

**Summary Minutes of the  
U.S. Environmental Protection Agency (EPA)  
Clean Air Scientific Advisory Committee (CASAC)  
Sulfur Oxides Panel  
Public Meeting  
September 18-19, 2017**

Date and Time: Monday, September 18, 2017, 9:00 AM – 5:00 PM ET;  
Tuesday, September 19, 2017, 8:30 AM – 5:00 PM ET

Location: Residence Inn Arlington Capital View, 2850 South Potomac Avenue, Arlington,  
Virginia 22202

Purpose: The purpose of the meeting was to peer review EPA's *Risk and Exposure Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides (External Review Draft - August 2017)*<sup>1</sup> and *Policy Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides (External Review Draft - August 2017)*.<sup>2</sup>

Participants: CASAC Sulfur Oxides Panel (for full Panel, see roster<sup>3</sup>)

Dr. Ana Diez Roux, Chair  
Dr. James Boylan  
Dr. Judith Chow  
Dr. Aaron Cohen (9/18 only - by phone)  
Dr. Alison Cullen  
Dr. Delbert Eatough  
Dr. H. Christopher Frey  
Dr. William Griffith  
Dr. Steven Hanna  
Dr. Jack Harkema  
Dr. Daniel Jacob  
Dr. Farla Kaufman  
Dr. Donna Kenski  
Dr. Lianne Sheppard  
Dr. Frank Speizer (9/19 only - by phone)  
Dr. James Ultman  
Dr. Ronald Wyzga

Mr. Aaron Yeow, Designated Federal Office (DFO)  
Mr. Christopher Zarba, EPA SAB Staff Office

Dr. Erika Sasser, EPA Office of Air Quality and Planning Standards (OAQPS)  
Ms. Karen Wesson, EPA OAQPS  
Dr. Stephen Graham, EPA OAQPS  
Dr. Nicole Hagan, EPA OAQPS  
Dr. Deirdre Murphy, EPA OAQPS  
Other Attendees (See Attachment A)

**Monday, September 18, 2017**

## **Opening Remarks**

Mr. Aaron Yeow, DFO, opened the meeting. He 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,<sup>4</sup> and the meeting minutes will be made publicly available after the meeting. He stated that there were two public comment periods noted on the agenda for members of the public who registered in advance with the SAB Staff Office to make oral comments.<sup>5</sup> He noted that there were also two clarifying comment periods on the agenda where members of the public could request an opportunity to provide short clarifying comments. He stated that the SAB Staff Office determined that there were no issues with conflict-of-interest nor any issues with an appearance of a lack of impartiality for any of the Panel members. He then turned the meeting over to Mr. Christopher Zarba, Director of the SAB Staff Office, who welcomed everyone, and then turned it over to Dr. Ana Diez Roux, Chair of the CASAC.

Dr. Diez Roux welcomed everyone and had the Panel members introduce themselves. She then provided an overview of the Agenda<sup>6</sup> and asked the EPA to begin their presentation.

## **EPA Presentation on REA**

Dr. Erika Sasser, EPA Office of Air Quality Planning and Standards (OAQPS), began the EPA presentation on the Risk and Exposure Assessment (REA),<sup>7</sup> focusing on an overview of the National Ambient Air Quality Standard (NAAQS) process, the roles of the REA and PA in the NAAQS review process, and the schedule for the current review of the Primary SO<sub>2</sub> NAAQS. Dr. Stephen Graham, EPA OAQPS, continued the presentation, focusing on the overall purpose for the REA and SO<sub>2</sub>-specific goals, the organization of the REA, the features of the REA study area, hourly and 5-minute ambient concentrations, the approach and findings of the exposure and risk analyses, and sensitivity analyses. The panel members had questions regarding why EPA only ran scenarios of just meeting the current standard and not other scenarios. EPA indicated that the purpose of the First Draft REA was to determine whether the current standard was protective and if not, a Second Draft REA would be developed with alternate scenarios. The panel questioned how could EPA know the current standard was protective without running other scenarios. EPA responded that they looked at the REA from the previous NAAQS review and how that information was used and concluded that this REA produced results with risks no higher than in the last NAAQS review.

