Preliminary Comments from Members of the Chartered SAB on the SAB Draft Report "SAB Review (7-26-12 Draft) of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources (September 2011)"

List of comments received

Comments from lead reviewers

Comments from Dr. James Hammitt

Overall, I found this a difficult report to read. Partly, because the topic is complex and the objectives of the underlying EPA document are not made clear. In addition, the SAB report seems repetitive. Finally, there is a dissenting opinion that is not adequately addressed by the main report.

Response to specific questions:

1) Were the charge questions to the committee adequately addressed?

Yes.

2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?

The dissenting opinion (Appendix E) seems to imply that the EPA document and the SAB report do not adequately consider the alternative approach to this problem taken by IPCC and supported by USDA. But the response to charge question 2(a) seems to clearly reject the IPCC approach. It is not clear whether the main report or the dissenting opinion need to be revised to clarify their disagreement. Perhaps the disagreement is fundamentally a question about who is supposed to be responsible for greenhouse gas (GHG) emissions associated with production of bioenergy. One notion is that the stationary source (e.g., electric power plant) is responsible and hence it is necessary to account for the effects of the particular fuels it purchases; an alternative is that the nation as a whole is responsible and individual power plants can purchase any (legitimate/authorized/certified?) biofuel without worrying about how it is produced.

If I understand correctly, the idea behind BAF is to estimate the incremental net GHG emissions associated with using some type of bioenergy source (e.g., to account for GHG withdrawal from the atmosphere when the plant is grown). The report claims that BAF depends on the business as usual scenario (i.e., what would happen if the bioenergy source in question were not used), but it is not clear to me why (to first order) the incremental effect depends on the baseline time path of, e.g., forest stocks. The statement beginning on p. 29 line 43 ‘So long as rates of growth across the landscape are sufficient to compensate for carbon losses from harvesting over the long run, the climate system is less sensitive to the imbalance in the carbon cycle that might occur in the short run from harvesting of biomass for bioenergy facilities’ seems to confuse incremental net emissions (and their effect on climate) with the baseline trend in emissions. I.e., why does the effect on climate of harvesting and burning some unit of biomass depend (much) on whether biomass in the source region is increasing or decreasing?

3) Is the draft report clear and logical?

I do not find the report to be very clear. First, there does not seem to be a very clear explanation of what the underlying objective of the BAF is. One question is highlighted above: whether the

stationary source is supposed to be responsible for net emissions associated with how its bioenergy is produced. A second question is what the BAF is supposed to capture. Evidently it is a scalar (single number) that is supposed to summarize the net GHG emissions over time from using a biofuel. Because the time paths of combustion and carbon uptake from the atmosphere when the fuel is grown differ, it is not obvious how to summarize a time path of net incremental GHG emissions as a scalar (analogous to the problem of defining GWP, i.e., global warming potential). To evaluate the adequacy of an approach it is essential to have a clear idea what concept it is attempting to estimate (and to not confuse a limitation of the approach with a lack of clarity about the goal).

Second, key terms (e.g., BAF = biogenic accounting factor, "anyway" emissions) do not seem to be defined. This makes it difficult to understand what it means for an energy source to be 'assigned a BAF of 0' (p. 5); does that mean emissions associated with burning the fuel are fully offset by its production?

Third, the report seems rather repetitive, with the same phrase used multiple times (as one example, 'Feedstocks could be categorized into short rotation dedicated energy crops, crop residues, forest residues' appears on p. 45 at lines 12-13 and lines 21-22). It might be easier to follow if the key points were made in a single section and the responses to charge questions were very brief (one or two sentences, referring to paragraph numbers or subsections of the main response). The response to charge question 1 is a good model in that it discusses key concepts in an organized fashion.

Fourth, on the first reading I found the executive summary quite hard to follow (it made more sense after I had read the full report). It might be made more accessible by moving the first two paragraphs of its conclusion to the start of the executive summary.

4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Broadly, yes. As noted above, the challenge presented in the dissenting opinion is not addressed.

Comments from Dr. Duncan Patten

1. Were the charge questions adequately addressed?

The charges were very well addressed to the point that the panel found the framework inadequate and recommended several improvements, changes, and/or revisions. One important recommendation is development of default BAFs by feedstock, category and region.

A fundamental statement to charge question 6a, underlines the overall assessment of this report of the BAF. "Its main contribution is to force important questions and offer some ways to deal with these."

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

Not sure if the following discussion goes here or as a general comment.

Recognition of the basic carbon flow is an important part of the BAF development, but the fact that forests will grow back and sequester carbon is only part of the carbon balance. I'm not sure whether determining pre-harvest carbon uptake, essentially all of the carbon stored in the feedstock shouldn't be part of the framework and not only the grow-back carbon sequestration. What this requires is a constant reminder during the report of the carbon cycle and where certain discussion points fall along or within this cycle. A basic discussion of the carbon cycle and how it relates to carbon fixation, natural respiration or ecological losses such as fire, post carbon loss sequestration of "new growth", etc. would enhance this report. Although the carbon cycle is constantly referred to, the "location" of a process within that cycle is not clear. Spatial and temporal aspects both are important parts of this cycle discussion and it seems that spatial issues were addressed but temporal not as well.

3. Is the draft report clear and logical?

It attempts to be clear and logical through use of clearly labeled sections and responses. It might have been clearer if some of the discussion of carbon flow from different carbon biogenic sources were accompanied by some conceptual diagrams showing where the carbon flow originates and through what pathways it "moves" from source to emissions.

Using landscape approaches and relating carbon flow to sources that do not change over time may offer a misguided discussion. For example, if a forest is harvested as the carbon source, then burned, and then the forested area is converted to corn (for example), what is the carbon balance in the process. If the forest would take 200 years to grow back and corn is harvested each year, is the total biomass for energy production equivalent over time? This emphasizes the need to explain how different sources, economies and management drive the outcome of any accounting framework.

There are so many potential biogenic energy sources, some natural products, other cultivated created through some physio-chemical process that a discussion which would try to include all these would have to be general in nature. This discussion has tried to cross walk between some simplicity and some complexity which helps with the logic.

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

The basic recommendation of this report is that EPA did not do a good job scientifically in developing its framework and that development a BAF such as suggested in the "default BAF" section is probably the soundest recommendation the panel could make after considering its responses to all the charge questions.
Other recommendations appear to be logical based on the discussion of the issue related to the charge questions.

