

**Compilation of Member Comments on Draft SAB Panel Reports
September 21-22, 2006 Telephone Conference Meetings**

1. All-Ages Lead Model

a) Lead Reviewers

i) Dr. Rogene Henderson

First, the most important sentence in the whole report is in italics on the last page of the letter, saying the model is not ready for deployment. Unfortunately, this sentence is not in the actual report and it should be. The report does a great job in saying what should be done to improve the model.

The answer to all three of the questions we are to answer is yes. The report is clear and logical, answers all charge questions and contains backup information for the recommendations. I had some editorial comments but will report those on the phone call--don't want to risk losing the message again.

ii) Dr. Rebecca Parkin

Answers to the Board's Charge questions

- 1) Yes, it adequately addresses the questions.
- 2) Yes, it is clear and logical, although sometimes quite repetitious.
- 3) Yes, the conclusions are supported by the information and evidence presented.

Additional comments

Several significant points made in the report were not included in the letter, although the letter is already quite long. If a long letter is preferred,

- Consider adding in two points from page 6 of the report.
 - Pica should not be a surrogate for soil ingestion.
 - Bioavailability is not addressed in the model, but should be a key parameter.
- Letter page 3, line 39 would be strengthened by more specifically noting that these are the child-specific factors noted on page 8 of the report.
- Letter page 4, following line 35 should note that NHANES and Lanphear (see report pg. 13) are excellent data sources for validating the model.
- On page 16 of the report, the panel notes that the model does not meet EPA's original goal (lines 20-26). This is an important point that merits note in the letter to the Administrator.
- Report, page 26: Specification of many parameters leads to great uncertainty; this should be noted in the letter.

Editorial comments

-On page 19 of the report: Is this the correct table? The text points do not match with the lines in the table.

- Page 25 of the report, line 38: Remove the use of "I" here.

b) Other Board Reviewers

i) Dr. Granger Morgan

While it appears that Panel has done a very careful and extensive review, the report and cover letter are in need of rather extensive editing.

The letter to the Administrator is currently 6 single-spaced pages. It should be edited back to 2 or 2.5 pages and should focus on a few bottom lines. Given the various problems the committee has found (e.g. the Figure on page 15, the factor of 5 difference between model outputs and Boston data noted on page 16, the Figure on page 32, etc.) it seems to me that one of those recommendations should be that this model not be used until its many problem can be resolved, and it is better calibrated.

The panel recommends that model results be produce as probability distributions. Can this be done with the current computational structure of the model? Assuming that the answer is yes, the panel needs to be explicit about what the distributions should represent. Are they intended to report uncertainty about the average value of key model coefficients; the person-to-person variability in the value of those coefficients; or some combination of both?

I realize that the model does not properly label some of its output but we should. Thus the vertical axis of the plots on page 14 and 23 should be labeled.

While I will defer to senior SAB staff, the strategy of writing a page or two of text in each section *before* getting around to stating the charge questions strikes me as unwise. I'd much prefer to see the charge question stated and then answered. If the answer is first general and then elaborated, that would be fine. The current strategy also results in some duplicate language.

Often the wording in the report is overly complicated. Here are just three examples:

On page 3 and again on page 4 we read: "Within the model itself there is first a need to computationally-synchronize internally all the biokinetic parameters..."

Might that read? "The model should be modified to assure that all biokinetic parameters remain internally consistent."

On page 4 we read: "The use of recognizable and routine units of measurement is highly recommended, as is routine specification of those measurements in all outputs (e.g. graphics)."

Might that read? "Standard units of measure should be used throughout the model and should be reported in all outputs, including graphics."

And on page 6 we read: "For example, it is known that lead ore milling wastes over time, e.g. the galena form of mineralogical lead weathers to more bioavailable cerussite (lead carbonate).

Might that read? "For example, the galena form of lead ore in milling wastes weathers to more bioavailable lead carbonate (cerussite).

A final nit. Could we use "date are" rather than "data is"?

ii) Dr. Thomas Theis

Comments on SAB RadNet, AALM, and SGM reviews.

General:

- 1) All three reports appear to respond to the charge questions posed to the respective Panels.
- 2) The Regulatory Environmental Modeling (REM) initiative has been active within the Agency since the early eighties. This effort provides uniform guidance and standards for models used by the Agency (and most recently has established the Models Knowledge Base --MKB) is intended to be a “clearinghouse” for all models developed by or used by Agency personnel in carrying out their scientific and regulatory mandates. Both the AALM and SGM are such EPA models, and should be subject to REM guidelines, and included in the MKB. Indeed many of the Panels’ criticisms and suggestions for improvement would have been obviated had the Agency followed its own guidance on model development and implementation. Accordingly, I believe that both the AALM and the SGM reports should state clearly and unambiguously that the Agency must begin to follow its REM guidance, and in addition prepare these specific models for uploading into the MKB. If necessary, the most recent SAB review of REM/MKB should be made available to the Panels and cited in the two modeling reports (the final draft of this report has been forwarded to the Board for approval as of September 7, 2006). Of course there are many previous EPA and SAB reports on REM that are also available.
- 3) A considerable amount of SAB activity involves the review of EPA modeling activities. As a general recommendation, I suggest that all future Panels formed for this purpose be instructed on the nature of REM/MKB, and the specific principles for model development and use that it contains.

Specific comments on AALM report:

- 1) There has been a trend within the SAB, especially since the reorganization, in favor of reviews that are organized according to the intended audience: the main body (including appendices) toward EPA scientists who are responsible for the report under review; an Executive Summary aimed at the level of Program Managers (or equivalent); and a letter of transmittal aimed at the AA level or, ideally, the administrator directly. By these criteria, the letter of transmittal in the AALM report fails: it is far too long and contains too much detail, essentially recapitulating, almost word for word, the executive summary. I suggest redrafting the letter emphasizing only the most important findings of the Panel. It should be no more than two pages long.
- 2) The body of the report contains many useful observations by the Panel, but there appears to have been little in the way of prioritization. For example section 5.1, discussing the guidance manual, raises questions about several statements (correctness, clarity), but then includes “nits” (pp 24-26) in the same section. Perhaps these kinds of minor criticisms could go into one or more appendices.
- 3) The report should be written in the person of the Panel. Often an observation or recommendation is phrased as “we”, or in the imperative (e.g. page 21 line 15, “Revisit the historical dietary...”).
- 4) Page 21 line 15. “this” should be “these”.
- 5) Page 21 line 35. “This unease involving the model construction...” should be replaced with “This is illustrated...”
- 6) Page 2 lines 8, 9. Need to decide what to call the SAB. “statutory” and “chartered” appear to mean the same thing, but I don’t think they are.

iii) Dr. Michael McFarland

The All Ages Lead Model (AALM) review panel (Panel) is commended on developing a clear, concise and well written document that comprehensively identifies and addresses the deficiencies in the current version of the AALM. The Panel provides direct and unambiguous responses to each of the Agency charge questions together with detailed scientific and technical recommendations that, if implemented, could substantively improve both the functionality and usability of the AALM in Agency decision-making.

The only concern that I had with the current draft of the report was with its structure. Although the cover letter is well written, I believe that its length is too long and its content too detailed for Agency senior management to consider in a reasonable amount of time. In my opinion, the document would be strengthened if the cover letter were shortened to no more than two (or perhaps three) pages in length with a focus on the salient and overarching issues. The Panel may also want to consider adding an Executive Summary to the document in which the summary details surrounding the overarching issues (most of which is now contained in the cover letter) could be further described. Following implementation of the appropriate changes to the document's structure, I would strongly be in favor of supporting its approval.

iv) Dr. Steven Heeringa

All-Ages Lead Model (AALM) I must admit that I struggled in my review of the AALM draft report. Some of my difficulty is undoubtedly due to my personal lack of specific scientific expertise on the topic of lead exposure modeling in human physiological systems. I have restricted my comments to specific editorial/typographical changes that I identified in my review

Editorial/typographical comments for the Panel Chair.

Administrator letter

Page 1, Line 35 “.. requested..”

Page 1, Line 40 “review and to provide the Agency with advice and recommendations concerning EPA’s All-Ages ...”

Page 2, Line 3 “..use these as..”

Report

Page 2, Line 4 “and consultation and ..”

Page 2, Line 9 “... and comply...”

Page 2, Line 38 “justify the structure...”

Page 2, Line 42 “... Leggett’s model definitions.”

Page 3, Line 2 “...compare model results with...”

Page 3, Line 34 “ ...implementation of more realistic...”

Page 3, Line 42 “...manner consistent with how...”

Page 4, Line 30 – standardize PBPK acronym throughout the report. See P4, Line 37.

Page 4, Line 40 – “Draft Models Background” (or all lower case)

Page 4, Line 42 “ ...limitations, is critical...”

Page 5, Line 20 – Choose report standard for capitalization labeling modules, e.g “Biokenetic Module” or “biokenetic module” – conventions differ across report sections.

Page 6, Line 6 “ ...viewed as..”

Page 6, Line 13 Use quotes to infer the definition , “Pica”. No quotes for behavior.

Page 6, Line 26 ff –Standardize on PbB or Pb-B (see page 4, Line 23)

Page 6, Line 26 "... testing at such sites is typically..."

