

**Program Announcement
To DOE National Laboratories**

LAB 12-03

**Office of Science
Office of Fusion Energy Sciences**

*Collaborative Research in Magnetic Fusion Energy Sciences on
the National Spherical Torus Experiment Upgrade*

**Notice of change to Proposal Due Date to:
October 3, 2012, 5:00 PM Eastern Time**

**GENERAL INQUIRIES ABOUT THIS PROGRAM ANNOUNCEMENT TO DOE
NATIONAL LABORATORIES SHOULD BE DIRECTED TO:**

Dr. Stephen Eckstrand, Office of Fusion Energy Sciences

PHONE: (301) 903-5546

E-MAIL: Steve.Eckstrand@science.doe.gov

SUMMARY:

The Office of Fusion Energy Sciences (OFES) program of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving proposals for collaborative research on the National Spherical Torus Experiment-Upgrade (NSTX-U) at Princeton Plasma Physics Laboratory. The NSTX-U program contributes to two goals of the OFES program: developing a predictive understanding of magnetically confined plasmas and investigating the unique properties of the spherical torus configuration.

The NSTX-U program helps to build the scientific foundations for fusion energy by both contributing to the fundamental understanding of magnetically confined plasmas and assessing the attractiveness of the spherical torus for future fusion facilities. Proposals for collaborative research must support the NSTX-U Program by addressing key scientific issues related to one or more of the following topics: Macroscopic Stability, Multi-Scale Transport Physics, Plasma Boundary Interfaces, Energetic Particles, Start-up, Ramp-up and Sustainment without a Solenoid, and Advanced Operating Scenarios. To be considered for funding, applicants must have discussed their proposed research with the NSTX-U National Research Program Leaders and must include a Record of Discussion that

specifies the benefits of proposed research to the NSTX-U program and the interface support required to carry it out. Proposals to renew on-going NSTX-U collaborative research must include a list of project goals from the previous project period and a summary of the actual accomplishments. Some examples of specific areas of research under each topic are listed in the **SUPPLEMENTARY INFORMATION** section.

All DOE National Laboratories planning to submit proposals for new or renewal funding in Fiscal Year 2013 should submit in response to this Program Announcement.

NSTX is currently undergoing a major upgrade and may not resume research operations until FY 2015. Therefore, the proposed research projects should cover a 4-year period.

Letter of Intent (LOI)

LOI DUE DATE: August 15, 2012, 5:00 PM Eastern Time

A LOI is STRONGLY ENCOURAGED and should be submitted by 5:00 PM Eastern Time on August 15, 2012. It is important that the LOI be in a single PDF file. The LOI should clearly indicate the basic plasma science research area or areas to which the proposal is responding (including those identified in the **SUPPLEMENTARY INFORMATION** section). The LOI must be submitted electronically through the DOE Office of Science Portfolio Analysis and Management System (PAMS) website <https://pamspublic.science.energy.gov/>. **The Principal Investigator and anyone submitting on behalf of the Principal Investigator must register for an account in PAMS before it will be possible to submit a letter of intent or a full proposal.** To register, click “Create New PAMS Account” on the website <https://pamspublic.science.energy.gov/> and follow the instructions for creating an account. You will be prompted to create a username and password and to enter your contact information. Registering to PAMS is a two-step process; once you create an individual account, you must associate yourself with (“register to”) your institution. Follow the onscreen instructions to do this. **All PIs and those submitting on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays.** You may establish a PAMS account at <https://pamspublic.science.energy.gov/>.

To access PAMS, please use either Internet Explorer or Firefox. Currently, PAMS is not supporting the Chrome or Safari browsers, but an upgrade in the future will make it possible to use them.

To submit the letter of intent, log in to PAMS. Select “View DOE National Laboratory Announcements” and find the current announcement in the list. Click on “Actions/Views” for this announcement, select “Submit Letter of Intent” from the dropdown, and follow the instructions from there. Note that you must select one and only one Principal Investigator (PI) per LOI; click on “Select PI” on the far right side of the screen and then select the appropriate PI from the list of all registered users from your institution returned by PAMS. If the PI for whom you are submitting does not appear on the list, he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, choose “Invite PI” at the top left of the “Select PI” screen. You can enter an optional personal message to the PI in the “Comments” box that PAMS presents, and it will be included in the email sent by PAMS to the PI. To upload the LOI as an attachment into PAMS, select “Attach File” at the far right side of the screen. Search for your file and then select “Attach” to upload the file. You may enter an optional

description of the file you are attaching. Using the dropdown at the bottom of the screen, save the LOI and then submit it to DOE. Upon submission, the PI will receive an email from the PAMS system acknowledging receipt of the LOI.