Other comments:
Executive Summary
Page 5. Lines 27-30. Insert "that" after BAF…. Also, is this one sentence paragraph from EPA or the panel… it is lengthy and unclear.
Page 6. The importance of landscape approach mentioned here and in body of text is critical and well thought through.
Page 9. Recommendation to address different feed stocks and their fate is critical to developing a workable Framework…. These points are well developed in the text and demonstrate one of the primary weaknesses of the present framework.
Page 31. Line 7. Why are forest stock neutral if forest stocks are increasing? Not clear.
Page 31. Lines 18-25. This paragraph needs some clarification or better explanation. Why wouldn't a 150 yr old forest be counted in a facilities greenhouse gas emissions?
Page 36. Line 14-16. Seems this statement needs clarification relative to different forest types. Can one generalize about forests such that "all forests are created equal" and thus treated equal in a framework? I don't think so.
Page 41. Paragraph lines 14-18. Here is a good place to bring up cumulative effects which may be a compounding factor in any accounting framework… did the panel consider this?
Page 47, lines 11-12. This statement emphasizing the "capture of incremental carbon cycle and net emissions effects" is much of the crux of the review.
Page E-5. Some of dissenter's comments need a comment.

Line 2-4. He is probably right that it is the whole forest that influences the atmosphere not just a stand which is what gets harvested.

Line 29-32. I think he is wrong in his assessment of the panel falling into a trap by trying to support the flawed system proposed by EPA. The panel was very critical and helpful, not condescending.

Comments from Dr. Stephen Polasky

The SAB Draft Report does a good job of raising and discussing important issues regarding the EPA's Accounting Framework. In particular, I agree with the report that it is important for EPA's Accounting Framework for Biogenic CO2 emissions to be both internally consistent and consistent with the accounting framework for emissions from fossil-fuels. I also think it is important for the emissions framework to include all relevant greenhouse gases such as N20 and methane and not just CO2. The move towards a default BAF approach is also a very appealing suggestion especially given the difficulties involved in implementing other more data hungry approaches. I have some concerns with specific issues raised in the report but I will detail these concerns in response to question 2 below.

Question 1: Were the original charge questions to SAB adequately addressed?

Yes. The committee is quite responsive to charge questions from EPA and addresses each charge point in the report.

Question 2: Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

I do not think there are technical errors in the report nor are there any glaring omissions. However, I think the SAB Committee missed a chance to provide needed insight and clarity around several issues that the Accounting Framework needs to address. I also have questions about several issues raised by the committee. Some of my questions may simply be because I don't fully understand what the committee is trying to say. At the very least, though, this indicates that some rewriting for clarity may be needed.

The report devotes a fair amount of space to criticizing the EPA Accounting Framework for not adequately dealing with the issue of timing of emissions. I am not sure that I understand why the committee thinks timing of emissions in the context of whether to require a permit from a stationary source is so important or what the EPA Accounting Framework should do about it. It is true that the timing of emissions can be an important factor in terms of the impacts on climate change. But unless the source being evaluated is likely to have persistent shifts in timing of emissions and these timing effects are not picked up in an evaluation of overall emissions from the project then it is not likely to be of first-order importance to evaluation of the project. The material on pages 15-17 is scientifically correct but its relevance to the Accounting Framework is not immediately apparent. I think the Committee needs to make clear the relevance of this issue and provide more specific recommendations for improvement, or it will need to downplay its criticism.

I think a similar comment could be made in regard to consideration of disturbance. Yes disturbances such as forest fires matter in terms of carbon storage but what should EPA do regarding this issue in the Accounting Framework for evaluating particular stationary sources?

The Committee Report rightly points out that the Accounting Framework is partially defined by the policy context and cannot be separated from it. In this regard, I think the Committee Report

has missed an opportunity to provide clarity on several important related points and in some cases has muddied the water further. In principle, what one really wants to know in evaluating the emissions from a potential source is the change in emissions with versus without the source. That simple statement can be devilishly difficult to implement in practice if one gets into all of the general equilibrium changes that can result, which can involve questions of market price changes, indirect land use change, leakage, additionality, and other issues. If the relevant question that the Accounting Framework seeks to answer is how much an individual source contributes to emissions I'm not sure that I would recommend going very far in terms of considerations of general equilibrium changes. An individual project is unlikely to have a large influence on market prices, especially for global markets like those for oil or commodities like corn. I think the analysis of individual sources is quite different in this regard from analysis of renewable fuel policy that seeks to increase production on a large scale. The section on leakage raises valid points when one is taking on large scale policy changes but it wasn't clear to me that much of this was relevant for the Accounting Framework. I have some questions about some of particular arguments within the leakage discussion and whether the discussion of leakage is balanced overall, but I think the larger issue here is how much of this is relevant in the first place.

I think the Committee Report also raises a fair issue about what is the relevant benchmark by which to judge a source, both in terms of spatial scale and assumed reference point. Again, there is an important distinction between what should be done in principle and what can be reasonably implemented in practice. The practical difficulties of constructing business-as-usual paths on which to base considerations of additionality is a real impediment to following a path that the Committee seemed to be recommending.

Question 3: Is the Committee's report clear and logical?

The overall organization of the report is clear and logical. There is a fair bit of repetition in the report. Part of this is unavoidable as similar points come up in different places in response to different charge questions. However, I felt that too much material was repeated sometimes almost verbatim. A simple reference to another section saying that the issue was covered elsewhere should suffice.

There were also specific places in the report that I felt were not that clear. For example, on page 5, lines 27-30 contain one very long and confusing sentence:

"The *Framework* presents an alternative to a categorical inclusion or exclusion by offering an equation for calculating a Biogenic Accounting Factor (BAF) would be used to adjust the onsite biogenic emissions at the stationary source emitting biogenic CO2 on the basis of information about growth of the feedstock and/or avoidance of biogenic emissions and more generally the carbon cycle."

Breaking this into several sentences would help here.

While it may be perfectly reasonable advice to reject the IPCC approach, the logic of doing so wasn't clearly explained. I did not understand the following statements about the failings of the

IPCC approach on page 18: “but (it) does not describe linkages among supply chains. In other words, it is essentially a “production-based inventory” or 13 “geographic inventory” rather than a “consumption-based inventory” (Stanton et al. 2011).