Page 6, Line 31 "...exposures for affected..."

Page 6, Line 41 "...mean exposure but also the upper percentiles of the exposure distribution."

Page 7, Line 14 "...differences among..."

Page 8, Line 1 –use standard references to papers, e.g. Leggett (1993) says nothing...

Page 9, Line 25 "...not be reproduced and **do not** match those..."

Page 9, Line 39 "...10, of the EPA..."

Page 9, Line 40 "...biokinetic explanation..."

Page 9, Line 45 "...the data sets..."

Page 10, Line 2 "... model inconsistent with ..."

Page 10, Line 8 "...have a sum of 1?"

Page 10, Line 9 – (Åg/day) appears elsewhere as (Åg/d)—see page 8, line 10, page 13, line 27..

Page 10, Line 36 – "*et al.*" for consistency with line 41

Page 11, Line 19 "Pounds JG, Leggett RW."

Page 13, Line 19, 20 "...the National Health and **Nutrition Examination** Survey (NHANES) data set..."

Page 13, Line 33, 34 "...dust lead from a representative..."

Page 14, Line 7 "...must be in the same units and from the same location..."

Page 14, Line 30ff –Label this Figure including ordinate. (ignore if this is exact copy of model graphic output).

Page 15, Line 8 "...neither constant nor smooth, nor consistent..."

Page 15, Line 18ff Legend shows to plot formats, Plot has three curves (far left and two converging over 8-12 Blood Pb. Which is 1 hour time step. Units for Blood Pb (ppm?).

Page 15, Line 28 – formally reference Leggett (Leggett, 1993).

Page 16, Line 35 ff –report switches to imbedded citations. Produce references at end with standard citations.

Page 17, Line 13 – declare GI acronym at first use. (I believe this is the first).

Page 17, Line 19 – 'Absorption Module...' – several sections interchange module and model. See P 17, L 28, P 17 L17.

Page 18, Line 2 "The Skeletal Module..."

Page 20, Line 12 Acronym PM is the ppm?

Page 21, Line 1 gastro-intestinal tract (GIT).."

Page 21, Line 14 ff , use "historical" in place of historic

Page 22, Line 3 provide citation for quote.

Page 22, Lines 22,23 Should AALS be AALM?

Page 22, Line 44 "...descriptions of plasma..."

Page 23, Line 11 –what is age 0.274 (is that .274 years)

Page 23, Line 21 "Page 51, section..."

Page 23, Line 43 "...removal half-time of ten days for Liver 1 is a ..."

Page 24, Line 6,7 – clarify the mediation impacts of vitamin D—on lead uptake?

Page 26, Line 1 "This figure describing..."

Page 27, Lines 13-16—The age ranges recommended here are not completely inconsistent with those suggested on Page 7 but there may be confusion.

Page 27, Line 23 "not be a user input."

Page 27, Line 29 – Statistical question – one explanation for this behavior of the program is that it relies on random number seeds that are not controllable by the user or preserved when exiting the program. The capability for user input of random seeds is critical for replication (when it is desired).

Page 27, Line 41 ff – format with 1., 2. as in Section 5.4

Page 28, Line 24 "...the Absorption Module..."

Page 28, Line 24 –use module or model (not both)

Page 32, Line 3 ff –is original legend in color? Reader cannot discriminate between the two curves (except implicitly)

v) **Dr. Valerie Thomas**

Here are my comments on the review of the All Ages Lead Model:

The content of the review is strong, and the reviewers are to be commended for their detailed and substantive review. Before it is approved by the SAB Board, however, it should be clarified, better organized, and streamlined, so that the key points stand out.

In the letter to the Administrator, the first sentence regarding the content of the review is (p. 1, lines 44-45) "The members of the AALM panel were generally supportive of progress in developing the model, while offering a series of suggestions for its improvement." When I read that, I assumed that the remainder of the report would consist of discussions of minor technicalities to fine tune the model. So I was increasingly surprised as I read through the rest of the letter to the Administrator, as the problems with the model appear not to be minor, and the review has really nothing positive to say about the model other than that the user interface is quite good. To avoid giving the Administrator the impression that the review is "generally positive", page 1, lines 44-45 should be changed to communicate the extent of revision needed in the model.

There does not appear to have been a substantial effort to streamline the report. Streamlining -- that is, making key points once, in a logical position in the report -- is important to ensuring that the review is correctly understood.

p.2, lines 29-30 "Complied responses": This heading gives the impression that the report is not yet an integrated document, but rather reports from different reviewers.

p. 19: It's not clear how the figure on this page relates to the comments about lines 1, 4, 5, and 7. Is it the wrong figure?

The report is repetitive. Several times the user interface is discussed -- se for example p 31 lines 15-16. Several times the problem of varying parameters is raised (see, for example, p. 31 lines 22-28. Several times the need to specify soil lead rather than just dust lead is mentioned (see for example p. 31, line 36).

The coding errors are mentioned several times. There is a figure on p. 32 illustrating coding errors, and there is a similar figure on p. 15 illustrating coding errors. These coding errors should be discussed together.

The errors and confusing wording in the documentation is discussed several times. See for example p. 23, and also p. 33, lines 3-4.

The response to charge question 9, "does the AALM follow the Agency's Regulatory Environmental Model Guidance?" needs a yes or no answer. Presumably the answer is no, but it is hard to tell from the review text (p. 35, lines 26-31).

The report should be reorganized so that the most important points are brought out. The current draft does address all points, but they are addressed with equal emphasis. Coding errors and inconsistencies and errors in the model seem to be significant problems, and these issues should be brought forward.

vi) Dr. Genevieve Matanoski

The review by the AALM Panel adheres to the criteria of the SAB in that it provides thoughtful advice to the Agency, is clear and logical in its recommendations and supports its conclusions with documentation. However, the review has focused on many very specific small items, which may be the result of the specificity in the questions that were asked by EPA. They also have repeated the same problems throughout the document many times. For example the errors in assigning levels to broad groups of children appear on pages 7, 8 and 27. The problem of an incorrect blood Pb predicted by the model appears on pages 15, 29 and 31. These duplications may have resulted from the similar sections in the charge questions. However, they do make the document cumbersome to read and lead to an impression that the use of the same errors may imply that the reviewers have only found this one problem and have repeated it. The document, however, would certainly be useful to EPA since different individuals may be responsible for addressing corrections to specific questions. Therefore, this aspect of the document may not need to be changed.

Several changes should be considered by the Panel. The letter to the Administrator is far too detailed. He only needs to know the general flaws that are in the model so that he can decide on the next steps in the use of the model. For example, it would seem to be very important that the model does not utilize the newest biokinetic information in deriving the parameters. The current letter reads like an executive summary rather than a letter to Dr Johnson.

Specific changes

Pages 23 –top 26. These pages look as if they would be better in an appendix so that they did not interrupt the flow of the document for the reader.

Page 22: On this page and several others, there are paragraphs consisting of single sentences. Can that structure problem be rectified?

Page 17 line 25 The word is “rates”

Page 23 line 11 The sentence is strange . Is “it” necessary?

Page 29 line 10 Does “be” equal “by”?

In the current letter, page 2 line 13 has a phrase “used before the Agency” that is difficult to understand. Also on Page 6 line 20. Page 6 on line 28 has the term “deployment” that appears to be strange in the sentence’s context.

2. RadNet

a) Lead Reviewers

i) **Dr. Deborah Cory-Slechta**

The Panel is to be commended for its careful and comprehensive response to the charge questions that were posed for its consideration. It appears from reading the document that the committee report does respond to all of the charge questions and does so in a thoughtful manner. Most of the comments on the document reflect changes that could improve and clarify those responses and to relate them more directly to the charge questions.

First, there are many different conclusions and suggestions that are listed in the document in response to the questions. What is less clear is how the Panel felt about the relative importance of the different conclusions. Certainly some would be considered much more important than others, but that aspect does not come through in the document. In accord with that, the report itself does not provide any prioritization in terms of how various actions should proceed from this point, nor is it easily discernable given that the importance of the various conclusions is not indicated. This would seem to make it difficult for EPA to determine how to proceed based on the SABs input. It is clear that these issues raised by the Panel, at least considered collectively, clearly raised concerns, since the letter to the Administrator encourages improvement should occur as expeditiously as possible. This sense of urgency occurs so late in the letter, however, that it is almost overlooked.

In some cases, conclusions and suggestions are presented in the document in the absence of any context, i.e., in the absence of understanding what EPA has proposed to do or has presented as a plan. This makes it more difficult to understand the committee's deliberations and suggestions, and this also makes it difficult to ascertain the committee's sense of the need for revision. For example, the response to charge question 1 (beginning on p. 11) is difficult to follow and some of the context is actually presented later (p. 12)

The document appears to be differentially organized based on the charge question. Charge question 1 presents a series of bullet points that expand the question. This is followed by various paragraphs, but it is not clear how these relate to the various bullet points that comprise the charge question. The responses to the other charge questions are more directly related to the specific sub-points of the charge question, making the responses of the Panel clearer.

It would probably be useful to have a summary paragraph at the end of each section (charge question) summarizing Panel recommendations. This could also be a mechanism for their prioritization.

