

**Office of Science
Financial Assistance
Funding Opportunity Announcement
DE-FOA-0000219**

***Research in Integrated Assessment
Inter-Model Development,
Testing and Diagnostics***

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 grant applications for Research in Integrated Assessment Inter-Model Development, Testing, and Diagnostics under the Integrated Assessment Research Program (IARP). The IARP, located within the Climate and Environmental Sciences Division (CESD) of BER, supports the DOE mission and the U.S. Global Change Research Program's interests to improve fundamental understanding of the interactions between human and natural systems in climate change, including the central role and implications for energy systems, and to develop the integrated, science-based models and tools that inform national and regional decision-making on options for mitigation and adaptation. In the broadest sense, IARP is concerned with modeling in collective frameworks, the end-to-end processes of climate change and the complex, non-linear interactions among major human and natural systems. To strengthen the scientific foundations upon which Integrated Assessment models are built, DOE is requesting applications for a single, coordinated research effort that will: 1) advance progress on a select set of major scientific challenges in the field of Integrated Assessment that are widely recognized and confronting the major Integrated Assessment modeling teams, 2) advance methods and capabilities for inter-model testing and diagnostics, and 3) enhance capabilities for multi-model, "ensemble-like" analyses for improved insights in science studies and science-based analyses.

PREAPPLICATIONS

PREAPPLICATIONS ARE REQUIRED

Potential applicants are **required** to submit a three-page preapplication by email referencing Funding Opportunity Announcement **DE-FOA-0000219** in the subject line of the email header. The intent in requesting a preapplication is to save the time and effort of applicants in preparing and submitting a formal application that may be inappropriate for the program.

Preapplications must be received by DOE by **4:30 p.m., Eastern Time, January 11, 2010.** (The **preapplication should be sent from the email address that will be monitored for the response.**) Feedback on the preapplications encouraging or discouraging formal applications will be communicated to the applicants through email by January 15, 2010. Applicants who have not

received a response regarding the status of their preapplication by this date are responsible for contacting the program to confirm the status. Note that notification of a successful preapplication is not a guarantee that an award will be made in response to a formal application.

Preapplications will be reviewed relative to the scope and research needs as outlined in the summary paragraph and in the SUPPLEMENTARY INFORMATION. In preparing the preapplication, the first page of the three-page (maximum length) submission should identify (1) the Principal Investigator's name, telephone number, and email address; (2) the name of the Principal Investigator's employing institution and physical address; (3) the title of the proposed project, (4) a clear and concise description of the proposed research and research objectives, (5) a brief (two sentence) statement of background and significance of the proposed project, and (6) a clear statement of the institutional capabilities that the applicant can bring to bear to assure the success of this large, complex project. Page two should include a (1) description of the proposed research methods and (2) a rough dollar approximation and, as appropriate, cross-institutional allocation of the budget for each year of the proposed research. Page three of the preapplication must include (1) a paragraph description of the Principal Investigator's expertise and background in successful research related to the subject of this announcement and the proposed research, and (2) a preliminary list of the proposed research team members, their institutional affiliations, and one line descriptions of the relevant expertise they will contribute.

All preapplications should be sent as Word file attachments, set with 1 inch margins, referencing Funding Opportunity Announcement

DE-FOA-0000219. Preapplications should be directed by email to: bob.vallario@science.doe.gov. It is critical that applicants include "**Preapplication DE-FOA-0000219**" in the subject line of the email and only e-mail preapplications will be accepted. **No FAX or mail submission of preapplications will be accepted.**

APPLICATION DUE DATE: March 1, 2010, 8:00 p.m. Eastern Time

Formal applications submitted in response to this FOA must be received by March 1, 2010, 8:00 p.m. Eastern time, to permit timely consideration of awards. You are encouraged to transmit your application well before the deadline. **APPLICATIONS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.**

IMPORTANT SUBMISSION INFORMATION:

The full text of the Funding Opportunity Announcement (FOA) is located on FedConnect. Instructions for completing the Grant Application Package are contained in the full text of the FOA which can be obtained at: <https://www.fedconnect.net/FedConnect/?doc=DE-FOA-0000219&agency=DOE>. To search for the FOA in FedConnect click on "Search Public Opportunities". Under "Search Criteria", select "Advanced Options", enter a portion of the title "Research in Integrated Assessment Inter-Model Development, Testing and Diagnostics", then click on "Search". Once the screen comes up, locate the appropriate Announcement.

