

Office of Science
Notice DE-FG02-06ER06-05

***Research in High Energy Density Physics
using the Atlas Pulsed Power Facility***

U.S. Department of Energy

**Office of Science Financial Assistance Program Notice
DE-FG02-06ER06-05: Research in High Energy Density Physics using the ATLAS Pulsed
Power Facility**

AGENCY: U.S. Department of Energy
Office of Science

ACTION: Notice inviting grant applications from universities and industry.

SUMMARY: The Office of Fusion Energy Sciences (OFES) of the Office of Science (SC), U.S. Department of Energy (DOE), announces its interest in receiving grant applications for research in high energy density physics in fusion energy sciences using the Atlas pulsed power facility at the Nevada Test Site.

The OFES has a broad program of science-based research to develop the knowledge base needed for an economically and environmentally attractive fusion energy source in the long term. Fusion reactions can occur in hot plasmas. Magnetic fields are a means by which the thermal energy of the hot plasma may be confined. The behavior and interaction of plasmas with magnetic fields are thus of great interest to the fusion energy sciences program. In the pulsed modes, plasma densities required to produce significant fusion burn are usually quite high, typically exceeding 10^{26} particles per m^3 . The combination of high density and high temperature leads to plasmas of extremely high energy densities, with values typically exceeding 10^{11} J/ m^3 . For the magnetic fields to be able to interact significantly with the plasmas, magnetic fields with field energy densities of comparable magnitudes are required. The magnetic field strength is in the range exceeding 100 T. The physics of matter in the presence of magnetic fields of the order of 100 T or greater is an emerging subfield of high energy density physics that cuts across many areas of science [Reference: The National Research Council, High Energy Density Physics: The X-Games of Contemporary Science, Committee on High Energy Density Physics, The National Academy Press, Washington, D.C., 2003]. The OFES is sponsoring research in high energy density physics (HEDP) that underpins the science of creating fusion energy using high density and high pressure plasmas.

This Notice seeks competitive applications for experimental research in magnetized high energy density physics relevant to the goal of fusion energy sciences that can be conducted using the Atlas pulsed power facility at the Nevada Test Site (NTS). Emphasis is on research leading to plasma configurations that can be compressed to produce plasmas and magnetic fields, each with

energy densities of the order of 10¹¹ J/m³ or greater, or equivalently, with plasma and magnetic field pressures each in the megabar range. Theoretical research will be accepted for consideration under this Notice when bundled with and in support of an experimental application. The Atlas facility is operated by the DOE at the Nevada Test Site under the programmatic direction of Los Alamos National Laboratory. The Atlas capacitor bank (240-kV, 25-MA, 25-MJ, microsecond rise time) can be used in a variety of ways to generate high-energy-density conditions. The facility is used by NNSA to study the hydrodynamic response of materials subjected to megabar pressures. Information about the Atlas test schedule and operating constraints is available from the Atlas Program Director, Dr. Robert Reinovsky, Los Alamos National Laboratory (505-667-8214 or email at bobr@lanl.gov.)

Applications for conducting scientific analysis, design, and/or assessment of a proposed experiment that is not yet ready for implementation on Atlas may also be considered. The product of such assessment would be a clear scientific description of the experiment to be performed on Atlas. Applications in this category would typically have a funding request between \$25,000 and \$100,000.

DATES: A Letter-of-Intent (LOI) to submit an application is REQUIRED and should be submitted by February 15, 2006. Failure to submit a Letter-of-Intent by an applicant may preclude the full application from due consideration. Please see the "Supplementary Information" section below for further instructions on the preparation of the Letter-of-Intent and the full application. Electronic submission of the Letter-of-Intent and the formal application in PDF format are required. It is important that the submission be in a single PDF file. Please see the "Addresses" section below for further instructions on the method of proposal submission.

Formal applications submitted in response to this notice must be received by DOE no later than 8:00 p.m., Eastern Time, March 1, 2006 to permit timely consideration for awards in FY 2006. Funding decisions are expected in early May 2006.

ADDRESSES: The Letter-of-Intent should be submitted electronically by email to John.Sauter@science.doe.gov and Francis.Thio@science.doe.gov. Please include "Letter-of-Intent for Notice 06-05" in the subject line.

Formal Applications

Applications submitted to the Office of Science must be submitted electronically through Grants.gov to be considered for award. The Funding Opportunity Number is: DE-FG02-06ER06-05 and the CFDA Number for the Office of Science is: 81.049. Instructions and forms are available on the Grants.gov website. Please see the information below and also refer to the "Funding Opportunity Announcement", Part IV - Application and Submission Information; H. Other Submission and Registration Requirements for more specific guidance on "Where to Submit" and "Registration Requirements." If you experience problems when submitting your application to Grants.gov, please visit their customer support website: <http://www.grants.gov/CustomerSupport>; email: support@grants.gov; or call 1-800-518-4726.

