FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT

U.S. Department of Energy

Office of Science
Fusion Energy Sciences

National Spherical Torus Experiment: Diagnostic Measurements of Spherical Torus Plasmas

Funding Opportunity Number: DE-FOA-0000576

Announcement Type: Initial

CFDA Number: 81.049

ISSUE DATE: **August 1, 2011**

PREAPPLICATION DUE DATE: **September 14, 2011, 11:59 p.m. Eastern Time**
(Preapplications are Required)

APPLICATION DUE DATE: **October 18, 2011, 11:59 p.m. Eastern Time**

NOTE: REQUIREMENTS FOR GRANTS.GOV

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.

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). 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 this Funding Opportunity Announcement (FOA) explains how to submit other questions to the Department of Energy (DOE).

Application Receipt Notices

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of four e-mails. It is extremely important that the AOR watch for and save each of the emails. It may take up to two (2) business days from application submission to receipt of email Number 2. The titles of the four e-mails are:

Number 1 - Grants.gov Submission Receipt Number
Number 2 - Grants.gov Submission Validation Receipt for Application Number
Number 3 - Grants.gov Grantor Agency Retrieval Receipt for Application Number
Number 4 - Grants.gov Agency Tracking Number Assignment for Application Number

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PART I – FUNDING OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Dr. Stephen Eckstrand, Office of Fusion Energy Sciences, SC-24.2
PHONE: 301-903-5546
FAX: 301-903-4716
E-MAIL: Steve.Eckstrand@science.doe.gov

STATUTORY AUTHORITY

Public Law 95-91, US Department of Energy Organization Act
Public Law 109-58, Energy Policy Act of 2005

APPLICABLE REGULATIONS

U.S. Department of Energy Financial Assistance Rules, codified at 10 CFR Part 600
U.S. Department of Energy, Office of Science Financial Assistance Program Rule, codified at 10 CFR Part 605

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 collaborative research employing innovative diagnostic instruments on the National Spherical Torus Experiment (NSTX) at Princeton Plasma Physics Laboratory. The NSTX program contributes to two goals of the FES program: developing a predictive understanding of magnetically confined plasmas and investigating the unique properties of the spherical torus configuration. All individuals or groups planning to submit applications for new or renewal funding in Fiscal Year 2012 should submit applications in response to this FOA. Applications for collaborative research that is not focused mainly on implementing and operating a diagnostic instrument and analyzing the resulting data should not be submitted in response to this FOA.

The NSTX 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. Applications for collaborative research must support the NSTX 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 National Research Program Leaders and must include a Record of Discussion that specifies the benefits of proposed research to the NSTX program and the interface support required to carry it out. Applications to renew on-going NSTX collaborative research must include a list of project goals from the previous project period and a summary of the actual accomplishments.

SUPPLEMENTARY INFORMATION:

National Spherical Torus Experiment

The NSTX is a major facility designed to study the physics of fusion plasmas confined in a very 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 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 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 program is available in the peer reviewed five-year research program for NSTX starting in FY 2009, which is available at:

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

An NSTX Program Letter providing updated information on the NSTX research priorities and collaboration opportunities during the next four years, based in part on the advice of the NSTX Program Advisory Committee, will be available on August 8, 2011 at:

http://nstx.pppl.gov/DragNDrop/Program_PAC/Program_Letters/NSTX_Program_Letter_FY2012-15.pdf

Research on NSTX 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. The following research areas are included in this solicitation.

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 – measurements are needed to study 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 – measurements are needed to investigate the physical processes that govern the confinement of heat, momentum, and particles in plasmas.

