MEMORANDUM

To: The Members of the CCSP Product Development Advisory Committee.
From: The authors the CCSP Product 2.1a report.
Date: Wednesday, November 1, 2006.

This memorandum accompanies the revised version of the 2.1a report. This version was revised in response the comments received from the committee during the meeting held on August 17 and 18, 2006, as well as comments received prior to that meeting from the public. What follows is a brief summary of the key elements of the report that have been changed to meet the requests of the committee. Detailed responses to the public comments, along with a draft database of model results that support the report, will be made available to the committee early the week of November 6.

The authors also note that two of the modeling teams (the teams for MERGE and Minicam) have revised their scenarios based in part on comments received during the various review processes for these scenarios. These changes have not altered the general tenor of the scenarios, although specific numerical results have changed. The revised scenarios are incorporated in the attached document. Finally, the authors intend to continue to improve the document by making minor edits (e.g., grammar, spelling, numbering, and abbreviations) and clarifications until the time that the document goes to production. A final round of technical editing will be part of this process. A summary of these minor changes will be sent to the CPDAC.

Issue #1: Executive Summary. The committee requested that the Executive Summary be improved to better communicate the character and insights of the scenarios. Such an improvement should include the addition of several figures into the Executive Summary.

Response. The text in the Executive Summary has been substantially revised, and the Executive Summary now contains a number of explanatory figures from the report. It should serve much more effectively as a stand-alone summary of the effort.

Issue #2. Cost-Benefit Analysis. One committee member was concerned that readers might be confused as to whether the scenarios address only the costs of stabilization or whether they also consider the benefits of stabilization.

Response. The authors have placed bold-faced text in several prominent locations in the document that makes clear that these scenarios are not a cost-benefit analysis. For example, bold-faced text in the Executive Summary now reads:

> *This report should in no way be perceived as a cost benefit analysis of climate policy. The focus is exclusively on the nature and costs of the mitigation required to meet various stabilization levels. No attempt has been made to assess the damages avoided by adopting a particular stabilization level or ancillary benefits that may be realized (e.g., in air pollution reduction). Although the information contained in the report should provide a useful input to policy deliberations, it provides an incomplete guide to decisions on particular policy measures.*

Issue #3: Policy Assumption. Members of the committee noted that assumptions of full when, where, and what flexibility are unlikely to be met in reality. Although this approach was requested in the Prospectus, and efforts to consider other potential approaches would be out of the scope of this effort, the committee felt that this assumption and its ramifications should be better highlighted in the report.

Response. The importance of the underlying policy assumptions in the model have now been highlighted more extensively in the body of the report as well as in the Executive Summary. For example, the following text is displayed in bold-face in the portion of the Executive Summary that discusses the economic implications of stabilization:

> *As noted earlier, the overall cost levels are strongly influenced by the idealized policy scenario that has all countries participating from the start, the assumption of "where" flexibility, an efficient pattern of increasing stringency over time, and integrated reductions in emissions of the different GHGs. An assumption that policies were implemented in a less efficient manner would lead to higher cost. Thus, these scenarios should not be interpreted as applying beyond the particular conditions assumed.*

Issue #4: Technology Assumptions. Members of the committee raised concerns over the transparency of the technology assumptions underlying the scenarios. The committee discussed the challenges in communicating such information. Committee members suggested a number of different approaches that could be used to resolve this technology description issue.

Response. The authors have chosen to approach the issue of technology assumptions in several ways. First, the authors will make available to the public detailed documentation on the model versions, and associated technology assumptions, upon publication of the report. References to this documentation will be in the report where the technology issues are discussed. Such documentation will produce information at a level well beyond what would be feasible for the report itself, and interested parties will have the opportunity to understand at this level of detail the differences between both assumptions and the approaches to technology used in the participating models.

Second, the authors have enhanced the text that describes technology and discusses the difficulties in making apples-to-apples comparisons. Third, the authors have attempted to better highlight information already presented in the report that already gives indications of technology costs and performance. For example, information on oil, natural gas, coal, and electricity prices is presented in Chapter 3 and Chapter 4. Information on carbon prices is provided in Chapter 4. Together, these two pieces of information provide a strong indication of the cost at which technologies are being deployed in the models. Biofuels, for example, compete with oil in the market for liquid fuels. The marginal cost of biofuels in any given scenario must be consistent with the marginal price of oil and the carbon price. This point has been highlighted in Chapter 2, Chapter 3, and Chapter 4.

Issue #5: Emissions of other Radiatively-Important Substances. The committee requested that any information on aerosols and other radiatively-important substances from the scenarios be made available.

Response. This information is being collected and will be made available upon publication of the report.

Issue #6: Aerosol Forcing in 2000. One committee member raised a question regarding the figure used for the anthropogenic forcing from pre-industrial times, stating the correct number was 2.7 W/m2 rather than the 2.2 in the report.

Response. Review of the relevant text in Chapter 1 revealed that the figure used is consistent with the literature for the bundle of gases specified in the Prospectus (CO_2, N_2O, CH_4, HFCs, PFCs, and SF_6). However, the juxtaposition in the text of the IPCC's radiative forcing bar diagram (Figure 1.1) and the forcing table (Table 1.1) created potential confusion as to whether the numbers in Table 1.1 represented the total radiative forcing for the well-mixed greenhouse gases (WMGGs). They do not because the Montreal gases and tropospheric ozone have been left out. The text has been revised to be clear that these scenarios are limited to the six gases and to be explicit about the fact that this estimate of their radiative effect does not represent the total WMGG forcing from pre-industrial conditions.

Issue #7. Basis for Differences. One committee member indicated that the Executive Summary needs to better explain the reasons why the economic implications of stabilization vary between the models.

Response. The authors have sharpened the discussion of these differences throughout the report. The two primary reasons for differences in costs are differences in reference scenario emissions and differences in technology assumptions, particularly in the second half of the century.

Issue #8. Indirect Effects of other Radiatively-Important Substances. At least one committee member was interested in a clarification of the means by which aerosols and other radiatively-important substances not included in the definition of stabilization for these scenarios might interact with those substances included in the analysis.

Response. Text has been added to clarify these effects. To the extent temperature is affected by these substances, they have a small, indirect influence on the results because trace gas cycles are climate-dependent. For example, climate affects vegetation and ocean temperature and thus carbon uptake, and natural emissions of CH_4 and N_2O and the lifetime of CH_4 also depend on climate. This point is now explicitly in the text.

Issue #9. Climate Feedbacks. One member of the committee was interested in ensuring that the report articulate the degree to which feedbacks from climate effects make their way into the scenarios.

Response. The following paragraph at the end of Chapter 2 gives an overview of the degree to which various feedbacks are included in the scenarios:

> *… the three models employed in this exercise are not fully closed. With few exceptions, these three models do not include the consequences of such feedback effects as temperature on heating and cooling degree days, local climate change on agricultural productivity, a CO_2 fertilization effect on agricultural productivity (though a CO_2 fertilization effect is included in the terrestrial carbon cycle models employed by IGSM and MiniCAM), climate effects of water availability for applications ranging from crop growing to power plant cooling. We leave such improvements to future research.*

In addition, the report is now far more explicit that the benefits of stabilization are not included in the analysis, implying that any economic or similar feedbacks that might arise through a changed climate do not influence the scenarios. The authors believe that the various discussions of benefits along with the above paragraph provide a clear sense of the degree to which feedbacks have been incorporated into the scenarios.