6450-01-P

DEPARTMENT OF ENERGY

Strengthening U. S. Academic Programs in Accelerator Science

AGENCY: Office of High Energy Physics, Department of Energy.

ACTION: Notice of Request for Information (RFI).

SUMMARY: The Office of High Energy Physics (HEP), as the Department of Energy's (DOE or Department) lead office for long-term accelerator research and development (R&D), invites interested parties to provide comments on proposed policies, practices and mechanisms which DOE-HEP may implement to foster robust academic R&D and workforce development in this vitally important high technology area.

DATES: Written comments and information are requested on or before **[INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Interested persons may submit comments only by e-mail. Comments must be addressed to AcademicAcceleratorScienceRFI@science.doe.gov, with the subject line

"Academic Accelerator Science RFI Comments".

FOR FURTHER INFORMATION CONTACT:

Dr. Bruce P. Strauss, (301)-903-3705, AcademicAcceleratorScienceRFI@science.doe.gov.

SUPPLEMENTARY INFORMATION:

The Challenge

Accelerators play a key role in the discovery sciences, including High Energy Physics, Nuclear Physics, and Basic Energy Sciences. Modern discovery science accelerators are high technology instruments of remarkable complexity, having advanced over eight orders of magnitude in energy since their invention. Aggressive reinvention of the underlying technology has driven improvements in this science, and has required sustained investment in accelerator science R&D that advances the methods, materials, and understanding of accelerator science.

Accelerator Science is an interdisciplinary field that encompasses the design and improvement of particle accelerators, the development of new methods of charged particle production and manipulation, and the development of unique supporting technologies needed for accelerators. Significant career specialization has evolved as the demand for ever greater performance has required reaching deep into mathematics, computation, materials science, plasma science, radio frequency technology, superconducting materials, laser engineering, and a variety of other disciplines. The accelerator science workforce must be capable of spanning both the breadth and depth of the subject matter needed to build discovery science accelerators. It must also possess the range of skills and proficiency levels needed to support operating accelerators for science, medicine, industry, security, defense, and energy & environmental applications.

National laboratories, academia, and industry each play vital, mutually reinforcing roles in the success of the accelerator-based discovery sciences, and in providing the scientific and technological advances necessary to sustain U. S. leadership in this area. With an estimated 30,000 particle accelerators operating worldwide, there is a significant—and growing—need[1] for a technically competent workforce that can design, install, operate, upgrade, and repair accelerators.

A High Energy Physics Advisory Panel subcommittee, in 2014, identified the present deficit in the accelerator science workforce as an area of special concern, both for its impact on the Office of Science mission, and for its broader consequences.[2,3] Approximately 10–12 accelerator science PhDs graduate each year in the U. S., nearly an order of magnitude less than Europe. This is traceable to the small number of U. S. universities that have accelerator faculty and offer instruction in accelerator science.

The Response

The Department, acting through the Office of High Energy Physics in the Office of Science, is considering funding practices and mechanisms which DOE-HEP could implement to help ensure continued world-class accelerator R&D and the training of a world-class accelerator workforce.

Request for information: The objective of this RFI is to gather information about the current state

[1] "Accelerators for America's Future", workshop report, http://science.energy.gov/~/media/hep/pdf/accelerator-rd-stewardship/Report.pdf , (2009).
[2] "OHEP Workforce Development", Report presented to HEPAP May 22, 2014, http://science.energy.gov/~/media/hep/hepap/pdf/May%202014/Patterson_HEPAP_DOEWorkforce_v1-1.pdf .
[3] "HEP Workforce Development Needs", report of the HEPAP subcommittee, June 30, 2014, http://science.energy.gov/~/media/hep/hepap/pdf/Reports/OHEP_Workforce_Letter_Report.pdf .

of academic practice and policy surrounding accelerator science (as defined above), and to elucidate potential mechanisms to strengthen academic programs in accelerator science at U. S. institutions of higher education. Please note that this is **not** a request for information about specific scientific research topics. Submissions arguing the merits of specific lines of scientific research will be disregarded as unresponsive.

The questions below are intended to assist in the formulation of comments, and should not be considered as a limitation on either the number or the issues that may be addressed in such comments. The Department will make all comments available to the general public.