II-1. *Develop/utilize diagnostics to determine the modes (low-k, high-k, electrostatic, electromagnetic, Alfvénic) responsible for causing anomalous electron energy transport - with particular emphasis on the development of internal measurements of magnetic field fluctuations and high-k density fluctuations.*

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. *Measure and interpret 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. *Measure and analyze the surface characteristics of lithiated and non-lithiated divertor and first-wall plasma facing components, and relate these characteristics to the core and edge plasma confinement and stability under both steady-state and transient edge conditions.*

III-3. *Measure and understand boundary plasma response to applied 3D magnetic field perturbations and other perturbations designed to control edge plasma transport and stability.*

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 Alfven eigenmode avalanches and other Alfvenic instabilities with particular emphasis on the possible redistribution of neutral beam current drive.*

IV-2. *Measure the eigenfunctions and dynamics of Alfvenic instabilities to aid in the validation of advanced numerical simulations and the development of a predictive capability for fast-ion transport relevant to FNSF(Fusion Nuclear Science Facility) 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. *Measure and optimize the formation, confinement, and heating of solenoid-free start-up plasmas created using Coaxial Helicity Injection (CHI) and other techniques such as poloidal-field ramp-up and plasma gun start-up.*

V-1. *Measure 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 real-time diagnostics for advanced plasma control, including for example: measurements of the safety factor profile, temperature and density profiles, and divertor heat-flux, radiation, and/or surface temperature measurements in support of advanced operating scenarios in NSTX Upgrade.*

VI-2. *Develop new or utilize 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.*

Collaboration

Because NSTX is a collaborative national program, all applicants must collaborate with researchers from other institutions who are part of the NSTX 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 must begin in advance of submitting an application. Thus, applications submitted in response to this FOA must include a Record of Discussion indicating the benefits of proposed research to the planned NSTX 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 program.

In addition, applications submitted from different institutions, which are directed at a common research activity, should clearly indicate that 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.

Each collaborating institution submitting an application must use the same title in Block 11 of the SF 424 (R&R) form.

PART II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT.

DOE anticipates awarding Grants under this Funding Opportunity Announcement (FOA).

B. ESTIMATED FUNDING.

It is anticipated that up to $2.0 million from DOE/OFES for new collaborative research awards during FY 2012 will be available, contingent upon the availability of appropriated funds. Multi-year funding of grant awards is expected, with out-year support contingent upon the availability of appropriated funds in future years, progress of the research, and continuing program need. It is expected that up to 8 awards will be made, depending on the size of the awards. Most awards will be for 4 years and will range from $100,000 to $375,000 per year.

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.

C. MAXIMUM AND MINIMUM AWARD SIZE.

See B. Estimated Funding section above.

D. EXPECTED NUMBER OF AWARDS.

See B. Estimated Funding section above.

E. ANTICIPATED AWARD SIZE.

See B. Estimated Funding section above.

F. PERIOD OF PERFORMANCE.

See B. Estimated Funding section above.

G. TYPE OF APPLICATION.

DOE will accept new and renewal applications under this FOA. Renewal applications compete with all other applications. In preparing a renewal application, applicants should assume that reviewers will not have access to previous applications. The application should be developed as fully as if the applicant were applying for the first time. A renewal application must include all the information required for a new project, plus the project narrative section should discuss the objectives and results from prior work.

PART III - ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS.

All types of domestic entities are eligible to apply, except other Federal agencies, Federally Funded Research and Development Center (FFRDC) Contractors, and nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995.

B. COST SHARING.

Cost sharing is not required.

C. OTHER ELIGIBILITY REQUIREMENTS.

N/A

PART IV – APPLICATION AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST APPLICATION PACKAGE.

Application forms and instructions are available at Grants.gov. To access these materials, go to http://www.grants.gov, select "**Apply for Grants**", and then select "**Download a Grant Application Package**". Enter the CFDA and/or the funding opportunity number located on the cover of this Funding Opportunity Announcement and then follow the prompts to download the application package.

B. LETTER OF INTENT AND PREAPPLICATION.

1. **Letter of Intent.**

   Letters of Intent are not required.

2. **Preapplication.**

   Preapplications are **REQUIRED** and must be submitted by September 14, 2011, 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 steve.eckstrand@science.doe.gov. **Please include "Preapplication for DE-FOA-0000576" in the subject line.**

   Preapplications should include cover page information, a brief description of the proposed work (1-2 pages, including text with minimum font size 11 point, figures, and references), and a one-page curriculum vitae from each Principal Investigator (PI), co-Principal Investigator (co-PI), and senior collaborator or consultant. The cover page should include: (a) A statement that the document is a preapplication in response to Funding Opportunity DE-FOA-0000576; (b) PI information: name, institutional affiliation, telephone number, fax number, and e-mail address; and, (c) names and institutions of all co-PIs, and senior collaborators or consultants (excluding postdoctoral associates). Since among the purposes of the preapplication is to facilitate FES in planning the merit review and the selection of peer-reviewers without conflicts of interest, it is important that applicants ensure their list of supported or unsupported participants is as comprehensive as possible.