You are encouraged to register for an account in PAMS at least a week in advance of the LOI submission deadline so that there will be no delays with your submission.

For help with PAMS, please contact the Office of Science PAMS Support Center. The PAMS Support Center can be reached Monday-Friday 7:00 AM-6:00 PM Eastern Time. Telephone: (301) 903-5313, Email: scsc@science.doe.gov. All submission and inquiries about this Program Announcement must reference Program Announcement **LAB 12-03**.

The purpose of the LOI is to help in planning the review and the selection of potential reviewers for the proposal. For this purpose, the LOI must include: (1) identification of relevant research area(s) of interest from among those identified in this Notice, (2) one-page abstract of the proposed research; (3) list of names and institutional affiliations of all Principal Investigators, key investigators, collaborators, or consultants; (4) for each funded PI, a list of collaborative co-investigators including co-authors of the past 48 months, co-editors of the past 24 months, graduate and postdoctoral advisors/advisees, and close associations, and (5) list of any individuals who are not listed in the previous categories with whom you are discussing future collaborations. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group with whom the Principal Investigator interacted on a regular basis while the research was being done. For proposed investigations requiring access to experimental user facilities, confirmation of communication with the facility's point-of-contact should be indicated in the LOI. Collaborations should submit a single LOI clearly indicating the collaboration and all PIs and institutions involved, and list a primary point of contact/Lead PI for the research activity.

PROPOSAL DUE DATE: October 3, 2012, 5:00 PM Eastern Time

Formal proposals submitted in response to this Program Announcement must be received by **October 3, 2012, 5:00 PM Eastern Time**, to permit timely consideration of awards in Fiscal Year 2013. **You are encouraged to transmit your proposal well before the deadline. PROPOSALS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.**

IMPORTANT SUBMISSION INFORMATION:

Full proposals must be submitted into the DOE Office of Science Portfolio Analysis and Management System (PAMS). For help with PAMS, please contact the Office of Science PAMS Support Center. The PAMS Support Center can be reached Monday-Friday 7:00 AM-6:00 PM Eastern Time. Telephone: (301) 903-5313, Email: scsc@science.doe.gov. Full proposals submitted in response to this Program Announcement must be submitted PAMS no later than **October 3, 2012, 5:00 PM Eastern Time**.

All PIs and those submitting on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays. You may establish a PAMS account at <https://pamspublic.science.energy.gov/>.

To submit the proposal, log in to PAMS. Select “View DOE National Laboratory Announcements” and find the current announcement in the list. Click on “Actions/Views” for this announcement, select “Submit Proposal” from the dropdown, and follow the instructions from there. Note that you must select one and only one Principal Investigator (PI) per proposal; click on “Select PI” on the far right side of the screen and then select the PI from the list of all registered users from your institution returned by PAMS. If the PI for whom you are submitting does not appear on the list, he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, choose “Invite PI” at the top left of the “Select PI” screen. You can enter an optional personal message to the PI in the “Comments” box that PAMS presents, and it will be included in the email PAMS sends to the PI.

All PIs and those submitting on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to ensure timely submissions. To register, click “Create New PAMS Account” on the website <https://pamspublic.science.energy.gov/> and follow the instructions for creating an account.

The cover page, budget, and attachments sections of the lab proposal are required by PAMS. Complete the sections in PAMS one at a time, starting with the cover page and following the instructions for each section. Save each section using the dropdown at the bottom of the screen. Once you have saved all of the sections, the “Submit to DOE” option will appear in the dropdown. If you save the proposal and navigate away from it, you may return later to edit the proposal by selecting “View My Proposals” or “My Proposals.” You must enter a budget for each annual budget period. In the “attachments” section of the lab proposal, the budget justification and the proposal narrative are required and must be submitted as separate files. You must bundle everything other than the budget and budget justification into one single pdf to be attached under “Proposal Attachment.” Do not attach anything under “Other Attachments.”

To upload an attachment into PAMS, select “Attach File” at the far right side of the screen. Search for your file and then select “Attach” to upload the file. You may enter an optional description of the file you are attaching.