In order to be considered for award, Applicants must follow the instructions contained in the Funding Opportunity Announcement.

WHERE TO SUBMIT: Applications must be submitted through Grants.gov to be considered for award.

You cannot submit an application through Grants.gov unless you are registered. Please read the registration requirements carefully and start the process immediately. Remember you have to update your CCR registration annually. If you have any questions about your registration, you should contact the Grants.gov Helpdesk at 1-800-518-4726 to verify that you are still registered in [Grants.gov](http://www.grants.gov).

Registration Requirements: There are several one-time actions you must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider, and register with Grants.gov). See <http://www.grants.gov/GetStarted>. Use the Grants.gov Organization Registration Checklist at <http://www.grants.gov/assets/OrganizationRegCheck.pdf> to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow at least 21 days to complete these requirements. It is suggested that the process be started as soon as possible.

IMPORTANT NOTICE TO POTENTIAL APPLICANTS: When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e. Grants.gov registration).

Questions: Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov. Part VII of the FOA explains how to submit other questions to the Department of Energy (DOE).

All applications should be in a single PDF file.

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Technical/Scientific Program Contact:

Program Manager: Robert Vallario
U. S. Department of Energy
Office of Biological and Environmental Research
Phone: 301-903-5758
E-Mail: Bob.Vallario@science.doe.gov

SUPPLEMENTARY INFORMATION:

Background:

The Climate and Environmental Sciences Division has established the following Long Term Measure (LTM) for its programs: *Deliver improved scientific data and models about the*

potential response of the Earth's climate and terrestrial biosphere to increased greenhouse gas levels for policy makers to determine safe levels of greenhouse gases in the atmosphere. The Department of Energy's strategy for basic research in climate science is described in a recent strategic plan (<http://www.sc.doe.gov/ober/Climate%20Strategic%20Plan.pdf>). The Plan's focus area entitled Climate Change Modeling includes a specific section on Integrated Assessment research which describes the program's resources, goals and anticipated outcome for this program. Submitters are encouraged to review this document and to address the Integrated Assessment program's goals and outcomes when developing applications. The IARP directly supports this LTM by developing the science-based models and tools to explore the interactions between human and natural systems in climate change, with an emphasis on the energy, technology, land use, and socioeconomic futures that can influence future climate, and the implications of those changes for human and natural systems, including feedbacks to the overall climate system.

The following four documents provide useful background material on the general field of Integrated Assessment and the IARP in particular. A major workshop report, Science Challenges and Future Directions: Climate Change Integrated Assessment Research, can be found at: http://www.sc.doe.gov/ober/IA%20Workshop_06-25-09.pdf. This report, documenting a recent IARP-sponsored workshop, identifies the long-term research challenges in Integrated Assessment and a science vision for the field. Two Synthesis and Assessment Products of the U.S. Global Change Research Program were sponsored by DOE's IARP. The reports, Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations and Global-Change Scenarios: Their Development and Use can be found at: <http://www.globalchange.gov/publications/reports/scientific-assessments/saps/sap2-1>.

Finally, a third Synthesis and Assessment Product, found at <http://www.climate-science.gov/Library/sap/sap4-5/default.php>, identifies research needs to understand the effects of climate change on energy production and use in the U.S.

The IARP is a basic research program and does not seek to apply the tools for the analysis of specific policy options. Rather, the Program aims to develop the scientific knowledge, data, and underlying models and tools that can be used by others to evaluate the implications of, for example, alternative energy policy options. This Announcement marks a shift in the IARP to advance, with greater focus and support, a more collaborative Integrated Assessment science community of practice. Underpinning this shift is a greater emphasis on common research topics, development and testing activities that extend across a broad set of models, and development of core capabilities that, ultimately, will advance the efforts of all the major modeling teams. Physical experimentation and observational research is beyond the scope of this Announcement.