   Preapplications will be reviewed by FES program officials for responsiveness to this Funding Opportunity Announcement and the NSTX program, eligibility of the applicant organization, and qualification of the applicant's personnel for carrying out a large-scale computational research activity. Only those applicants who receive notification from DOE encouraging a full application may submit a formal application. **No other formal applications will be considered.**

C. CONTENT AND FORM OF APPLICATION – SF 424 (R&R)

You must complete the mandatory forms and any applicable optional forms (e.g., SF-LLL-Disclosure of Lobbying Activities) in accordance with the instructions on the forms and the additional instructions below**. Files that are attached to the forms must be in Adobe Portable Document Format (PDF) unless otherwise specified in this announcement.**

1. **SF 424 (R&R)**
   Complete this form first to populate data in other forms. Complete all the required fields in accordance with the pop-up instructions on the form. The list of certifications and assurances referenced in Field 17 can be found on the DOE Financial Assistance Forms Page at http://www.management.energy.gov/business_doe/business_forms.htm, under Certifications and Assurances.

2. **RESEARCH AND RELATED Other Project Information.**
   Complete questions 1 through 6 and attach files. The files must comply with the following instructions:

   Project Summary/Abstract (Field 7 on the Form).
   The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s) (PD/PI), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as the Department may make it available to the public. The project summary must not exceed one page when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than 11 point. To attach a Project Summary/Abstract, click "Add Attachment."

   Project Narrative (Field 8 on the Form).
   The project narrative **must not exceed 25 pages** of technical information, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right). EVALUATORS WILL ONLY REVIEW THE NUMBER OF PAGES SPECIFIED IN THE PRECEDING SENTENCE. The font must not be smaller than 11 point. Do not include any Internet addresses (URLs) that provide information necessary to review the application, because the information contained in these sites will not be reviewed. See Part VIII.D for instructions on how to mark proprietary application information. To attach a Project Narrative, click "Add Attachment."

   The application narrative should begin with a cover page that includes: the project title, the Lead PI's name and complete contact information.

The cover page must also include the following information (this page will not count in the project narrative page limitation):

Applicant/Institution:
Street Address/City/State/Zip:
Principal Investigator:
Postal Address:
Telephone Number:
Email:
Funding Opportunity Announcement Number: DE-FOA-0000576
DOE/Office of Science Program Office: Fusion Energy Sciences, SC-24
DOE/Office of Science Program Office Technical Contact: Dr. Stephen Eckstrand
DOE Grant Number (if Renewal or Supplemental Application):

Is this a Collaboration? If yes, please list ALL Collaborating Institutions/PIs* and indicate which ones will also be submitting applications. Also indicate the PI who will be the point of contact and coordinator for the combined research activity.

The project narrative must include:

Project Objectives:
This section should provide a clear, concise statement of the specific objectives/aims of the proposed project.

The Project Narrative comprises the research plan for the project; 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 method 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.

The project narrative should include the following sections:

Executive Summary
Summarize the application in no more than two pages

Background and Recent Accomplishments

- Background – explanation of the importance and relevance of the proposed work
- Recent Accomplishments - this subsection is mandatory for renewal applications 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:

- Relationship of the proposed work to the longer-term goals of the NSTX project
- A discussion of how the proposed work plan fits into the overall NSTX program plans
- A description of how experimental work will be compared with theory/computation or how theory/computation will be compared with experimental data.

Project Timetable:

This section should outline as a function of time, year by year, all the important activities or phases of the project, including any activities planned beyond the project period. It should also include tables of quarterly milestones for each year of the proposed work Successful applicants must use this project timetable to report progress.