Upon submission, the PI will receive an email from the PAMS system acknowledging receipt of the proposal.

Please only submit a PAMS lab technical proposal in response to this announcement; do not submit a DOE Field Work Proposal (FWP) at this time. The Office of Fusion Energy Sciences will request FWPs later from those who are selected for funding under this announcement.

For help with PAMS, please contact the Office of Science PAMS Support Center. The PAMS Support Center can be reached Monday-Friday 7:00 AM-6:00 PM Eastern Time. Telephone: (301) 903-5313, Email: scsc@science.doe.gov. All submission and inquiries about this Program Announcement must reference Program Announcement **LAB 12-03**.

SUPPLEMENTARY INFORMATION:

National Spherical Torus Experiment - Upgrade

The NSTX-U is a major facility designed to study the physics of fusion plasmas confined in a low aspect-ratio Spherical Torus (ST) configuration. The ST is characterized by strong magnetic field curvature and high toroidal beta (the ratio of the average plasma pressure to the applied toroidal magnetic field pressure) due to its very low aspect ratio. These unique properties extend and complement the normal aspect ratio tokamak in addressing several overarching scientific issues in magnetic fusion energy science. The long-term programmatic goals of the NSTX-U program are to evaluate the attractiveness of a compact ST configuration, such as a Fusion Nuclear Science Facility (FNSF), as a cost-effective element in the development of practical fusion power, and to contribute to resolving important issues in predicting the physics of burning plasmas anticipated in ITER. The first programmatic goal encompasses the research elements for the ST identified in Thrust 16 of the report *Research Needs for Fusion Energy Sciences*:

http://science.energy.gov/~media/fes/pdf/workshop-reports/Res_needs_mag_fusion_report_june_2009.pdf.

The NSTX-U program includes research in all of the following topical areas: Macroscopic Stability, Multi-Scale Transport Physics, Plasma Boundary Interfaces, Energetic Particles, Start-up, Ramp-up and Sustainment without a Solenoid, and Advanced Operating Scenarios. More detailed information on the NSTX-U program is available in the peer reviewed five-year research program for NSTX-U starting in FY 2009, which is available at:

http://nstx.pppl.gov/DragNDrop/Five_Year_Plans/2009_2013/NSTX_Research_Plan_2009-2013.pdf.

Additional information on recent NSTX research results and initial ideas for the next five-year plan for NSTX-U are available from the last NSTX-U Program Advisory Committee (PAC) meeting at:

<http://nstx-u.pppl.gov/program/program-advisory-committee/pac-31>

An NSTX-U Program Letter providing updated information on the NSTX-U research priorities and collaboration opportunities during the next four years, based in part on the advice of the NSTX-U Program Advisory Committee, will be available on August 8, 2012 at:

http://nstx.pppl.gov/DragNDrop/Program_PAC/Program_Letters/

Research on NSTX-U is carried out by a national research team, which includes scientific personnel from many of the leading U.S. fusion research institutions. Researchers from outside of Princeton Plasma Physics Laboratory (PPPL) are involved in nearly all areas of research on NSTX-U. The following research areas are included in this announcement:

- I.** Macroscopic Stability
- II.** Multi-Scale Transport Physics
- III.** Plasma Boundary Interfaces

- IV. Energetic Particles
- V. Start-up, Ramp-up, and Sustainment without a Solenoid
- VI. Advanced Operating Scenarios

NSTX will not be operating from mid-FY 2012 to the end of FY 2014 for an extensive facility upgrade. During this time existing diagnostics may be upgraded and new diagnostics may be implemented to meet the needs of the NSTX Upgrade Program. The following sections provide a brief description of the high-priority research topics in the NSTX Upgrade Program.

NSTX Upgrade Research Priorities for FY 2015 and Beyond

The projected NSTX priorities for NSTX Upgrade are provided below and grouped in the following scientific areas:

I. Macroscopic Stability –the role of magnetic structure in plasma confinement and the limits to plasma pressure in sustained magnetic configurations.

- I-1. Understand the role of kinetic effects in RWM stability and toroidal rotation damping to optimize RWM stability and control in ITER and future facilities.*
- I-2. Study the impact of low aspect ratio, high beta, large ion gyro-radius, magnetic shear, and flow shear on classical and neoclassical tearing mode stability.*
- I-3. Assess neoclassical toroidal viscosity, plasma equilibrium and stability response to 3D fields, and the physics and control of toroidal rotation at reduced collisionality.*
- I-4. Characterize the dynamics of disruptions at low aspect ratio and high beta by measuring halo currents and thermal and current quench characteristics.*

II. Multi-Scale Transport Physics – physical processes that govern the confinement of heat, momentum, and particles in plasmas.

