

**Office of Science
Financial Assistance
Funding Opportunity Announcement
DE-FOA-0000252**

***Theoretical Research in
Magnetic Fusion Energy Science***

SUMMARY:

The Fusion Energy Sciences (FES) program of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving grant applications for theoretical research relevant to the U.S. program in magnetic fusion energy sciences. All individuals or groups planning to submit applications for new or renewal funding in Fiscal Year 2011 should submit in response to this Funding Opportunity Announcement (FOA).

The specific areas of interest are:

1. Magnetohydrodynamics
2. Confinement and Transport
3. Boundary Physics
4. Plasma Heating, Non-inductive Current Drive, and Energetic Particles
5. Innovative Magnetic Confinement Concepts
6. Atomic and Molecular Processes in Plasmas

In this FOA, priority will be given to work that is in support of developing an understanding of the edge or boundary plasma in tokamaks. Developing a predictive understanding of the plasma edge in a tokamak is a critical research need for the magnetic fusion energy sciences program, since the edge appears to determine many of the properties and the performance of tokamak plasmas. In an effort to foster close and effective collaborations between theorists, computational scientists, and experimentalists to address such issues, the FES program is establishing performance targets related to understanding the properties of the tokamak edge plasma. To achieve this understanding, it will be important for theorists and computational scientists to work together in teams with scientists from the three major facilities (DIII-D, NSTX, and C-Mod). In FY 2011, as the first year of this effort, the FES annual performance target is a joint theory/computational/experiment milestone to understand the physics mechanisms responsible for the structure of the edge pedestal, furthering the development of the required predictive capability.

More specific information on each area of interest is outlined in the general and program specific supplementary information below.

Due to the limited availability of funds, Principal Investigators with continuing grants may not submit a new application in the same area(s) of interest as their previous application(s), which

received funding. A Principal Investigator may submit only one application under each area of interest as listed above.

PREAPPLICATIONS

Preapplications are **REQUIRED** and must be submitted by February 22, 2010, 11:59 PM Eastern Time. **Failure to submit a preapplication by an applicant will preclude the full application from due consideration.** The preapplication should be submitted electronically by E-mail to John.Sauter@science.doe.gov and Curt.Bolton@science.doe.gov. **Please include "Preapplication for DE-FOA-0000252" in the subject line.**

The purpose of the preapplication is to facilitate the FES program in planning the peer review and the selection of potential reviewers for the application. For this purpose, the preapplication 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 qualified reviewers for the application.

APPLICATION DUE DATE: April 5, 2010, 11:59 p.m. Eastern Time

Formal applications submitted in response to this FOA must be received by April 5, 2010, 11:59 PM Eastern time, to permit timely consideration of awards. **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-0000252&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 "Theoretical Research in Magnetic Fusion Energy Science", 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:

Dr. Curtis Bolton, Fusion Energy Sciences

Phone: (301) 903-4914

E-mail: curt.bolton@science.doe.gov

SUPPLEMENTARY INFORMATION:

1. Magnetohydrodynamics:

Grant applications are solicited for new research or continuation of past efforts in magnetohydrodynamic (MHD) theory and computations. Work in support of tokamaks as well as non-tokamak innovative magnetic confinement configurations will be considered. Current areas of interest include, but are not limited to, equilibrium and stability, extended MHD including two-fluid effects, resistive wall modes, neoclassical tearing modes, and energetic particle effects.

2. Confinement and Transport:

Applications in this programmatic area should focus on the understanding and control of the collisional and turbulent physical processes that are responsible for the transport of heat,

momentum and particles from the core of magnetically confined plasmas. Work focused on theory-based predictive transport modeling, including verification and validation (V&V) efforts, will be considered. Both analytical and computational approaches are of interest.

3. Boundary Physics:

Applications in this programmatic area should focus on the understanding of the physical processes occurring in the edge region of magnetically confined plasmas. In tokamaks, this region extends from the top of the pedestal to the first wall. Specific areas of interest include, but are not limited to, pedestal formation and characteristics, edge localized modes, collisional and turbulent edge plasma transport, resonant magnetic perturbations, scrape-off layer and divertor physics, plasma-surface effects, and neutral particle transport. Applications for both analytical and computational work will be considered. Applications that are supportive of the FY 2011 joint milestone as described in the summary section above, will be given priority in determining funding.