I felt that the opening paragraph of Executive Summary was not particularly clear or compelling. I think it could be deleted.

A couple of other places where editing is needed for clarity include:

- Page 17, line 12: what is “GTPbio”?
- I really don’t know what the following means, page 43, lines 13-15: “An important limitation of the proposed *Framework* is that the accounting system replaces space for time…”

Question 4: Are the conclusions drawn or recommendations provided supported by the body of the Committee’s report?

Yes. The report draws conclusions and recommendations that are well supported by material in the body of the report.

Comments from Dr. Jerald Schnoor

I have reviewed the SAB Draft Report on *EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources* as one of the lead reviewers. I believe the SAB committee has provided some good advice to the Agency on how to improve the accounting framework for estimating whether a source meets applicability thresholds for triggering permit requirements. The report is balanced and discusses both the advantages of the EPA's approach as well as its limitations.

Regarding the *Framework's* limitations, it goes into detail on various shortcomings and provides suggestions how to improve the framework without being overly prescriptive. These issues are quite complicated, and the EPA does not want to add to the cost of administering regulations or make the task overly complicated. That is why I think Appendix E (the dissenting opinion) and the discussion within the body of the report that it engenders actually helps the Agency (and increases the value of the report) by laying out both sides of the question on how EPA might choose to accomplish its regulatory mandate under the PSD and Title V programs of the Clean Air Act Amendments of 1990.

The normal template of Quality Review Questions and my responses are shown below:

Question 1: Were the original charge questions to SAB adequately addressed?

Yes, responses to the charge questions are contained in the body of the report, point-by-point. Charge questions are shown in their entirety in Appendix 2 on pages A-2 through A-4. The number and specificity of the charge questions was more than is often requested for a SAB report, and the Committee's responses vary in the detail provided for each one, which is to be expected. The overall body of the report (48 pages, single space) provides sufficient detail to address the charge questions.

Question 2: Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

I found no technical errors in the report. And there are no glaring omissions, but I will comment on a couple of areas in the report that could be elaborated.

- **Incentives to use biomass for power**. I found the report to be rather agnostic on how the Committee actually feels about EPA providing incentives for waste-to-energy and the use of biomass to fire or co-fire power plants. The Committee members dealt in detail with the specifics of the charge questions and all the difficulties in actually estimating BAFs for various biomass fuels, locations, time horizons, and life cycles. But I found myself wondering how they really feel about expanded use of biomass, whether it could be effective at decreasing greenhouse gas emissions, and whether incentives should be provided.

- **DOE's Billion Ton Studies.** I may have missed it, but the report does little to prioritize for EPA where the Committee thinks the "action" will actually occur in

biogenic CO2 emissions in the future. Some discussion of the U.S. Department of Energy's outlook from its billion ton studies and other reports might provide good advice to the Agency as to where this will go.

- **EPA's Life Cycle Assessment for Biofuels Mandate under EISA (2007).** The Committee's report discussed the biofuel mandate somewhat, but I wonder if there aren't more lessons to be learned from it, and the SAB Committee would have a valuable perspective to offer EPA.

- **BAF Default Values.** The recommendation for EPA to develop default BAF factors is an excellent one (page 45 and throughout the document) as a sort of compromise between the conundrum of "inclusion" versus "exclusion" of biogenic CO2 emissions.

- **KISS Principle.** The beauty of the IPCC approach to biogenic emissions is that it is simple, transparent, easy to enforce, and easy to explain. It provides a strong economic incentive for increased use of biomass for power (a renewable resource?). Of course, if the principle is wrong, it is not the answer, and that is where the SAB Committee has come down.

- **Other Areas.** I agree with the recommendation in the report that, if BAF factors are to be estimated, they should definitely include methane and nitrous oxides as GHGs also. I also agree whole-heartedly with the SAB Committee report regarding the need for consistency between fossil fuel emissions accounting and biogenic emissions accounting – detailed accounting for both of them should be consistent.

I do not consider these points as criticisms of the report in any way, nor omissions that must be addressed. Rather they are points that resonated with me as I read the report for which the SAB Committee may wish to elaborate.

Question 3: Is the Committee's report clear and logical?

Yes, the report is clear and logical. I appreciated its detail and the back-and-forth discussion surrounding the use of the IPCC approach (dissenting opinion) versus the Biogenic Accounting Factor (BAF) approach with all its attendant nuances. Clearly, there are advantages and disadvantages to each approach. EPA could decide to promulgate rules that represent an initial starting point with a defined period for re-review with mid-course corrections. This is an adaptive management approach which could forestall "unintended consequences" and "anyway" emissions. Everyone wishes to keep the regulations as simple and least costly as possible.

Question 4: Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes, the conclusions and recommendations contained in the response to charge questions are supported in the body of the SAB's report. The Committee has provided a good report on a

tricky question. The strength of the Committee lies in the quality of its membership and broad representation across the natural and social/economic sciences.

Comments from other SAB Members

Comments from Dr. George Alexeeff

1. **Were the original charge questions adequately addressed?**

There were five primary charge questions, and many sub-questions to be considered by the Science Advisory Board.

These can be briefly summarized into the general area of overall evaluation, and the specific areas of biogenic CO2 accounting science, biogenic CO2 accounting approaches, methodological issues, accounting framework, and case studies,. Each of the charge questions, and sub-questions were thoroughly addressed in Chapter 3 of the SAB report. Each question was answered systematically and a justification was provided for the answer.

However the responses to the charge questions were not completely carried forward to the executive summary or letter to the Administration. It was not clear in the letter to the Administrator or in the executive summary that all the charge questions were addressed. Further while the systematic review of charge questions in Chapter 3 provided clear responses, the executive summary seems more like a summary of the EPA report. This may be due to the fact that the letter to the Administrator and the executive summary focus on some of the important issues considered in the report. I suggest that the letter and executive summary be revised to be clear how the charge questions are addressed.

2. **Are there any technical errors or omissions in the report or issues that are inadequately dealt with in the Panel's report?**

I did not identify any technical errors or omissions in the report or issues that are inadequately dealt with in the Panel's report.

3. **Is the Panel's draft report clear and logical?**

The Panel's report is not as clear as it could be. That is due to the way information is laid out in the executive summary.