Other more specific issues are elaborated below:

1. The suggestions related to issues of modeling is one sometimes presented in the absence of sufficient context, making panel views difficult to understand. This is the case on p. 2, lines 18-20, and on p. 11.
2. The text on page 11, lines 2-34 is densely presented and difficult to follow. It needs some context, and perhaps to be broken down into more manageable paragraphs. The concerns related to modeling as currently utilized need to be incorporated. The meaning of the sentence on lines 32-34 is not at all apparent.
3. Page 19, line 13 "...stemming from two seemingly contradictory drivers," is unclear.

4. Page 19, line 16, should the word 'or' be 'and'?
5. Page 19, lines 32-34, again, the problem of the existing models and their use is not provided for adequate context.
6. Page 20, line 37, should the word 'and' be 'or'?
7. Page 23, lines 23 on. Introduction of the existing siting plan here prior to lines 28-36 would be useful in understanding the response. Some of the appropriate context is presented on p. 24.
8. Page 27, Section 4.4, The context of the response would be helpful here; what is the current plan/specific problem that this responds to?
9. Page 30, lines 21-23. Has this been addressed?
10. Page 30, Section 4.5. Much of this text actually seems more pertinent to charge question 3 and does not seem to directly relate to charge question 2d. In fact, the response to 2d seems to be in the text preceding line 29 on p. 30.
11. Page 36, lines 2-4. It is not at all clear what this conclusion responds to; again, some context would be helpful.
12. Page 37 contains text/paragraphs that are identical to those presented on p. 36 and appears as a response to the same heading.
13. Page 39, lines 22-36. The message here does not seem consistent with the example given. Its not clear what is being conveyed here.

ii) Dr. Genevieve Matanoski

The Panel's review of the EPA's document entitled "Expansion and Upgrade of the RadNet Air Monitoring Network, Vols. 1 & 2, Concept and Plan is well written and provides thoughtful and useful advice to the Agency. The review adheres to the SAB's criteria that the document answer the charge questions, is clear and logical and present conclusions and recommendations that are well supported by information provided. The Panel is especially to be commended for calling EPA's attention to the fact that the stated objectives may not be well conceived either in the projected use of the fixed or the deployable monitors. The EPA's plan appears to call for two separate objectives that require a population-based system for the fixed monitors that is to answer the concerns of the public regarding possible exposures and a geographic system that will include both types of monitors to identify possible problems through surveillance by fixed monitors and clarify the exact nature of any problems noted through the use of deployable monitors. As the Panel has noted the most important activity is to be sure that we can detect and localize any problems and that clearly needs an accurate modeling of potential exposures, a result that requires a geographic system. The panel has emphasized that the modeling needs to be the focus of the system and testing of those models for their ability to locate points of problems and exposure doses. The Panel has noted on page 22 that the population coverage using all fixed sitings when they are finally in operation will include only 50% of the population, a limited proportion of all the US. Thus, they can't really use the data to reassure the majority of the population of their safety. The Panel might strengthen their argument by emphasizing this point. However, the sitings may actually have another purpose such as the protection of selected cities. Does the Panel know whether this is true? The Panel might strengthen their recommendation by adding these numbers to the other area where this is discussed.

The Panel has noted another point that would appear to be very important. That is the use of other sources of monitoring of radiation levels that could be added to the data gathered from RadNet. In fact, the use of data from other agencies and sources besides EPA is perhaps an important enough recommendation to be noted in the letter to the Administrator. Obviously, these systems could greatly expand the network coverage offered by EPA alone. Making the data compatible may involve a serious commitment of time and effort on the part of the Agency and that may not be a task they wish to

undertake. However, even if the information is not directly comparable to that of the RadNet system it may be useful for other purposes. The potential expansion of useable information appears to be very large. Perhaps the Panel could add a few words suggesting to EPA how this information could be useful in accomplishing their stated objectives if the Panel actually sees this as an important step. For example, it would seem that state data could be used to supplement population data in specific locations and other sources might target high-risk local sites. The use of other data resources has been mentioned in several places but the Panel might consider strengthening their discussion of this item if it is viewed as important.

In regard to the recommendation to immediately use all deployable monitors to place them in locations chosen for fixed monitors as noted on page 12, the reader has the impression that this is an obviously beneficial suggestion since the total projected adequate monitoring system would be implemented immediately. (Page 12) Later the document mentions some possible positive and negative reasons for doing this. Maybe you can suggest that there may be caveats here so the reader can see why it was not an obvious step that EPA proposed to take. Even on page 21 where some of the problems with the pre-deployment of these deployable monitors are again suggested it is not clear to this reader why it is not better to move a deployable monitor with accompanying and active personnel from an area where it is in use rather from two laboratory sites and find new personnel to service them. This needs some further explanation. The sentences on lines 26-28 on page 22 at least asks the Agency to evaluate the problems and costs. Maybe something like this can be added to page 21 rather than simply suggesting that it might not be easy to move them if needed. If the Panel recognizes other issues that need to be addressed rather than just monitor differences and moving problems they might add them since the scheme seems to be very worthwhile to this reader.

The Panel should review the discussion of communication development on page 38. The issue of communication to the public regarding potential exposure to radiation is a very important point. The Panel has even suggested that EPA prepare communication messages. The problem is that the discussion on this page suggests that the FRMAC is the group who release all data to the public. Therefore, the question arises as to who should be developing the public communications messages and testing them. Can the Panel clarify in this section what are EPA's needs in terms of public communication? To whom will they be speaking in case of an emergency? The Panel has commended the EPA for thinking about this problem on page 4 and there is no question that communication should be planned well in advance of any problem but the reader needs a clarification about where EPA fits in terms of communication.

Specific Comments:

Page 25. The Panel has emphasized an important point. Since it is impossible to monitor everybody so we can reassure them that they would not have any effects from potential radiation exposure, the alternative is to make the modeling as accurate as possible so that we can with high probability monitor the exposure of all populations. This is true for both the evaluation of continuous data input for surveillance as well as input to risks from local sources. This section might be strengthened some if the Panel could discuss whether other sources of radiation data might be used to validate or even develop appropriate models.

Page 28. The Panel is to be commended for noting the potential real problems that EPA will face in trying to provide trained personnel in a nuclear incident. As pointed out this may be a real problem for a "volunteer" group. The problem also would extend to the Agency's planning of how to bring in and where to locate the deployable monitors since they may be activated in an emergency and especially when EPA is responding to simultaneous attacks. The Panel has

asked the appropriate questions on page 29. The Panel might consider whether it is important to note in the letter to the Administrator that the document has not well defined the procedures for using deployable instruments in emergency situations. This problem is mentioned in the summary but not in the letter.

Page 37 Four paragraphs repeated.

Page 40 Under 5.4.6, we still have the problem of “lines of communication.” Perhaps somewhere in lines 28-29, the document should note that the decision-makers are constantly changing in local areas and new persons must be re-initiated into the workings of the RadNet and its needs and uses. State and local government radiation programs should help with this.

Most of these comments are only suggestions that struck this reviewer when reading the document. They are simply for the consideration of the Panel. The only suggestion that needs careful review is the fact that the Panel has suggested that EPA seek other sources of radiation monitoring data to add to that of the network to expand EPA’s capabilities. This needs to be included in the letter in some way and also may require further suggestions from the Panel.

iii) Dr. Jana Milford

Re: Comments on RAC RadNet Panel review of draft “Expansion and Upgrade of the RadNet Air Monitoring Network Concept and Plan,”

The review panel has done an excellent job of addressing the charge questions and presenting their recommendations in a clear and logical report. I have a few suggestions to improve the clarity of the report and a few concerns about adequacy of support in the report for the panel’s recommendations.

Letter to the Administrator

- 1) The statement that “there should be a better balance between physical deployment schemes and modeling requirements” isn’t clear. I think the panel is equating “physical deployment schemes” to population-based deployment; could the latter phrase be used?
- 2) A related issue is that the panel’s recommendation that more weight be given to geographical coverage/modeling needs is not very well justified. Given that this is a significant change from what must have been a carefully considered decision on the part of the Agency, the panel should explain more fully why it believes this shift is needed.

Executive Summary

- 1) In paragraph 3, it would help put the upgrade into context if the ES mentioned that the current ERAMS system has 59 air monitors. In regard to the concern that the full network of 180 new monitors will not be deployed until 2012, it may be worth noting in the ES that EPA expects to have 130 fixed site monitors deployed in fall 2007.
- 2) As in the letter, the meaning of “physical deployment schemes” on p. 2 of the ES isn’t clear and the recommendation to place more emphasis on geographic coverage warrants more justification.
- 3) The recommendation on p. 4 that unprocessed RadNet monitoring data should not be used to estimate excess cancers needs further explanation, especially given that EPA says data from fixed monitors would be used for population dose reconstruction, and that the Agency is tasked with estimating the effects of radioactive releases on human health.

Chapter 2

- 1) The panel should consider noting in the first paragraph that the ERAMS system has 59 air monitors among its 200 sampling stations.
- 2) On p. 2, it would be helpful if the deployment timetable for the 180 fixed monitors were provided, including the interim steps as well as date of deployment of the full network.