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](http://www.grants.gov)). See <http://www.grants.gov/GetStarted>. Use the Grants.gov Organization Registration Checklist 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 14 days** to complete these requirements. It is suggested that the process be started as soon as possible.

VERY IMPORTANT - Download PureEdge Viewer: In order to download the application package, you will need to install PureEdge Viewer. This small, free program will allow you to access, complete, and submit applications electronically and securely. For a free version of the software, visit the following Web site: <http://www.grants.gov/DownloadViewer>.

FOR FURTHER INFORMATION CONTACT: Office of Fusion Energy Sciences, U.S. Department of Energy, SC-24.2/Germantown Building, 1000 Independence Avenue, SW, Washington, DC 20585-1290. Dr. Francis Thio, SC-24.2, (301) 903-4678, francis.thio@science.doe.gov, is the Program Manager for the OFES HEDP Program, and may be contacted for technical information. Mr. John Sauter, SC-24.2, (301) 903-3287, john.sauter@science.doe.gov may be contacted for administrative information relating to the submission of the application and Letter-of-Intent. Information for the Atlas test schedule and operating constraints is available from the Atlas Program Director, Dr. Robert Reinovsky, Los Alamos National Laboratory 505-667-8214 or email at bobr@lanl.gov.

SUPPLEMENTARY INFORMATION:

Collaborative research projects involving more than one institution are allowed. Applications submitted from different institutions, which are directed at a common research activity, should clearly indicate they are part of a proposed collaboration and contain a brief description of the overall research project, and include Letters of Coordination from the collaborative partners. However, each application must have a distinct scope of work and a qualified principal investigator, who is responsible for the research effort being performed at his or her institution. Collaboration from a national laboratory is permitted so long as the level of effort at the national laboratory does not exceed 30% of the work. Further information on preparation of collaborative applications may be accessed via the Internet at: <http://www.science.doe.gov/grants/Colab.html>.

The purpose of the Letter-of-Intent (LOI) is to facilitate the OFES in planning the review and the selection of potential reviewers for the application. For this purpose, the LOI must include a one-page abstract of the proposed research, and list the names and institutional affiliations of Principal Investigators, any Co-Principal Investigators, key investigators, collaborators, or consultants, so as to identify any potential conflict of interest in the selection of reviewers for the application.

Submission Information

The following is a list of essential items that an application must contain:

A. **The Face Page SF-424 (R&R)** - completed and signed by appropriate officials.

B. **Research and Related Budget Page(s) (OMB Number: 4040-0001)** using U.S. dollars, with supporting written justification sufficient to evaluate the costs of the proposed project. List and explain cost-sharing arrangements, if any. If the application is for a multi-year period, use one budget page for each year of requested support.

C. Research & Related Other Project Information

Project Summary/Abstract - The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information that the Department may make it available to the public. It must not exceed 1 page when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than 11 point.

Project Narrative - Since we expect that the same reviewers will be asked to review several applications, all applications should be limited to a **maximum of thirty (30) pages** (including text and figures) of technical information in PDF format, when printed using standard 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) and font not smaller than 11 point. Applications exceeding these page limits may be rejected without review. The PDF file may also include a few selected publications in an Appendix as background information. In addition, please limit biographical and publication information for the principal investigator and key personnel to no more than two pages each. Each principal investigator should provide an e-mail address. The page count of 30 does not include the Face Page and Budget Pages, the Title Page, the biographical material and publication information, and any Appendices of publications. Reviewers are not obliged to read the Appendices.

The narrative should be written in strict compliance with the format below and included in one PDF file.

1. **Title Page** (see description of required Title Page contents below)
2. **Executive Summary** - summarize the proposal in no more than two pages
3. **Background and Recent Accomplishments**
 - 3.1. Background
 - 3.2. Recent Accomplishments - This subsection is mandatory for

applications seeking to expand currently funded research, but optional for new applications

4. Proposed research

- 4.1. Detailed Plan (Scope)
- 4.2. Project schedules and milestones
- 4.3. Statement of Work, Work Breakdown Structure (WBS) with resource allocations, and Deliverables

5. **Textual Summary of Budget** (in addition to the formal budget pages) - in particular, showing how the budget relates to the proposed research and task plans

6. **Management plan** - if appropriate (for projects of large size and complexity)

7. **Facilities and Resources** - Include information on the experience of the applicant organization, its facilities and resources

8. **Biographical Sketches** - Detailed information about the background and experience of the principal investigator(s) and key personnel including references to publications (limit to 2 pages)

9. **Statement of all current and pending support** for the project and all related projects, and description of support for all projects which involve the principal investigator(s) and the period of time devoted to each project.

