

**Office of Science
Notice 02-20**

*Theoretical Research in
Plasma and Fusion Science*

Department of Energy

Office of Science Financial Assistance Program Notice 02-20; Theoretical Research in Plasma and Fusion Science

AGENCY: U.S. Department of Energy

ACTION: Notice inviting grant applications.

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 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 2003, should submit in response to this Notice.

The specific areas of interest are:

1. Magnetohydrodynamics and Stability
2. Confinement and Transport
3. Edge and Divertor Physics
4. Plasma Heating and Non-inductive Current Drive
5. Innovative/Integrating Concepts
6. Atomic and Molecular Processes in Plasmas

More specific information on each area of interest is outlined in the general and program specific supplementary information section below. OFES may also solicit proposals from time to time under separate announcements of Initiatives to support coordinated, goal-directed community efforts. The Initiatives will be funded to achieve specific programmatic and scientific aims and will be subject to requirements that are different from those of this notice. Such grants, if funded, will be subject to periodic reviews of progress.

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.

DATES: To permit timely consideration for awards in Fiscal Year 2003, applications submitted in response to this notice must be received by DOE no later than 4:30 p.m., E.D.T., June 4, 2002. Electronic submissions of formal applications will not be accepted.

Applicants are requested to submit a letter-of-intent by May 7, 2002, which includes the title of the application, the name of the Principal Investigator(s), the requested funding and a one-page abstract. These letters-of-intent will be used to organize and expedite review processes. Failure to submit a letter-of-intent will not negatively prejudice a responsive formal application submitted in a timely fashion. Electronic submissions of letters-of-intent are preferable.

ADDRESSES: Formal applications referencing Program Notice 02-20, should be sent to: U.S. Department of Energy, Office of Science, Grants and Contracts Division, SC-64, 19901 Germantown Road, Germantown, Maryland 20874-1290, ATTN: Program Notice 02-20. The above address must also be used when submitting applications by U.S. Postal Service Express or any other commercial overnight delivery service, or when hand-carried by the applicant.

Letters-of-intent referencing Program Notice 02-20, sent by mail should be addressed to: U.S. Department of Energy, Office of Science, Office of Fusion Energy Sciences, SC-55, 19901 Germantown Road, Germantown, Maryland 20874-1290, ATTN: John Sauter. Letters-of-intent submitted via E-mail should be sent to the following E-mail address:
john.sauter@science.doe.gov

FOR FURTHER INFORMATION CONTACT: Office of Fusion Energy Sciences, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290. Specific contacts for each area of interest, along with telephone numbers and Internet addresses, are listed below:

1. Magnetohydrodynamics and Stability: Rostom Dagazian, Research Division, SC-55, Telephone: (301) 903-4926, or by Internet address: rostom.dagazian@science.doe.gov.
2. Confinement and Transport: Curt Bolton, Research Division, SC-55, Telephone: (301) 903-4914, or by Internet address: curt.bolton@science.doe.gov.
3. Edge and Divertor Physics: Mike Crisp, Research Division, SC-55, Telephone: (301) 903-4883, or by Internet address: michael.crisp@science.doe.gov.
4. Plasma Heating and Non-inductive Current Drive: Rostom Dagazian, Research Division, SC-55, Telephone: (301) 903-4926, or by Internet address: rostom.dagazian@science.doe.gov.
5. Innovative/Integrating Concepts: Steve Eckstrand, Research Division, SC-55, Telephone: (301) 903-5546, or by Internet address: steve.eckstrand@science.doe.gov.
6. Atomic and Molecular Processes in Plasmas: Mike Crisp, Research Division, SC-55, Telephone: (301) 903-4883, or by Internet address: michael.crisp@science.doe.gov.

SUPPLEMENTARY INFORMATION: 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 and required forms is possible via the Internet using the following Web site

address: <http://www.science.doe.gov/production/grants/grants.html>. 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.

Program Funding

It is anticipated that about \$4,000,000 of Fiscal Year 2003, funding will be available to fund new work or renewals of existing work from applications received in response to this Notice. The number of awards and range of funding will depend on the number of applications received and selected for award. 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. Applications requiring annual funding as low as \$50,000 are welcomed and encouraged.

Collaborative research projects involving more than one institution, as well as basic work in support of the Scientific Discovery through Advanced Computing initiative, 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 federal laboratories and 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 Notice. Further information on preparation of collaborative applications may be accessed via the Internet at: <http://www.science.doe.gov/production/grants/Colab.html>.