Request for Grant Application:

All applications submitted in response to this Announcement must explicitly state how the proposed research will support accomplishment of the BER CESD's LTM: "Deliver improved scientific data and models about the potential response of the Earth's climate and terrestrial biosphere to increased greenhouse gas levels for policy makers to determine safe levels of greenhouse gases in the atmosphere."

Integrated Assessment research provides scientific insights into climate change with multi-scale models of the combined human-climate system. These models include human processes responsible for greenhouse gas emissions, land use and more generally, the carbon cycle, and combined climate change impacts on and adaptations of human and natural systems, including the energy system. Integrated Assessment research develops advanced quantitative tools for exploring the implications of science and technology decisions and innovations on our energy, environmental, and economic futures.

To accelerate progress in the field, DOE is requesting applications for a program to: (1) advance progress on a select set of major scientific challenges in the field of Integrated Assessment that are widely recognized and confronting the major Integrated Assessment modeling teams, (2) advance methods and capabilities for inter-model testing and diagnostics, and (3) enhance capabilities for multi-model, "ensemble-like" analyses for improved insights in science studies and science-based analyses.

(1) Advance progress on a select set of major scientific challenges in the field of Integrated Assessment that are widely recognized and confronting the major Integrated Assessment modeling teams. Specifically, applicants should demonstrate their knowledge of the key accompanying issues and outline innovative, defensible methodologies to address:

(a) *Science and technology.* Improve our fundamental understanding of the role of transformational science, technology, and overall innovation (within Integrated Assessment models), particularly for energy systems and climate change mitigation as well as for adaptation.

(b) *Impacts and adaptation.* Incorporate explicit representations of impacts and adaptations within Integrated Assessment models with an initial emphasis on energy and infrastructure, multi-sectoral vulnerabilities, systems that affect the carbon cycle and other greenhouse gas emissions, and the effects of interacting stressors from both mitigation and adaptation.

(c) *Regional scale Integrated Assessment modeling.* Develop regional Integrated Assessment modeling methods and capabilities to respond to critical needs for decision-making at finer spatial and temporal scales.

(d) *Key intersecting energy-relevant systems.* Improve representations of energy- water-land interactions and interdependencies in Integrated Assessment models.

(e) *Uncertainty.* Support expansion beyond economic metrics to reveal risk and uncertainty perspectives.

Applications should reflect the unique dimensions and state of knowledge in each of these areas and propose methods and approaches suited to the topics, range of collaborations, and participants that will be required to address these substantial modeling challenges. Ultimately, the goal of this work is to support fundamental understanding and scientific foundations in Integrated Assessment that will stimulate and accelerate advances within many Integrated

Assessment models, not just a single model. Broad community engagement in the development of these research topics is, therefore, highly desirable. Research strategies and methods should be tailored to meet this goal and should demonstrate this intent. Joint research studies, multi-model analyses, visiting scientists, technical workshops, community studies, collaborative applications, leveraged research funds, effective use of existing infrastructure and institutional mechanisms, and other methods are all possible strategies that should be considered for addressing these highly interdisciplinary research challenges.

(2) Advance methods and capabilities for inter-model testing and diagnostics. There is a growing, recognized need within the Integrated Assessment community for improved model testing, diagnostics and inter-comparisons. The climate modeling community has its equivalent in the Program for Climate Model Diagnosis and Intercomparison (PCMDI) (see <http://www-pcmdi.llnl.gov/>). Applicants should outline the core elements of a robust research program for Integrated Assessment inter-model testing and diagnostics, specifically identifying the methods considered appropriate for the field of Integrated Assessment and the corresponding rationale. Additionally, applicants should address the opportunities for use of high performance computing in meeting these objectives. As Integrated Assessment models evolve and begin to work in tandem (or become fully interoperable) with detailed Earth System Models, as the models increase spatial and temporal resolution, and as impacts, adaptation, and vulnerability are incorporated into Integrated Assessment models, the computational and data storage and handling needs are expanding rapidly.