4. Plasma Heating, Non-inductive Current Drive, and Energetic Particles:

Applications will be considered for work in the areas of plasma heating, non-inductive current drive, and energetic particle effects. Heating and current drive of plasmas based on radio frequency (RF) methods, neutral beam injection, helicity injection, and plasma injection will be considered. Specific areas of interest include, but are not limited to, the understanding of the physical processes involved in wave propagation and absorption in magnetically confined plasmas-including wave coupling at the plasma edge and wave-antenna interactions, the understanding of how waves affect macroscopic stability and transport in fusion plasmas, the dynamics of unstable modes excited by energetic particles, and the behavior of alpha particle dominated burning plasmas. Applications for both analytical and computational work will be considered.

5. Innovative Magnetic Confinement Concepts:

Grant applications are desired for analytical and computational research on innovative concepts that have the possibility of leading to improved magnetic fusion systems. Increased analytical and computational research is needed to help in the analysis of experimental data and aid in planning innovative fusion related experiments. Concepts of interest include, but are not limited to, compressional heating of magnetized plasmas, field reversed configuration, spheromak, levitated dipole, plasma jets, centrifugal confinement, reversed field pinch, spherical torus, and stellarator.

6. Atomic and Molecular Processes in Plasmas:

Grant applications will be considered for analytical and computational research relevant to the description of atomic processes in plasmas. In addition to overall scientific merit, emphasis will be given to work that promises to aid the understanding of the basic atomic processes that are important for modeling of magnetically confined plasmas. The program has found understanding electron-atom and electron-ion collisions and the radiation emitted by atoms and ions to be of

importance for the modeling of plasma behavior in experiments. Some current areas where atomic processes are considered to be important include transport, impurities, plasma-wall interaction, and the understanding of diagnostic methods.

AGENCY CONTACTS:

Magnetohydrodynamics: Dr. Curtis Bolton, Research Division, SC-24.2, Telephone (301) 903-4914, or by E-mail: curt.bolton@science.doe.gov

Confinement and Transport: Dr. John Mandrekas, Research Division, SC-24.2, Telephone (301) 903-0552, or by E-mail: john.mandrekas@science.doe.gov

Boundary Physics and FY 2011 Joint Milestone: Dr. Curtis Bolton, Research Division, SC-24.2, Telephone (301) 903-4914, or by E-mail: curt.bolton@science.doe.gov

Plasma Heating, Non-inductive Current Drive, and Energetic Particles: Dr. John Mandrekas, Research Division, SC-24.2, Telephone (301) 903-0552, or by E-mail: john.mandrekas@science.doe.gov

Innovative Magnetic Confinement Concepts: Dr. Sam Barish, Research Division, SC-24.2, Telephone: (301) 903-2917, or by E-mail: sam.barish@science.doe.gov.

Atomic and Molecular Processes in Plasmas: Dr. Michael Crisp, Research Division, SC-24.2, Telephone (301) 903-4883, or by E-mail: michael.crisp@science.doe.gov.

Collaboration

Collaborative research projects involving more than one institution, as well as basic theoretical work in support of the FES Scientific Discovery through Advanced Computing (SciDAC) portfolio, are encouraged. 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. 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. Synergistic collaborations with researchers in Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories, are also encouraged though no funds will be provided to these organizations under this FOA. Further information on preparation of collaborative applications may be accessed via the Internet at: <http://www.science.doe.gov/grants/Colab.html>.

Program Funding

It is anticipated that about \$3,900,000 Fiscal Year 2011 funding will be available to fund new work, or renewals of existing work, from applications received in response to this FOA. Since future year funding is not anticipated to increase, applications should propose constant effort in future years (allowing for inflation). Future year funding will depend upon suitable progress and the availability of funds. The cost-effectiveness of the application will be considered when

comparing applications with differing funding requirements. The number and size of awards will depend on the number of meritorious applications and the availability of appropriated funds. DOE is under no obligation to pay for any costs associated with preparation or submission of applications. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this FOA.

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 (CFDA) 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
January 28, 2010.