Chapter 3

- 1) On pp. 11-12, the panel explains that it believes modeling results are more important than individual monitor data in emergency situations; consequently it recommends greater emphasis on geographic monitoring to support modeling requirements. However, it isn't clear how strongly modeling done in emergency situations depends on additional radiation monitoring data, especially at the scale being addressed by the RadNet system. Would modelers actually use RadNet data to calibrate or adjust their models, or would they just use information on release locations and meteorology and run with that? And if RadNet data would be used, would a few additional RadNet monitors make any difference? It seems like the panel needs to address these questions in order to adequately justify its recommendation that greater "declustering" is needed. As it stands, neither the draft EPA Expansion Plan report nor the panel's review ever really explains how RadNet data (or ERAMS data) would actually be used to assist in emergency release modeling. The reports just suggest that it might be used to help calibrate or evaluate models.

Chapter 4

- 1) On p. 20, the recommendations to use regional meteorological models to redistribute fixed monitors and to use model sensitivity analyses to optimize placement are not clear. At the least, it would be helpful to refer the reader to section 4.3.1, where more explanation is provided.
- 2) In the first paragraph on p. 22, the terms "population coverage" and "land coverage" need to be defined, as they have very specific meanings in the context of this report.
- 3) It isn't clear how the example model-based optimization approach presented on p. 25 compares or relates to the proposal from the Westinghouse Savannah River Company.
- 4) Did the panel consider the resource requirements for undertaking the "complete inventory" of "all existing, functional radiation equipment" recommended on p. 26?

Chapter 5

- 1) Four paragraphs of text are repeated on pp. 36-37.

b) Other Board Reviewers:

i) Dr. Granger Morgan

The report implicitly suggests that with fewer stations in high population areas, adequate estimates of human exposure can be made via modeling. Is this known for sure? If not, shouldn't the recommendation be to rapidly do such modeling to determine that it is true BEFORE suggesting that declustering should be done. Similarly, shouldn't such modeling be done before it is decided whether and how many of the deployable stations are used in place of fixed stations that are not yet available. perhaps the panel has done or seen analysis that leaves them confident in their recommendations, but the supporting evidence is not present in the report.

On page 32, if data are only reported when the exceed some critical value how will others know that all the stations were reporting and not that some were simply off-line?

Is there any issue of calibration drift over time? If so, has that been addressed?

Both in the executive summary and in the text on pages 38 and 40 the text on developing risk communications should be more explicit. For example, the current text that reads: "EPA should consider developing sample informational messages with the aid of social science experts..." should read:

"EPA should develop, empirically test, and refine, sample informational messages with the aid of social science experts..."

I would also like to see both this and the text urging pre-planning for how to deal with emergency contingencies also mentioned in the cover letter to the Administrator.

The report says that "the estimation of the number of excess deaths...[is] not the responsibility of RadNet." An obvious question than is whose responsibility is it. If EPA does not do it, you can be sure that others will – and perhaps less carefully.

The bold text in the middle of page 36 appears to be repeated in the middle of page 37.

ii) Dr. Rebecca Parkin

Answers to the Board's Charge questions

- 1) Yes, the report addresses most questions adequately. Issues that merit additional attention are noted in the comments below.
- 2) Yes, the report is largely clear and logical. Some elements of responses that could be improved with further clarification are presented below.
- 3) Yes, the conclusions are usually supported by the information and evidence presented. In some sections, additional evidence and/or citations would strengthen the responses.

Overall, the report covers many important issues. Some gaps in the documentation may simply be a reflection of the Panel and EPA staff having shared knowledge and experience that is not reflected in the draft report.

Additional comments

The "ultimate goal" is stated as being "to provide timely, scientifically sound data and information to decision makers and the public" (p. 5, lines 19-20). The report addresses both routine and emergency conditions, but discussions about providing sound data and information is largely focused on emergencies. Communication strategies for routine and emergency conditions are fundamentally different in many ways, but are not explicitly acknowledged in this draft report.

While data collection is designed to understand baseline levels of radiation in the environment and maintain readiness (p. 10, lines 9-11), there is no indication whether sharing data under routine conditions is needed either to educate decision makers or the public, or to achieve any other goals.

Knowledge of what "decision-making and public information needs" are (p. 36, lines 8-9) is crucial to addressing charge question #3c. Without such knowledge the Panel cannot fully answer the question, because it is the basis on which "efficient and effective" data review and evaluation are to be judged.

In a number of places in the draft, the Panel touches on issues that relate to what the agency assumes about decision-makers' information needs.

- P. 16, lines 25-27: EPA is expected to make data conversions so that decision-makers can make comparisons, but it is not clear to this reviewer that EPA is informed about what types of data or converted data decision-makers need or

want. If EPA does have sound evidence about decision-makers' information needs, the report would be strengthened by noting how the agency obtained that evidence and what they learned from it.

- The Panel recognizes that decision-making processes and priorities may differ depending on the length and nature of the event (p. 19, lines 25-27), but does not indicate how these differences may affect what decision-makers will want from RadNet. Does the agency know how decision-maker information needs vary under different conditions? If so, how was that knowledge obtained?
- P. 24, lines 10-19: The draft states that EPA assumes that modelers and planners want a "well-spaced network," while decision-makers want monitors clustered in large population centers or locations relevant to inducing potentially wide-spread exposure. Is the latter based on evidence or the Panel's assumption?
- Siting of monitors needs to be "driven by technical and practical issues" (p. 26, lines 9-10), but the practical issues related to decision-makers' information needs are not mentioned here.
- P. 40, lines 26-32: This is the Panel's first mention of *asking* decision-makers what they need and want to know, or what they think "messages" should be. In this reviewer's opinion, pointing out the importance of asking people (decision-makers and the public) what they know, and need and want to know under routine and emergency conditions should be highlighted earlier in the draft (perhaps as early as subsection 5.4.2).
- P. 40, lines 28-29 do not include public health officials, who will virtually always be brought into emergency responses. This is especially true if a physician is one of these officials, and is seen as a highly credible public spokesperson on health-related concerns.

There is a lack of discussion of what the public needs and wants to understand and respond effectively to radiation information.

- The agency is said to have assumed that the public may want monitors in their area regardless of other priorities (p. 24, lines 21-24). Was this determined in conversation with agency staff?
- Pretested sample informational messages are expected to be sufficient in emergency conditions (p. 38, lines 10-13). However, messages also need to be tailored to populations of concern and specific emergency conditions. (This latter aspect of tailoring is acknowledged on p. 40, lines 37-38, but should be moved up in the draft.) In this reviewer's experience, designing communications without prior assessment of populations' knowledge, perceptions, expectations, and their relevant and pivotal information needs results in ineffective approaches. Without a sound basis, it is unlikely that sample messages will have the desired impacts during a specific event. In this reviewer's opinion pretesting will help but is unlikely to be sufficient for designing effective, strategic messages.
- P. 38, lines 25-27: While ensuring that messages are "consistent, accurate and useful" is an important strategic communication priority, being prescriptive about the chain through which data should be released to the public may not serve the agency well for a wide range of conditions (such as those noted on p. 19, lines 25-27).
- It is not clear to this reviewer why "EPA should then make every effort to rapidly supply the validated raw data in a form that is easy for the public to understand" (p. 38, lines 34-35). While the paragraph is focused on emergencies and the Panel's intent is likely focused on motivating effective actions, the sentence as it stands opens a number of questions about how the goal of understandability can be effectively met for various public users

(particularly if the agency does not have sound information about users' information interests and priorities). There is no evidence presented to indicate whether the agency or the Panel knows whether the public wants the raw data and, if so, in what context and form the data should be presented so that it will be understandable among a wide range of users.

- Further on p. 39 (lines 26-27), the Panel notes that raw data may “convey an improper perception of the risk from any event.” Raw data may also trigger public perceptions that do not match expert perceptions during routine conditions. Is the Panel implying here that only expert perceptions are “proper,” or only perceptions during events matter? If only expert perceptions are viewed as correct, this view would deny the validity of non-expert perceptions, which are what they are. One’s perceptions are one’s reality, regardless of whether those perceptions are judged by other parties to be right or wrong. This reviewer recommends that this portion of the draft be revised.
- Why does information on background levels and variability need to be conveyed to the public? (p. 40, lines 1-2) What is the evidence base for this statement? Have members of the public been studied to assess what they want about background levels and how they want it? (This point is relevant to lines 5-9 on p. 40.)
- The point about “appropriate language” (p. 40, lines 9-11) is only one of several issues that need attention when preparing and presenting cancer risk information for various populations. This statement and level of detail seem out of place, or should be expanded with other key issues (cultural sensitivity, modes of communication that the public prefers, etc).
- Preparation of “standard informational messages for use in ... emergency broadcast messages” (p. 40, lines 19-20) sounds like an oxymoron to this reviewer. Emergencies are rarely “standard,” and messages need to be tailored to specific contexts (event, population, geographic and jurisdictional characteristics to name a few) to be effective. While certain factual elements may not change (e.g., be standard?), a great deal of what the public may need to know in order to take appropriate action may vary depending on the nature of the event and the public’s particular circumstances. Review by social scientists should help but may not ensure that messages will be “understandable” during emergencies (p. 40, lines 23-24). The Panel appropriately recommends that statements be tested during exercises (p. 40, lines 20-21).
- P. 40, lines 38-41 appear to be based on knowledge or assumptions about what the public needs to understand, and that only rational bases need to be considered in designing messages. It is widely known that affect plays an important role in risk perception and communication responses, and potentially plays a very powerful role in time-pressured circumstances. These lines should be redrafted.

