

Office of Science
Notice 00-07

New Programs in Fusion Energy Sciences

Department of Energy
Office of Science

Office of Science Financial Assistance Program Notice 00-07: New Programs in Fusion Energy Sciences

AGENCY: U.S. Department of Energy (DOE)

ACTION: Notice inviting grant applications

SUMMARY: The Office of Fusion Energy Sciences (OFES) of the Office of Science, U.S. Department of Energy (DOE) announces its interest in receiving grant applications for new research in fusion energy sciences. Programs planning to submit applications for renewal or continuation funding in FY 2000 should not submit to this Notice, but rather submit according to the procedures outlined in 10 CFR Part 605.

The specific areas of interest are:

1. Magnetic Fusion Concept Exploration Experiments;
2. Inertial Fusion Energy Concept Exploration Research;
3. Inertial Fusion Energy Chamber and Target Research;
4. Magnetic Fusion Liquid Wall Experiments;
5. Fusion Materials Modeling.

More specific information on each area of interest is outlined in the general and program specific supplementary information sections below. Each grant application can be submitted to only one area of interest. Applicants must identify the area of interest in their formal submission.

DATES: To permit timely consideration for awards in Fiscal Year 2000, applications submitted in response to this notice must be received no later than 4:30 p.m., February 29, 2000. Electronic submissions of formal applications will not be accepted.

Applicants are requested to submit a letter-of-intent by January 31, 2000, which includes the title of the proposal, 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 manner. Electronic submissions of letters-of-intent are acceptable.

ADDRESSES: The completed formal applications referencing Program Notice 00-07 should be forwarded 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 00-07. The above address must also be used when submitting applications by U.S. Postal Service Express, any commercial mail delivery service, or when hand-carried by the applicant.

Letters-of-intent referencing Program Notice 00-07 should be forwarded to: U.S. Department of Energy, Office of Science, Office of Fusion Energy Sciences, SC-50, 19901 Germantown Road, Germantown, Maryland 20874-1290, ATTN: John Sauter. Letters-of-intent can also be submitted via E-mail at 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:

Magnetic Fusion Concept Exploration Experiments: Ronald A. Blanken, Research Division, SC-55; Telephone: (301) 903-3306 or 4095, or by Internet address, ronald.blanken@science.doe.gov.

Inertial Fusion Energy Concept Exploration Research: Ronald McKnight, Research Division, SC-55; Telephone: (301) 903-4597 or 4095, or by Internet address, ronald.mcknight@science.doe.gov.

Inertial Fusion Energy Chamber and Target Research: Gene Nardella, Facilities and Enabling Technologies Division, SC-52; Telephone: (301) 903-4956 or 3068, or by Internet address, gene.nardella@science.doe.gov.

Magnetic Fusion Liquid Wall Experiments: Sam Berk, Facilities and Enabling Technologies Division, SC-52; Telephone: (301) 903-4171 or 3068, or by Internet address, sam.berk@science.doe.gov

Fusion Materials Modeling: Bill Wiffen, Facilities and Enabling Technologies Division, SC-52; Telephone: (301) 903-4963 or 3068, or by Internet address, fw.wiffen@science.doe.gov.

GENERAL 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 (SC) 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.sc.doe.gov/production/grants/grants.html>. DOE is under no obligation to pay for any costs associated with the preparation or submission of applications if an award is not made.

Approximately \$1,900,000 of Fiscal Year 2000 funding divided by program element as outlined below will be available to start new projects 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 year effort (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.

New research is herein defined as research which is not within the scope of work of existing programs. In cases where the new work assumes the availability of a facility, experimental apparatus or base group to perform the work, the funding source(s) for the base must be identified in the grant application.

Applicants are encouraged to collaborate with researchers in other institutions, such as universities, industry, non-profit organizations, federal laboratories and Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories. A parallel announcement for DOE National Laboratories for some of the areas of interest will be available on the Office of Science Grants and Contracts Web Site. In the case of collaborative applications submitted from different institutions which are directed at a single research activity, 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. Further information on preparation of collaborative proposals may be accessed via the Internet at <http://www.sc.doe.gov/production/grants/Colab.html>.

To enable all reviewers in each category to read all applications in that category, the application must be limited to a maximum of twenty (20) pages (including text and figures) plus no more than one page each of biographical information and publications of the principal investigator. Although it is not required, it would be helpful for each applicant to submit fifteen (15) copies of their application due to the anticipated

number of reviewers; otherwise the standard number of copies must be received with each application as outlined in the Application Guide.

In selecting applications for funding, the DOE Office of Fusion Energy Sciences will give priority to applications that can produce results within the first project period after grant initiation (typically three years but as many as five years in the case of grants where construction of complex experimental apparatus is required). The detailed description of the proposed research in addition to the information required by 10 CFR Part 605 should contain the following items: (1) A succinct statement of the goal of the research, (2) A detailed research plan, (3) The specific results or deliverables expected at the end of the project period, (4) A detailed analysis of the adequacy of the facilities and budget, (5) Discussion of how the research would elucidate the physics or engineering principles of the innovation, and (6) Discussion of why this research would have an important impact on the prospects for either magnetic or inertial fusion.

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:

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;
4. Reasonableness and appropriateness of the proposed budget.