4. **Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?**

The conclusions of the report are supported by the body of the Committee's report. However at the same time the conclusions do not comprehensively incorporate the information in the review. The executive summary, and the letter to the Administrator, seem a little more like a companion thoughtful piece than a summary. For example in the executive summary page lines 2-3 state" Comprehensive accounting for both biogenic and fossil fuels would extend through time and space to estimate the long-term impacts on net greenhouse gas emissions." While this is true, it is unclear if this was done in the EPA report or not. Also, on page 11, lines 37-38 the executive summary states: "The *Framework* is a step forward in considering biogenic carbon emissions." In contrast on page 42, lines 24-25 state: "Yes, the *Framework* contributes to advancing the understanding of accounting for biogenic emissions and addresses many issues that arise in such

an accounting system." I think if more of the executive summary was drawn from the body of the report it would be stronger and clearer.

Comments from Dr. Joseph Arvai

General Comments

In our last teleconference we talked about adaptive management and the difficulties associated with its strict application in a federal agency like EPA. However, it strikes me that the Biogenic Accounting Factor (BAF)—and, specifically, the uncertainty that calculating it entails—might be an ideal candidate for the application of an adaptive management (AM) approach. The fact that there is so much uncertainty around it (the BAF), according to this report, might lower the stakes (for the EPA) associated with identifying "failures" (and promoting learning) as defined by an AM approach.

1. Were the charge questions adequately addressed?

Yes. This was a very clearly written report, down to the dissenting opinion in Appendix E. So splendid was the report that it read like a nicely written journal article.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

This is not my specific area of expertise so, admittedly, some of my points here may be off base. However, I was left with the following questions after reading the report.

(i) If memory serves, researchers from the late Dr. Lester Lave's group at Carnegie Mellon University have been using LCA to study CO_2 fluxes associated with the production and combustion of different energy feedstocks (including biogenic ones). The work of Dr. Joule Bergerson, in particular, comes to mind. Was any of this material reviewed for the preparation of the report? Should it have been?

(ii) I am not fond of the phrase on page 11, line 32: "With the increasing threat of global climate change, it is important…" It sounds a little wishy-washy to me. Climate change is real and the threat is already high (though I concede it *is* getting *higher*). I would prefer something like, "Because of the need to address the pressing realities of climate change, it is important…"

(iii) On page 4, line 25 the report states: "The SAB's consensus advice is highlighted in this Executive Summary with more details in the attached report." Then, on lines 35 and 36, the report refers to a dissenting opinion. You can't have consensus if you have a dissenting opinion. Having a dissenting opinion is okay in my mind but the line about consensus should probably be removed.

(iv) The dissenting opinion in Appendix E provides a harsh, but carefully reasoned critique of the SAB report. It left me wondering why the SAB chose a position on biogenic CO_2 that (according to the dissenting opinion) is quite different from the IPCC's position. I don't know enough about biogenic CO_2 accounting, so I trust the majority opinion of the SAB. However, were I a part of the review, I would have lobbied for a detailed response (in the SAB report) to Dr. Sedjo. Is there a reason such a response was not included?

(v) On page 5, line 22 the report states: "The dissenting opinion in Attachment E offers support for a categorical exclusion so long as aggregate measures of land-based carbon stocks are steady or expanding." In my read of Appendix E, I could not identify an argument *directly* in favour of a categorical exclusion. I did however detect an argument in favour of the IPCC accounting framework. If the IPCC framework and categorical exclusions are one-and-the-same, this should be spelled out by the SAB. If they are different things, this should be spelled out too.

3. Is the draft report clear and logical?

Yes. Considerably.

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes, though clarification with respect to the items noted under QR Question 2 would, in my view, enhance the clarity of connections between the report's conclusions and the body of the draft.

Comments from Dr. George Daston

We were asked to address four specific questions as part of the quality review.

1. whether the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed;
2. whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report;
3. whether the Committee's report is clear and logical; and
4. whether the conclusions drawn or recommendations provided are supported by the body of the Committee's report.

Question 1: The charge questions posed to the review panel were addressed in a straightforward and transparent way.

Question 2: I found the report to be thorough and constructive.

Question 3: I found the report to be clearly and logically presented.

Question 4: I found the conclusions of the report to be well documented and supported.

Comments from Dr. Costel Denson

Six charge questions, each with several subsidiary parts, were presented to the SAB for review. Overall, a total of twenty-two charge questions were presented.

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

   Yes.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

   None that this reviewer noted.

3. Is the Committee's report clear and logical?

   Yes, the comments are judged to be clear and logical.

4. Are the conclusions drawn or recommendations providedsupported by the body of the Committee's report?

   In general, the conclusions and recommendations are supported by the contents in the report.

Comments from Dr. Otto Doering

With respect to the four charge questions for the Review of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources;

1. This was an extremely difficult task for the committee. I think the charge questions were mostly adequately addressed, but I have great concerns about the charge questions themselves which were so centered on the chosen accounting framework. When the SAB is asked to consider a methodology that relates to a regulatory standard, should the SAB review consider the extent and intent of the regulatory standard as part of the consideration of the efficacy of the methodology? I.e. should not the SAB be able to go beyond the charge question to the broader question of whether the basic approach makes sense?

My concern here is similar to Roger Sedjo's in his minority report. Accounting for this activity is so fraught with difficulties, my personal judgment is that some other accounting frame should be utilized at this time that is simpler (and probably at the macro level) until EPA can demonstrate a more robust and doable accounting system at the specific case level. I believe that making such a suggestion would make sense. There is a charge question specifically to this issue, but that is overwhelmed by the highly specific questions about the suggested accounting framework.

2. Technical errors and emissions; this field of "accounting" is extremely difficult, and while the committee struggled valiantly, everything just could not be covered adequately. For example the difficulties with time frame considerations are legion.

3. Is the draft clear and logical? Yes, except I do have a concern that the conclusion that the BAF would be worth fixing is a struggle given all the documented weaknesses (page 29 on).

4. Are the conclusions supported by the body of the draft report? Again, the conclusion that the accounting system can be fixed to the extent necessary to make it useful and usable is a stretch from the concerns with the basic accounting system.

Comments from Dr. Michael Dourson

1) Were the charge questions to the committee adequately addressed?

