**6450-01-P**

**DEPARTMENT OF ENERGY**

# Proposed New Program in Stewardship of Accelerator Technologies for Energy and Environmental Applications

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

**ACTION:** Notice of request for information (RFI).

**SUMMARY:** The Office of High Energy Physics, as DOE's lead office for long-term accelerator R&D, invites interested parties to provide input on a possible new program to perform R&D leading to advances in particle accelerator technology used in energy and environmental applications.

**DATES**: Written comments and information are requested on or before [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***].

**ADDRESSES**: Interested persons may submit comments by email only. Comments must be sent to EnergyEnvironmentRFI@science.doe.gov with the subject line "Stewardship RFI Comments".

**FOR FURTHER INFORMATION CONTACT:**

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**SUPPLEMENTARY INFORMATION:**

**The Challenge**

With world energy consumption predicted to grow by 56% between 2010 and 2040[1], innovations that reduce pollutants from energy production, improve energy efficiency of industrial processes, and develop cost-effective techniques to clean up water and destroy environmental toxins will become increasingly important both to sustaining economic growth, and to protecting the environment.

Accelerator technologies have been demonstrated to have significant impact in each of these areas,[2,3,4,5] but have not reached a sufficient level of technical maturity and economy to be widely adopted.

**The Response**

The U. S. Department of Energy, acting through the Office of High Energy Physics in the Office of Science, has developed a program in Accelerator Stewardship to serve as a catalyst in transitioning accelerator technologies to applications beyond High Energy Physics.

The Stewardship Program will apply the scientific and technical resources of the DOE accelerator R&D program to facilitate developing accelerator technology innovations into

[1] International Energy Outlook 2013, http://www.eia.gov/forecasts/ieo/.

[2] R. Hamm, M. Hamm, *Industrial Accelerators and Their Applications*, (World Scientific, Singapore: 2012).

[3] *Environmental Applications of Ionizing Radiation*, W. Cooper, R. Curry, and K. O'Shea, Editors, (John Wiley & Sons, New York: 1998).

[4] "Accelerators for America's Future", http://science.energy.gov/~/media/hep/pdf/accelerator-rd-stewardship/Report.pdf (2009).

[5] Office of High Energy Physics Accelerator R&D Task Force Report, May 2012 http://science.energy.gov/~/media/hep/pdf/accelerator-rd-stewardship/Accelerator_Task_Force_Report.pdf .

practice.

Accelerator technology includes the accelerator structures, high power radio frequency and microwave sources and systems, high efficiency high-voltage pulsed-power systems, particle beam transport using magnetic components, and high power targets for producing secondary beams. Sophisticated superconducting magnets and accelerators now routinely produce magnetic and electromagnetic fields of unsurpassed strength, power, and quality. Accelerator technology also includes computer control and automation systems, supporting laser systems, safety systems, and diagnostics.

Accelerators produce high power particle beams of electrons and protons that have been used to generate a wide array of intense secondary beams, principally neutrons and photons. Spectral control of both primary and secondary beams has become sophisticated, allowing beams to be specifically tailored to meet demanding application requirements[6].

The Stewardship Program will pursue several technical "thrust areas", each of which will address an identified group of technically related challenges that, if solved, will result in high impact to society.

In the process, high technology will be transferred from the DOE accelerator R&D program into broader use, new public/private partnerships will be fostered, and high quality high technology jobs will be created.

[6] "Accelerators and Beams: Tools of Discovery and Innovation", APS-DPB brochure, http://www.aps.org/units/dpb/upload/accel_beams_2013.pdf

*Request for information:* The objective of this request for information is to gather information about opportunities for research and development of accelerator technologies to address national challenges in energy and the environment.

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. All comments will be made public.

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

**Application Areas with High Impact**

1. What are the most promising applications of accelerator technology to:
    a. Produce safe and clean energy?
    b. Lower the cost, increase the efficiency, or reduce the environmental impact of conventional energy production processes?
    c. Monitor and treat pollutants and/or contaminants in industrial processes?
    d. Monitor and treat pollutants produced in energy production?
    e. Increase the efficiency of industrial processes with accelerator- or RF/microwave-based processes?
    f. Treat contaminants in domestic water supplies and waste water streams?
    g. Treat contaminants in the environment at large (cleanup activities)?

h. Produce alternative fuel sources?

i. Address critical environmental or energy related issues not already mentioned?

2. How should Federal, State, or Local regulators consider technologies in determining regulatory compliance?
3. What metrics could be used to estimate the long-term impact of investments in new accelerator technologies?

**For each proposed application of accelerator technology:**

**Present State of the Technology**

4. What are the current technologies deployed for this application?
5. Does accelerator technology have the potential to revolutionize the application or make possible something that was previously thought impossible?
6. Does the US lead or lag foreign competition in this application area?
7. What are the current obstacles (technical, regulatory, operational, and economic) that prevent the technology from being adopted?
8. How is accelerator technology used in the application?
9. Does the performance of the accelerator (either technical, operational, or cost) limit the application?
10. What efforts (both public and private, both domestic and off-shore) currently exist to develop this application?
11. What are the perceived and actual market barriers for the final product?
12. What aspects of the overall technology solution are proprietary or likely to be developed as

proprietary, and what aspects are non-proprietary?

**Defining the Stewardship Need**

13. What is the present technology readiness level (TRL) of the accelerator technology for this application?
14. What resources (both skill and infrastructure) are needed to advance the technology to a prototype phase?
15. What mix of institutions (industrial, academic, lab) could best carry out the required R&D, and who should drive the R&D?
16. What collaboration models would be most effective for pursuing joint R&D?
17. Would partnering with a DOE National Laboratory be beneficial for the required R&D? Which laboratories could provide the greatest leverage?
18. Should cost sharing be considered for a grant or contract to pursue the R&D?
19. How should R&D efforts engage with other innovation and manufacturing initiatives, such as the NNMI[7]?
20. In what ways are the R&D needs not met by existing federal programs?
21. At what point in the manufacturing development cycle would external support no longer be needed?
22. What metrics should be used to assess the progress of a stewardship effort?

**Other Factors**

23. Are there other factors, not addressed by the questions above, that impact the successful adoption of accelerator technology for industrial purposes?

[7] See http://manufacturing.gov/ for an NNMI program description.

Depending on the response to this RFI, a subsequent workshop may be held to further explore and elaborate the opportunities.

Issued in Washington, DC, on April 8, 2014.

Dr. Michael Procario
Acting Associate Director
Office of High Energy Physics

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