Chain of command issues with partner agencies are noted when the Panel discusses reconsideration of the deployable monitor plans (p. 21, lines 17-18). This communication concern may be important for more than this issue, particularly in emergencies. Without elaboration or wider recognition of chain of command issues, this statement seems out of place.

Editorial comments

P. 26, line 26: What is the “two-meter rule?” Maybe everyone in the agency knows, but all readers of the report may not. Perhaps a footnote would help here.

P. 37, lines 5-37 repeat the immediately prior lines on pp. 36-37.

P. 37, line 39: The word “to” in the subsection heading (and various places in the text) implies that the Panel views one-way communication as the only appropriate option for communicating RadNet results. However, on page 40 (lines 26-29) the Panel includes two-way communication with decision-makers among its suggestions. If leaving a one-way impression does not correctly convey the Panel’s intent, then the Panel should consider revising this heading and including more two-way mentions in this section.

iii) Dr. Thomas Theis

[See Dr. Theis’s “General Comment” above on these reports at 1.b)ii)]

iv) Dr. Michael McFarland

The Panel is applauded for conducting an outstanding review of the Agency document “Expansion and Upgrade of the RadNet Air Monitoring Network”. It is my opinion that the Panel has addressed all of the Agency charge questions in a clear, thoughtful and comprehensive manner. Both the cover letter and executive summary reflect the contents of the report and capture the Panel’s salient points to Agency decision-makers including the need to: 1) expand the modeling activities for defensible decision-making, 2) achieve a more equitable balance between physical deployment of monitoring requirements, 3) ensure minimum skill set requirements for volunteers tasked to deploy radiation monitors and 4) establish scientifically-defensible decision rule criteria before attempting to interpret monitoring information.

I was also encouraged by the Panel’s strong emphasis to the Agency of the need for effective risk communication and stakeholder involvement early in the decision-making process. I have no substantive recommendations for modifying the contents of the report. Based on its responsiveness and quality, I support approval of the panel’s report as currently drafted.

v) Dr. Valerie Thomas

I concur with the RadNet review. It is an excellent report: clear, informative, and with what appears to be advice that will help EPA to improve the RadNet system.

I do have a few comments:

p. 4, lines 18-21. This comment seems to be a non sequitur, out of place and not addressed in the report. I suggested cutting it.

p. 11, lines 43-46. The review stresses the panel's belief that in an emergency situation the output of modeling is significantly more important and useful ... than the output of individual monitors. This point is made repeatedly throughout the review. But the panel never explains why modeling will be more important and useful. It would improve the report to have a one or two page explanation of why or how modeling will be more useful. Can the panel provide a "worked example" of what would happen with and without the modeling?

p. 30, line 7 as well as earlier in the report. Throughout the report it is mentioned that the monitors will be outside the contaminated area. It might be helpful to clarify that (I assume) there will be monitoring inside the contaminated areas, but that this is the responsibility of other agencies.

p. 36, lines 36-37. There are a number of comments about the problem of false positives and the need for data QA/QC. The report doesn't make clear whether the panel does this that these issues can be resolved; left open is the possibility that there will be too many false positives relative to actual events, or that QA/AC cannot be well controlled. Does the panel think there is a possibility that EPA is deploying an unworkable system?

vi) Dr. Steven Heeringa

The RADNET Panel's review is well organized and well-written. The Administrator letter and Executive Summary clearly and succinctly highlight the Panel's major findings and recommendations in response to its specific charge and general review of the EPA plan for expanding the nation's radioactivity monitoring network. The detailed discussion in the body of the report is "to the point" and reflects the correct balance of best science with the homeland security, population risk and political concerns that are inherent in any nationally distributed, multi-purpose monitoring system of this type.

A few minor typographical/editorial notes:

Administrator Letter,

page 1, Line 19 – place comma after Plan outside quotes.

page 2, Lines 26,27 – wording is a bit awkward, simplify/clarify

Report

Page 6, Line 18 – "As of December..."

Page 14, Line 12-13 "Each of these factors can impact the measurements' representation of ambient air"

Page 26, Line 16 – tab for c) is offset

Page 29, Line 7,8 "dirty bomb"

Page 33, Line 2 – delete comma, "raw data is..."

Page 35, Line 37 – "unaffected states.."

Page 36, Line 39 – "...systems.."

Page 37, Line 41 ff –paragraph duplicates page 36, line 39 ff

Page 37, Line 37 "incident, a local Incident.."

vii) Dr. Phil Hopke

The report emphasizes that they believe modeling will be more important in an emergency than the fixed monitors. However, they really do not adequately address the interplay of the modeling with the fixed monitor values. Although they get to the modeling later in the report, there needs to be more discussion of the rationale for declustering the fixed monitor locations. It is not well justified in the presentation on page 12 and for a significant change in the monitoring strategy, there needs to be a much clearer rationale for the recommendation than is currently present in the report.

In general, a considerable degree of separation can be obtained between natural radon decay products and artificial alpha emitters dispersed through explosions based on particle size. The surface area of the ambient aerosol is in the size range of 0.1 to 1 μ m while particles from explosions will be less than 100 nm. Thus, size discrimination can provide substantial separation that would ease the algorithmic requirements.

One of the problems that arose in the discussion of post-Katrina monitoring was the lack of defined action levels against which to gauge the effectiveness of monitoring plans. Thus, the emphasis on defining the PAF so that the MDA values can be evaluated relative to PAG is critical to developing an effective monitoring plan.

I find the report authors suggesting such wide distribution of monitors to be unreasonable and poorly justified. The primary threat is a dirty bomb that will be relatively localized in large metropolitan areas. They are deploying monitoring as if nuclear weapons will be detonated and dispersing radioactivity over a wide region. There is no rationale provided for their advice and thus, it appears quite unreasonable to monitor low population areas relative to focusing on population areas where the threat would seem to be much more likely to be manifested. The objective should be to protect the maximum number of people and the review committee's suggested deployment fails to provide appropriate exposure assessment for the bulk of the population.

There is too much emphasis on models that are notoriously unreliable. We have been trying to model dispersion for 40 years and still have a long way to go to get it right. We cannot accurately predict the weather 24 hours in advance. The idea that primary reliance should be on models is clearly unreasonable.

The report seems to want answers to questions that cannot be known *a priori*. One can imagine a variety of emergency scenarios that would require very different uses of the deployable monitors. The guidelines can be in terms of exposure assessment guidelines to protect people and physical assets, but the idea that physical guidelines such as the questions on page 29 outline are unreasonable compared to guidelines based on broader guidelines based on protection of public health and welfare.

The remainder of the recommendations seems to be well articulated and adequately explicated.

3. Second Generation Model

a) Lead Reviewers

i) **Dr. Trudy Cameron**

- 1) Are the original charge questions to the SAB Standing or Ad Hoc Committee/Panel adequately addressed in the draft report?

I did not notice the specific original charge questions itemized in the report, thus it is difficult to assess whether the report has adequately addressed them. It appears only that “EPA’s Office of Atmospheric Programs (OAP) requested that the Science Advisory Board (SAB) provide advice on a principal economics-based computer model used by the EPA to perform analysis of potential U.S. climate change policies.”

- 2) Is the draft report clear and logical?

For the most part, yes. However, I include detailed suggestions for line edits, below. As always, some of these may be a matter of taste, but I read draft reports with an eye to smoothing out the prose for the reader and removing all ambiguities, large or small.

- 3) Are the conclusions drawn, and/or recommendations made, are supported by information in the body of the draft SAB report.

These are my most significant points:

- 1) p. 14, lines 27-30: “A major consequence of explicitly representing trade is the [question] of [which] trade elasticities to specify. There is a long-standing debate in the literature on this issue: the econometric estimates are “too low” in relation to the *a priori* belief that many (particularly small) countries have zero market power on global markets.” {This suggests that “reality is not sufficiently realistic.” If you are going to make this assertion, for goodness sake, back it up with the relevant references. The SAB cannot afford the perception that the economists on the Panel pick and choose which “facts” they want to believe.
- 2) p. 17, line 1: “...may imply too much flexibility in capital and [therefore] under-representdevelopers to consider [adjusting] [] capital lifetimes in the electricity sector to make them more consistent with empirical evidence.” {Here, oddly enough, “reality would be more realistic....”}
- 3) p. 19, line 44: Why would one choose a t-distribution for unknown parameters? Maximum likelihood estimates are asymptotically normal. Joint normal distributions are typically easier multivariate distributions from which to make draws (i.e. use the Cholesky factorization of the desired covariance matrix). Perhaps there should also be some mention that certain parameters are logically constrained to be strictly positive (or at least non-negative). The joint normal distribution can readily be used to include parameters which are assumed to be lognormal. What is the usual strategy for simulations in this literature when a normally (or t-) distributed parameter appears in a denominator? How does one avoid the theoretical possibility of a zero denominator? How are inadmissible simulated values, due to the possibility of wrong-signed parameter draws, accommodated in these simulations?
- 4) I was mildly surprised to encounter Appendix B at the end of the report. At that point, I could not recall where it had been cited in the paper. If it was, I was not sufficiently motivated by the text of the report to explore the contents of Appendix B.