Appendix 1: Biographical Sketch

Provide a biographical sketch for the project director/principal investigator (PD/PI) and each senior/key person listed in Section A on the R&R Budget form. **Provide the biographical sketch information as an appendix to your project narrative. Do not attach a separate file. The biographical sketch appendix will not count in the project narrative page limitation.** The biographical information (curriculum vitae) for each person must not exceed 2 pages when printed on 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) with font not smaller than 11 point 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 5 professional and scholarly activities related to the effort proposed.

Identification of Potential Conflicts of Interest or Bias in Selection of Reviewers. Provide the following information in this section:

Collaborators and Co-editors: List in alphabetical order all persons, including their current organizational affiliation, who are, or who have been, collaborators or co-authors with you on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of this application. Also, list any individuals who are currently, or have been, co-editors with you on a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of this application. If there are no collaborators or co-editors to report, state "None."

Graduate and Postdoctoral Advisors and Advisees: List the names and current organizational affiliations of your graduate advisor(s) and principal postdoctoral sponsor(s) during the last 5 years. Also, list the names and current organizational affiliations of your graduate students and postdoctoral associates during the past 5 years.

Appendix 2: Current and Pending Support.
Provide a list of all current and pending support (both Federal and non-Federal) for the Project Director/Principal Investigator(s) (PD/PI) and senior/key persons, including subawardees, for ongoing projects and pending applications. For each organization providing support, show the total award amount for the entire award period (including indirect costs) and the number of person-months per year to be devoted to the project by the senior/key person. **Provide the Current and Pending Support as an appendix to your project narrative. Do not attach a separate file. This appendix will not count in the project narrative page limitation.** Concurrent submission of an application to other organizations for simultaneous consideration will not prejudice its review.

Appendix 3: Bibliography & References Cited.
Provide a bibliography of any references cited in the Project 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. Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the application. **Provide the Bibliography and References Cited information as an appendix to your project narrative. Do not attach a separate file. This appendix will not count in the project narrative page limitation.**

Appendix 4: Facilities & Other Resources.
This information is used to assess the capability of the organizational resources, including subawardee resources, available to perform the effort proposed. Identify the facilities to be used (Laboratory, Animal, Computer, Office, Clinical and Other). If appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Describe only those resources that are directly applicable to the proposed work. Describe other resources available to the project (e.g., machine shop, electronic shop) and the extent to which they would be available to the project. **Provide the Facility and Other Resource information as an appendix to your project**

narrative. Do not attach a separate file. This appendix will not count in the project narrative page limitation.

Appendix 5: Equipment.
List major items of equipment already available for this project and, if appropriate identify location and pertinent capabilities. **Provide the Equipment information as an appendix to your project narrative. Do not attach a separate file. This appendix will not count in the project narrative page limitation.**

Appendix 6: Other Attachment.
If you need to elaborate on your responses to questions 1-6 on the "Other Project Information" document, p**rovide the Other Attachment information as an appendix to your project narrative. Do not attach a separate file. This appendix will not count in the project narrative page limitation.**

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.

Do not attach any of the requested appendices described above as files for fields 9, 10, 11, and 12; instead follow the above instructions to include the information as appendices to the project narrative file (these appendices will not count in the project narrative page limitation).

3. RESEARCH AND RELATED BUDGET.
Complete the Research and Related Budget form in accordance with the instructions on the form (Activate Help Mode to see instructions) and the following instructions. You must complete a separate budget for each year of support requested. The form will generate a cumulative budget for the total project period. You must complete all the mandatory information on the form before the NEXT PERIOD button is activated. You may request funds under any of the categories listed as long as the item and amount are necessary to perform the proposed work, meet all the criteria for allowability under the applicable Federal cost principles, and are not prohibited by the funding restrictions in this FOA (See PART IV, G).

Budget Justification (Field K on the form).
Provide the required supporting information for the following costs (See R&R Budget instructions): equipment; domestic and foreign travel; participant/trainees; material and supplies; publication; consultant services; ADP/computer services; subaward/consortium/contractual; equipment or facility rental/user fees; alterations and renovations; and indirect cost type. Provide any other information you wish to submit to justify your budget request. **Attach a single budget justification file for the entire project period in Field K.** The file automatically carries over to each budget year.