(3) Enhance capabilities for multi-model, "ensemble-like" analyses for improved insights in science studies and science-based analyses. The report, *Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations*, contains one of the more recent, highly visible multi-model analyses in the field of Integrated Assessment. It was groundbreaking and at the same time it pointed to the many unresolved challenges in conducting such multi-model analyses. Examining systems behaviors and sensitivities across models has been demonstrated to be of great value in the related field of climate modeling, such as in the Intergovernmental Panel on Climate Change (IPCC). Applicants should propose a short, candidate list of study topics, no more than a few items of critical scientific interest, and should clearly outline the methodologies proposed to advance, test, and refine multi-model analyses in applications to these study topics. More fundamentally, applicants should propose research that will attempt to answer such questions as: What mathematical and/or statistical techniques offer value for drawing inferences from multi-model analyses? What visual displays and other methods can be applied to facilitate understanding and integration across model outputs? What class of issues seems best suited (and least suited) for such analyses? What are the affects of adjustments and standardization of assumptions and data streams? And, ultimately, what techniques are most valuable, appropriate, and defensible for Integrated Assessment multi-model analyses?

Applicants are required to address, in a balanced way, all three main topics. Applicants should also address all five main sub-elements for item 1), above. Ultimately, the goal of this research program is to begin the process for systematically addressing the long-term science challenges identified in this Announcement. The anticipated funding for work to be performed for this Announcement is consistent with this long-term view and, recognizing the breadth and

significance of topics, applications should stress rational and well-formulated processes and study designs that will deliver sustained progress.

Overall, applications will be viewed favorably that can:

(1) *Integrate across DOE/BER research programs to build on DOE investments in climate change research as well as knowledge possessed by the DOE national laboratories*. Relevant information on BER and, in particular, CESD research can be found at:

http://www.science.doe.gov/ober/CCRD_top.html.

(2) *Demonstrate the appropriate leadership, knowledge, innovative ideas, and capabilities for motivating and building collaborations within the Integrated Assessment Research Community, and between the Integrated Assessment Research Community and other climate science communities, domestically and internationally*. The ability to motivate and lead major community participants and collaborators will be essential to the success of this project.

(3) *Demonstrate the ability, institutional capacity, and experience to manage a highly diverse, multi-disciplinary team of individuals and organizations that can address the broad range of topics and needs outlined in this Announcement*.

(4) *Leverage other investments in Federal research*. For example, applicants are encouraged to consider coordinating their research with existing research sites or teams supported by other agencies. These sites or teams include, for example, those funded by the National Science Foundation (NSF) in programs such as the Decision Making Under Uncertainty for Climate Change (DMUU) (<http://dcdc.asu.edu/dcdcmain/index.php>; <http://www.cred.columbia.edu/>; <http://cdmc.epp.cmu.edu/>) or the sites that are members of the Long Term Ecological Research (LTER) Network (<http://www.lternet.edu/sites/>). NSF will select new DMUU sites early in 2010 (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503374&org=NSF&sel_org=NSF&from=fund) and was to add a number of urban LTER exploratory sites in late summer 2009 (<http://www.nsf.gov/pubs/2009/nsf09551/nsf09551.htm?org=NSF>). The Regional Integrated Sciences and Assessments teams (http://www.climate.noaa.gov/cpo_pa/risa/) funded by the National Oceanic and Atmospheric Administration present additional possibilities for productive coordination of research.

Applications that include participants from a DOE National Laboratory are encouraged where unique skills and capabilities are available. However, the effort allocated to national laboratory participants must remain a modest portion of the overall budget. Additionally, any applicant who has constructed, maintains, and is actively developing an Integrated Assessment model may only serve in a contributory role and funding profiles should reflect those subordinate contributions.

Program Funding

It is anticipated that approximately \$2,000,000 per year will be available under this Announcement, contingent on satisfactory peer review and the availability of appropriated funds. A single award is anticipated and applicants may request project support up to three years, not to

exceed a total of \$6,000,000, with out-year support contingent on the availability of funds, progress of the research, and programmatic needs. Awards are expected to begin in FY 2010. DOE is under no obligation to pay for any costs associated with preparation or submission of preapplications and applications. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this Announcement.

Merit Review

Applications will be subjected to scientific 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; and
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 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 may be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

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

Posted on the Office of Science Grants and Contracts Web Site
December 8, 2009.