## **Public Comments on the REA**

Lindsey Jones, Texas Commission on Environmental Quality, made an oral statement on the REA that focused on there being little scientific support for using sRaw as the health endpoint, failure to consider the possibility of a threshold in the risk models, uncertainty in the risk estimates, the need for confidence intervals, and the need to consider uncertainty quantitatively.

## **Discussion of the REA Charge Questions<sup>8</sup> and Response to REA Charge Questions**

*Chapter 1 – Introduction and Background; Chapter 2 – Conceptual Model and Overview of Assessment Approach*

The panel members found the introductory and background material, including the material pertaining to the previous SO<sub>2</sub> risk and exposure assessments, to be adequately communicated and appropriately characterized. They found Chapter 1 to be clear and concise. They suggested EPA consider adding an Executive Summary to help set the stage for the rest of the document.

For Chapter 2, the members found the summary of the conceptual model in Section 2.1 to be very useful and that Figure 2-1 effectively illustrates the conceptual model. The panel recommended adding a brief, but clear explanation for why simulations were only done for meeting the current standard. There was also a general comment that HERONET links for cited studies throughout the entire document would be very helpful and useful.

### *Chapter 3 - Ambient Air Concentrations*

The panel members found that Chapter 3 was generally well written and that the three study areas were generally adequate. They did note that the three selected study areas were different from the six focus areas presented in the Integrated Science Assessment (ISA) and justification of the selection of these three study areas needs to be provided. The REA should document the other areas considered but not selected and why they were not selected. One member suggested the addition of a fourth study area, Detroit, which would be a high exposure site similar to Fall River, but would include emissions from integrated iron and steel mills.

The members also noted that different emissions data were being used in the modeling and that this should be discussed and justified. Model evaluation should also be performed with data paired in time and space. There was also a suggestion that an overlap of high exposures with high population densities be added as a study selection criterion for future reviews.

### *Chapter 4 – Population Exposure and Risk*

The panel members generally found the representation of populations at-risk to be technically sound and clearly communicated. They did note several issues related to spatial variability associated to geographic location that could be clarified. There also needs to be better explanations of census blocks vs census tracts. There needs to be better justification for the use of probit regression and a discussion of the implications of falling outside of the 5<sup>th</sup> and 95<sup>th</sup> percentile envelope around the probit fit. There was discussion about why race was not considered in asthma prevalence.

There was a suggestion for either the uncertainty section or for future reviews, to provide information on the total population that is potentially affected, or what percent of total population are affected, not percent of asthmatics only. Because health impacts are so driven by asthma and where people live, it would be helpful to have description of how areas focused on compare to U.S. data on those dimensions. There should be some discussion of how results from one area can be generalized to other areas.

### *Chapter 5 - Exposure and Risk Estimates*

The panel members found the chapter to be well written, however, there were some suggestions for better clarity on several issues. There needs to be better discussion about uncertainties from assigning children the same exposure-response curves as adults, obesity, CHAD activity logs not being specific to individuals with asthma, and from extrapolating results from the three study areas to a national scale.

## *Chapter 6 – Characterization of Uncertainties and Representativeness of Variability*

Overall the panel members found the chapter to be clear and appropriate for its goals. They found it appropriate to use observed variability in the input data when these data were available and sufficiently representative. The panel found that overall the uncertainty characterization was thorough and well done, but was concerned about any deviations from the assumed inputs that would increase potential risks, particularly the 95% prediction interval for the exposure-response function noted in the REA actually being a 90% confidence interval. The panel members also identified other uncertainties that should be considered: AERMOD inputs, algorithms, outputs; study areas and spatial make-up; spatial overlap of poverty and race; extrapolations of key quantities from one geographic area to another; and the contributions of microenvironmental variables.

### **Public Clarifying Comments**

There were no public clarifying comments.

With deliberations completed, the meeting was recessed for the day at 2:45 pm. The panel members were encouraged to use the remainder of the day to begin writing the consensus responses for the report with their subgroups and to finalize their individual comments.

### **Tuesday, September 19, 2017**

The Panel was reconvened at 8:30 am.

