

Office of Science
Notice DE-FG01-04ER04-14

***Program for Ecosystem Research:
Scaling Across Levels of Biological Organization in Ecological
Systems***

Department of Energy

Office of Science Financial Assistance Program Notice DE-FG01-04ER04-14; Program for Ecosystem Research: Scaling Across Levels of Biological Organization in Ecological Systems

AGENCY: U.S. Department of Energy

ACTION: Notice inviting grant applications.

SUMMARY: The Office of Biological and Environmental Research (BER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications for grants for the Scaling Across Levels of Biological Organization in Ecological Systems Initiative, a component of the BER Program for Ecosystem Research (PER). Applications should describe research projects to determine the theoretical and empirical bases of whether, and how, *information obtainable at the level of genomes and proteomes of species or communities can be used to explain, and predict, effects of environmental changes associated with energy production on the structure and functioning of important ecosystems.* The focus of applications should be to: (1) demonstrate a capability to collect genomic, proteomic, and/or metabolomic data from within a terrestrial ecosystem and then use that data to explain and/or predict observed effects of controlled manipulations of temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration on the structure and functioning of the ecosystem, or (2) advance the theoretical basis for scaling genomic and proteomic information to higher levels of biological organization, ultimately to the level of whole ecosystems.

All applications submitted in response to this Notice must explicitly state how the proposed research will support accomplishment of the BER Long Term Measure of Scientific Advancement to deliver improved data and models to determine acceptable levels of greenhouse gases in the atmosphere.

DATES: Applicants are encouraged (but not required) to submit a 1-2 page preapplication for programmatic review. There is no deadline for the preapplication, but early submission of preapplications is encouraged to allow time for meaningful discussions.

Formal applications submitted in response to this Notice must be received by 4:30 p.m., Eastern Time, April 29, 2004, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2004.

ADDRESSES: Preapplications referencing Notice DE-FG01-04ER04-14, should be sent to Dr. Jeffrey S. Amthor, PER program manager, via e-mail to jeff.amthor@science.doe.gov. Please include "Preapplication Notice DE-FG01-04ER04-14" in the e-mail subject field.

Formal applications referencing Program Notice DE-FG01-04ER04-14, must be sent electronically by an authorized institutional business official through DOE's Industry Interactive Procurement System (IIPS) at: <http://e-center.doe.gov/>. IIPS provides for the posting of solicitations and receipt of applications in a paperless environment via the Internet. In order to submit applications through IIPS, your business official will need to register at the IIPS website. **IIPS offers the option of using multiple files, please limit submissions to one volume and one file if possible, with a maximum of no more than four PDF files.** The Office of Science will include attachments as part of this notice that provide the appropriate forms in PDF fillable format that are to be submitted through IIPS. Color images should be submitted in IIPS 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 them. They should be numbered and referred to in the body of the technical scientific grant application as Color image 1, Color image 2, etc. Questions regarding the operation of IIPS may be E-mailed to the IIPS Help Desk at: HelpDesk@pr.doe.gov, or you may call the help desk at: (800) 683-0751. Further information on the use of IIPS by the Office of Science is available at: <http://www.sc.doe.gov/production/grants/grants.html>.

If you are unable to submit an application through IIPS, please contact the Grants and Contracts Division, Office of Science at: (301) 903-5212 or (301) 903-3604, in order to gain assistance for submission through IIPS or to receive special approval and instructions on how to submit printed applications.

FOR FURTHER INFORMATION CONTACT: Dr. Jeffrey S. Amthor, phone: (301) 903-2507; e-mail: jeff.amthor@science.doe.gov.

SUPPLEMENTARY INFORMATION:

Background: Program for Ecosystem Research (PER) and the Scaling Initiative

The PER mission is to measurably improve the scientific basis for predicting or detecting effects of environmental changes associated with energy production (i.e., global and regional changes in atmospheric composition and related climatic changes) on terrestrial ecosystems and their component organisms and processes. Terrestrial ecosystems, their functions, and their components most valued by society are of highest priority to the PER. The PER mission supports the DOE Energy Strategic Goal "to protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy" by contributing to the science base needed to judge environmental implications of various energy supply options.

The PER is intended to contribute specifically to the long-term BER program goal of delivering data and models needed to determine acceptable levels of greenhouse gases in the atmosphere. The PER's contribution to this goal is carried out by quantifying cause-and-effect relationships between environmental changes associated with energy production (i.e., increased concentrations of greenhouse gases in the atmosphere and related environmental changes) and the structure and functioning of important terrestrial ecosystems. Understanding of such relationships is important to a determination of acceptable levels of greenhouse gases.