4. **R&R SUBAWARD BUDGET ATTACHMENT(S) FORM.**
   Budgets for Subawardees, other than DOE FFRDC Contractors. You must provide a separate cumulative R&R budget for each subawardee that is expected to perform work estimated to be more than $100,000 or 50 percent of the total work effort (whichever is less). If you are selected for award, you must submit a multi-year budget for each of these subawardees (See Section IV.D for submission of Subawardees' multi-year budgets). Download the R&R Budget Attachment from the R&R SUBAWARD BUDGET ATTACHMENT(S) FORM and e-mail it to each subawardee that is required to submit a separate budget. After the Subawardee has e-mailed its completed budget back to you, attach it to one of the blocks provided on the form. Use up to 10 letters of the subawardee's name (plus.xfd) as the file name (e.g., ucla.xfd or energyres.xfd).

5. **PROJECT/PERFORMANCE SITE LOCATION(s)**
   Indicate the primary site where the work will be performed. If a portion of the project will be performed at any other site(s), identify the site location(s) in the blocks provided.

   Note that the Project/Performance Site Congressional District is entered in the format of the 2 digit state code followed by a dash and a 3 digit Congressional district code, for example VA-001. Hover over this field for additional instructions.

   Use the Next Site button to expand the form to add additional Project/Performance Site Locations.

6. **SF-LLL Disclosure of Lobbying Activities** If applicable, complete SF- LLL.
   Applicability: If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the grant/cooperative agreement, you must complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying."

Summary of Required Forms/Files

Your application must include the following documents:

Name of Document	Format	Attach to
SF 424 (R&R)	Form	N/A
RESEARCH AND RELATED Other Project Information	Form	N/A
Project Summary/Abstract	PDF	Field 7
Project Narrative, including required appendices	PDF	Field 8
RESEARCH & RELATED BUDGET	Form	N/A
Budget Justification	PDF	Field K
PROJECT/PERFORMANCE SITE LOCATION(S)	Form	N/A
SF-LLL Disclosure of Lobbying Activities, if applicable	Form	N/A

D. SUBMISSIONS FROM SUCCESSFUL APPLICANTS.

If selected for award, DOE reserves the right to request additional or clarifying information for any reason deemed necessary, including, but not limited to:

- Indirect cost information
- Other budget information
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
- Representation of Limited Rights Data and Restricted Software, if applicable
- Commitment Letter from Third Parties Contributing to Cost Sharing, if applicable

E. SUBMISSION DATES AND TIMES.

1. Letter of Intent.

Letters of Intent are not required.

2. Preapplication.

Preapplications are **REQUIRED** and must be submitted by September 14, 2011, 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 steve.eckstrand@science.doe.gov. **Please include "Preapplication for DE-FOA-0000576" in the subject line.**

Preapplications should include cover page information, a brief description of the proposed work (1-2 pages, including text with minimum font size 11 point, figures, and references), and a one-page curriculum vitae from each Principal Investigator (PI), co-Principal Investigator (co-PI), and senior collaborator or consultant. The cover page should include: (a) A statement that the document is a preapplication in response to Funding Opportunity DE-FOA-0000576; (b) PI information: name, institutional affiliation, telephone number, fax number, and e-mail address; and, (c) names and institutions of all co-PIs, and senior collaborators or consultants (excluding postdoctoral associates). Since among the purposes of the preapplication is to facilitate FES in planning the merit review and the selection of peer-reviewers without conflicts of interest, it is important that applicants ensure their list of supported or unsupported participants is as comprehensive as possible.

Preapplications will be reviewed by FES program officials for responsiveness to this Funding Opportunity Announcement and the NSTX program, eligibility of the applicant organization, and qualification of the applicant's personnel for carrying out a large-scale computational research activity. Only those applicants who receive notification from DOE encouraging a full application may submit a formal application. **No other formal applications will be considered.**

3. **Formal Applications.**

Formal applications submitted in response to this FOA must be received by October 18, 2011, 11:59 PM Eastern Time, to permit timely consideration of awards in Fiscal Year 2012. **You are encouraged to transmit your application well before the deadline. APPLICATIONS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.**

F. INTERGOVERNMENTAL REVIEW.

This program is not subject to Executive Order 12372 Intergovernmental Review of Federal Programs.