The questions appeared to be adequately addressed, but the dissenting opinion calls into question the SAB report's reliance on the EPA process versus the IPCC.

2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?

Not of which I am aware, but this is not my area of expertise.

3) Is the draft report clear and logical?

The report seemed reasonable, however, in a few places the panel could perhaps be more clear, in particular:

- Page 28, line 30+. "The notion that biomass is carbon neutral arises from the fact that the carbon released as CO2 upon combustion was previously removed from the atmosphere as CO2 during plant growth."

  But is this concept correct in a big picture sense? If so, how precise are the estimates and will these estimates tend to even out over time? Perhaps more importantly, how can the use of biomass ever be carbon positive? If it is carbon negative (i.e., not neutral), is this not desired?
- Page 34, line 1. "Given that some biomass combustion **could have positive net emissions,** a categorical *exclusion* would remove any responsibility on the stationary source for CO2 emissions from its use of biogenic material from the entire system (i.e., the global economy) and provide no incentive for the development and use of best management practices."

  Does it not depend on when the measurement is taken? Please convince me that this statement is correct.
- Page 34, line 41. "This term refers to the proportion of feedstock carbon embodied in post-41 combustion residuals such as ash or biochar."

  Well, ok, but the rate of decomposition is also important, correct? Biochar stays in the soil a lot longer than leaf litter, and so a continued addition of biochar to soils will both improve soil and act as a carbon sink. Am I missing something here?
  Page 39, line 23. "Excluding CH4 because it is not "CO2" is not a legitimate rationale." The SAB admonishment seems very reasonable to me. If CH4 is much more a global warming gas than CO2, then it should be counted. Besides, is not a certain percentage of CH4 release from farm animals raised for human consumption? A reduction in meat consumption might be a good thing for human health and global warming.
  Page 75. APPENDIX E: Dissenting Opinion from Dr. Roger Sedjo
  This dissent makes a lot of sense to me. I would be interested in EPA's reasons for not relying on the IPCC (2006) report.

4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Although this is not my area of expertise, the dissenting opinion appears to call into question the SAB report's reliance on the EPA process versus the IPCC. I would value some thoughts from the SAB panel on this.

If EPA's initial problem formulation was reduction of atmospheric carbon rather than carbon monitoring, why is something like biochar not being more actively pursued?

Comments from Dr. David Dzombak

I commend the panel for developing a comprehensive response to the charge questions. The detailed comments and recommendations should be very helpful to the EPA team developing the accounting framework for biogenic CO_2 emissions from stationary sources.

1. Were the original charge questions adequately addressed?

   Yes, the original charge questions are addressed adequately. The response to the charge questions is systematic in the body of the report, but in the Letter to the Administrator and in the Executive Summary, the charge questions are not mentioned. This needs to be remedied, especially for the Executive Summary. The outline for the Executive Summary should follow the outline of the report, i.e., it should follow the responses to the charge questions, in order, as in the report.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Panel's report?

   I found no technical errors or omissions.

3. Is the Panel's draft report clear and logical?

   The draft report is well written and comprehensive. It responds to the charge questions adequately and comprehensively.

   As noted above, the response to the charge questions is systematic in the body of the report, but in the Letter to the Administrator and in the Executive Summary, the charge questions are not mentioned. This needs to be remedied, especially for the Executive Summary. The outline for the Executive Summary should follow the outline of the report, i.e., it should follow the responses to the charge questions, in order and with the same structure as in the report. A short-version of each charge question should be given in the ES preceding the summary of the response to the question. In the Letter to the Administrator, the charge to the panel should at least be given in summary form, and in the paragraphs summarizing the major points there should be some degree of mapping of the major points to components of the charge. As currently written, the Letter to the Administrator seems to summarize a report initiated by the SAB, rather than a report that is responsive to a series of charge questions.

   Section 4 of the report, which is one page in length (page 47) and entitled "Default BAFs Based on Feedstock Categories," is not well connected to the main body of the report which follows a systematic response to the charge questions. I recommend that Section 4 be moved to an appendix.

   Some specific suggestions for modifications to the Letter:

(a) In the top paragraph of page 2 of the Letter to the Administrator, I suggest not using the jargonistic term "additionality" as its definition is not general knowledge and it is not explained adequately in the Letter.
(b) In the next to last paragraph on page 3 of the Letter to the Administrator, the meaning of the word "calculus" is unclear and I would replace this with words with more direct meaning.
(c) In the second paragraph of page 3 of the Letter to the Administrator, I suggest that the discussion of the dissenting opinion in Appendix E be omitted. In my view, the Letter should focus on the findings that reflect consensus.
(d) On the bottom of page 19 of the report, the following statement is made: "It would be beneficial if the EPA and USDA approaches could be harmonized to avoid conflicts and take advantage of opportunities for synergy." This is an important recommendation that should be considered for highlighting in the Letter to the Administrator.
(e) On pages 26 and 44 in the report, there is discussion of the importance of clarifying certain policy questions, at least by assumption, to allow the Framework to be less ambiguous. This is an important issue that should be highlighted more clearly in the Letter to the Administrator.

Some specific suggestions for modifications to the body of the report:
(f) Page 19, response to Charge Question 2(c): list the specific charge questions that overlap with Question 2(c).
(g) Page 29, response to Charge Question 4(b): The first statement in the response is "The SAB did not find the *Framework* to be scientifically rigorous." This seems inconsistent with the tone of the rest of the draft SAB report, which commends the scientific effort, notes the high degree of scientific complexity involved, and points out some deficiencies and issues to consider. I suggest replacing the words "scientifically rigorous" with "sufficiently complete" or "sufficiently comprehensive."

4. Are the conclusions drawn or recommendations provided are supported by the body of the Panel's report?

The conclusions and recommendations are adequately supported in the body of the report. However, as noted above, the conclusions and recommendations developed in systematic response to the charge questions in the body of the report need to be mapped to the charge questions in the Letter to the Administrator and in the Executive Summary. In the Executive Summary, this mapping needs to be systematic as in the report. The Letter need not have the same structured format, but the relationship of the conclusions and recommendations presented to the charge questions needs to be discussed.

Comments from Dr. John Giesy

1) Were the charge questions to the committee adequately addressed? Yes

2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report? No. I found the report to be excellent. It is very comprehensive and the suggestions are well explained and supported with appropriate references. The suggestions made by the committee will provide excellent guidance to the agency on how to improve the CO2 inventory accounting system

3) Is the draft report clear and logical? Yes, but have made some comments relative to the executive summary.

