

**A Vision for Nuclear Science Education and Outreach for the Next Long Range  
Plan  
January 2007**

**Executive Summary**

Education and outreach are central to the mission of both the DOE and the NSF. They are the fundamental underpinnings that support the mandate of the agencies to advance the broad interests of society (e.g. in academia, medicine, energy, national security, industry, and government) and to help ensure United States competitiveness in the physical sciences and technology.

Over the past decade, numerous studies have pointed to an increasingly urgent need to prepare more U.S. citizens for leadership roles in basic and applied physical sciences. The recent National Academy of Sciences report “*Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*”, is the latest and most visible report that paints a dire picture for the future of America if there is not a significant increase in the number of Americans entering careers in Science, Technology, Engineering and Mathematics (STEM) fields.

Similarly, education and outreach are key components of any vision of the future of the field of nuclear science. That the unquestioned importance of these efforts is recognized within this field can be seen by the many diverse activities in which members of our community are presently engaged. These programs are having a profound impact. They establish clear evidence that an individual’s efforts can make a difference. They also serve as models upon which strategies to enhance education and outreach in the nuclear science community can be based.

In December 2006 a workshop on the “Vision for Education and Outreach in Nuclear Science” was convened to examine a number of such models for successful education and outreach – both internal and external to the nuclear science community. The objective of the meeting and the subsequent discussions was to define goals and strategies for a community-wide effort in nuclear science education and outreach. Important criteria for the goals considered were that they should be actionable and achievable and that they should leverage existing programs and unique strengths of our community. Based on these discussions, two major recommendations emerged:

**Recommendation #1.** The field of nuclear science is facing a potential serious shortage of a trained workforce in pure and applied research, nuclear medicine, nuclear energy and national security. As but one example, *The Education and Training of Isotope Experts*, the 1999 report submitted to Congress by the AAAS, noted “Too few isotope experts are being prepared for functions of government, medicine, industry, technology and science.” In 2004, based on a comprehensive survey of the nuclear science workforce over the last decade, the Nuclear Science Advisory Committee recommended a significant increase in the number of new nuclear science PhDs during the next decade.

Increasing the number of PhD nuclear scientists, especially U.S. citizens, includes the need to increase participation from the full diversity of backgrounds. It also requires introducing students to nuclear science and its research before they start graduate school. Because these two points are very effectively addressed at the undergraduate level, the first recommendation focuses on undergraduate education and research:

***The nuclear science community should increase its involvement and visibility in undergraduate education and research, so as to increase the number of nuclear science PhDs, and the number of scientists, engineers and physics teachers exposed to nuclear science.***

**Recommendation #2.** An effective program of nuclear science outreach is also essential to ensure a broad, basic knowledge of nuclear science in U.S. society, enabling informed decisions by individuals and decision making bodies on a wide range of important topics, including nuclear medicine, energy policy, homeland security, national defense and the importance and value of nuclear science research. At present, the public, and even scientists in other disciplines, are often uninformed or misinformed about nuclear science and its benefits. In public discussions, any topic involving the word “nuclear” is likely to generate unreasoned reaction to the word itself, preventing informed discussion on important technical and societal issues that should be of primary interest.

Therefore, the second recommendation involves outreach to undergraduate non-physics majors, K-12 teachers and students, and the general public:

***The nuclear science community should develop and disseminate materials and hands-on activities that illustrate and demonstrate core nuclear science principles to a broad array of audiences, so as to enhance public understanding and appreciation of nuclear science and its value to society.***

It is important to recognize that these recommendations are by no means the only choices that could have been made, and that they constitute only a small subset of the many important ongoing activities that are currently underway. It is also crucial to recognize that the strength and future of the education enterprise in nuclear science in the United States requires funding support for both education opportunities that will inspire the next generation of nuclear scientists and the research and state-of-the-art facilities that drive that inspiration. One will not prosper without the other.

The workshop participants are convinced that a community-wide effort implementing these two recommendations will provide the greatest leverage in benefiting the entire spectrum of education and outreach needs in nuclear science, improving the vitality and diversity of the field, and contributing to U.S. competitiveness and societal needs.