- II-1. Determine the modes (low-k, high-k, electrostatic, electromagnetic, Alfvénic) responsible for causing anomalous electron energy transport.*
- II-2. Determine the role of low-k turbulence in causing anomalous energy and momentum transport, and understand the influence of plasma rotation on low-k and high-k turbulence.*
- II-3. Determine the relationship between the measured particle and impurity transport and simulated micro-turbulence and neoclassical transport.*
- II-4. Compare turbulence measurements with theory and simulation using a suite of micro-turbulence codes.*

III. Plasma Boundary Interfaces - interface between fusion plasma and its lower temperature plasma-facing material surroundings.

- III-1. Investigate energy and particle transport and turbulence in the Scrape-Off-Layer (SOL), and understand the linkage between SOL parameters and the peak heat flux to the divertor to develop means for heat-flux mitigation and control.*
- III-2. Understand boundary plasma response to applied 3D magnetic field perturbations and other perturbations designed to control edge plasma transport and stability.*

III-3. *Study the synergy of high flux-expansion divertor configurations with the radiative divertor and assess applicability to FNSF (Fusion Nuclear Science Facility).*

III-4. *Investigate lithium-based plasma facing components to better understand how lithium modifies recycling, confinement, edge localized mode (ELM) stability, and divertor radiation and power-handling.*

IV. Energetic Particles - use of electromagnetic waves and energetic particles to sustain and control high-temperature plasmas.

IV-1. *Measure the transport of supra-Alfvénic fast ions due to Alfvén eigenmode avalanches and other Alfvénic instabilities with particular emphasis on the possible redistribution of neutral beam current drive.*

IV-2. *Measure the eigenfunctions and dynamics of Alfvénic instabilities to aid in the validation of advanced numerical simulations and the development of a predictive capability for fast-ion transport relevant to FNSF and ITER.*

IV-3. *Measure and simulate interactions between high-harmonic fast-waves (HHFW) and neutral beam fast-ions with application to optimizing plasma heating and current-drive by the HHFW.*

V. Start-up, Ramp-up and Sustainment without solenoid - physical processes of magnetic flux generation and sustainment.

V-1. *Perform simulations and contribute to design activities for electron cyclotron heating of non-inductive start-up plasmas and for electron Bernstein wave heating and current drive in advanced scenarios.*

V-2. *Understand and optimize the non-inductive current ramp-up of low-current target plasmas driven by high-harmonic fast wave (HHFW) and/or neutral beam injection (NBI) heating and current drive.*

VI. Advanced Operating Scenarios - physics synergy of external control and self-organization of the plasma.

VI-1. *Develop techniques for advanced plasma control in support of advanced operating scenarios in NSTX Upgrade.*

VI-2. *Use existing diagnostics for the identification of disruption onset and/or MHD precursors for potential use in triggering controlled plasma shut-down and/or disruption mitigation techniques.*

VI-3. *Achieve and maintain high-performance plasmas with reduced density and collisionality. Use the upgrade hardware capabilities to produce long-pulse plasmas with increased non-inductive current fraction and sustained high normalized beta.*

Additional Considerations

Proposals must be formulated as four-year projects with specific goals and deliverables that demonstrate the scientific merit and impact of the proposed research.

Management structure

If applicable, the proposers must identify a management structure that enables an effective collaboration among the participants from various disciplines. The structure and management must be sufficiently flexible to adapt quickly to changing technical challenges and scientific needs. To that end, the proposers must identify a Lead Principal Investigator, Principal Investigator(s), and Senior/Key Personnel. Typical duties, responsibilities and authorities for each category are provided below:

- **Lead Principal Investigator** - The Lead Principal Investigator must be employed by the Lead institution and will serve as the primary contact responsible for communications with DOE Program Officials on behalf of all of the Principal Investigators in the team.
- **Principal Investigator** - A Principal Investigator (PI) is the individual designated by each collaborating institution and empowered with the appropriate level of authority and responsibility for the proper conduct of the research within that organization. These authorities and responsibilities include the appropriate use of funds and administrative requirements such as the submission of scientific progress reports to DOE.
- **Senior/Key Personnel** - A senior/key person is an individual who contributes in a substantive, measurable way to the scientific or technical development or execution of the project.