4) Are the conclusions drawn or recommendations provided supported by the body of the draft report? No.

Specific comments:

Line 20 remove "the"

Line 31 change gas emissions to gases

The executive summary seems to be too long. It is of course redundant of the body of the report, but more detail is given than is needed in an executive summary which reduces the readability of the executive summary. It is too long to be an effective quick read but does not give enough detail to be truly understandable if it were the only section of the report read. I suggest that the executive summary be shortened and focused to give just answers to the charge questions and present the most salient deficiencies of the accounting approach suggested by EPA and to lay out the alternative suggested by the SAB. Leave out the more detailed discussion. As is, the executive summary to a "tweener" to long and complex with too much background and discussion to be effective, but not enough to be understandable if that is all that is read. One most actually read the full report to even understand the issues and choices between alternative methodologies. Also, there is so much detail included in the executive summary that reading the main body of the report is redundant if the executive summary had already been read.

Default BAFs. The section on page 21 of the executive summary that suggests an alternative plan to be implemented is unclear to the reviewer. This seems to be the most important section of the report so it needs to be crystal clear. It was unclear to me how the default BAFs would be used. A crisper definition of exactly what they are and how they are calculated should appear at the beginning of this section so that the subsequent discussion of the advantages and limitations of the default BAF approach would be easier to understand. It was hard for me to see how this was default and how it would be related to "actual" or empirically determined relationships between activities and the carbon cycle and response of climate.

To me this exercise seems impossible to implement. The goal is to establish the relationships between activities and alternative activities, especially relative to biomass augmentation and

utilization. Only once these relationships are established can the potential effects of alternative pathways be evaluated and the rate of change of climate change related to fossil fuels and biomass be evaluated.

While not an expert in the field, it seems to me that neither the framework proposed by EPA or the alternative approach suggested by the SAB will be successful. It seems like a monumental task to collect the data that would be required for accurate modeling and then weighing of the potential trajectories based on the various alternative futures.

This is a difficult problem and the alternative framework suggested by SAB seems more achievable than the framework initially suggested by EPA. I prefer the regional approach where the world is segmented and then effects of alternatives within a region are considered. Unfortunately, this will be impossible to implement on a global basis. It might be more effective to list the major pathways in the carbon cycle and inventory and then develop relationships to predict linkages of these canonical sources and sinks so that relative values for rates of change can be developed for assessing alternative strategies and effects on climate.

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Comments from Dr. Bernd Kahn

The SAB review is a first-rate tutorial on this topic. My response to the four quality review questions is (1) yes, (2) no, (3) yes, and (4) yes. Following are a few comments on the contents and corrections of typos.

Letter and Executive Summary: Format both to indicate that the SAB review is in response to specific charge questions, or at least state this fact.

p.5, l.28: Insert ‘that’ after ‘(BAF)’.

p.11, l.7: Although default BAFs may be more ‘scientifically robust’, their application to a specific case surely would counteract this benefit by increasing the uncertainty of the specific calculated result (see also p.47).

p.34, l.1-4: Remove indent.

p.35, l.14: Should be ‘principle’, not ‘principal’.

p.35, l.15: Insert ‘and’ after ‘periodically,’

p.42, l.24-32: It would be worth saying something to the effect that applying the Framework provides the discipline for considering the magnitude of biogenic CO2 contributions, but using it for regulatory decisions would be a mistake, at least within the immediate future, because of major knowledge gaps and uncertainties.

Comments from Dr. Nancy Kim

General Comments

From the committee's draft report, the review of EPA's Framework appeared to be challenging. This is not my area of expertise, but the committee's technical review and comments seemed thorough and offered many scientific suggestions for EPA to consider and/or incorporate as it moves forward. However, it isn't clear if these are comments, suggestions, recommendations to consider or recommendations that should be undertaken.

1. Were the charge questions to the committee adequately addressed?
   Yes, although this is not my area of expertise.
2. Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report? Not that I detected.
3. Is the draft report clear and logical? The comments appeared to be clear and logical. The report is not clear as to its recommendations; specific illustrations are given for the letter to the administrator, but the executive summary and report have the same issue.

Comments on the letter to the administrator

1. The letter seems too long and detailed especially in the first two pages. Assuming that the bottom line is that the framework for calculating BAFs is not workable, given lack of data, etc., and that default BAFs should be developed instead, here's another approach. Begin the letter (after introductory paragraphs) with a brief summary (1 – 2 paragraphs) about the framework's technical problems, followed with the conclusion that scientifically defensible BAFs can not be calculated as described in the framework and then recommend using default BAFs.
2. Here is an example of a statement and it isn't clear if it is a recommendation. See p2, line 10. "In general the Framework should provide a means to estimate the effect of stationary source biogenic feedstock demand, on the atmosphere over time." Does this mean that the Framework is able to do the estimation or does it mean that the committee is recommending that the framework be revised (given previous comments) so the Framework can make the estimation?
3. On page 2, line 37, the letter states that "…modeling the decay of agricultural and forest residues based on their alternate fate…could be incorporated to improve scientific accuracy. Is the committee recommending that this be done? Statements similar to this one occur throughout the report and they are not clear as to what the committee is recommending, suggesting or?

Comment on the executive summary

The letter to the administrator seems to have more information about the dissenting opinion than the executive summary. Including additional information about the opinion in the executive summary would seem logical.

Comments on report

I've taken examples from the Case Study area, but other sections have similar statements.

1. Is there an inconsistency between the sentence beginning on line 16 of p.40 and the sentence beginning line 25, page 40? One appears to suggest that looking at related case

studies may be more useful than a series of completely separate examples while the other states that multiple, unique cases would provide more information.

2. p41, line 4-5. The statement says that some sensitivity/uncertainty analysis would be useful. Is this a recommendation that should be done, something EPA should consider…?
3. p41, line 22-23. "Regional look-up tables could be valuable and EPA could learn a great deal…" Is this a recommendation that should be done, something EPA should consider…?
4. p42, line 8. "…there should be a formal evaluation…" Should this statement be The SAB recommends that a formal evaluation….
5. p42, line 31-32. Should there be a recommendation with the statement "However, the solutions offered in many cases, particularly those related to the use of harvested wood for bioenergy, lack transparency or a scientific justification."