The DOE Office of High Energy Physics is specifically interested in receiving comments pertaining to any of the following questions:

Increasing the Recognition of Accelerator Science in Academia

1. Does your institution regard accelerator science as an academic discipline? Why or why not?
2. If your institution offers graduate training in accelerator science:
    a. What is the core curriculum shared by all accelerator students, regardless of specialization? (e.g. What is the common coursework taken by all accelerator students?)
    b. How often do students change fields to study accelerator science? From which fields do these students typically come?
    c. Is your accelerator science program primarily located in the physics, applied

physics, or engineering department, or in a combination of two or more of those departments?

d. What incentives would increase the likelihood that your institution would hire additional accelerator science faculty?

e. Is there an on-campus particle accelerator that is dedicated to accelerator science R&D? If not, do you make use of accelerator test facilities at U.S. national laboratories?

f. How often do collaborations occur between accelerator science and other programs at the university?

g. Does your institution actively seek out corporate sponsorship for an accelerator science program? Do private companies actively recruit students from your accelerator science program?

3. If your institution no longer offers graduate training in accelerator science, why was the program terminated?
4. What funding sources for accelerator science are you aware of?

Integrating the Roles of the Universities and the U.S. National Laboratories

5. How can the national laboratory system be best utilized by the university accelerator science community?
6. What are the current barriers (e.g. technical, operational, and economic) that prevent closer collaboration between universities and the national laboratories?
7. Does your university accept accelerator course credits from other institutions?
8. Do accelerator science students at your institution routinely take courses and training

elsewhere?

9. What could be done to strengthen the participation of academia in the operation and improvement of existing national laboratory accelerators?
10. Considering disciplines, **other than** Accelerator Science, what mechanisms are in place at your university for collaboration with national laboratories? Could these mechanisms be extended to accelerator science?

Contemporary Models of University Accelerator Science

11. What examples exist of thriving academic accelerator science programs?
    a. Are there policies at your university specific to the accelerator science program that are essential to its success?
    b. Are there scholarships, endowed chairs, or other awards and positions that give special recognition to accelerator science?
    c. Are there barriers to having accelerator scientists serve as PI or Co-I on proposals?
    d. Is conversion from research faculty to full faculty in accelerator science possible? How many faculty members have attempted the transition, and how many have succeeded?
    e. Are there specific attributes of the institution's culture that contribute to the success of the accelerator science program?
    f. Are there joint appointments with a nearby national laboratory or a private company engaged in accelerator R&D? How many?
12. Are there successful examples of academic programs from other technologically-oriented **disciplines** that you believe are relevant to establishment or improvement of an accelerator

science program? What key attributes make the program successful? (See 11(a)-(f) above).

13. Are there successful examples of academic accelerator science programs from other **countries** that you believe are relevant to the U. S. system? What key attributes make the programs successful? (See 11(a)-(f) above).

Possible Mechanisms to Encourage Academic Accelerator Science

14. What specific, cost-effective actions could be taken to:
    a. Raise the academic status of accelerator science? Examples in this category might include: funding named accelerator science faculty positions or named scholarships.
    b. Improve the business case for accelerator science in a university setting? Examples in this category might include grants and practices designed to increase interactions with private industry.
    c. Encourage students to choose a career in accelerator science and technology? Examples in this category might include a grant for young faculty to conduct R&D in accelerator science, a tuition stipend for a co-terminal master's degree, or grants to develop instructional materials.
    d. Increase the enrollment in education opportunities at the baccalaureate and master's level?
    e. Increase the availability of hands-on training opportunities in accelerator technology?

Other Factors

15. Other than the actual award of funding, is there any specific funding agency behavior that

impacts positively or negatively on the success of an accelerator science program?

16. Are there other factors, not addressed by the questions above, which contribute to the strength or weakness of U.S. academic accelerator science?

This RFI is issued to gather information that may be used to help formulate DOE-HEP funding practices and grant mechanisms to strengthen academic accelerator science.

Issued in Washington, DC, on April 30, 2015.

Dr. James Siegrist,
Associate Director,
Office of High Energy Physics.

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