

**Program Announcement
To DOE National Laboratories
LAB 07-05**

***Nuclear Physics Research
and Development
For the Advanced Fuel Cycles***

SUMMARY: The Office of Nuclear Physics (NP), Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications for basic Research and Development (R&D) projects relevant to development of advanced fuel cycles (AFC) for nuclear reactors. This research should help provide the nuclear data and knowledge, and related theory efforts required for advanced nuclear fuel cycles. Subject to appropriations, funds are anticipated to be available in the Low Energy and Theory/Nuclear Data programs within the Office of Nuclear Physics (NP) for this program.

DATES: Full proposals submitted in response to this Announcement must be submitted to the DOE Electronic Proposal Management Application (ePMA) system (<https://epma.doe.gov>) no later than 8:00 p.m., Eastern Time, January 10, 2007, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2007. It is important that the entire peer reviewable proposal be submitted to the ePMA system as a single PDF file attachment.

Please see the "Addresses" section below for further instructions on the methods of submission for the full proposal.

ADDRESSES: A complete formal FWP in a single Portable Document Format (PDF) file must be submitted through the DOE ePMA system (<https://epma.doe.gov>) as an attachment. To identify that the FWP is responding to this program announcement, please fill in the following fields in the "ePMA Create Proposal Admin Information" screen as shown:

Proposal Short Name:

Fiscal Year:

Proposal Reason:

Program Announcement Number: LAB 07-05 *

Program announcement Title: Nuclear Physics Research and Development for the Advanced Fuel Cycles, DOE Research Program Announcement *

Proposal Purpose:

Estimated Proposal Begin Date:

HQ Program Manager Organization:

* Please use the wording shown when filling in these fields to identify that the FWP is responding to this Program Announcement.

In order to expedite the review process, please submit a CD and one paper copy of the proposal and FWP using the following address by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand-carried.

Ms. Christine Izzo
U.S. Department of Energy
Office of Nuclear Physics, SC-26.2/GTN
19901 Germantown Road
Germantown, MD 20874-1290
ATTN: Program Announcement LAB 07-05

DOE National Laboratories should submit using ePMA as instructed above. Researchers from other Federal agencies and Non-DOE Federally Funded Research and Development Centers (FFRDCs) should follow the format at http://www.science.doe.gov/grants/fed_prop.html and submit the proposal as a CD and two paper copies using the above address, by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand-carried.

In the proposal package, include an extra copy of the one-page abstract.

FOR FURTHER INFORMATION CONTACT: Dr. Eugene Henry, Office of Nuclear Physics, SC-26/Germantown Building, Office of Science, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, D.C. 20585-1290; telephone: (301) 903- 6093; facsimile: (301) 903-3833; e-mail: <mailto:Gene.Henry@science.doe.gov> Communications related to the formal proposal should use "Program Announcement LAB 07-05 FORMAL" in the subject line.

The full text of Financial Assistance Funding Opportunity Announcement 07-05 is available via the Internet using the following web site address: <http://www.science.doe.gov/grants/>.

SUPPLEMENTARY INFORMATION: The *Nuclear Physics and Related Computational Science R&D for Advanced Fuel Cycles Workshop* was held in Bethesda, Maryland, on August 10-12, 2006, bringing together over 130 participants from universities, national laboratories, the private sector and U.S. government agencies to explore basic research opportunities in nuclear physics and advanced computational science R&D as applied to the Department of Energy's activities in advanced fuel cycles. The workshop was sponsored by the Offices of Nuclear Physics and Advanced Scientific Computing Research, of the Department of Energy (DOE) Office of Science. A principal aim of the workshop was to bring the applied and basic research communities with nuclear expertise together to identify the research opportunities that would be beneficial to the Department of Energy's Nuclear Energy program on advanced fuel cycles (AFC). Primary objectives for the workshop included:

- determine nuclear physics R&D needs of the AFC,
- determine how these 'needs' can be met by existing programs,
- determine what facilities are appropriate for this research, and
- identify computing resource needs for modeling and simulation.