G. FUNDING RESTRICTIONS.

Cost Principles**.** Costs must be allowable, allocable and reasonable in accordance with the applicable Federal cost principles referenced in 10 CFR Part 600. The cost principles for commercial organization are in FAR Part 31.

Pre-award Costs**.** Recipients may charge to an award resulting from this FOA pre-award costs that were incurred within the ninety (90) calendar day period immediately preceding the effective date of the award, if the costs are allowable in accordance with the applicable Federal cost principles referenced in 10 CFR Part 600. Recipients must obtain the prior approval of the awarding agency/contracting officer for any pre-award costs that are for periods greater than this 90 day calendar period.

Pre-award costs are incurred at the applicant's risk. DOE is under no obligation to reimburse such costs if for any reason the applicant does not receive an award or if the award is made for a lesser amount than the applicant expected.

H. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS

1. Where to Submit.

APPLICATIONS MUST BE SUBMITTED THROUGH GRANTS.GOV TO BE CONSIDERED FOR AWARD.

Submit electronic applications through the "Apply for Grants" function at www.Grants.gov. If you have problems completing the registration process or submitting your application, call Grants.gov at 1-800-518-4726 or send an email to support@grants.gov.

2. Registration Process.

You must COMPLETE the one-time registration process (all steps) before you can submit your first application through Grants.gov (See www.grants.gov/GetStarted). We recommend that you start this process at least three weeks before the application due date. It may take 21 days or more to complete the entire process. Use the Grants.gov Organizational Registration Checklists at http://www.grants.gov/assets/OrganizationRegCheck.pdf to guide you through the process. IMPORTANT: During the CCR registration process, you will be asked to designate an E-Business Point of Contact (EBIZ POC). The EBIZ POC must obtain a special password called "Marketing Partner Identification Number" (MPIN). 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).

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.

3. Application Receipt Notices

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of four e-mails. It is extremely important that the AOR watch for and save each of the emails. It may take up to two (2) business days from application submission to receipt of email Number 2. The titles of the four e-mails are:

Number 1 - Grants.gov Submission Receipt Number
Number 2 - Grants.gov Submission Validation Receipt for Application Number
Number 3 - Grants.gov Grantor Agency Retrieval Receipt for Application Number
Number 4 - Grants.gov Agency Tracking Number Assignment for Application Number

PART V - APPLICATION REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria.

Prior to a comprehensive merit evaluation, DOE will perform an initial review in accordance with 10 CFR 605.10(b) to determine that (1) the applicant is eligible for the award; (2) the information required by the FOA has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the funding opportunity announcement. Applications that fail to pass the initial review will not be forwarded for merit review and will be eliminated from further consideration.

2. Merit Review Criteria

Applications will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria, listed in descending order of importance as found in 10 CFR Part 605.10 (d), the Office of Science Research Financial Assistance Program. Included with each criterion are the detailed questions that are asked of the reviewers.

1. **Scientific and/or Technical Merit of the Project.**
   - What important issues in plasma/fusion science does the proposed research address?
   - How will the proposed research contribute to the NSTX program during the next three years?
   - 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?
2. **Appropriateness of the Proposed Method or Approach.**
   - How well developed are the proposed techniques and analyses, and are they likely to lead to scientifically valid conclusions?
   - What innovative concepts or methods will be employed in the proposed research?
   - Are there significant potential problems and, if so, how well does the applicant address these potential problems?
3. **Competency of the Applicant's Personnel and Adequacy of the Proposed Resources.**
   - How well qualified are the project'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.)
   - Please comment on the applicant's research environment and resources and whether the applicant has any unique facilities or capabilities.
4. **Reasonableness and Appropriateness of the Proposed Budget.**
   - Are the staffing levels and budget appropriate for carrying out the proposed research?
   - Are the proposed milestones appropriate?

For renewal applications, the reviewers will also be asked to answer the following question:

5. Performance Under Existing Award.

- Assess the progress made thus far towards the project's research goals.
- Have the project personnel taken a leadership role in any aspect of the NSTX 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 reviewers are also asked to comment on **Other Appropriate Factors:**

- What are the overall strengths and weaknesses of the proposal?
- Could the proposed research make a significant contribution to magnetic fusion research or to another field?
- If applicable, please comment on the educational benefits of the proposed activity.