Additional Resources

1. Magnetic Fusion Energy Sciences Research Needs Workshop (ReNeW) report, June 2009, http://science.energy.gov/~media/fes/pdf/workshop-reports/Res_needs_mag_fusion_report_june_2009.pdf
2. FESAC Report on Priorities, Gaps and Opportunities: Towards a Long-Range Strategic Plan for Magnetic Fusion Energy, October 2007, http://science.energy.gov/~media/fes/fesac/pdf/2007/Fesac_planning_report.pdf

Collaboration

Because NSTX-U is a collaborative national program, all proposers must collaborate with researchers from other institutions who are part of the NSTX-U National Research Team. The team currently includes researchers from Princeton Plasma Physics Laboratory, industry, universities, and other DOE National Laboratories. Planning for collaborative research on NSTX-U must begin in advance of submitting an application. Thus, applications submitted in response to this Program Announcement must include a Record of Discussion indicating the benefits of proposed research to the planned NSTX-U research program, the interface support required by the proposed collaborative work, and a description of how the proposed work will be integrated into the overall NSTX-U program.

Further information on preparation of collaborative proposals may be accessed via the Internet at <http://www.sc.doe.gov/grants/Colab.asp>

Please list ALL Collaborating Institutions/PIs and indicate which ones will also be submitting proposals. Also indicate the PI who will be the point of contact and coordinator for the combined research activity.

Collaborative proposals submitted from different DOE National Laboratories should clearly indicate they are part of a collaborative project/group. Every partner laboratory must submit a proposal through its own business office that has distinct scope of work and a qualified principal investigator who is responsible for the research effort being performed at his or her institution. Each proposal within the collaborative group, including the narrative and all required appendices and attachments, should be identical with one exception: The exception is that each proposal should contain unique budget and budget justification documents corresponding to the expenditures for that proposal's submitting institution only. Each collaborative group can have only one lead institution, which should be identified in the common narrative. The common narrative should also contain a summary table describing the budget breakdown by institution for all participants.

Each proposal belonging to a collaborative group should have the same title. Our intent is to create from the various proposals associated with a collaborative group one document for merit review that consists of the common, identical required appendices and attachments combined with a set of detailed budgets from the partner institutions. Thus, it is very important that every proposal in the collaborative group be exactly identical (including the title) with the exception of the budget and budget justification.

Program Funding:

It is anticipated that up to \$1,700,000 total will be available for multiple awards to be made in FY 2013, contingent on the availability of appropriated funds. Awards are expected to be made for a period of four years at a funding level appropriate for the proposed scope, with out-year support contingent on the availability of funds, satisfactory progress, and continuing program needs. Depending on the size of the awards that range from \$100,000 to \$600,000 per year (total costs), it is expected that up to five awards will be made. Due to funding limitations, no more than one proposal will be accepted from each Principal Investigator.

DOE is under no obligation to pay for any costs associated with the preparation or submission of a proposal. DOE reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted in response to this Program Announcement. OFES reserves the right to make fewer awards than would be possible at \$1,700,000 per year, if an insufficient number of proposals are judged to be of suitable scientific quality or of sufficient relevance to the programs.

Type of Proposal

DOE will accept both new and renewal proposals under the Program Announcement.

Eligibility

This is a DOE Lab-only Announcement. FFRDCs from other Federal agencies are not eligible to submit in response to this Program Announcement.

For official postings see the Office of Science Grants and Contracts web site, <http://www.science.doe.gov/grants>.

The instructions and format described below should be followed. You must reference Program Announcement LAB 12-03 on all submissions and inquiries about this program.

OFFICE OF SCIENCE GUIDE FOR PREPARATION OF SCIENTIFIC/TECHNICAL PROPOSALS TO BE SUBMITTED BY NATIONAL LABORATORIES

Proposals from DOE National Laboratories submitted to the Office of Science (SC) as a result of this Program Announcement will follow the Department of Energy Field Work Proposal (FWP) process with additional information requested to allow for scientific/technical merit review. The following guidelines for content and format are intended to facilitate an understanding of the requirements necessary for SC to conduct a merit review of a proposal. Please follow the guidelines carefully, as deviations could be cause for declination of a proposal without merit review.

