Program Announcement
To DOE National Laboratories
LAB 05-13

Integrated Assessment of Climate Change Research

SUMMARY: The Office of Biological and Environmental Research (OBER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces interest in receiving proposals for the Integrated Assessment of Climate Change Research Program. The program funds research that contributes to integrated assessment of climate change, and in particular, research to develop and improve methods and tools that focus on specialized topics of importance to integrated assessments. The research program supports the Administration's Climate Change Science Program goals to understand, model, and assess the effects of increasing greenhouse gas concentrations in the atmosphere. The program places special emphasis on developing methods to evaluate economic and other costs and benefits of climate change under "what if" scenarios that include policy interventions to mitigate greenhouse gas emissions.

All proposals submitted in response to this Solicitation must explicitly state how the proposed research will support accomplishment of the BER Climate Change Research Division's Long Term Measure of Scientific Advancement to deliver improved data and models to determine acceptable levels of greenhouse gases in the atmosphere.

DATES: Researchers are encouraged (but not required) to submit a brief preproposal for programmatic review. There is no deadline for the preproposal, but early submission of preproposals is encouraged to allow time for meaningful discussions.

The deadline for receipt of formal proposals is 4:30 p.m., Eastern Time, May 5, 2005, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2005 and early Fiscal Year 2006.

ADDRESSES: Preproposals, referencing Program Announcement LAB 05-13, should be sent E-mail to john.houghton@science.doe.gov.

Formal proposals in response to Program Announcement LAB 05-13 are to be submitted as 2 paper copies of the proposal and one CD containing the proposal in PDF format. Color images should be submitted as a separate file in PDF format and identified as such. These images should be kept to a minimum due to the limitations of reproducing hardcopies. They should be numbered and referred to in the body of the technical scientific proposal as Color image 1, Color image 2, etc.

The 2 copies of the proposal and the CD, referencing Program Announcement LAB 05-13, should be sent to: Climate Change Research Division, SC-74/Germantown Building, Office of

Biological and Environmental Research, Office of Science, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, D.C. 20585-1290, ATTN: Program Announcement LAB 05-13.

When submitting by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand carried by the researcher, the following address must be used: Climate Change Research Division, SC-74, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290, ATTN: Program Announcement LAB 05-13.

FOR FURTHER INFORMATION CONTACT: Dr. John Houghton, Climate Change Research Division, SC-74, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 1000 Independence Ave, SW, Washington, DC 20585-1290, telephone:
(301) 903-8288, E-mail: john.houghton@science.doe.gov, fax: (301) 903-8519.

SUPPLEMENTARY INFORMATION: An integrated assessment of climate change is defined here as the analysis of the human (including economics), physical, and biological aspects of climate change from the cause, such as greenhouse gas emissions, through impacts, such as changes in unmanaged ecosystems, sea level rise, and altered growing conditions for crops. The primary emphasis in an integrated assessment is to represent all three aspects in such a way that the costs and benefits of climate change can be evaluated. Integrated assessments are commonly based on simulated scenarios using a computer model. Integrated assessment models are used to evaluate, for example, specific climate change policy options, including those for reducing greenhouse gas emissions.

A description of integrated assessment may be found in Volume 3, Chapter 10, of the report "Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report: Climate Change 2001". The reference is: Ferenc Toth, et al., "Decision- Making Frameworks," Chapter 10 in Climate Change 2001: Mitigation, Cambridge University Press, 2001, (http://www.ipcc.ch/pub/reports.htm) [TAR].

The IA program funds fundamental research primarily oriented toward national-level decision making on climate change policy. One driving policy question is: "What are the potential implications of alternative energy policy options on greenhouse gas emissions and climate, including the costs and benefits of the policies and of the climate change that would result from the emissions?" The research addresses information needs critical to answering policy-related questions that arise from numerous sources, including a) climate change policy considerations within the federal government, b) proposals advanced by private and non-governmental organizations, c) preparation for international negotiations related to climate change, d) consideration of legislative proposals, and e) priority setting processes for science and technology programs. [see the Strategic Plan published by the US Government's Climate Change Science Program http://www.climatescience.gov/Library/stratplan2003/final/default.htm].