Line edits:

p. 3 of cover letter: Awkward: "...the model needs to provide more information for the uncertainties underlying the values for its inputs, and the associated uncertainties in the policy outcomes." Perhaps use "...the model needs to be accompanied by more information about the fundamental uncertainties associated with its simulated policy outcomes." These uncertainties stem from uncertainty about the empirical estimates of the parameters that drive the model."

p. 2, line 9 "...labor markets, [energy/fuel markets, and non-energy] commodity markets in each region."

p. 2, line 19 "...may be found in the OAP section of the EPA's Web site at..."

p. 4, line 36: "...and count them up..." seems a little too colloquial.

p. 4, line 45: "should acknowledge the departure [and explain the reason(s) for it]."

p. 5, line 7: What, precisely, is meant by "activated"? "non-constant"? "non-zero"?

p. 5, line 13: "for Walras' [] Law in every [iteration]" {Is this the intention?}

p. 5, line 22: "...Clarify [which] emissions [are attributed] to the "everything else" sector..."

p. 5, line 25: "feedback" is a noun. "to feed back" is the verb, I believe.

p. 5, line 28: "Clarify the relationship between [prices?] P, P_[i], and P_[r]. PiETE seems to be the [price of the] numeraire [good]" {Is this the intention? Are the subscripts right?}

p. 5, line 33: "Walras' [] Law is verified[,], there should be no effect [of what?] on quantities.

p. 5, line 44. Perhaps append: "While the GTAP data may or may not dominate the SGM base year data, it does allow comparisons to a body of existing work."

p. 5, line 46: "...parameterized model [can replicate] the benchmark data" [How does one measure the "extent" to which replication occurs? With a loss function of some type for "missed marks"?

p. 6, line 2: By "source links," do you mean hyperlinks in the document, or merely references?

p. 6, line 8: "For example, [comparisons] for regions of the USA..."

p. 6, line 10: "...does not provide any comparison [of the SGM baseline year data] with the GTAP energy data. There is a discussion of GTAP [expenditure] data (price times quantity), the IO table [for] China (price times quantity), and IEA energy data (quantit[ies])..."

p. 6, line 16: "...to see how they [line up] globally."

p. 6, line 20: "...should report aggregate [quantities?] for CO₂..." {The formula for carbon dioxide should probably be displayed with a subscript on the 2 wherever it appears. A global replace would probably suffice.}

p. 6, line 27: "...based on non-CO2 emission [values] (or emission factor values) and..."

p. 6, line 35: "...and any refinements [necessary] to arrive at them..."

p. 6, footnote 1, "...for example[,] by providing [hyperlinks].... [However,] the Panel was unable to get any detail on data..."

p. 7, line 9: "...This severely reduces the [user's] ability to evaluate..."

p. 7, line 12: "sensitivity analy[ses]"

p. 7, line 17: {Is there actually no mention of the software or algorithm used to solve the CGE model???

p. 8, lines 12-14: Sentence that spans these lines was confusing. Is it intended to say "It is also possible that the data currently used in the SGM model could not be updated as often as GTAP without incurring high (and duplicative) costs."

p. 8, line 16: "...offers a list of studies [which have generated] econometric estimates of demand elasticities."

p. 8, line 18: "...which the elasticities [used in] the SGM model are consistent with these estimates..."

p. 8, line 29: "...Panel's recommendations for a more [systematic,] extensive[,] and informative sensitivity analysis...."

p. 9, line 11, "...changes in economic conditions [and changes in technologies in critical sectors], and would allow..."

p. 9, line 13: "...Many counties and regions have [experienced] substantial changes..."

p. 9, line 15: "...particularly in [sectors which are critical] for the analysis of carbon policies."

p. 9, line 23: "Many researchers working on [] issues relating to climate change..."

p. 9, line 25: "The GTAP data include[] detailed accounts..."

p. 9, line 33: "...GTAP data may be accessed [either using the] GEMPACK software ..."

p. 9, line 36: "...allow the user to match the [resolution of the] GTAP data to their own needs, [removing the need to] carry along the complete detail [of] the full data set.

p. 9, line 41: "Whether [the SGM's] developers ultimately decide..."

p. 9, line 42: "...Panel urges the developers[,] at a minimum[,] to provide a comparison..."

p. 9, line 43: "For the energy data[,] these comparisons should be in [both] value terms and [] physical flows. The use of constrained optimization routines to

facilitate such [updates??] has a venerable tradition [(see Stone, Champernowne and Meade (1942))], and has become much more common in recent years [(see Harrison, Rutherford, Tarr and Gurgel [2004; p. 297]).]

p. 10, line 7: “Such [a] disaggregation would not be difficult...”

p. 10, line 11: “One possibility is that SGM developers [retain] the current procedures...”

p. 10, line 26: “The Panel urges the [SGM’s] developers to improve the...”

p. 10, line 28: “This [precludes] the use of theoretically consistent...”

p. 10, lines 31-36: {Where IS this issue covered? Mention where, for the reader.}

p. 10, line 41: “The [widely used] representative consumer approach can [be] a pragmatic way to assess welfare effects. This could be the first major improvement to the [SGM’s] modeling of consumer behavior.

p. 11, line 1: “...by a particular utility function [requires] either [] strong restrictions on preferences.....of a set of disaggregate [individual] consumer demand functions.

p. 11, lines 5-10: {Empirically, one would describe this as a decision to allow parameters of preferences to vary systematically with indicators for socioeconomic status.}

p. 11, lines 15-18: {How does heterogeneity enter into preferences in these cases? Translation? Scaling?}

p. 11, line 24: {Clarify what is meant by a “flat” CES production specification.}

p. 11, line 28: “...and employ a nested-CES production structure [that is] more in line with existing CGE models and parameterized...”

p. 12, line 17: “...functional form that can [accommodate] local second- p. 11, line 31: “...capital and energy, [being currently] highlighted in the literature.”

p. 11, line 33: “...(maintaining global [regularity] and [estimating] their own empirical parameter[s] using updated data.”

p. 11, lines 37-40: “... “Flexibility” and “parsimony” refer to models that capture the full range of theoretically consistent, local substitution possibilities. A “practical representation,” referred to as “global regularity,” is one that defines [plausible/admissible] demand behavior (i.e. positive and downward-sloping demand curves) for all combinations of positive prices. Finally, “empirical data” refers to the need to have simulated behavior match [historical] experience as much as possible.

p. 11, line 44 “... A fully[]flexible representation...”

p. 12, line 2: “...complementarity of inputs [in the vicinity of] the initial benchmark prices.”

p. 12, line 8: “...all non-negative input[s] (and input combinations) is especially hard to guarantee when the second[]derivatives are complex...”

- p. 12, line 9: “For simulations to be [admissible], regularity is...”
- p. 12, line 17: “...functional form that can [accommodate] local second-order flexibility [yet] remains globally regular. [However, t]heir formulation...second-order conditions), and [thus it] has not been widely implemented.
- p. 12, line 21: “More-common approaches...in part because of the difficulty [of] parameterizing a fully flexible...”
- p. 12, line 25: “—in contrast to the[]non-separable model [above, which is] required for full...”
- p. 12, line 29: “We also see[, within] the capital-labor-energy aggregate[,] either a ...”
- p. 12, line 32: “...on the questions being asked and [the available] empirical data.”
- p. 13, line 6: “involves [countries besides] the United States...”
- p. 13, line 22: “The second [improvement] is part of a longer-term...”
- p. 13, line 23: “...full-blown multi-region version of [the] SGM. “
- p. 13, line 25-26: {How disaggregated are the commodities?}
- p. 13, line 33: {This is the first mention of “partners.” What are these?}
- p. 13, footnote 2: “...carbon-intensive in their production processes[,] then emissions increase. ...this trade-induced effect is [entirely plausible] for Sweden.”
- p. 13, footnote 3: {This footnote does not use a matching font.}
- p. 14, line 9: “constant-elasticity[-]of[-]substitution”
- p. 14, line 12: “constant-elasticity[-]of[-]transformation”
- p. 14, line 16: {This is ambiguous. Do you mean “domestically [consumed] and exported”?}
- p. 14, line 18: The first time you mention Armington, you should footnote the description with the standard references.
- p. 14, line 24: “We emphasize that these [five] alterations can be implemented immediately...”
- p. 15, line 2: “...the partitioning of the aggregate {uses} of each commodity into imported and domestic {varieties}. {These nouns are inconsistent.}
- p. 15, line 8: “...--e.g. for North America[:] Stern, Francis...”
- p. 15, line 13: “...by the modeling term [i.e. the logistic share equations?] would not only fail to capitalize...”
- p. 15, lines 15-22: {Check the order of “domestic” [D?] and “imported” [M?]}. The notation and the descriptions sometimes do not appear in the same orders.}