4. Are the Conclusions drawn or recommendation provided supported by the body of the report? Yes, from my limited knowledge although the statements that are meant to be recommendations would be clearer if revised to say something like…"The SAB recommends…."

Comments from Dr. Cecil Lue-Hing

General Comments

The Panel has done a very good job of reviewing the Framework and of highlighting its pros and cons. The review and discussion were very instructive to this novice. The Panel is obviously very well versed in the subject.

Specific Comments

Letter to the Administrator
My reading of the letter suggests that some of the recommendations or advice are not clear, e.g., page 3, lines 4-14.

Executive Summary
Similar to Letter above, page 5, lines 27-30.

The Recommendations for Revising BAF
After conducting a very careful and thorough review that revealed numerous deficiencies and inconsistencies, the Panel conditions/precedes all its recommendations for BAF (pp.45-46) with the following – **If EPA decides to revise the *Framework,* the following recommendations for specific, improvements are summarized below:**

This pre-conditioning renders the recommendations far less than serious, indeed, it cheapens the recommendations and should be removed. The SAB's recommendations should be based on scientific justification and not on whether we believe that EPA will or will not implement any or all of them. The prerogative to accept or reject recommendations is exclusively EPA's, and should not be a factor in crafting any SAB recommendations.

The Dissenting Opinion
I find the Dissenting Opinion interesting, but I support the Panel's Consensus report.

Charge Questions

1) Were the charge questions to the committee adequately addressed? – **Yes.**

2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report? – **This is beyond my level of expertise.**

3) Is the draft report clear and logical? – **Yes, except that some of the recommendations do not seem to stand out.**

4) Are the conclusions drawn or recommendations provided supported by the body of the draft report? – **Yes.**

Comments from Dr. Judy Meyer

1. Were the original charge questions to the SAB Committee adequately addressed?

Yes in the body of the report, but not as clearly in either the Letter or the Executive Summary. I found both much more difficult to understand than the body of the report.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

The Panel needs to better explain why it concludes that EPA should not use the IPCC approach. That conclusion is not adequately justified.

In its final recommendations for using default BAFs, the Panel recommends developing these on the scale of a region without ever defining what it means by a region. In earlier sections the Panel criticizes EPA for doing that; yet they have done it themselves in this section. What the Panel means by region in this context needs to be clarified.

In its response to charge question 2(b), the Panel should make reference to the dissenting opinion. The question asks about whether categorical exclusions are appropriate, and the dissenting opinion specifically addresses this point.

3. Is the Committee's report clear and logical?

This is a very complex issue, and the report was difficult to follow in many parts. However, I think the report is as clear and logical as it can be given the complexity of the material.

The dissenting opinion needs editing. The grammatical and typographical errors in the opinion reduce the effectiveness of the arguments presented. Editing can be done only by the author of that opinion. He should be encouraged to do so. (e.g. E-1, 25: "commonly used included a critical qualification"; E-2, 26: "it acknowledges that the it is widely acknowledged in the literature"; E-3, 22: "data going back to a least 1952";).

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

As I said in response to #2, the Panel needs to better explain why it concludes that EPA should not use the IPCC approach. That conclusion is not adequately justified.

I understand why the Panel recommends using a projected baseline and accounting for leakage, but the complexity and uncertainties in the data and calculations required make it seem like a research project and not something that could be dealt with in a regulatory context. The very complexity of the Panel's recommendations for improving the Framework is the strongest argument for use of default BAFs. Section 4 on default BAFs is one of the more important sections of the report; its recommendations could be more clearly highlighted in the letter and executive summary.

Editorial: Page, Line

5, 28: "(BAF) that would" – insert "that"

8, 12-14 and 16, 15-16: The sentence doesn't make sense. "…reduce the odds of limiting climate warming if climate warming is limited to 2 …"

27, 13: "…other users of biomass which also have…" insert "which"

33, 42: strange sentence construction – how can omissions inform? Rephrase for clarity.

Comments from Dr. James Mihelcic

1) Were the charge questions to the committee adequately addressed?

Each charge question is addressed in great detail.

2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?

I did not observe any errors or omissions.

3) Is the draft report clear and logical?

The report was clear and logical. It provides clear recommendations on how to revise the Framework for implementation.

4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes. However, the many strongly worded recommendations found in the full report are not found in the letter to the Administrator. In fact, the letter to the Administrator appears to not be as strongly worded in regards with the many scientific issues the SAB Draft Report raised in the draft report regarding the Framework. For example, on page 29 for charge question 4b the draft report states the SAB did not find the *Framework* to be scientifically rigorous. This strong language is not used in the letter to the Administrator. In addition, I believe the conclusion that EPA and USDA approaches could be harmonized to avoid conflicts and take advantage of opportunities for synergy is very important and should be raised in the letter to the Administrator.

Comments from Dr. H. Keith Moo-Young

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

   Yes. The original charge questions were addressed. The SAB committee should be commended on the quality of the work. The report is detailed and has very strong recommendations based.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

   No technical error or omissions in the report were found by this reviewer.

3. Is the Committee's report clear and logical?

Yes, the report is clear and logical.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

The conclusions and recommendations support the body of the committee's report.

Comments from Dr. Eileen Murphy

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?
The charge questions were adequately addressed. The charge questions were specific and multi-faceted. I thought the panel addressed these questions I a concise and well-summarized fashion. The executive summary is particularly concise and well written.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?
IPCC is never spelled out (International Panel on Climate Chang.). As a nonexpert in this area, I am not familiar with this acronym. Should be spelled out first time it is used.
There were no technical errors or omissions that this reviewer found, though this is not my area of expertise.

3. Is the Committee's report clear and logical?
This is a well-written and logically-organized report.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?
Yes, the conclusions in the report are validated by the narrative.

Comments from Dr. James Opaluch

1) Were the charge questions to the committee adequately addressed?

Yes

2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?

The Draft Report discusses the important issue of temporal distribution of emissions, which occur when bioenergy results in carbon emissions at the time of harvest of the feedstock, while carbon sequestration occurs at a different (often later) date when the feedstock is regrown on the previously harvested land. This is analogous to emissions banking and borrowing in the economics literature, which is conceptually equivalent to financial banking and borrowing. Banking occurs when sequestration happens at one point in time, and offsets emissions in later time periods. Borrowing occurs when excess emissions occur today, and emissions are "paid back" by future sequestration.