1. Evaluation Criteria

Proposals 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. Included within each criterion are specific questions that the merit reviewers will be asked to consider:

a) Scientific and/or Technical Merit of the Project

- *What is the potential impact of proposed research on establishing the physics basis for a fusion nuclear science facility?*
- *How will the proposed research contribute to the NSTX –U program during the next three years and how important is this contribution likely to be?*
- *How does the proposed research compare with other research in its field, both in terms of scientific and/or technical merit and originality?*
- *What is the likelihood that it will lead to new or fundamental advances in its field?*

b) Appropriateness of the Proposed Method or Approach

- *Is the conceptual framework of the proposed research adequately developed and appropriate?*
- *What innovative concepts or methods will be employed in the proposed research?*
- *Are there significant potential problems in the proposed method or approach? If so, are the proposer's plans to address these problems—including the consideration of alternative strategies—adequate?*

c) Competency of Applicant's Personnel and Adequacy of 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.)?*
- *Have the resources needed from the host facility been clearly identified?*
- *Please comment on the proposer's research environment and resources?*

- *To what extent does the proposed research take advantage of unique facilities and capabilities and/or make good use of collaborative arrangements?*

d) Reasonableness and Appropriateness of the Proposed Budget

- *Is the applicant's requested budget appropriate?*
- *Does the requested budget support the applicant's specified collaboration plans?*

e) Performance under Existing Award

- *Assess the progress made towards achieving the research goals of the previous project period.*
- *Have the project personnel taken a leadership role in any aspect of the NSTX-U program?*
- *Has the project team disseminated the results of their research through publications in peer-reviewed journals, meetings, conferences presentations and/or other appropriate means?*

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, such as developing a scientific workforce capable of scientific leadership in the ITER era. 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 a proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

2. Summary of Proposal Contents

- Proposal Cover Page
- Table of Contents
- Budget (DOE Form 4620.1) and Budget Explanation
- Abstract (one page)
- Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, management plan and responsibilities of key project personnel – 20 page limit)
- Literature Cited
- Biographical Sketch(es)
- Description of Facilities and Resources
- Other Support of Investigator(s)
- Appendix (optional)

2.1 Submission Instructions

Full proposals must be submitted into the DOE Office of Science Portfolio Analysis and Management System (PAMS). For help with PAMS, please contact the Office of Science PAMS Support Center. The PAMS Support Center can be reached Monday-Friday 7:00 AM-6:00 PM Eastern Time. Telephone: (301) 903-5313, Email: scsc@science.doe.gov. Full proposals submitted in response to this Program Announcement must be submitted PAMS no later than **October 3, 2012, 5:00 PM Eastern Time**.

3. Detailed Contents of the Proposal

Adherence to font size and line spacing requirements is necessary. Font size must be at least 11 point. Line spacing is at the discretion of the researcher but there must be no more than 6 lines per vertical inch of text. Pages should be standard 8 1/2" x 11" (or metric A4, i.e., 210 mm x 297 mm).

3.1 Proposal Cover Page

The following proposal cover page information may be placed on plain paper. No form is required.

Title of proposed project:

SC Program Announcement title: *Collaborative Research in Magnetic Fusion Energy Sciences on the National Spherical Torus Experiment Upgrade – Lab 12-03*

Name of laboratory:

Name of principal investigator (PI):

Position title of PI:

Mailing address of PI:

Telephone of PI:

Fax number of PI:

Electronic mail address of PI:

Name of official submitting for laboratory: Title of official:

Fax number of official:

Telephone of official:

Electronic mail address of official:

Requested funding for each year; total request:

3.2 Budget and Budget Explanation

The budget must be submitted into PAMS using the PAMS budget form. Research proposed under this announcement should have three annual budget periods. Please enter the following budget period start and end dates into PAMS for proposals submitted to this announcement:

- Budget Period 1: 4/1/2013 – 3/31/2014
- Budget Period 2: 4/1/2014 – 3/31/2015
- Budget Period 3: 4/1/2015 – 3/31/2016

PAMS will calculate the cumulative budget totals for you.

A written justification of each budget item is to follow the budget pages. For personnel this should take the form of a one-sentence statement of the role of the person in the project. Provide a detailed justification of the need for each item of permanent equipment. Explain each of the other direct costs in sufficient detail for reviewers to be able to judge the appropriateness of the amount requested.

Further instructions regarding the budget and justification are given below and in the PAMS software.