To advance understanding of future potential benefits and costs of alternative climate change policy options by the US government, many supporting questions need to be investigated. For

example, in what ways would national-level policy actions, such as a price or quantity limit on greenhouse gas emissions, influence emission scenarios, including fuel switching, economic productivity, conservation, and innovation and diffusion of climate change technologies? What is the value of improved technologies for reducing greenhouse gas emissions as a solution? How can possible future international policies and measures that are likely to be more complex than traditional targets and timetables, taxes, and trading systems, be analyzed? How well can other countries' incentives during multi-lateral climate policy discussions be predicted? In what ways can costs of Federal policy options reliably be measured, such as jobs or equity considerations? In addition to explicit consideration of climate change policy questions, climate change questions are implicit in a large number of connected policy topics, such as general R&D policy, the allocation of R&D funds across various mitigation technologies, tax policy, transportation policy, trade policy, foreign policy including economic aid policy, and environmental policies such as regional air quality.

Research funded under this program addresses several topics discussed in the CCSP Strategic Plan. Goal 3 of the Decision Support Objective is to: "Develop and evaluate methods (scenario evaluations, integrated analyses, alternative analytical approaches) to support climate change policymaking". Appropriate research topics include investigations into the evaluation of uncertainties and into analytic approaches for integrating scientific and technical information to compare the effects of alternative response options. Question 1 of the Objective for Research into Human Contributions is: "What are the magnitudes, interrelationships, and significance of primary human drivers of and their potential impact on global environmental change?" Illustrative research topics include the role of technological change in adaptation and in energy supply and demand as well as the impact of policy options on the international movement of goods and services.

The program will concentrate support on Topics A and B described below. Research projects in these elements are intended to fill critical gaps in current integrated assessments. Topics proposed by principal investigators that fall outside this list will require a preproposal and a justification to be considered for funding. Proposals that involve development of analytical models and computer codes will be judged partly on the basis of whether they include proposed tasks to document and make the models and model codes available to the community.

The research funded as a result of this solicitation will be judged in part on its potential to develop and improve integrated assessment methods and models needed to support policy analysis and development. However, policy analysis and development itself will not be funded.

A. Improve Methods for Constructing Emission Scenarios Used to Drive Integrated Assessment and Climate Models. A scenario is a description of a potential future situation that serves as input to more detailed analysis or modeling. Scenarios are often tools to explore "If..., then..." statements and are not predictions of or prescriptions for the future [CCSP Strategic Plan, 2003]. Scenarios published by the IPCC (Special Report on Emission Scenarios (SRES) (http://www.ipcc.ch/pub/reports.htm#sprep) detail various possible directions for future economic, social, land use, and energy development and include projections of economic growth, population dynamics, and technology development that vary by region. Although the SRES report was developed by the international body over several years and made considerable

progress over efforts that came before it, there have been shortcomings articulated by the climate change community, including the lack of probabilities or a central case, the lack of pessimistic growth alternatives, the use of population projections that are now out of date, the lack of sufficiently detailed results to promote downscaling, and the measurement of GDP.

The users of scenarios generally make use of projections of greenhouse gas emissions as well as other parameters that are consistent with those emission projections, such as economic growth and land use, by experts for further analysis. Integrated Assessment models require scenarios as input and are used to analyze the differences implied by alternative scenarios to test a variety of conditions, such as possible future policy choices. General circulation models (GCM) are run using greenhouse gas emissions as input. Experts studying possible future impacts of climate change use information from scenarios as well as outputs of the integrated assessment models; GCMs; and regional, sector-specific, and other information.

This notice solicits research to improve on the existing methodologies for developing emission scenarios. Research is sought that will improve some of the parameters such as energy consumption by fuel, carbon intensity, and labor productivity used as input for emission scenarios. Research focusing on input parameters for projecting emissions from energy sources and economics parameters is preferable to input parameters that are primarily non-economic, such as demography or land use changes. The parameters of high priority include those required for predicting economic productivity, for example, the possible convergence over time of the disparity of productivity levels between developed and developing countries. Research is also sought on ways to represent policy instruments, such as efficiency standards, subsidies, etc., that produce potential emission reductions with marginal costs that vary appreciably across applications. Research is sought that will provide guidance on how to improve measures of uncertainty in scenarios, such as methods to assign uncertainty to integrated assessment model input parameters, e.g. demographics and productivity, and measures of quantifying the ability of a relatively small number of individual scenarios to span adequately the "uncertainty space" inherent in the parameters.

Several research topics mentioned in the SRES special report [page 11, 12] are high priority for this solicitation. These include the need to assess future developments in the driving forces for emission of key greenhouse gases in greater regional and sectoral detail, and to focus on gridded emissions that would facilitate improved regional assessment. Another high priority topic is suggested in the IPCC TAR (7.3.2) to develop baseline scenarios against which to compare alternative emission scenarios, such as stabilization levels.

B. Technology Innovation and Diffusion. A primary focus of the Integrated Assessment of Climate Change Research Program is developing and improving methods and models for assessing innovation and diffusion of technologies that affect the emission of greenhouse gases. Assumptions regarding technology innovation and diffusion are some of the most important contributors to overall uncertainty in predicting future emissions of greenhouse gases from human activities.