The Office of Fusion Energy Sciences shall also consider, as part of the evaluation, other available information as well as program policy factors, such as ensuring an appropriate balance among the program areas and within the program areas, and quality of previous performance. The selected projects will be required to acknowledge support by DOE in all public communication of the research results.

B. REVIEW AND SELECTION PROCESS.

1. Merit Review.

Applications that pass the initial review will be subjected to a formal merit review and will be evaluated based on the criteria codified at 10 CFR Part 605.10(d) in accordance with the guidance provided in the "Office of Science Merit Review System for Financial Assistance." This Merit Review System is available at: http://www.sc.doe.gov/grants/merit.asp.

2. Selection.

The Selection Official will consider the merit review evaluation, program policy factors, and the amount of funds available.

3. Discussions and Award.

The Government may enter into discussions with a selected applicant for any reason deemed necessary, including but not limited to: (1) the budget is not appropriate or reasonable for the requirement; (2) only a portion of the application is selected for award; (3) the Government needs additional information to determine that the recipient is capable of complying with the requirements in 10 CFR part 600 and 605; and/or (4) special terms and conditions are required. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES.

DOE is striving to make **awards under this program within 6 months**. The time interval begins on the date applications are due or the date the application is received, if there is no specified due date/deadline. **Awards will be made in Fiscal Year 2012**.

PART VI - AWARD ADMINISTRATION INFORMATION

A. AWARD NOTICES.

1. Notice of Selection.

Selected Applicants Notification: DOE will notify applicants selected for award. This notice of selection is not an authorization to begin performance. (See Part IV.G with respect to the allowability of pre-award costs.)

Non-selected Notification: Organizations whose applications have not been selected will be advised as promptly as possible. This notice will explain why the application was not selected.

2. Notice of Award.

An Assistance Agreement issued by the contracting officer is the authorizing award document. It normally includes, either as an attachment or by reference: 1. Special Terms and Conditions; 2. Applicable program regulations, if any; 3. Application as approved by DOE/NNSA; 4. DOE assistance regulations at 10 CFR Part 600; 5. National Policy Assurances to Be Incorporated As Award Terms; 6. Budget Summary; and 7. Federal Assistance Reporting Checklist, which identifies the reporting requirements.

B. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS.

1. Administrative Requirements.

The administrative requirements for DOE grants and cooperative agreements are contained in 10 CFR 600 and 10 CFR Part 605 (See: http://ecfr.gpoaccess.gov). Grants and cooperative agreements made to universities, non-profits and other entities subject to Title 2 CFR are subject to the Research Terms and Conditions located on the National Science Foundation web site at http://www.nsf.gov/bfa/dias/policy/rtc/index.jsp.

DUNS and CCR Requirements

Additional administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR, Part 25 (See: http://ecfr.gpoaccess.gov). Prime awardees must keep their data at CCR current. Subawardees at all tiers must obtain DUNS numbers and provide the DUNS to the prime awardee before the subaward can be issued.

Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR, Part 170. (See: http://ecfr.gpoaccess.gov). Prime awardees must register with the new FSRS database and report the required data on their first tier

subawardees. Prime awardees must report the executive compensation for their own executives as part of their registration profile in the CCR.

2. Special Terms and Conditions and National Policy Requirements.

The DOE Special Terms and Conditions for Use in Most Grants and Cooperative Agreements are located at:
http://management.energy.gov/business_doe/business_forms.htm.
The National Policy Assurances to Be Incorporated As Award Terms are located at http://www.nsf.gov/bfa/dias/policy/rtc/appc.pdf.

Intellectual Property Provisions.
The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at
http://www.gc.energy.gov/financial_assistance_awards.htm.

C. REPORTING.

Reporting requirements are identified on the Federal Assistance Reporting Checklist, DOE F4600.2, attached to the award agreement. For a sample checklist, see http://www.management.energy.gov/documents/DOEF4600pt292009.pdf.