The theme defining PER objectives is mechanistic understanding and quantification of effects of ongoing and potential future environmental changes associated with energy production on whole ecosystems. *Present program emphasis is on effects of multiple (concurrent) environmental changes, i.e., effects on ecosystems of combinations of changes in atmospheric composition and/or climatic variables.* Environmental changes of key interest to the PER are: (1) warming and changes in diurnal, seasonal, and interannual temperature cycles; (2) changes in precipitation and evapotranspiration (e.g., intensification of the hydrologic cycle); and (3) increasing atmospheric carbon dioxide and (tropospheric) ozone concentrations. Specific PER objectives are to improve scientific understanding of how and why (or if) terrestrial ecosystems and their component organisms are affected by, and respond to, multiple environmental changes, and how and why critical biological and/or ecological processes in terrestrial ecosystems are controlled or modified by multiple environmental changes.

The PER supports experimental research, (in the laboratory or field as appropriate to individual research project objectives), and modeling at both universities and government laboratories. The research and modeling considers both, (either) direct and indirect effects of environmental changes on terrestrial ecosystems, their components, their processes, and their structures. Experimental research based on underlying theory, and modeling that considers ecological hierarchies (i.e., multi-level or mechanistic modeling), are foci of the PER. Ecosystem responses to environmental changes of particular interest include: (1) adjustments at the ecosystem scale, such as changes in the organized hierarchy of ecosystem processes, structures, biological diversity, and/or succession; and (2) adjustments at the organismal scale that are manifested at the ecosystem scale, including physiological, biochemical, and/or genetic changes that may facilitate (or hinder) ecosystem homeostasis.

The goal of the new Scaling Across Levels of Biological Organization in Ecological Systems Initiative is to determine the theoretical and empirical bases of whether, and how, *information obtainable at the level of genomes and proteomes of species or communities can be used to explain, and predict, effects of environmental changes associated with energy production on the structure and functioning of important ecosystems.* This is a new emphasis within PER and is intended to explicitly link ecosystem research and modeling with the rapidly advancing capabilities being developed in genomics, proteomics, and metabolomics.

Request for Grant Applications

This Notice requests grant applications for activities in support of the goal of the Scaling Initiative as articulated above. Specifically, research is sought to advance the following two areas:

(1) the uses of genomic, proteomic, and/or metabolomic measurements and analyses to explain and/or predict effects of controlled changes in temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration on the structure and functioning of ecosystems, or

(2) the theoretical and/or computational bases for scaling information from the level of genomes, proteomes, and/or metabolomes to higher levels of biological organization, ultimately to the level of whole ecosystems.

Applications involving empirical studies (area (1) above) should consider the use of existing manipulative field experiments as platforms for research. (Requests for support for implementation or maintenance of field manipulations of temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration will not be considered. Moreover, studies using natural gradients of environmental factors, rather than controlled manipulations, will not be considered.) In particular, applications should propose to use existing field experiments to obtain new genomic, proteomic, and/or metabolomic data and use that data and, if appropriate, hierarchical theory of biological and ecological systems to: (1) explain (previously) observed effects of the manipulation(s) of temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration on ecosystem-scale processes and states (ecosystem structure and functioning); and/or (2) make predictions based on theoretical models about changes in ecosystem structure and/or functioning that can and will be tested with observations and data at multiple scales within the range from the genome of individual species to the entire ecosystem. Performance of the ecosystem-scale observations and data analysis can be made a component of the proposed research. A few laboratory (i.e., mesocosm or microcosm) projects might be considered for funding, but it will be critical for such projects to represent well the processes, structures, and functioning of intact (actual) terrestrial ecosystems. Experimental control of the same environmental variables (ozone concentration, carbon dioxide concentration, soil moisture, and/or temperature) would need to be included in laboratory projects.

Applications involving theoretical and modeling studies (area (2) above) should concentrate on developing new theoretical models or approaches to biological and ecological modeling. Such studies should incorporate genomic, proteomic, and/or metabolomic data, along with information on the associated biochemical and physiological mechanisms and pathways that control and influence biological and ecological processes, into hierarchical (multi-level) ecosystem models. The new models or modeling approaches should enhance a capability to explain and predict effects of environmental changes associated with energy production on ecosystem structure and functioning. The use of existing biological or ecological models to study or simulate biological or ecological effects of environmental change, without clearly articulated plans to improve the theoretical bases of scaling across multiple levels of biological organization within such models, will not be considered for support.

