)(C)(iv)). Mr. Holmstead said this obligation was a very important part of the public debate.

One panelist asked if Mr. Holmstead's recommendation had any bearing on CASAC's deliberations with regard to the health impacts of ozone. Another panelist commented that EPA would have to first produce an analysis of "adverse consequences" for CASAC to review. Another panelist commented that Mr. Holmstead's recommendation was impossible to implement. An EPA attorney said the Supreme Court made it very clear this part of CASAC's mandate was not to be part of the standard-setting process. There was also some clarification discussion between Dr. Frey and Mr. Holmstead regarding whether the statutory language to advise the Administrator regarding adverse effects of implementation of the standard is part of the five year review cycle specifically mandated for advising on revised or new standards (i.e. Section 109(d)(1), and Section

109(d)(2)(B)), with Mr. Holmstead expressing the opinion that the requirement is part of the five year review cycle. There was also clarification discussion as to whether the process for review of possible adverse effects of implementation of a standard could be conducted separately from that for scientific review of the current standard and possible alternative standards, such as by a different panel of CASAC.

Nicole Downey of Earth System Sciences said EPA should calculate the risks down to background levels for all health and welfare endpoints. Dr. Downey presented an analysis that showed that bringing the nation into compliance with the current standard would lead to drastic reductions in W126.

Kurt Blasé, attorney for Kennecott Utah Copper, presented two studies on background ozone in rural counties in Utah. Some 36 exceedances over 75 ppb were found which researchers attributed to transport from Asia. Mr. Blasé said he was worried that EPA's exemption for "exceptional events" would not prevent the problem of regulators having to adopt control strategies that won't be effective.

#### **THURSDAY, MARCH 27, 2014**

Dr. Stallworth announced that she would be scheduling an "overflow" teleconference to give the Panel more time for its deliberations in the event that the allotted time on the May 28, 2014 teleconference was insufficient. Dr. Stallworth also reminded panelists that homework was due April 9, 2014.

#### **Panel Discussion of the Policy Assessment:**

Dr. Frey reviewed the history of the Ozone Review Panel's meetings to set the stage for the current review of the second draft of the PA.

The Panel turned its attention to Chapter 2 of the PA on air quality and monitoring. Comments were generally very positive on this chapter. A panelist called for more discussion on NO<sub>x</sub> titration and the paradoxical increase in lower level ozone in response to controls. It was mentioned that CASAC concurs with EPA's treatment of background ozone and the method by which background ozone is being calculated. Another panelist asked EPA to take out the influence of weather in plotting ozone concentrations over time. Concern was raised over EPA's use of background as a source apportionment tool. An EPA scientist said the supplementary model was only intended to be responsive to some comments on the limitations of zero-out as an extremely hypothetical scenario. According to the EPA scientist, the source apportionment model was intended to answer this question: of the ozone being measured right now, how can we allocate that to the U.S. anthropogenic portion versus other sources? Depending on the purpose of the analysis, a panelist said that EPA would need to run simulations with perturbed sources for policymaking because the percentages of U.S. anthropogenic sources versus other sources would break down immediately due to the non-linearity of the atmospheric chemistry once emissions decline. Dr. Frey said EPA needed to be

extremely clear on the policy-relevant questions being answered by the two models. A suggestion was made to relegate source apportionment back to the Appendix, and that the current analyses conducted by EPA are sufficient if they are properly interpreted.

Panelists discussed whether CASAC should stress the need to move to a control strategy that was hemispheric or global in scale – the need to address methane sources and sources in East Asia. Dr. Frey said it would be acceptable to provide that advice so long as we segregate it from CASAC’s responses to EPA’s charge questions. Another panelist raised the importance of anthropogenic influences via land management on so-called “natural” sources. An EPA scientist said that with the source apportionment approach, they only tried to isolate U.S. background. EPA did not look at natural or North American background. Both models (source apportionment and zero-out models) provided relatively similar estimates on the impact of U.S. emissions.

On the chapter describing the adequacy of the current primary standard, panelists were extremely pleased and quite laudatory. Some caution was raised against repetition in the chapter. A suggestion was made to reduce the text by adding in more figures and summary tables. Another caution was issued on EPA’s treatment of the evidence on using anti-oxidant supplements. Dr. Frey emphasized CASAC’s support for the bottom line conclusion of the chapter that the current standard is not adequate.

On the chapter considering alternative primary standards, comments were again quite laudatory. Minor suggestions were made on avoiding value judgments with words like “small” or adding sub-headings. Dr. Frey said he would like the Panel to offer research recommendations, even if it only agreed with the research needs stated in Section 4.7 of the PA.

The suggestion was made that CASAC make a science finding of adverse effects at 70 ppb and options were explored for statements CASAC might make about lower levels, e.g. 65 ppb and 60 ppb. In response to a suggestion to bring background into the discussion of alternative levels of the standard. Dr. Frey said his understanding was that background could be considered by the Administrator but only as a secondary consideration.

A suggestion was made for CASAC to say that the scientific evidence from human controlled and epidemiological studies show there are adverse effects on human health from exposures to 70 ppb. Based on human controlled studies done in healthy adults, the lack of clinical studies for more sensitive populations, and the scientific judgment of the panel, effects could be expected in susceptible populations such as asthmatics and children. Dr. Frey said CASAC could say it has confidence of adverse effects at lower levels for susceptible populations. One panelist said CASAC could organize its thoughts into a tripartite structure, leading with strong scientific findings, following by effects that can be anticipated based on multiple lines of scientific evidence, followed by an uncertainty or margin of safety factor. Panelists discussed what endpoints to use when discussing the scientific evidence and all agreed that it was time to go beyond pulmonary lung function decrements (FEV<sub>1</sub>) in discussing the evidence. Panelists discussed the

increments in which to recommend a standard, whether a recommendation for a level such as 68 ppb could be supported by the data or whether the increments of 5 ppb found in the data required a recommendation in the 60 – 65 ppb range.

