



Department of Energy
Office of Science
Washington, DC 20585

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Office of the Director

Dr. Keith Hodgson
Stanford Synchrotron Radiation Laboratory
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Stanford, California 94305

Dear Dr. Hodgson:

I am charging the Biological and Environmental Research Advisory Committee (BERAC) to undertake a review of the Office of Biological and Environmental Research's (BER) terrestrial carbon cycle research program. The review is to include an evaluation of the carbon cycle research funded through not only the core program, but also through the National Institute for Global Environmental Change (NIGEC). The BERAC review should address the following questions:

1. In what ways will the currently configured program contribute to the long term goal of BER's Climate Change Research to deliver improved climate data and models for policy makers to determine a safe level of greenhouse gases in the earth's atmosphere? Is the program on track to do so, and are any changes recommended to better enable the program to make important contributions toward that long term goal? In addition, the subcommittee of BERAC that conducts the review is asked to comment on draft performance metrics for use in tracking progress of the program toward the goal. The draft metrics will be provided to the subcommittee when it meets.
2. In what ways will the currently configured program help reduce uncertainties about the quantitative role of the terrestrial biosphere as a global sink or source of atmospheric CO₂ and how much the terrestrial biosphere might amplify or dampen the increase in atmospheric CO₂ as a result of changes in climate and/or the direct effect of elevated atmospheric CO₂ levels on plants, for example?
3. Is the current focus of BER's terrestrial carbon cycle research, which is targeted on addressing the North American Carbon Program (NACP) goals, an appropriate near-term priority given the uncertainties about future atmospheric concentrations of CO₂, and whether and by how much terrestrial sources and sinks of carbon will change in the future? Over the longer term, should BER consider making any changes in its terrestrial carbon cycle research program to address carbon cycle issues and questions besides those included in the NACP, and if so, what changes should be considered?
4. Does the current program have an appropriate balance of experimental and process studies, field observations, and modeling studies to both identify and provide an understanding of the environmental factors regulating the net exchange of CO₂ between the terrestrial ecosystems and the atmosphere and improve our ability to accurately predict changes and variation in the net exchange at scales ranging from the ecosystem to regional to continental? Are results from observational studies, such as the AmeriFlux network, used effectively in carbon cycle modeling studies? Is

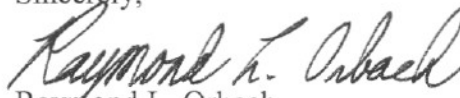


there sufficient interaction and collaboration between the modeling and process studies funded by the program to ensure that information and data from process studies and observations are being collected and used to improve carbon cycle models, and model results are used to help define the kinds of information needed from process and observational studies to test and improve carbon cycle models? What changes, if any, are recommended to enhance use of such data to improve our ability to understand and reliably predict the effects on the terrestrial carbon cycle of, for example, future potential environmental changes, such as climatic change and increasing atmospheric CO₂ levels?

5. Are the AmeriFlux sites funded by BER effectively operating as an integrated network? What changes in AmeriFlux, if any, are recommended to demonstrate and enhance its added value as an integrated network of flux measurement sites? Is AmeriFlux providing data and information that will be helpful in resolving uncertainties about the role of terrestrial ecosystems in the global carbon cycle? Is the current distribution of sites in the network representative of dominant vegetation types in the conterminous US? If additional sites were necessary to achieve representative coverage, what would be an appropriate strategy or rationale for site selection? Are the AmeriFlux quality control standards and protocols for both site operations and data quality assurance appropriate, and are all sites adequately and consistently complying with the AmeriFlux guidelines? What changes, if any, in AmeriFlux quality control standards and protocols and their implementation are necessary to help ensure that the DOE component of AmeriFlux is an effective network using comparable methods and providing comparable data and results across all DOE-funded sites?
6. Are the Free-Air CO₂ Enrichment (FACE) Experiments funded by BER providing important and useful process information for understanding and interpreting the direct effects of elevated CO₂ on terrestrial plants, communities, and ecosystems? How useful are results from these studies for assessing the potential response of terrestrial ecosystems to future increases in atmospheric CO₂ levels, especially the effect of elevated CO₂ on carbon cycle processes and the capacity of terrestrial ecosystems to sequester carbon from the atmosphere at the elevated levels? What changes in the FACE experiments, if any, are recommended to improve their value and relevance?

I recommend that Dr. Knute Nadelhoffer from the University of Michigan be asked to chair a subcommittee of BERAC to undertake this review. Dr. Nadelhoffer is an expert on terrestrial carbon cycling. If possible, I would like the subcommittee to give at least a preliminary report of its findings and recommendations at the fall, 2005 meeting of the BERAC which is tentatively scheduled to be held in November of this year.

Sincerely,



Raymond L. Orbach
Director
Office of Science