PART VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

Questions regarding the content of the announcement must be submitted through the FedConnect portal. You must register with FedConnect to respond as an interested party to submit questions, and to view responses to questions. It is recommended that you register as soon after release of the FOA as possible to have the benefit of all responses. More information is available at https://www.fedconnect.net/FedConnect/PublicPages/FedConnect_Ready_Set_Go.pdf. DOE will try to respond to a question within 3 business days, unless a similar question and answer have already been posted on the website.

Applications submitted through FedConnect will not be accepted.

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. DOE cannot answer these questions.

B. AGENCY CONTACTS:

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Dr. Stephen Eckstrand, Office of Fusion Energy Sciences, SC-24.2
PHONE: 301-903-5546
FAX: 301-903-4716
E-MAIL: Steve.Eckstrand@science.doe.gov

PART VIII - OTHER INFORMATION

A. MODIFICATIONS.

Notices of any modifications to this FOA will be posted on Grants.gov and the FedConnect portal. You can receive an email when a modification or an announcement message is posted by registering with FedConnect as an interested party for this FOA. It is recommended that you register as soon after release of the FOA as possible to ensure you receive timely notice of any modifications or other announcements. More information is available at http://www.fedconnect.net.

B. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE.

DOE reserves the right, without qualification, to reject any or all applications received in response to this announcement and to select any application, in whole or in part, as a basis for negotiation and/or award.

C. COMMITMENT OF PUBLIC FUNDS.

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by other than the Contracting Officer, either explicit or implied, is invalid.

D. PROPRIETARY APPLICATION INFORMATION.

Patentable ideas, trade secrets, proprietary or confidential commercial or financial information, disclosure of which may harm the applicant, should be included in an application only when such information is necessary to convey an understanding of the proposed project. The use and disclosure of such data may be restricted, provided the applicant includes the following legend on the first page of the project narrative and specifies the pages of the application which are to be restricted:

"The data contained in pages _____ of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the government's right to use or disclose data obtained without restriction from any source, including the applicant."

To protect such data, each line or paragraph on the pages containing such data must be specifically identified and marked with a legend similar to the following:

"The following contains proprietary information that (name of applicant) requests not be released to persons outside the Government, except for purposes of review and evaluation."

E. EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL.

In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

F. INTELLECTUAL PROPERTY DEVELOPED UNDER THIS PROGRAM.

Patent Rights. The government will have certain statutory rights in an invention that is conceived or first actually reduced to practice under a DOE award. 42 U.S.C. 5908 provides that title to such inventions vests in the United States, except where 35 U.S.C. 202 provides otherwise for nonprofit organizations or small business firms. However, the Secretary of Energy may waive all or any part of the rights of the United States subject to certain conditions. (See "Notice of Right to Request Patent Waiver" in paragraph G below.)

Rights in Technical Data. Normally, the government has unlimited rights in technical data created under a DOE agreement. Delivery or third party licensing of proprietary software or data developed solely at private expense will not normally be required except as specifically negotiated in a particular agreement to satisfy DOE's own needs or to insure the commercialization of technology developed under a DOE agreement.

G. NOTICE OF RIGHT TO REQUEST PATENT WAIVER.

Applicants may request a waiver of all or any part of the rights of the United States in inventions conceived or first actually reduced to practice in performance of an agreement as a result of this FOA, in advance of or within 30 days after the effective date of the award. Even if such advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver of the rights of the United States in identified inventions, i.e., individual inventions conceived or first actually reduced to practice in performance of the award. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784, http://www.gc.doe.gov/documents/patwaivclau.pdf.

Domestic small businesses and domestic nonprofit organizations will receive the patent rights clause at 37 CFR 401.14, i.e., the implementation of the Bayh-Dole Act. This clause permits domestic small business and domestic nonprofit organizations to retain title to subject inventions. Therefore, small businesses and nonprofit organizations do not need to request a waiver.

H. NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES

N/A

I. AVAILABILITY OF FUNDS.

Funds are not presently available for this award. The Government's obligation under this award is contingent upon the availability of appropriated funds from which payment for award purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the Contracting Officer for this award and until the awardee receives notice of such availability, to be confirmed in writing by the Contracting Officer.