3.3 Abstract

Summarize the proposal in one page. Give the project objectives (in broad scientific terms), the approach to be used, and what the research is intended to accomplish. State the hypotheses to be tested (if any). At the top of the abstract give the lead DOE national Laboratory, project title, names of all the investigators and their institutions, and contact information for the principal investigator, including e-mail address.

3.4 Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel).

The narrative comprises the research plan for the project and is limited to **20 pages (maximum)**. It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science. The major part of the narrative should be devoted to a description and justification of the proposed project, including details of the methods to be used. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities. It is important that the 20-page technical information section provide a complete description of the proposed work, because reviewers are not obliged to read the Appendices. Proposals exceeding these page limits may be rejected without review or the first 20 pages may be reviewed without regard to the remainder.

The page count of 20 does not include the Face Page and Budget Pages, the Title Page, the biographical material and publication information, or any Appendices. Letters of endorsement from unfunded collaborators should also be included, if applicable. Please do not submit general letters of support as these are not used in making funding decisions and can interfere with the selection of peer reviewers.

Background and Recent Accomplishments

Background – explanation of the importance and relevance of the proposed work.

Recent Accomplishments – this subsection is mandatory for renewal proposals and should summarize the proposed work and the actual progress made during the previous funding period.

Proposed Research and Tasks

In addition to the technical description of the proposed work and tasks, include a discussion of the following:

- Impact of the proposed research on other fields of science, if appropriate.
- Project schedule, milestones, and deliverables.

If any portion of the project is to be done in **collaboration** with another institution (or institutions), provide information on the institution(s) and what part of the project it will carry out. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation," "Biographical Sketches," and "Description of Facilities and Resources."

3.5 Literature Cited

Give full bibliographic entries for each publication cited in the narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. Include only bibliographic citations. Principal investigators should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the proposal.

3.6 Biographical Sketches

This information is required for senior personnel at the institution submitting the proposal and at all subcontracting institutions (if any). The biographical sketch is limited to a maximum of two pages for each investigator and must include:

Education and Training. Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.

Research and Professional Experience. Beginning with the current position list, in chronological order, professional/academic positions with a brief description.

Publications. Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or substituted for publications.

Synergistic Activities. List no more than five professional and scholarly activities related to the effort proposed.

To assist in the identification of potential conflicts of interest or bias in the selection of reviewers, the following information must also be provided in each biographical sketch.

Collaborators and Co-editors: A list of all persons in alphabetical order (including their current organizational affiliations) who are currently, or who have been, collaborators or co- authors with the investigator on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of the proposal. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group with whom the Principal Investigator interacted on a regular basis while the research was being done. Also, include those individuals who are currently or have been co- editors of a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of the proposal. Finally, list any individuals who are not listed in the previous categories with whom you are discussing future collaborations. If there are no collaborators or co-editors to report, this should be so indicated.

Graduate and Postdoctoral Advisors and Advisees: A list of the names of the individual's own graduate advisor(s) and principal postdoctoral sponsor(s), and their current organizational affiliations. A list of the names of the individual's graduate students and postdoctoral associates during the past five years, and their current organizational affiliations.

3.7 Description of Facilities and Resources

Facilities to be used for the conduct of the proposed research should be briefly described. Indicate the pertinent capabilities of the institution, including support facilities (such as machine shops), that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution (if any).

3.8 Other Support of Investigators

Other support is defined as all financial resources, whether Federal, non-Federal, commercial, or institutional, available in direct support of an individual's research endeavors. Information on active and pending other support is required for all senior personnel, including investigators at collaborating institutions to be funded by a subcontract. For each item of other support, give the organization or agency, inclusive dates of the project or proposed project, annual funding, and level of effort (months per year or percentage of the year) devoted to the project.


3.9 Appendix

Information not easily accessible to a reviewer may be included in an appendix, but **do not use the appendix to circumvent the page limitations of the proposal**. Reviewers are not required to consider information in an appendix, and reviewers may not have time to read extensive appendix materials with the same care they would use with the proposal proper.

The appendix may contain the following items: up to five publications, manuscripts accepted for publication, abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community; and letters from investigators at other institutions stating their agreement to participate in the project (do not include letters of endorsement of the project).

4. Detailed Instructions for the Budget

Budgets are required for the entire project period. A budget form should be completed for each budget period of the award, and a cumulative budget form for the entire project period will be populated by PAMS. A detailed budget justification narrative should be included after the budget pages. The justification should cover labor, domestic and foreign travel, equipment, materials and supplies, and anything else that will be covered with project funds.