The report of this Workshop outlines the nuclear physics R&D needed for the AFC and serves as a basis of awards for funding from this solicitation. A copy of the report may be obtained from the Office of Nuclear Physics, is available on the Office of Nuclear Physics web site at <http://www.science.doe.gov/np/> and is also available on the Workshop web site at <http://www-fp.mcs.anl.gov/nprcsafc/>. In addition to a summary of the meeting results, the reports of the four working groups, including identified research opportunities are in the report. Furthermore, all presentations given at the Workshop, both in plenary sessions and in parallel meetings of the four working groups can be found on the Workshop web site listed above. In addition, early documents are posted on the Workshop web site to introduce workshop participants to on-going activities in the AFC program.

Program Objective:

The material in the workshop report encompasses a large body of scientific opportunities in nuclear physics and related computational activity relevant to DOE's advanced fuel cycle efforts. As such, it can be used as a resource by the research community to plan R&D efforts in this area.

Some areas of potential R&D highlighted in the Workshop Report are:

- The use of advanced sensitivity analyses has helped clearly identify nuclear data needs due to both the characteristics of AFC reactors (high transuranic content and high fissile-to-fertile ratio in the cores) and the new requirement to consider not only the reactor but also the complete fuel cycle. A number of opportunities for basic research are identified.
- Several experimental and theoretical opportunities were identified that will enable challenging and exciting basic research as well as meeting the needs of the AFC program. High quality measurements will be driven by the new stringent AFC data requirements.
- There is a strong need to produce nuclear data for covariances to support reactor and fuel cycle design and to identify priorities for cross section measurements and improved modeling of nuclear reactions. Precision neutron cross sections (fission, capture and scattering) are needed for both major and minor actinides in several well-defined energy ranges. In addition, consolidation of data for decay properties, delayed neutrons, fission yields and photon production is required.
- To increase reliability of reactor simulation codes that have an impact on safety and economy, a wall-to-wall simulation of the reactor core will require advanced nuclear theory calculations of relevant cross sections. While some tools exist, these cross section calculations will require the development of both theoretical and computational methods to approach the required AFC accuracy.

Applications requesting support for basic research in these broad areas will be evaluated on the basis of the significance and merits of the proposed research to address the needs of advanced fuel cycles; the competence and promise of the researchers; the feasibility of the plans for carrying out the proposed program; the size and scope of the budget; and the resources and interest of the sponsoring institution. For each task the applications should address the goal of the effort; the method or approach to be taken; a cost-breakdown and schedule of the effort; the manpower to carry out the effort; the deliverable result of the work; and the anticipated benefit to advanced fuel cycles for nuclear reactors. Applications may be for up to three years, with support

beyond the first year dependent upon a report of satisfactory progress. Institutional contributions to the effort should be clearly indicated.

Collaboration

Applicants are encouraged to collaborate with researchers in other institutions, such as: universities, industry, non-profit organizations, federal laboratories and Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories, where appropriate, and to include cost sharing and/or consortia wherever feasible. All collaborators should be listed with the abstract or summary. Additional information on collaboration is available in the Application Guide for the Office of Science Financial Assistance Program that is available via the World Wide Web at: <http://www.science.doe.gov/grants/Colab.html>.

Program Funding

It is anticipated that up to \$2,400,000 will be available for multiple awards to be made in Fiscal Year 2007, in the areas described above, contingent on the availability of appropriated funds. It is anticipated that successful applicants will be notified within ninety days of the close of the solicitation. Proposals should be for one year, with a continuation of up to two additional years for those tasks requiring a multi-year effort. For continuation of multi-year effort, out-year support is contingent on the availability of funds, progress of the research and programmatic needs. The number of awards will be determined by the number of excellent proposals received and the total funds available for this program. DOE reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted.