- p. 15, line 30: "...are [estimated parameters from outside sources]"
- p. 14, line 32: "In the general[] n-input case[,] the logit share..."
- p. 15, line 35: {I am accustomed to the use of the term "fungible" to convey the idea that some piece of capital, once purchased and installed, can readily be converted to the production of a different commodity than that for which it was originally intended. Is not "substitutability" what is implied in this context, instead?}
- p. 15, line 39: {Which "original" guidance?}
- p. 16, lines 3-4: "In the case of quantity [shares] rather than cost shares, i.e. [when]..."
- p. 16, line 10: {Is analogue, or analog, the conventional U.S. spelling?}
- p. 16, line 11: {By "vanishes," do you mean "goes to zero"}
- p. 16, line 16: "...employ the Armington specification without [this choice] having much of an adverse impact on..."
- p. 16, line 24: "However, it concludes that [further] refinements to modeling..."
- p. 16, line 44: "In the electricity sector, [historically,] capital lifetimes are significantly longer..."
- p. 17, line 9: {By "the current structure of demand" do you mean "empirical demands"??}
- p. 17, line 12: "...from peak to [off-peak] consumption."
- p. 17, line 16: {What are "benefit programs"?? }
- p. 17, line 17: "...policies have important [effects on the distribution of capital vintages]."
- p. 17, line 27: "...the amount of land [devoted to] crops, pasture, and forests..."
- p. 17, line 29: "...pays farmers to take [croplands] out of production. The lands are left unplowed and planted [with] a cover crop.
- p. 17, line 34: "...potential participation of[,] and gains from[,] agriculture..."
- p. 17, line 36: "The SGM [does not accommodate much at all in the way of] agricultural and forest policies. ...in the model does not [permit detailed simulations of] the effect of...influencing carbon fluxes [or non-carbon GHGs] in these sectors."
- p. 17, line 40: "...for [agriculture-/forest-related] GHG policy analysis..."
- p. 17, line 43: "...would offer an opportunity[,] as well[,] [to revisit] the specification..."
- p. 18, line 1: "...policies on GHGs and [on the] marginal costs of [different] mitigation policies]

p. 18, lines 15-18: “In the SGM, the [options for] CO2 emissions mitigation are endogenous...responds to [an increased] carbon price via [changes] in demand [and/or] supply, [technological change,] [different investment decision, etc.]

{By using “exogenous curves” do you mean “exogenous functions”?}

p. 18, line 18: {Perhaps use “limits” rather than “stunts”}

p. 18, line 23-24: “...incorporate non-CO2 emissions mitigation into the production structure and [into consumption].”

p. 18, line 32: “...number of [ruminant] animals...”

p. 18, line 34: “documentation states that[,] for the non-CO2 emission...”

p. 18, line 35: {I know it is a quote, but what is meant by “the process modeling”}

p. 19, line 14: “...robustness of [predicted] policy outcomes. In Part I[,] we indicated an initial approach to sensitivity analysis that could be introduced immediately. Here, we offer and recommend the use of Monte Carlo...as to the robustness of [predicted] policy outcomes.

p. 19, line 26. {I think it would be good to launch the idea of joint distributions right from the top. By a “range of possible distributions” do you mean for EACH parameter? It is hard to tell. Why not use just “user specifies possible distributions for the parameters and modeling assumptions employed in the model.”

p. 19, line 38: {When empirical information on parameter covariances is unavailable, why should we assume a zero covariance, rather than some other (perhaps equally) defensible value?}

p. 20, line 5: “If no estimate of the standard error is available [for a needed parameters], [a standard error] can be assumed a priori.

p. 20, line 8: {Do you mean “utilities” for multivariate random number generation (rather than “facilities”?)}

p. 20, line 10: {Should there be scaling parameters for both the expected values and the dispersions of each relevant parameter, or at least some of them.}

p. 20, line 14-15: “...since [these are] what typically [drive] the intuition...”

p. 20, lines 16-20: {These instructions are too “jargony.” I wouldn’t know what was expected in response to these instructions. Can the strategy be spelled out more clearly?}

p. 20, line 23: “...widely employed in models that are solved in “level form” and [they] do not entail significant...” {Do the consumers of this document know what “level form” means?}

p. 20, lines 27-29: The last point, about specialized methods, could be relegated to a footnote, since it does not seem relevant to the SGM.

p. 20, line 4: “method is [merely to] display a histogram...”

p. 20, line 6: "...having some sense of the confidence in [at least] the predicted sign..."

p. 20, line 10: "...Beyond these simple reporting advantages of [] a sensitivity analysis, one could..."

p. 20, lines 11-15: {The regression being described is an attempt to "estimate" an additively separable and linear approximation to the true relationships between the parameters (and specifications) used in the simulations. It is sort of like trying to recover a less accurate version of what you started with. }

p. 21, line 31: "...it is valuable to [understand] their sensitivity..."

p. 21, line 36: "...observing how well the model tracks history [from that point onward]."

p. 21, line 41-42: "will provide useful information [for] the model['s] developers[--] information that can guide..."

{The Appendix giving "Econometric Studies of Energy Demand Elasticities" is consistently formatted. However, the references for the paper are still a mess. There are numerous gaps suggesting that the references were copied in from a text file with different line-lengths. The dates are not consistently displayed, and many references do not format journal/book titles the same way, or use quotes consistently around the article title. The reference between Hill and Kristrom, and Kirman, is incomplete. }

p. 30, line 34, "Env[i]ronmental and Resource Economics"

p. 27: Is the reference meant to be Kristrom, rather than Kirstrom?

ii) Dr. Maureen Cropper

While most of the charge questions are implicitly answered in the report, and the report is very constructive offering a detailed critique of the agency effort, some of the questions are not explicitly answered (especially the first question). The Board should consider whether it is acceptable to answer implicitly rather than to respond to each explicitly for the record – for example by saying that the model is not quite appropriate in its current form, but it could be made appropriate with specific noted modifications. (Preliminary Comments)

iii) Dr. Cathy Kling

This report is clearly written and entirely responsive to the charge questions. The report is logical and the conclusions drawn are supported by the information in the body of the report. I assume that the names of the panel members will be added to the document before this goes forward. Other than that, my comments and suggested edits are minor.

- 1) Letter to the administrator: lines 33 and 35 use the word "indicates" to refer to what the model does. A more accurate verb to me would be "predicts" or "projects" or some other word that makes clear that this is not a known outcome. A similar comment applies to the Introduction, lines 13 and 15 where "indicates" is used in the same manner.
- 2) Isn't there usually an executive summary to these reports?
- 3) I suggest explicitly number the three documents referred to in the Introduction (page 2, lines 33-35) and using those numbers when referring back to the documents later

in the report. This should help reduce confusion about which document is being discussed.

- 4) There are a lot of acronyms used in the document; might a glossary to acronyms be useful? I don't know what PNNL refers to and couldn't find it defined in the report.
- 5) Page 10, line 41 is missing the word "be" at the end of the line.
- 6) Page 20, did the authors consider recommend that Bayesian model averaging be considered as an approach for dealing with uncertainty over choice of model? I think it's akin to the weighting approach suggested here.

iv) Dr. Kathleen Segerson

Since the Panel chose not to explicitly respond to or organize their report around the charge questions, it is difficult to determine whether the draft Advisory adequately addresses the charge questions. In fact, it appears that many of the specific charge questions were not addressed. Apparently, the focus and organization of the draft advisory was acceptable to EPA, despite this fact. For that reason, I will not refer to the charge questions in the comments below but instead focus my comments on whether the draft report is clear and logical, and whether the conclusions and recommendations are supported by the report.

General comments:

In general, the draft advisory is clear and logical. The Panel has provided specific (and in some cases very detailed) advice to the Agency on how the model and its use can be improved both in the short run and over a longer period. The Panel's recommendations are generally clear and supported by the accompanying text. (Exceptions to this are noted below.) The draft advisory includes numerous references, which serve both to support the findings and recommendations and to provide EPA with suggestions on where to look for additional detail and information on the suggested approaches. Although many of the suggested improvements would be substantial, the Panel has provided EPA with practical advice on what can be done and examples in the literature to support that advice.

Specific comments:

The letter to the Administrator contains a sentence stating "The EPA should consider the benefits from this use of funds as well as the potential benefits from investments in other climate policy models." It is not clear if the Panel is suggesting here that the resources that would be required to improve the SGM model would (or might) be better spent on other climate policy models. If this is the view of the Panel, this should be stated more clearly and supported by the report with a discussion of alternative models in which EPA might invest. There is little if any discussion of this in the report.

p. 2, line 37: It is not clear what "model improvements" this statement refers to and whether these improvements have already been made or are in the process of being made.

Part I, A: This section provides recommendations for improvement without really any "findings" to support those recommendations, i.e., without saying what is wrong with the current documentation. One can infer that the Panel believes the current documentation is not well organized (see lines 12-13, p. 4), but is this the only problem with the documentation? Some of the discussion below this point in the report suggests that the documentation did not allow the Panel to understand fully the model structure.

p. 5, line 9: Provide an example of the type of nomenclature that is inconsistent.

Throughout: "data" should be a plural, not singular, noun.