One particular difficulty in modeling technological change is in representing the penetration of new technologies. Over the 21st century, the typical timeframe simulated by the integrated

assessment models, technologies need to be invented, innovated upon, and diffused to the sectors in which they are used. Proposals are sought that address issues identified in the CCSP strategic plan such as: 1) understanding the ability to influence technological change and technology transfer, 2) modeling investments in research and development as policy options, 3) placing value on competing or temporary resources, such as impermanent carbon storage or land availability for biomass, and 4) connecting the movement of goods and services across country boundaries with climate change policies. Other issues with high priority for this solicitation are identified in the IPCC Third Assessment Report on Mitigation [TAR, referenced above], including (2.6) the impacts of timing and burden sharing on mitigation costs, (3.9 and 5.6) the influence of barriers that prevent the adoption of major mitigation technologies, and (8.4.5) the role of endogenous technology change, such as induced technical change and learning-by- doing.

The rate and nature of technology diffusion from the more-developed nations to developing nations is particularly important and not well understood. Proposals are sought to help a) understand how historical precedents can be used to understand the future movement of technologies across national borders, b) predict economic structural changes that influence technology diffusion in developing nations, and c) project technology changes in non-market economies.

In general, research that proposes to investigate these issues with empirical data will be preferred to the development of models that are data poor but promise insights through the modeling structure.

Program Funding

It is anticipated that up to $1,000,000 will be available for multiple awards to be made in Fiscal Year 2005 and early Fiscal Year 2006, in the categories described above, contingent on the availability of appropriated funds. Proposals may request project support up to two years, with out-year support contingent on the availability of funds, progress of the research and programmatic needs. Annual budgets for project proposals are expected to range from $50,000 to $175,000 total costs. Funds for this research will come from the Integrated Assessment Research Program. DOE is under no obligation to pay for any costs associated with preparation or submission of proposals.

Preproposals

A preproposal is strongly encouraged (but not required) prior to submission of a full proposal. The preproposal should list the Principal Investigator's name, institution, address, telephone number, and E-mail address; title of the project; and proposed collaborators. The preproposal should consist of a one to two page narrative describing the research project objectives and methods of accomplishment. A response to each preproposal, discussing the potential program relevance of a formal proposal, generally will be communicated within 15 days of receipt. There is no deadline for the submission of preproposals, but researchers should allow sufficient time to meet the proposal deadline. Please note that notification of a successful preproposal is not an indication that an award will be made in response to the formal proposal.

The instructions and format described below should be followed. Reference Program Announcement LAB 05-13 on all submissions and inquiries about this program.

OFFICE OF SCIENCE
GUIDE FOR PREPARATION OF SCIENTIFIC/TECHNICAL PROPOSALS TO BE SUBMITTED BY NATIONAL LABORATORIES

Proposals from National Laboratories submitted to the Office of Science (SC) as a result of this program announcement will follow the Department of Energy Field Work Proposal process with additional information requested to allow for scientific/technical merit review. The following guidelines for content and format are intended to facilitate an understanding of the requirements necessary for SC to conduct a merit review of a proposal. Please follow the guidelines carefully, as deviations could be cause for declination of a proposal without merit review.

1. Evaluation Criteria

Proposals will be subjected to formal merit review (peer review) and will be evaluated against the following criteria which are listed in descending order of importance:

Scientific and/or technical merit of the project

Appropriateness of the proposed method or approach

Competency of the personnel and adequacy of the proposed resources

Reasonableness and appropriateness of the proposed budget

The evaluation process will include program policy factors such as the relevance of the proposed research to the terms of the announcement and the agency's programmatic needs. Note that external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Both federal and non-federal reviewers will often be used, and submission of a proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

2. Summary of Proposal Contents

- Field Work Proposal (FWP) Format (Reference DOE Order 5700.7C) (DOE ONLY)
- Proposal Cover Page
- Table of Contents
- Budget (DOE Form 4620.1) and Budget Explanation
- Abstract (one page)
- Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel)
- Long Term Measure
- Renewal Proposals

- Collaborative Arrangements
- Literature Cited
- Biographical Sketch(es)
- Description of Facilities and Resources
- Other Support of Investigator(s)
- Appendix (optional)

2.1 Number of Copies to Submit

Formal proposals in response to Program Announcement LAB 05-13 are to be submitted as 2 paper copies of the proposal and one CD containing the proposal in PDF format. Color images should be submitted as a separate file in PDF format and identified as such. These images should be kept to a minimum due to the limitations of reproducing hardcopies. They should be numbered and referred to in the body of the technical scientific proposal as Color image 1, Color image 2, etc.