Formal Proposals

The research project description must be fifteen pages or less, exclusive of attachments and must contain an abstract or summary of the proposed research. All collaborators should be listed with the abstract or summary. For additional guidance see Nuclear Physics Guidance at <http://www.science.doe.gov/np/grants/grants.html>. Attachments include curriculum vitae, a listing of all current and pending federal support and letters of intent when collaborations are part of the proposed research. Curriculum vitae should be limited to no more than two pages per individual.

The instructions and format described below should be followed. You must reference Program Announcement LAB 07-05 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 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 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 formal merit review (peer review) and will be evaluated against the following criteria which are listed in descending order of importance:

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

Additional criteria which will be considered: The application must address the significance and merit of the proposed research to address advanced fuel cycles for nuclear reactors.

The evaluation will include program policy factors such as the relevance of the proposed research to the terms of the announcement, the Department's programmatic needs, and quality of previous performance. External peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. 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. Proposals found to be scientifically meritorious and programmaticaly relevant will be selected in consultation with DOE selecting officials depending upon availability of funds in the DOE budget. Funding under this Notice is limited to supporting research activities based in the U.S., though subcontracts with limited funding for collaborators outside the U.S. may be allowed with appropriate justifications. The selected projects will be required to acknowledge support by DOE in all public communications of the research results.

2. Summary of Proposal Contents

- Field Work Proposal (FWP) Format (Reference DOE O 412.1A) (DOE ONLY)
- 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, and responsibilities of key project personnel)
- Literature Cited
- Biographical Sketch(es)
- Description of Facilities and Resources
- Other Support of Investigator(s)
- Appendix (optional)

2.1 Number of Copies to Submit

A complete formal FWP in a single Portable Document Format (PDF) file must be submitted through the DOE ePMA system (<https://epma.doe.gov>) as an attachment. To identify that the FWP is responding to this program announcement, please fill in the following fields in the "ePMA Create Proposal Admin Information" screen as shown:

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Fiscal Year:

Proposal Reason:

Program Announcement Number: LAB 07-05 *

Program announcement Title: Advanced Fuel Cycle Initiative, DOE Research Program Announcement *

Proposal Purpose:

Estimated Proposal Begin Date:

HQ Program Manager Organization:

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In order to expedite the review process, please submit a CD and one paper copy of the proposal using the following address by U.S. Postal Service Express Mail, any commercial mail delivery service, or hand-carried.

Ms. Christine Izzo
U.S. Department of Energy
Office of Nuclear Physics, SC-26.2/GTN
19901 Germantown Road
Germantown, MD 20874-1290
ATTN: Program Announcement LAB 07-05

3. Detailed Contents of the Proposal

Adherence to type size and line spacing requirements is necessary for several reasons. No researcher should have the advantage, or by using small type, of providing more text in their proposals. Small type may also make it difficult for reviewers to read the proposal. Proposals must have 1-inch margins at the top, bottom, and on each side. Type sizes 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 Field Work Proposal Format (Reference DOE O 412.1A) (DOE ONLY)

The Field Work Proposal (FWP) is to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office. Additional information is also requested to allow for scientific/technical merit review.

Laboratories may submit proposals directly to the SC Program office listed above. A copy should also be provided to the appropriate DOE operations office.

3.2 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
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 signing for laboratory*
Title of official
Fax number of official
Telephone of official
Electronic mail address of official
Requested funding for each year; total request
Use of human subjects in proposed project:
 If activities involving human subjects are not planned at any time during the proposed project period, state "No"; otherwise state "Yes", provide the IRB Approval date and Assurance of Compliance Number and include all necessary information with the proposal should human subjects be involved.
Use of vertebrate animals in proposed project:
 If activities involving vertebrate animals are not planned at any time during this project, state "No"; otherwise state "Yes" and provide the IACUC Approval date and Animal Welfare Assurance number from NIH and include all necessary information with the proposal.
Signature of PI, date of signature
Signature of official, date of signature*

*The signature certifies that personnel and facilities are available as stated in the proposal, if the project is funded.