PROGRAM SPECIFIC SUPPLEMENTARY INFORMATION:

Magnetic Fusion Concept Exploration Experiments: Grant applications are desired for new innovative scientific experiments that have the possibility of leading to improved magnetic fusion systems (this includes tokamak based systems with improved performance). The research should be aimed at experimentally elucidating the physics principles of such improved systems. Experiments are sought which are unique, first of a kind and which provide new insights. These funds are targeted toward the establishment of new experiments and are not meant to support collaborations on existing concept exploration or proof-of-principle experiments. Applications for research on existing large tokamaks, independent theory investigations and new diagnostic development should not be submitted in response to this notice. Applications for new programs based on the replacement of the cores of existing experimental facilities with cores designed to study new physics ideas are allowed. Approximately \$600,000 of FY 2000 funding, depending on the quality of the applications, is targeted for applications received in this area.

Inertial Fusion Energy Concept Exploration Research: Grant applications are desired for new concept exploration scientific research that has the possibility of leading to improved inertial fusion energy systems. Such research may include, for example, expanding the scientific basis for concepts which could lead to significant increases in performance for more developed approaches. Efforts directed toward providing advances in physics understanding of problem areas, which have potentially high impact on inertial fusion energy science, are also of interest. Primary interest is in experimental programs, although it is recognized that part of a coordinated application may include theory and modeling in support of experiments. It is not anticipated that stand-alone theory applications will be supported. Approximately \$400,000 of FY 2000 funding, depending on the quality of the applications, is targeted for applications received in this area.

Inertial Fusion Energy Chamber and Target Research: Grant applications are desired for new innovative research that will address the key critical issues in the chamber systems, target technology, and safety and environmental areas for both heavy ion and laser driven inertial fusion energy systems. Examples of critical issues in the chamber systems area for heavy ion drivers are liquid chamber clearing and final focus/chamber interface. Examples of critical issues in the chamber systems area for laser drivers are chamber material lifetime uncertainty and final optics design and survivability. Examples of critical issues in the target technology area are low-cost, high production rate target fabrication and accurate injection and tracking. Examples of critical issues in the safety and environmental area are minimization of accident consequences and management of radioactive materials. The examples identified are not an inclusive list. This research can be either experimental and/or analytical in nature. Approximately \$200,000 of FY 2000 funding, depending on the quality of the applications, is targeted for applications received in this area.

Magnetic Fusion Liquid Wall Experiments: Grant applications are sought for innovative experiments that can significantly advance the knowledge base for plasma chamber concepts using liquids in direct contact with plasmas for first walls, divertors, and/or limiters. Research on such liquid wall approaches should be aimed at providing fundamental data and at elucidating dominant phenomena for a more complete scientific understanding of the following key issues: (a) effects of liquid surfaces on plasma edge and core performance, particularly with regard to influx of particles to the plasma and trapping/pumping of particles from the plasma, (b) effects of liquid surfaces on plasma stability and confinement, particularly with regard to influences from shells and flows of electrically conducting liquids, and (c) limits of power handling and operating temperature for candidate liquid coolants, particularly with regard to turbulence and MHD considerations in free surface flow thermal-hydraulics. Proposed experiments must be accompanied by supporting analysis and

modeling activities that provide for an ability to interpret experimental data and support development of computational tools for predicting liquid wall behavior under fusion-relevant conditions. Background information about ongoing research related to liquid walls can be obtained through the Internet at the following web sites:

<http://www.fusion.ucla.edu/APEX/> and <http://pentium.ep.anl.gov/alps/>.

Approximately \$300,000 of FY 2000 funding, depending on the quality of the applications, is targeted for applications received in this area.

Fusion Materials Modeling: Applications are solicited for three-year grants for research on modeling and/or theory that will expand the knowledge base on understanding of the behavior of structural materials in the service environment of fusion systems. In particular, effects of the temperature, neutron flux, stress state, system fluids, dissimilar materials contact, or other components of the environment are of interest. Response to stresses arising from thermal, mechanical or other loading sources can be included. Material composition, microstructure and/or macrostructure variables may also be relevant to particular modeling approaches. In a broader sense, proposed research should also contribute to advancing the science of the behavior of materials. While the focus must be on the fusion environment, importance of proposed work beyond the interests of fusion should be identified. A particular goal of proposed modeling and/or theoretical research should be to add value to the in-place experimental program of research on materials for fusion systems. Models are desired that can guide and help interpret costly and difficult-to-obtain experimental results and that can be applied to resolving key material feasibility issues. Applications that request funding for experimental work will not be considered. However, close collaboration with the currently in-place fusion and/or other experimental materials programs is expected and encouraged. Critical interfaces with experimental programs should be identified. Background information and definition of specific areas of interest are provided in two documents produced by the fusion materials community and available on the Internet at the Virtual Laboratory for Technology (VLT) web site, located at <http://vlt.ucsd.edu/>. The documents are "A Whitepaper Proposing an Integrated Program of Theoretical, Experimental, and Database Research for the Development of Advanced Fusion Materials" and "Advanced Materials Program", which is Appendix D of the VLT Roadmap. These documents should be used for background and guidance, but should not be considered as establishing absolute boundaries or scope for this solicitation. Relevance of proposed research to fusion materials, especially to the feasibility issues identified in the above two referenced documents, will be considered in the process of selecting grant applications for funding. Approximately \$400,000 of FY 2000 funding, depending on the quality of the applications, is targeted for applications received in this area.

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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