One panelist said that 70 ppb could not be in the range recommended by CASAC after concluding that 70 ppb definitely caused adverse effects in healthy individuals. Panelists pondered whether health effects could be derived within two significant figures and that might be why the data tended to come in 5 ppb increments.

Dr. Frey confirmed that the Panel supports EPA's discussion of the indicator, averaging time and form of the primary standard. In terms of lines of evidence for the 70 ppb, Dr. Frey said mortality needed to be added.

With respect to the PA's discussion of the adequacy of the current standard, EPA was encouraged to continue emphasizing Class 1 areas, flux-based metrics and the reduced uncertainty in the exposure-response relationship from open-top chamber data. Support was offered for EPA's effort to monetize welfare effects. Concern was expressed about high-value crops grown in high-altitude, high-ozone areas which may not show up in national estimates of producer surplus. EPA was asked to revise the verbiage on the species for which data on responsiveness to ozone were not available. The Panel endorsed EPA's conclusion that the current secondary standard fails to protect vegetation from adverse effects. Ozone-induced injury may occur in areas that meet the current standard. Panelists said the revised standard should be lower than 15 ppm-hours on the W126 scale.

It was said that of the three metrics driving the decision on the W126 recommendation (relative biomass loss in trees, crop yields and visible foliar injury), evidence on relative biomass loss and visible foliar injury pointed to a standard below 15 ppm-hours.

A panelist cautioned EPA against saying the magnitude of effects becomes "more uncertain" when, in fact, the magnitude was simply smaller.

Panelists discussed the problems posed by the 3-year averaging period for the W126 standard, stating that a 1-year averaging time was biologically more plausible. Program stability was cited as a reason to keep the 3-year averaging time in EPA's PA. One panelist said it did not make sense to wait for 3 years to find out if an area was in compliance. Panelists said a lower level might be more preferred if the 3-year averaging time is retained but despaired of the lack of data for determining exactly how much lower the level should be.

On the consideration of alternative secondary standards, panelists reiterated their support for using 1 – 2% relative biomass loss as the benchmark for vegetation and 5% as the benchmark for crops. One panelist suggested that 15ppm-hours on the W126 index would not be acceptable since it represented the current standard which has clearly been shown to be insufficiently protective of vegetation and crops. A panelist again raised the issue of what is "requisite" protection and the need to protect crops and tree species that

can be “anticipated” to suffer effects from ozone. It was suggested that the “median” or “community” response was appropriate to consider as well as the “sensitive species” response.

An EPA scientist asked the panel how they arrived at 15 ppm-hours as the upper end of the recommended range. Dr. Frey asked panelists for their recommendations on research efforts. One panelist suggested multi-factorial studies were needed, especially in view of increasing CO<sub>2</sub> levels and the difficulty of pulling out an ozone signal. Large pasturelands in the Southeast were also cited as a topic deserving of further research.

Three public commenters provided “clarifying comments.” After each public commenter spoke, Dr. Frey provided an opportunity for the panel members to ask questions of clarification. Anne Smith, on behalf of UARG, said the mortality estimates from the Jarrett paper were based on respiratory causes. Dr. Smith said the 2p models in that paper seemed to have a higher slope. Dr. Smith showed a slide that depicted the threshold model was a better fit and should be used to estimate core risks in the HREA.

David Baron from Earthjustice reminded panelists they are not limited to situations in which there is direct proof and that scientifically acceptable inference from multiple lines of evidence can be the basis for CASAC’s recommendation.

Allen Lefohn presented information on background levels in various areas around the country, e.g. Houston.

Dr. Frey asked the panel to turn its attention to the major points needed for the letter on the Policy Assessment.

One panelist voiced support for using a threshold model for long term exposure mortality estimates based on Dr. Anne Smith’s comments.

Another panelist said the letter should call for international cooperation to reduce ozone levels and the need for methane controls.

Panelists debated whether it was appropriate to recommend a primary standard “less than 70 ppb.” Some panelists voiced support for 68 ppb as the upper end of the recommended range. One panelist pointed out the data comes in 5 ppb “chunks” and that if CASAC takes 70 ppb off the table, it should go down to 65 ppb.

In a response to a discussion about the accuracy of ozone monitors, an EPA scientist offered the information that most modern ozone monitors could measure levels down to 0.5 ppb.

Panelists agreed to continue the discussion about the upper end of the recommended range for the primary NAAQS on the teleconference scheduled for May 28, 2014.

Panelists voiced different views on the upper range for the secondary NAAQS recommendations as well with some supporting an upper end “below 15 ppm-hours” and others comfortable with including 15 ppm-hours.

The Panel was unanimous in saying the Policy Assessment is adequate for its intended purposes and that they did not need to see another draft.

Dr. Frey and Mr. Zarba thanked the Panel and Dr. Stallworth adjourned the meeting.

On Behalf of the Committee,  
Respectfully Submitted,

Holly Stallworth, Ph.D. /s/  
Designated Federal Officer

Certified as True:

Christopher Frey, Ph.D. /s/  
Chair, Clean Air Scientific Advisory Committee  
Chair, Ozone Review Panel

**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 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.