10. Bibliography of Literature

Note: Only the pages in Sections 2, 3, 4, 5 and 6 count towards the page count limit of 30 pages.

The Title Page of your narrative must include the following information:

Applicant/Institution:

Street Address/City/State/Zip:

Principal Investigator:

Address:

Telephone Number:

Email:

DOE/Office of Science Program Office:

DOE/Office of Science Program Office Technical Contact:

DOE Grant Number (if Renewal or Supplemental Application):

Is this a Collaboration? If yes, please list ALL Collaborating Institutions/PIs* and indicate which ones will also be submitting applications.

*** Note that collaborating applications requesting separate grants must be submitted separately.**

General information about development and submission of applications, eligibility, limitations, evaluations and selection processes, 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 Guide is possible via the Internet using the following Web site address: <http://www.science.doe.gov/grants/>. DOE is under no obligation to pay for any costs associated with the preparation or submission of an application if an award is not made. The information required by 10 CFR Part 605 and Grants.gov should be conveyed by the application using the above format wherever possible.

Program Funding

This is a new initiative. Funding is limited to two years and a sum total of \$990,000 at the present time, though applications may propose research for up to three years. Funding support for the out years is contingent on the availability of funds and satisfactory progress in the research.

OFES reserves the right not to make any awards if no application is judged to be of suitable scientific quality or of sufficient relevance to the OFES HEDP program. The cost-effectiveness of the application will be considered when comparing applications with differing funding requirements. Previous awards have ranged from \$50,000 to \$1,000,000 per year in similar areas. A single award or multiple awards may be made depending on the number and quality of the applications received and favorably reviewed. If multiple awards are made, it is anticipated that award sizes may range from \$25,000 to \$990,000 per year. The total FY 2006 funding for all awards under this Notice cannot exceed \$990,000.

Merit Review

Applications will be subjected to formal merit review and will be evaluated against the following criteria, which are listed in descending order of importance as set forth in 10 CFR Part 605. (<http://www.science.doe.gov/grants/605index.html>). Included with each criteria are the detailed questions that are asked of the reviewers.

1. Scientific and/or technical merit of the project;

- Does this application address an important problem in magnetized high energy density physics that is relevant to the goal of fusion energy science?
- Does the research involve or does it have the potential to lead to the study of the behavior of matter/plasma in the presence of magnetic fields exceeding 100 T?
- Does it have clearly stated scientific objectives showing how the proposed work contributes to the field of magnetized high energy density physics?
- If the stated objectives are successfully attained, what is the significance of or how would the new advances impact the field?

2. Appropriateness of the proposed method or approach;

- Are the conceptual framework, methods, and analyses adequately developed and sound?
- How compelling is the explanation of why Atlas is the appropriate test bed for the proposed research?
- For experimental investigations, are the proposed diagnostics appropriate, likely to be effective, or adequate?
- How would you rate the proposed plans for analyzing and interpreting the data?
- Are the proposed method or approach likely to lead to scientifically valid conclusions or advances in the field?
- Are there significant potential problems and how well does the applicant address these problems?
- Does the research plan have significant deliverables in the presently available two-year time frame?

3. Competency of the applicant's personnel and adequacy of the proposed resources;

- How well qualified are the applicant's personnel to carry out the proposed research? (If appropriate, please comment on the scientific reputation and quality of recent research by the principal investigator and other key personnel.)
- Are the applicant's research environment and resources adequate?
- Does the proposed work take advantage of the unique facilities and capabilities and/or make good use of collaborative arrangements?

4. Reasonableness and appropriateness of the proposed budget.

The reviewers are also asked to comment on Other Appropriate Factors:

- How is the proposed research relevant to the long-term performance measure for the OFES High Energy Density Physics program? The OFES HEDP Program has the long-term performance measure of demonstrating progress in developing the fundamental understanding and predictability of high energy density plasma physics, including potential energy producing applications.
- Could the proposed research make a significant contribution to another field?
- Is there potential for spin-offs?
- If applicable, please comment on the educational benefits of the proposed activity.

The Office of Fusion Energy Sciences will also consider, as part of the evaluation, other available advice or information as well as program policy factors such as ensuring an appropriate balance among the program areas and within the program areas, coupling to the theory and computational efforts, and quality of previous performance. Selection of applications for award will be based upon the findings of the technical evaluations, the importance and relevance of the proposed research to the Office of Fusion Energy Sciences' mission in high energy density physics, and funding availability. Funding under this Notice is limited to supporting research activities based in the U.S., though subcontracts with limited funding for collaborators outside the U.S. may be allowed with appropriate justifications.

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

Martin Rubinstein, Director
Science Programs Support Division
Office of Science

Posted on the Office of Science Grants and Contracts Web Site
January 13, 2006.