The concept of emissions banking and borrowing is an integral part of the dynamics of biogenic CO_2 accounting, especially for long-rotation feedstocks. I think it is important for the SAB report to discuss the potential role of penalties in borrowing, trades over time are one-to-one. There are at least three arguments for use of a non-zero discount rate when accounting for intertemporal transfers of carbon emissions. First, there may be a pure rate of time preference—we may simply want to encourage and reward early progress and penalize delay in meeting greenhouse gas goals. Second, there may be issues such as uncertain positive feedback effects, regime shift, or even tipping points, where a future sequestration in carbon does not fully offset the adverse climate effects of an equal increase in emissions at an earlier date. Or damages might simply be correlated with the cumulative atmospheric concentrations over time, so that future sequestration on a one-to-one basis is not adequate to offset damages associated with earlier emissions. And these damages would be higher the greater the delay in sequestration, especially for greenhouse gases with long atmospheric residence times.

The issue of penalties for intertemporal trades is one that should be discussed in the Draft Report.

Dissenting Opinion (Appendix E)

I fundamentally disagree with the argument about carbon-debt on page E-3 lines 4 through 23 in the dissenting opinion. The goal of the framework is to adjust biogenic carbon emissions from stationary pollution sources to account for carbon uptake by the feedstock from sequestration or avoided emissions from natural decay. As a consequence it is essential that the framework account for the *incremental* effects of bioenergy feedstocks compared to emissions from fossil fuels.

Therefore, the proper conceptual framework is the "with versus without" bioenergy production. This is different than total carbon sequestration across the landscape. The proper measure is the difference between baseline carbon emissions with versus without bioenergy production. This means there is no ambiguity associated with selection of a base year.

If an existing forest is cut down for bioenergy production, then there is a carbon-debt that is "paid back" over time if the forest regrows. The fact that the forest grew and sequestered carbon sometime in the past is not a consideration when calculating the incremental effects of bioenergy production. On the other hand if forest stand is planted with the intention of later cutting it down to use for bioenergy, then there is a the sequestration attributable to bioenergy production occurs prior to carbon emissions. Conceptually there is no ambiguity, although in practice it may not be straightforward in some cases to determine whether the feedstock was planted with the explicit purpose of later bioenergy extraction. As a practical matter, determining whether a particular feedstock was planted with the intention of being used for bioenergy might not always be straightforward, but this is not a conceptual problem with the framework.

The IPCC approach of based on aggregate carbon sequestration across the landscape is a fine for accounting for carbon emissions associated with land use change, but is not appropriate for calculating the incremental effects on carbon balance associated with bioenergy production. Merely knowing whether carbon sequestration at the landscape level has increased or decreased tells us nothing about the incremental effect that bioenergy production has on carbon emissions. Rather one must compare sequestration with and without bioenergy production. It is my understanding that this is the intent of the comments in the Draft SAB report.

The Dissenting Opinion also argues against a parcel-by-parcel approach in favor of a landscape approach. I agree it is not practical to calculate carbon emission separately from each and every parcel, just like it is not possible to calculate carbon emissions from each and every barrel of petroleum produced or from each ton of coal. Some fossil fuels require more energy intensive extraction or transportation than others, so they embody different levels of carbon emissions. But while it is not possible to carry out accounting for each and every unit, it is important to characterize relative emissions from very different sources. For example, an accurate framework for accounting for the fact that extraction of petroleum from Canadian tar sands is more energy intensive then extraction from conventional sources, implying higher carbon emissions. The Draft Report suggests EPA consider this type of approach by developing default BAFs that differ by feedstock category and region. I understand that the purpose of this approach is precisely to capture these kinds of large differences without having to develop a parcel-by-parcel accounting.

3) Is the draft report clear and logical?

Yes

4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes

Typos

Page E-2 Line 19. Should read "positive or negative"

Page E-2 Line 37. "redound"?

Comments from Dr. Amanda Rodewald

1. Were the charge questions adequately addressed?

Yes, I applaud the committee for so thoroughly addressing charge questions, clearly linking responses to the science and peer-reviewed literature, and suggesting alternative approaches. This is among the most thorough and impressive reports that I have read.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

No, not that I saw.

3. Is the draft report clear and logical?

Yes.

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes, the committee did an excellent job of explaining their rationale and supporting statements with references to scientific literature.

Comments from Dr. James Sanders

1. Were the charge questions adequately addressed?

Yes.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

The concerns noted in the body of the report were not clearly stated in the letter to the Administrator or in the executive summary. Please see below.

3. Is the draft report clear and logical?

The body of the report is, but please see below.

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Not completely.

Overall, the body of the report was clear, and the panel was responsive to the charge questions presented. However, it appears that the level of concerns noted in the body was not reflected in either the letter to the Administrator, or in the executive summary. For example, the letter notes that the Framework includes most of the elements that would be needed to gauge changes in CO2 emissions, then goes on to suggest many modifications and additions. The letter concludes that the Framework has uncertainties, technical difficulties, data deficiencies and implementation challenges. The Executive Summary provides further detail on these issues, notes that the Agency faces daunting technical challenges but concludes (p. 11, lines 37-38) that the Framework is a step forward in considering biogenic carbon emissions. From these summaries, I would conclude that the Framework needs considerable tweaking, but that it provides a path forward for the EPA. However, in the body of the report, the panel states that the Framework is not scientifically rigorous (p. 29, line 33), that there are conceptual and scientific deficiencies (p. 47, lines 7-8) and data, scientific and implementation problems that bedevil the Framework (p. 47, line 35). The level of concern noted throughout the body of the report rises above the more carefully measured statements in the letter and the summary, and I recommend strongly that the panel consider whether they have adequately stressed these concerns in the front sections.

This reviewer also was swayed by arguments found in the dissenting opinion.

Comments from Dr. John Vena

I quickly read the letter and executive summary. This report is far afield from my expertise. I think the letter and executive summary are very well done.

1.Were the charge questions adequately addressed? Yes
2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report? No expertise to judge
3. Is the draft report clear and logical? yes
4. Are the conclusions drawn or recommendations provided supported by the body of the draft report? Yes