The focus of all applications should be on the advancement of the theoretical and empirical bases for scaling information and data from the genomic, proteomic, and metabolomic level of component species and communities up through higher levels of biological organization within ecosystems to explain the causal mechanisms and pathways that determine whether and how

effects of energy-related environmental changes are manifested on the structure and functioning of an ecosystem.

All applications submitted in response to this Notice must explicitly state how the proposed research will support accomplishment of the BER Long Term Measure of Scientific Advancement to deliver improved data and models to determine acceptable levels of greenhouse gases in the atmosphere. Applications failing to fulfill this criterion will not be considered for funding.

Applications focusing primarily on plant or ecosystem carbon exchange or carbon balance, or directed at carbon sequestration in terrestrial ecosystems, are inappropriate for PER. Such applications should be directed to the DOE BER Terrestrial Carbon Processes (TCP) and Carbon Sequestration programs, respectively.

To enhance potential collaboration and synergism within the Scaling Initiative and the larger PER, successful applicants will participate in annual Investigator Meetings. Costs for such meetings should be included in each application budget, and should be based on one trip of 5 days each year to Washington, DC, for all key personnel of each project.

Program Funding

It is anticipated that about \$2,400,000 will be available for multiple awards in Fiscal Year 2004. Applications may request project support for up to 3 years, with out-year support contingent on availability of funds, progress of the research, and programmatic needs. Annual budgets are expected to range from \$100,000 to \$500,000 total costs, unless there is prior approval from the Program Manager. DOE may encourage collaboration among prospective investigators to promote joint applications by using information obtained in the preapplication or other forms of communication. DOE is under no obligation to pay for any costs associated with preparation or submission of applications.

Preapplications

A preapplication is strongly encouraged (but not required) prior to submission of a full application. The preapplication should list the Principal Investigator's name, institution, address, telephone number, and E-mail address; title of the project; and proposed collaborators. The preapplication should consist of a one to two page narrative describing the research project objectives and methods of accomplishment. These will be reviewed relative to the goals of the Scaling Across Levels of Biological Organization in Ecological Systems Initiative. A response to each preapplication, discussing the potential program relevance of a formal application, generally will be communicated within 15 days of receipt. There is no deadline for the submission of preapplications, but applicants should allow sufficient time to meet the application deadline of April 29, 2004. Please note that notification of a successful preapplication is not an indication that an award will be made in response to the formal application.

Merit Review

Applications will be subjected to formal merit review (peer review) and will be evaluated against the following evaluation criteria which are listed in descending order of importance codified at 10 CFR 605.10(d):

1. Scientific and/or Technical Merit of the Project;
2. Appropriateness of the Proposed Method or Approach;
3. Competency of Applicant's Personnel and Adequacy of Proposed Resources;
4. 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, 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 an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

Submission Information

Information about the development and submission of applications, eligibility, limitations, evaluation, selection process, and other policies and procedures may be found in the Application Guide for the Office of Science Financial Assistance Program and 10 CFR Part 605. Electronic access to SC's Financial Assistance Application Guide and required forms is made available via the World Wide Web: <http://www.sc.doe.gov/production/grants/grants.html>.

In addition, for this Notice, the research description must be 20 pages or less (10-point or larger font), including figures and tables but excluding attachments, and must include a one-page summary of the proposed project. The summary should appear on a separate page (page 1) and must include the proposed-project title; name of the applicant and the applicant's address, phone number, and e-mail address; names of any co-investigators; and the proposed-project summary. Attachments should include literature references cited in the research description, curriculum vitae for each investigator (2-page maximum per investigator), a listing of all current and pending federal support for each investigator, and letters of intent when collaborations are part of the proposed research.

For researchers who do not have access to the World Wide Web (WWW), please contact Karen Carlson, Office of Biological and Environmental Research, Climate Change Research Division, SC-74/Germantown Building, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585-1290, phone: (301) 903-3338, fax: (301) 903- 8519, e-mail: karen.carlson@science.doe.gov; for hard copies of background material mentioned in this solicitation.

The Catalog of Federal Domestic Assistance number for this program is 81.049, and the solicitation control number is ERFAP 10 CFR Part 605.

Martin Rubinstein
Acting Director

Grants and Contracts Division
Office of Science

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