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Charge Question: Overall organization and clarity: *To what extent does the Panel find that the draft IRP clearly and appropriately communicates the plan for the current review of the primary SO₂ NAAQS and the key scientific and policy issues that will guide the review? To what extent are the decisions made in the last review, including the rationales for those decisions, clearly articulated?*

Response: The draft IRP clearly communicates the plan for this review. The decisions and the rationales from the previous review (e.g., the “definitive evidence” came from the 5-10 minute controlled human studies with exercising asthmatics, and “supporting evidence” came from observational studies of respiratory symptoms, ED visits, and hospitalizations) were also clearly described. In particular, the description of the areas of uncertainty (e.g., the relationship between 5-min values to longer averaging times) was very helpful in setting up the focus for the current review.

Charge Question: Introduction (Chapter 1) and Schedule (Chapter 2): *To what extent does the Panel find that Chapters 1 and 2 clearly communicate the NAAQS legislative requirements, summarize the steps in the review process, summarize the history of the SO₂ NAAQS, and present the anticipated schedule for the current review?*

Response: Both chapters are clear.

Charge Question: Key Policy Relevant Issues (Chapter 3): *Building on key considerations and issues addressed in the last review, Chapter 3 presents a set of policy-relevant questions that will serve as a focus in this review. To what extent does the Panel find that these questions appropriately characterize the key scientific and policy issues for consideration in the current review? Are there additional issues that should be considered?*

Response: The chapter lists most relevant policy-relevant questions, and I cannot think of additional questions at the moment. However, I think that, to the extent that it is unlikely (I could be wrong on this, of course) that we will have a new controlled human study on SO₂ in the current review, the “definitive evidence” established in the human control studies on exercising asthmatics will be unchallenged. Thus, the focus will be on the questions that can be addressed with observational epidemiological studies. Then, the challenge will be that we will have studies that may have substantively lower levels of SO₂ compared to the past studies, and the evaluation will need to distinguish a lack of association from a lack of statistical power due to reduced

exposure contrast. This is probably not something that can be incorporated as part of policy-relevant issues, so I will comment on this for Chapter 4.

Charge Question: *Science Assessment (Chapter 4): Chapter 4 describes the plan for the Integrated Science Assessment (ISA), which will critically evaluate and integrate the scientific evidence on health effects due to sulfur oxides in the ambient air. To what extent does Chapter 4 clearly and adequately describe the scope, approach, specific issues to be considered, and organization of the ISA? Please provide suggestions for any other issues that should be considered.*

Response: I have several comments so far below:

- I thought this chapter very thoroughly describes the scope, approach, and issues to be considered for the current review.
- I am not sure if it is appropriate for the EPA to do this, but if the ISA plans to consider studies that are published or accepted for publication up to two months before the external review draft of the ISA (which would put the cut-off to be April 2015), it may be helpful for the EPA to identify ongoing studies and send the investigators the review criteria as well as the list of key policy-relevant questions. Obviously this is too late for experimental studies, but for the studies that are currently analyzing data, it may come down to a matter of running a few additional models, or procuring 1-hr max SO₂ in addition. This is not a suggestion for the IRP, but I thought it could be important. The researchers are not necessarily paying attention to what
- One potential scenario is that, we may have much lower SO₂ levels in some of the cities in the studies eligible for this round of review compared the previous, due either to general reduction in emissions or changes in fuel types used. This can lead to reductions in exposure contrasts for both the short-term (temporal) and long-term (spatial) studies, resulting in reduced statistical power. The ISA review will need to be careful about distinguishing a lack of association vs. a lack of statistical power. In addition, reduced levels of SO₂ can affect several of the specific issues to be addressed: the exposure error may be augmented for both measurements and prediction; the correlation with other pollutants may become weaker, etc. These points may sound too convoluted to be on the “Specific Issues”, so I just want the EPA to be aware of them.