- p. 6, line 30: Define the acronym MACS when it is first used. A similar comment applies to PNNL and other acronyms.
- p. 7, line 12: Should read “in Part IC below.”
- p. 9, line 13: Should “counties” be “countries”?
- p. 9, line 44: This paragraph begins by urging EPA to provide comparisons but then switches in this line to “such updates”. There seems to be a disconnect here.
- p. 11, line 33: Should “regulatory” be “regularity”? If not, the phrase is unclear.
- p. 11, lines 37-42. This paragraph is very unclear. For example, the second sentence is true for “Flexibility” but not for “parsimony.” The third sentence makes no sense to me, and the final sentence needs to be reworded.
- p. 14, line 9-10: This is unclear. It seems that it should state that aggregate imports should be a CES function of the imports of each commodity (as done for exports) rather than the reverse. If not, it is unclear.
- p. 15: It is not clear from the discussion here if the calibrated logistic share equations have already been incorporated into the SGM (in which case it is too late to “avoid” the “significant additional work”) or are simply under consideration.
- p. 17. The discussion here raises the general question of how SGM should handle the (possible) existence of policies such as peak load pricing, tax incentives, or the CRP that can affect GHG emissions and the impact of climate change policies. The Panel’s advice on this question is unclear. Since the extent of the adoption or continuation of these policies is uncertain, one possibility is to treat this “policy uncertainty” through sensitivity analysis. If the Panel is suggesting this, it should state this explicitly. Otherwise, it should provide EPA with more direction on how it feels this issue should be handled. (For example, should current policies such as the CRP be incorporated into the model and assumed to be continued indefinitely?) Currently, the report raises the issue but does not provide any meaningful guidance on how to address it.
- p. 20, lines 31-41: It is not clear if the Panel is recommending that EPA do Monte Carlo simulation to investigate uncertainty about model specification. The concept is discussed here in general, but there is no reference to how this might be used specifically in the context of SGM or whether EPA should pursue this.
- p. 21, lines 10-24: This discussion does not seem to belong in a subsection on “characterizing uncertainty in the presentation of policy results”. In addition, the comment above applies here as well.

b) Other Board Reviewers:

i) Dr. Granger Morgan

The membership of the panel is not listed.

While I have only read the Advisory, and have not looked at any of the underlying documentation, I know enough about modeling in this domain to believe that the Advisory should say something about what, if anything, this effort is likely to gain in terms of insights as compared with what a variety of other models that have been developed, or are under development, can provide.

At a minimum I would like to see line 1 on page 2 which now reads:
"EPA should consider the benefits of this use of funds as well as the potential benefits from investments in other climate policy models."

to read:

"EPA should consider the benefits of this use of funds compared with the potential benefits from investments in other climate policy studies and models."

If in fact the panel has its doubts about the value of fixing this model, we should be more explicit.

On the subject of the cover letter I note the author has avoided the phrase "carbon tax". That is fine but lets say "carbon emission fees" rather than "carbon fees". Also, unless I have misread the document, I'd like to drop the word "considerable" before potential in line 8 of page 3.

The discussion of the importance of sensitivity analysis and the treatment of uncertainty are both good.

Two other important issues that are not discussed, but probably should be mentioned are: How far into the future it makes sense to run this model before basic structural assumptions and data render the outputs nonsensical. Such models often tend to be run far longer than can be justified.

Finally, there is no discussion of whether and how well new technology is treated. For example are IGCC with CCS; Oxyfuel; and other low emissions technologies for using coal included? Are plug-hybrids charged from carbon-free power sources included? Are a range of high efficiency end use devices such as high efficiency solid state lighting, included? If the answer to these questions is no, and the plan is to run the model for periods of more than just a few years, the results will likely be very misleading.

ii) Dr. Rebecca Parkin

I didn't find charge questions in this report, other than noting "provide advice" to the agency in the letter and on p. 2, line 5 of the report. As a result, it's hard to answer the Board's first question except to say that yes, the panel provides advice. The report is largely clear and logical as best as I can determine. However, there is some repetition in the report that does not appear to be necessary (e.g., p. 9, lines 20-21 repeat section B.1). I can't answer the third question, as I don't know this field.

iii) Dr. Thomas Theis

[Also, see Dr. Theis's general comments on "models" above at 1.b)ii) in this compilation.]

Specific comments on SGM report:

1. The draft circulated does not contain a listing of Panel members and their affiliations.
2. In the letter to the administrator, line 27-28 is awkwardly worded ("...the economic interactions and contributions to greenhouse gas..."). Perhaps something like "economic basis of greenhouse gas..." or similar wording would convey the meaning more clearly. This phrase is repeated in the report (page 2 line 8).
3. Page 20, line 16: "idea" should read "ideas".

iv) Dr. Michael McFarland

Overall, the Panel's technical arguments in support of modifications to the SGM are scientifically sound and clearly described in the report. Although I admittedly have a limited knowledge of computer model development and evaluation, my initial impression is that the Panel's report has identified and described a number of critically important factors that need to be addressed before the Second Generation Model (SGM) output can effectively support Agency policy decisions with a known level of confidence. The report's cover letter provides a clear and detailed summary of the main body of the report while highlighting the broad range of technical recommendations whose adoption will significantly improve the overall utility of the SGM. Beyond the cover letter and main body of the report, the appendices provide additional sources of technical information that should be considered in future model refinement. Given the importance of its subject matter and the scientific merit of its recommendations, I strongly support approval of the Panel's report.

v) Dr. Valerie Thomas

I concur with the Second Gen review. It is well written; its recommendations are detailed and clear. It provides a substantial basis for EPA to improve the Second Generation Model.

vi) Dr. Steven Heeringa

The ad hoc Panel's report on EPA's Second Generation Model (SGM) is generally well written. The critique of the SGM and the Panel's recommendations are clear although the discussion is laced with jargon and many acronyms that are not identified in full. This adds some difficulty for readers who are not familiar with the terminology used in this discipline. Some of this jargon is actual technical terminology that is econometric or economic modeling in origin—others such as “shadow price adder” (page 17, Line 19) may have a less well-defined disciplinary interpretation. The bibliographic references in Appendix A and the References require standardization and general editorial review.

A few editorial/typographical notes for the Chair:

Administrator letter:

Page 1, Line 33, “simulated, the SGM indicates..”

Report

Page 4, Lines 34 and 35 – standardized dashes (single or double)—single

Page 4, Line 37 “the supply and demand sides..”

Page 5, Lines 5 CES- undefined acronym ?

Page 5, Line 16 everything else” (ETE)

Page 5, Line 26 GHG- undefined acronym at this point in report.

Page 6 ff – CO₂ is used to avoid line ½ space, e.g. CO₂

Page 9, Line 34 ‘package or..’ – delete comma

Page 9, Line 36 ‘ schemes to allow..’ – delete comma

Page 10, Line 31 “functions and..” –delete comma

Page 11, Line 27 “**ci**” in Specifically appears to be bold font

Page 13, Lines 7,8 “...United States including multi-lateral or joint policies as illustrated by the Kyoto Agreement.”

Page 15, Line 15 change to “that the aggregate demand for good i, A_i..” to be consistent with Page 15, Line 29 usage.

Page 17, Line 19 – is the term “shadow price adder” a commonly used and defined term. If not, is its implicit meaning clear to readers?

Page 18, Line 43 – delete quotes after “...regions”.

Page 20, Lines 33 ff – should the term Bayesian be use to describe this approach to model uncertainty?

Appendix A and References- standardize, especially usage of italics and quotes for monograph/report and paper/article citations.

vii) Dr. A. Myrick Freeman

Here are some initial comments based my first reading of the SGM Panel Draft Report:

1. Regarding the first charge question to the EC (were the original charge questions to the SAB Standing or Ad Hoc Committee/ Panel adequately addressed in the draft report?): Even though the Panel chose to organize its report in a different way (with the approval of the Agency), most of the original charge questions are answered either directly or implicitly in this Report. However, I couldn't find an answer to one of the most important charge questions, " Are the costs of compliance ... as represented in SGM, an appropriate measure of the aggregate or economy-wide cost of climate policies?"

I would like to see an answer to this question; or if it can not be answered, there should be an explanation of why not.

2. Concerning the second C charge question (is the draft report clear and logical?), I think that by and large, the answer is yes. However, I would make three points:

- It might be better to move some of the more technical discussion (esp., most of p. 12, and pp. 14-16) to an appendix.

- There should be a list of acronyms (PNNL? GTAP? EIA _vs_. IEA?)

- In p. 11, lines 37-42, there is reference to the need for parsimony in production modeling; but the doesn't explain what parsimony means in this context (the minimum number of variables and parameters necessary to capture the major features of the production processes?).

3. Are the conclusions drawn, and/or recommendations made, supported by information in the body of the draft SAB report. I think so.

A Typo? p. 28, line 45-46: Is Jacoby, et al. a separate reference? See Appendix B.

viii) Dr. Genevieve Matanoski

This is a well written review of the document “Second Generation Model”. The Panel has met the criteria of the SAB in that the document is clear and logical and offers thoughtful advice to the Agency. However, since there is no inclusion of the charge questions that I found, I could not evaluate whether the document answers the charge questions. If the Panel had a set of charge questions they might be added even as an Appendix. The letter to the Administrator is clear and offers concise advice regarding the next steps that are needed before the model can be used.

The Panel is to be commended for providing EPA with many references to possible sources of information. For the reader it would also be helpful if they could provide a glossary for the acronyms included in the response.

This document appears ready for approval.