3.3 Table of Contents

Provide the initial page number for each of the sections of the proposal. Number pages consecutively at the bottom of each page throughout the proposal. Start each major section at the top of a new page. Do not use unnumbered pages and do not use suffices, such as 5a, 5b.

3.4 Budget and Budget Explanation

A detailed budget is required for the entire project period and for each fiscal year. It is preferred that DOE's budget page, Form 4620.1 be used for providing budget information*. Modifications of categories are permissible to comply with institutional practices, for example with regard to overhead costs.

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 are given in section 4 of this guide.

* Form 4620.1 is available at web site: <http://www.science.doe.gov/grants/budgetform.pdf>

3.5 Abstract

Provide an abstract of less than 400 words. 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 project title, names of all the investigators and their institutions, and contact information for the principal investigator, including e-mail address.

3.6 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 **15 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.

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".

3.7 Literature Cited

Give full bibliographic entries for each publication cited in the narrative.

3.8 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.

To assist in the identification of potential conflicts of interest or bias in the selection of reviewers, the following information **must 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. 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. 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.

3.9 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).

3.10 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.

3.11 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

(DOE Form 4620.1 "Budget Page" may be used).

4.1 Salaries and Wages

List the names of the principal investigator and other key personnel and the estimated number of person-months for which DOE funding is requested. Proposers should list the number of postdoctoral associates and other professional positions included in the proposal and indicate the number of full-time-equivalent (FTE) person-months and rate of pay (hourly, monthly or annually). For graduate and undergraduate students and all other personnel categories such as secretarial, clerical, technical, etc., show the total number of people needed in each job title and total salaries needed. Salaries requested must be consistent with the institution's regular practices. The budget explanation should define concisely the role of each position in the overall project.

4.2 Equipment

DOE defines equipment as "an item of tangible personal property that has a useful life of more than two years and an acquisition cost of \$25,000 or more." Special purpose equipment means equipment which is used only for research, scientific or other technical activities. Items of needed equipment should be individually listed by description and estimated cost, including tax, and adequately justified. Allowable items ordinarily will be limited to scientific equipment that is not already available for the conduct of the work. General purpose office equipment normally will not be considered eligible for support.

4.3 Domestic Travel

The type and extent of travel and its relation to the research should be specified. Funds may be requested for attendance at meetings and conferences, other travel associated with the work and subsistence. In order 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. Consultant's travel costs also may be requested.

4.4 Foreign Travel

Foreign travel is any travel outside Canada and the United States and its territories and possessions. Foreign travel may be approved only if it is directly related to project objectives.

4.5 Other Direct Costs

The budget should itemize other anticipated direct costs not included under the headings above, including materials and supplies, publication costs, computer services, and consultant services (which are discussed below). Other examples are: aircraft rental, space rental at research establishments away from the institution, minor building alterations, service charges, and fabrication of equipment or systems not available off-the-shelf. Reference books and periodicals may be charged to the project only if they are specifically related to the research.

a. Materials and Supplies

The budget should indicate in general terms the type of required expendable materials and supplies with their estimated costs. The breakdown should be more detailed when the cost is substantial.

b. Publication Costs/Page Charges

The budget may request funds for the costs of preparing and publishing the results of research, including costs of reports, reprints page charges, or other journal costs (except costs for prior or early publication), and necessary illustrations.

c. Consultant Services

Anticipated consultant services should be justified and information furnished on each individual's expertise, primary organizational affiliation, daily compensation rate and number of days expected service. Consultant's travel costs should be listed separately under travel in the budget.

d. Computer Services

The cost of computer services, including computer-based retrieval of scientific and technical information, may be requested. A justification based on the established computer service rates should be included.

e. Subcontracts

Subcontracts should be listed so that they can be properly evaluated. There should be an anticipated cost and an explanation of that cost for each subcontract. The total amount of each subcontract should also appear as a budget item.

4.6 Indirect Costs

Explain the basis for each overhead and indirect cost. Include the current rates.