3. Detailed Contents of the Proposal

Proposals must be readily legible, when photocopied, and must conform to the following three requirements: the height of the letters must be no smaller than 10 point with at least 2 points of spacing between lines (leading); the type density must average no more than 17 characters per inch; the margins must be at least one-half inch on all sides. Figures, charts, tables, figure legends, etc., may include type smaller than these requirements so long as they are still fully legible.

3.1 Field Work Proposal Format (Reference DOE Order 5700.7C) (DOE ONLY)

The Field Work Proposal (FWP) is to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office. Additional information is also requested to allow for scientific/technical merit review. Laboratories may submit proposals directly to the SC Program office listed above. A copy should also be provided to the appropriate DOE operations office.

3.2 Proposal Cover Page

The following proposal cover page information may be placed on plain paper. No form is required.

Title of proposed project
SC Program announcement title
Name of laboratory
Name of principal investigator (PI)
Position title of PI
Mailing address of PI
Telephone of PI
Fax number of PI

Electronic mail address of PI
Name of official signing for laboratory*
Title of official
Fax number of official
Telephone of official
Electronic mail address of official
Requested funding for each year; total request
Use of human subjects in proposed project:

If activities involving human subjects are not planned at any time during the proposed project period, state "No"; otherwise state "Yes", provide the IRB Approval date and Assurance of Compliance Number and include all necessary information with the proposal should human subjects be involved.

Use of vertebrate animals in proposed project:

If activities involving vertebrate animals are not planned at any time during this project, state "No"; otherwise state "Yes" and provide the IACUC Approval date and Animal Welfare Assurance number from NIH and include all necessary information with the proposal.

Signature of PI, date of signature
Signature of official, date of signature*

*The signature certifies that personnel and facilities are available as stated in the proposal, if the project is funded.

3.3 Table of Contents

Provide the initial page number for each of the sections of the proposal. Number pages consecutively at the bottom of each page throughout the proposal. Start each major section at the top of a new page. Do not use unnumbered pages and do not use suffices, such as 5a, 5b.

3.4 Abstract

Provide an abstract of no more than 250 words. Give the broad, long-term objectives and what the specific research proposed is intended to accomplish. State the hypotheses to be tested. Indicate how the proposed research addresses the SC scientific/technical area specifically described in this announcement.

3.5 Narrative

Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel)

The narrative comprises the research plan for the project and is limited to **25 pages (maximum).** It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science. The major part of the narrative should be devoted to a description and justification of the proposed project, including details of the methods to be used. Describe new techniques and

methodologies and explain the advantages over existing techniques and methodologies. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities.

If any portion of the project is to be done in collaboration with another institution (or institutions), provide information on the institution(s) and what part of the project it will carry out. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation", "Biographical Sketches", and "Description of Facilities and Resources".

Long Term Measure
All proposals submitted in response to this Solicitation must explicitly state how the proposed research will support accomplishment of the BER Climate Change Research Division's Long Term Measure of Scientific Advancement to deliver improved data and models to determine acceptable levels of greenhouse gases in the atmosphere.

Subcontract or Consortium Arrangements: If any portion of the project described under "Research Design and Methods" is to be done in collaboration with another institution, provide information on the institution and why it is to do the specific component of the project. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation", "Biographical Sketches", and "Description of Facilities and Resources".

3.6 Literature Cited

List all references cited in the narrative. Limit citations to current literature relevant to the proposed research. Information about each reference should be sufficient for it to be located by a reviewer of the proposal.

3.7 Budget and Budget Explanation

A detailed budget is required for the entire project period, which normally will be three years, and for each fiscal year. It is preferred that DOE's budget page, Form 4620.1 be used for providing budget information*. Modifications of categories are permissible to comply with institutional practices, for example with regard to overhead costs.

A written justification of each budget item is to follow the budget pages. For personnel this should take the form of a one-sentence statement of the role of the person in the project. Provide a detailed justification of the need for each item of permanent equipment. Explain each of the other direct costs in sufficient detail for reviewers to be able to judge the appropriateness of the amount requested.

Further instructions regarding the budget are given in section 4 of this guide.

* Form 4620.1 is available at web site: http://www.sc.doe.gov/grants/Forms-E.html.

3.8 Other Support of Investigators

Other support is defined as all financial resources, whether Federal, non-Federal, commercial or institutional, available in direct support of an individual's research endeavors. Information on active and pending other support is required for all senior personnel, including investigators at collaborating institutions to be funded by a subcontract. For each item of other support, give the organization or agency, inclusive dates of the project or proposed project, annual funding, and level of effort devoted to the project.