Since we expect that reviewers will be asked to review several applications, those applications from individual PIs or small groups (1-4 people) should be limited to a maximum of twenty (20) pages (including text and figures), while applications from theory groups should be limited to thirty (30) pages. A few selected publications may be included in an Appendix as background information. In addition, please limit biographical and publication information for the principal investigator and senior personnel to no more than two pages each. A minimum of a signed original and seven copies of each application must be submitted as stated in the Application Guide. However, due to anticipated number of reviewers, each applicant is requested to submit twelve (12) copies of his/her application. In addition, each principal investigator should provide an e-mail address.

In addition to the information required by 10 CFR Part 605 each application should contain the following items: (1) a succinct statement of the goal of the research, (2) a detailed research plan, (3) the specific results expected at the end of the project period, (4) an analysis of the adequacy of the budget, (5) a discussion of the impact of the proposed research on other fields of science, and (6) for projects requiring significant computational resources (e.g. at the National Energy Research Scientific Computing Center), the application should contain an estimate and justification of the resources that will be required.

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/production/grants/605index.html>)

1. Scientific and/or technical merit of the project;
2. Appropriateness of the proposed method or approach;
3. Competency of the applicant's personnel and adequacy of the proposed resources; and
4. Reasonableness and appropriateness of the proposed budget.

Scientific and technical merit also includes the importance and relevance of the proposed research to the U.S. fusion program. Accordingly, preference will be given to work based in the U.S.

In addition, proposals from theory groups will also be rated on the synergy of the group and the management of the group. With respect to synergy, the criteria are:

- 1) Clear evidence of collaborative work.
- 2) The extent to which the group addresses difficult problems requiring a team effort.

With respect to management the criteria are:

- 1) Clear evidence of scientific leadership.
- 2) The extent to which the management evaluates the relevance and scientific impact of the group's work.

The Office of Fusion Energy Sciences shall 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, ensuring support for major computational efforts, ensuring support for experiments, and quality of previous performance. Selection of applications/proposals 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, and funding availability.

Program Specific Information:

1. Magnetohydrodynamics and Stability:

Grant applications are solicited for new research or continuation of past efforts in magnetohydrodynamics (MHD) theory in support of work on magnetically confined fusion plasmas. Current areas of interest include advanced tokamak (AT), innovative confinement concepts (ICC), burning plasma physics and steady state, high-beta plasma issues. Both analytical and computational approaches will be considered. Additional work is needed on nonlinear MHD codes to include new physics, such as extended MHD (including flows and various non-ideal MHD effects), resistive wall modes, and particularly neoclassical tearing

modes. Finally, basic work in support of the Scientific Discovery through Advanced Computing initiative that involves the development of large-scale MHD codes will also be considered.

2. Confinement and Transport:

Applications will be considered in the area of confinement and transport in plasmas. This area covers plasma turbulence, energy, particle, momentum and radiation transport in the core of the plasma and theory based transport modeling. The work of interest includes work in support of tokamak as well as non-tokamak innovative concepts. Topics of interest include among others, electromagnetic effects on turbulence, shear flow generation and its impacts on transport, and understanding of the role of collisions in turbulent plasmas. Both analytical and computational work is of interest. Basic work in support of the Scientific Discovery through Advanced Computing initiative that involves the development of large-scale codes to explore turbulence will also be considered.

3. Edge and Divertor Physics:

Applications will be considered in the area of edge physics theory. This area covers plasma turbulence, energy, particle and radiation transport in the edge of the plasma and in the neighborhood of the separatrix. The work of interest includes neutrals transport in divertors and plasma edge region, atomic physics processes affecting temperature, radiation and flame front propagation in divertors and pedestal and elm theory and modeling. Both analytical and numerical models are of interest. Techniques and algorithms for modeling fast particles in the edge region as well as adaptive grid methods and their application to modeling of plasma turbulence and transport in the edge region will be considered.

4. Plasma Heating and Non-inductive Current Drive:

Applications will be considered in the area of radio frequency (RF) physics in plasmas. This includes RF propagation, heating and current drive. Of interest are both analytical and numerical treatments of interaction of plasmas with radio frequency waves. These include electron cyclotron, ion cyclotron, lower hybrid and Bernstein waves. Topics of interest include, among others, physical processes involved in conversion layers, power deposition for temperature profile control and interaction of waves of different frequencies to produce specific effects on the plasma. Applications for modeling radio frequency launchers and their coupling to the edge plasma will also be considered.

5. Innovative/Integrating Concepts:

Grant applications are desired for theoretical and computational research on innovative concepts that have the possibility of leading to improved magnetic fusion systems. Increased theoretical and computational research is needed to make optimal use of innovative fusion related experiments. Applications are also desired for theoretical and computational research on integrated studies that include multiple topics.

6. Atomic and Molecular Processes in Plasmas:

Grant applications will be considered for theoretical 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 and high-density plasmas found in inertial confinement fusion experiments. 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 the effects of transport, the effects of impurities and the understanding of diagnostics.

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

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for Resource Management

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