To edit a section on the budget, click the edit icon () for each section on the page. Remember to save all budget periods before moving on to the next section.

A. Senior/Key Person (Required)

For each Senior/Key Person, enter the appropriate information. List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

B. Other Personnel

List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

C. Equipment Description

For the purpose of this budget, equipment is designated as an item of property that has an acquisition cost of \$5,000 or more and an expected service life of more than one year. (Note that this designation applies for proposal budgeting only and differs from the DOE definition of capital equipment.) List each item of equipment separately and justify each in the budget justification section. Allowable items ordinarily will be limited to research equipment and apparatus not already available for the conduct of the work. General-purpose office equipment, such as a personal computer, is not eligible for support unless primarily or exclusively used in the actual conduct of scientific research.

D. Travel

In the budget justification, list each trip's destination, dates, estimated costs including transportation and subsistence, number of staff traveling, the purpose of the travel, and how it relates to the project. Indicate whether travel cost estimates are based upon quotes from travel agencies; upon past experience of similar number of trips to similar travel destinations; or something else (describe). To qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results.

E. Participant/Trainee Support Costs:

If applicable, submit training support costs. Educational projects that intend to support trainees (precollege, college, graduate and post graduate) must list each trainee cost that includes stipend levels and amounts, cost of tuition for each trainee, cost of any travel (provide the same information as needed under the regular travel category), and costs for any related training expenses. Participant costs are those costs associated with conferences, workshops, symposia or institutes and breakout items should indicate the number of participants, cost for each participant, purpose of the conference, dates and places of meetings and any related administrative expenses. In the budget justification, indicate whether trainee cost estimates are based upon past experience of support of similar number of trainees on similar projects; past experience of support of similar number of participants attending similar conferences/workshops/symposia; or something else (describe).

F. Other Direct Costs:

Enter Other Direct Costs information for each item listed.

- **Materials and Supplies:** Enter total funds requested for materials and supplies in the appropriate fields. In the budget justification, indicate general categories such as glassware, and chemicals, including an amount for each category (items not identified under "Equipment"). Categories less than \$1,000 are not required to be itemized. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; quotes/catalog prices of similar or like items; or something else (describe).
- **Publication Costs:** Enter the total publication funds requested. The proposal budget may request funds for the costs of documenting, preparing, publishing or otherwise making available to others the findings and products of the work conducted under the award. In the

budget justification, include supporting information. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; vendor quotes of similar publication services; or something else (describe).

- **Consultant Services:** Enter total funds requested for all consultant services. In the budget justification, identify each consultant, the services he/she will perform, total number of days, travel costs, and total estimated costs. In the budget justification, indicate whether consultant cost estimate is based upon previous experience/quotes for similar or like services; or something else (describe).
- **ADP/Computer Services:** Enter total funds requested for ADP/Computer Services. The cost of computer services, including computer-based retrieval of scientific, technical and education information may be requested. In the budget justification, include the established computer service rates at the proposing organization if applicable. In the budget justification, indicate whether cost estimates are based upon quotes/past experience of purchase of similar computer services; established computer service rates at the proposing institution; or something else (describe).
- **Subawards/Consortium/Contractual Costs:** Enter total costs for all subawards/consortium organizations and other contractual costs proposed for the project. In the budget justification, justify the details.
- **Equipment or Facility Rental/User Fees:** Enter total funds requested for Equipment or Facility Rental/User Fees. In the budget justification, identify each rental/user fee and justify. In the budget justification, indicate whether cost estimates are based upon past experience with similar or like items; vendor quotes of similar items; or something else (describe).
- **Alterations and Renovations:** Enter total funds requested for Alterations and Renovations. In the budget justification, itemize by category and justify the costs of alterations and renovations, including repairs, painting, removal or installation of partitions, shielding, or air conditioning. Where applicable, provide the square footage and costs.
- **Other:** Add text to describe any other Direct Costs not requested above. Enter costs associated with “Other” item(s). Use the budget justification to further itemize and justify.

G. Direct Costs

This represents Total Direct Costs (Sections A thru F) and will be calculated by PAMS.

H. Other Indirect Costs

Enter the Indirect Cost information for each field. Only four general categories of indirect costs are allowed/requested on this form, so please consolidate if needed.

I. Total Direct and Indirect Costs

This amount will be calculated by PAMS (Sections G + H)