3.9 Biographical Sketches

This information is required for senior personnel at the institution submitting the proposal and at all subcontracting institutions (if any). The biographical sketch is limited to a maximum of **two pages** for each investigator.

To assist in the identification of potential conflicts of interest or bias in the selection of reviewers, the following information **must be provided in each biographical sketch.**

> **Collaborators and Co-editors:** A list of all persons in alphabetical order (including their current organizational affiliations) who are currently, or who have been, collaborators or co- authors with the investigator on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of the proposal. Also include those individuals who are currently or have been co-editors of a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of the proposal. If there are no collaborators or co-editors to report, this should be so indicated.
>
> **Graduate and Postdoctoral Advisors and Advisees:** A list of the names of the individual's own graduate advisor(s) and principal postdoctoral sponsor(s), and their current organizational affiliations. A list of the names of the individual's graduate students and postdoctoral associates during the past 5 years, and their current organizational affiliations.

3.10 Description of Facilities and Resources

Describe briefly the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe pertinent capabilities, including support facilities (such as machine shops) that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution, if any.

3.11 Appendix

Include collated sets of all appendix materials with each copy of the proposal. Do not use the appendix to circumvent the page limitations of the proposal. Information should be included that may not be easily accessible to a reviewer.

Reviewers are not required to consider information in the Appendix, only that in the body of the proposal. Reviewers may not have time to read extensive appendix materials with the same care as they will read the proposal proper.

The appendix may contain the following items: up to five publications, manuscripts (accepted for publication), abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community; and letters from investigators at other institutions stating their agreement to participate in the project (do not include letters of endorsement of the project).

4. Detailed Instructions for the Budget
(DOE Form 4620.1 "Budget Page" may be used)

4.1 Salaries and Wages

List the names of the principal investigator and other key personnel and the estimated number of person-months for which DOE funding is requested. Proposers should list the number of postdoctoral associates and other professional positions included in the proposal and indicate the number of full-time-equivalent (FTE) person-months and rate of pay (hourly, monthly or annually). For graduate and undergraduate students and all other personnel categories such as secretarial, clerical, technical, etc., show the total number of people needed in each job title and total salaries needed. Salaries requested must be consistent with the institution's regular practices. The budget explanation should define concisely the role of each position in the overall project.

4.2 Equipment

DOE defines equipment as "an item of tangible personal property that has a useful life of more than two years and an acquisition cost of $25,000 or more." Special purpose equipment means equipment which is used only for research, scientific or other technical activities. Items of needed equipment should be individually listed by description and estimated cost, including tax, and adequately justified. Allowable items ordinarily will be limited to scientific equipment that is not already available for the conduct of the work. General purpose office equipment normally will not be considered eligible for support.

4.3 Domestic Travel

The type and extent of travel and its relation to the research should be specified. Funds may be requested for attendance at meetings and conferences, other travel associated with the work and subsistence. In order to qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Consultant's travel costs also may be requested.

4.4 Foreign Travel

Foreign travel is any travel outside Canada and the United States and its territories and possessions. Foreign travel may be approved only if it is directly related to project objectives.

4.5 Other Direct Costs

The budget should itemize other anticipated direct costs not included under the headings above, including materials and supplies, publication costs, computer services, and consultant services (which are discussed below). Other examples are: aircraft rental, space rental at research establishments away from the institution, minor building alterations, service charges, and fabrication of equipment or systems not available off- the-shelf. Reference books and periodicals may be charged to the project only if they are specifically related to the research.

a. Materials and Supplies

The budget should indicate in general terms the type of required expendable materials and supplies with their estimated costs. The breakdown should be more detailed when the cost is substantial.

b. Publication Costs/Page Charges

The budget may request funds for the costs of preparing and publishing the results of research, including costs of reports, reprints page charges, or other journal costs (except costs for prior or early publication), and necessary illustrations.

c. Consultant Services

Anticipated consultant services should be justified and information furnished on each individual's expertise, primary organizational affiliation, daily compensation rate and number of days expected service. Consultant's travel costs should be listed separately under travel in the budget.

d. Computer Services

The cost of computer services, including computer-based retrieval of scientific and technical information, may be requested. A justification based on the established computer service rates should be included.

e. Subcontracts

Subcontracts should be listed so that they can be properly evaluated. There should be an anticipated cost and an explanation of that cost for each subcontract. The total amount of each subcontract should also appear as a budget item.

4.6 Indirect Costs

Explain the basis for each overhead and indirect cost. Include the current rates.