### **EPA Presentation on the PA**

Ms. Karen Wesson, EPA OAQPS, began the EPA presentation on the Policy Assessment (PA).<sup>9</sup> Dr. Nicole Hagan, EPA OAQPS, continued the presentation, focusing on purpose for the PA and the remaining NAAQS review schedule, the overarching policy relevant question for the PA, the policy relevant question and overview for health effects evidence, the policy relevant question and overview of exposure/risk information, preliminary staff conclusions, and key uncertainties and areas for future research.

### **Public Comments on the PA**

Lindsey Jones, Texas Commission on Environmental Quality, made an oral statement on the PA that focused on there being considerable uncertainty in the current SO<sub>2</sub> review, including the use of sRaw, not considering a threshold in the risk models, predicting the greatest risk occurring at concentrations where the causal relationship is uncertain, and not using confidence intervals in the risk estimates.

### **Discussion of the PA Charge Questions<sup>10</sup> and Response to Charge Questions**

#### *Chapter 1 – Introduction and Background*

The panel members found the introductory and background material in Chapter 1 to be clearly communicated and appropriately characterized. Table 1-1 provides a nice summary of the history of the primary NAAQS for SO<sub>x</sub>. Section 1.3 provides an adequate introduction to the general approach and

organization of the PA. The panel members suggested that EPA consider adding appropriate hyperlinks to the cited studies throughout the document.

### *Chapter 2 – Current Air Quality*

The panel members found the chapter to be well written and generally accomplishes its goal of providing useful context for the review. EPA should add a discussion explaining their reasons for using 2011-2013 emissions and modeling data, rather than the most recent data available, in their analyses. In addition, some discussion of the reasons for the decline in SO<sub>2</sub> ambient concentrations, and how that decline may factor in to the Administrator's decision, would be helpful.

### *Chapter 3 – Review of the Primary Standard*

#### *Charge Question 3 – Policy-Relevant Questions*

The panel members found that Chapter 3 provides an appropriate level of detail in addressing the policy-relevant questions. Section 3.1 is thorough and clearly presented in the text. Figure 3-1 is very helpful and nicely illustrates/summarizes the overall approach. The organization around a set of policy-relevant questions works well for the most part; however, this has led to some duplication of information that should be eliminated.

The concluding section of Chapter 3 (3.3; Key Uncertainties and Areas for Future Research and Data Collection) could be expanded to include other at-risk groups (e.g. obese/overweight, those with type 2 diabetes, asthmatic phenotypes). In addition, the authors should avoid giving the impression that a lack of quantifiable data for certain susceptible groups (e.g., individuals with severe asthma) equates with uncertainty that they will have an adverse response to exposure.

#### *Charge Question 4 – Health Effects Evidence*

The members found that the draft PA accurately reflects the key aspects of the evidence for the health effects for SO<sub>x</sub> as characterized in the second draft ISA. Although evidence for at-risk populations, such as children with asthma, African-American children, adults and children who are obese, has been strengthened since the last review, uncertainties remain concerning the possible effects and the magnitude of these effects in these populations. The current standard does not consider these high-risk sub-groups, so in the view of some panel members, questions remain regarding the adequacy of the margin of safety of the current standard.

#### *Charge Question 5 - Quantitative Analysis of Exposure and Risk*

The discussion of the quantitative analysis of exposure and risk accurately reflects the analyses contained in the draft REA, and lays out the associated key uncertainties and public health implications. It is not clear why modeling at levels below “just meeting the current standard” was not pursued. Additional detail or appropriate cross-referencing to where this detail could be found in the PA or REA needs to be provided.

The panel concurred that the lack of information about severe asthmatics and also children under age 12 (with asthma in particular) contributes to substantial uncertainty to the REA, as these individuals represent the population of greatest risk.

*Charge Question 6 - Integrated Health Evidence and Risk and Exposure Information*

The panel found the integration of health evidence with risk and exposure information to be technically sound and clearly communicated. The public health impact of SO<sub>2</sub> is well described for asthmatic children as a group. However, there is the potential for additional risks associated with SO<sub>2</sub> exposure in children and adults who are severely asthmatic, obese or of African-American ethnicity. Some discussion of how this might impact the margin-of-safety of the current standard is warranted.

*Charge Question 7 - Adequacy of Current Standard*

The members found the discussion to be appropriate and sufficient rationale has been provided to support the preliminary staff conclusions. The four basic elements (averaging time, indicator, form, and level) of the standard needs to be mentioned. The panel concurred with retaining the current standard and went through its scientific rationale, including that for the averaging time, indicator, form, and level of the standard.

The panel had some discussion regarding preliminary calculations of the expected number of hospitalizations due to exposures at the current SO<sub>2</sub> standard. The panel agreed that there was not enough scientific evidence to warrant a change of the standard to achieve a greater margin of safety, but recommended that future assessments better quantify the numbers of individuals expected to be affected at the current (or proposed alternative) standard so that a more informed judgment about the margin of safety can be made.

*Charge Question 8 - Key Uncertainties and Areas for Additional Research and Data Collection*

The panel found that most of the key uncertainties were adequately described, but there was no indication of the magnitude and potential impact of the uncertainties. Undiagnosed asthmatics, activity patterns and medication use in children and severe asthmatics, personal short-term exposures, and uncertainties related to AERMOD. The panel identified areas of additional research and data collection, including the need for greater understanding of the response of childhood and severe asthmatics to SO<sub>2</sub> exposure, the collection of personal SO<sub>2</sub> exposure data, and improvement of SO<sub>2</sub> monitoring with refined spatial resolution.

The panel had discussion on whether they needed to see another draft of the PA. They agreed that they did not need to see another draft of the PA.

**Public Clarifying Comments on the PA**

There were no public clarifying comments.

**Summary and Action Items**

Dr. Ana Diez Roux discussed action items and the remaining schedule for drafting the reports.

Mr. Yeow indicated that Dr. Diez Roux's CASAC term expires at the end of September and thanked her for her 6 years of service on CASAC as well as leadership in chairing the CASAC for the past 2 years.

The meeting was adjourned by Mr. Yeow at 12:00 pm.

Respectfully Submitted:

Certified as Accurate:

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/s/  
Mr. Aaron Yeow  
Designated Federal Officer  
EPA SAB Staff Office

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/s/  
Dr. Ana Diez Roux  
Chair  
CASAC Sulfur Oxides Panel

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 18-19, 2017 CASAC Sulfur Oxides Panel Meeting page](#):

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<sup>1</sup> Risk and Exposure Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides (External Review Draft - August 2017)

<sup>2</sup> Policy Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides (External Review Draft - August 2017)

<sup>3</sup> CASAC SOx Panel Roster

<sup>4</sup> Federal Register Notice Announcing the Meeting

<sup>5</sup> List of Public Speakers

<sup>6</sup> Agenda

<sup>7</sup> EPA Presentation - Risk and Exposure Assessment for the Review of the Primary National Ambient Air Quality Standard (NAAQS) for Sulfur Oxides, External Review Draft

<sup>8</sup> Charge for Sulfur Oxides Risk and Exposure Assessment for Primary (Health-based) National Ambient Air Quality Standards (NAAQS)

<sup>9</sup> EPA Presentation - Policy Assessment for the Review of the Primary National Ambient Air Quality Standard (NAAQS) for Sulfur Oxides, External Review Draft

<sup>10</sup> Charge for Sulfur Oxides Policy Assessment for Primary (Health-based) National Ambient Air Quality Standards (NAAQS)

**ATTACHMENT A – Other Attendees  
CASAC Sulfur Oxides Panel Public Meeting**

<b>Name</b>	<b>Affiliation</b>	<b>Sept 18</b>	<b>Sept 19</b>
Allen, George*	Northeast States Coordinated Air Use Consortium		
Chan, Elizabeth*	USEPA		
Graham, Dawn			
Graham, Taylor		x	
Jansen, John	Consultant	x	x
Jones, Lindsey*	Texas Commission on Environmental Quality		
Lackey, Leila	USEPA	x	x
Lamson, Amy	USEPA	x	x
Langworthy, Cindy	Hunton & Williams	x	x
Long, Tom	USEPA	x	x
Malashock, Daniel*	USEPA		
Parker, Stuart*	IWP News		
Thurmon, James	USEPA	x	
Wayland, Bob	USEPA	x	
Williams, Melina	USEPA	x	x
Woods, Clint*	Association of Air Pollution Control Agencies		

\*requested call-in information or participated via webcast