

MEETING OCRWM'S MULTIPLE MISSIONS THROUGH INITIATIVES TO INCREASE SCIENTIFIC LITERACY

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ABSTRACT

Due to an overall decline in the number of students pursuing degrees in science, mathematics, and engineering disciplines, there are indications that the Department of Energy (DOE) will lack the sufficient scientific and technical personnel needed to perform its multiple missions in the future. Education activities and programs are currently underway within DOE in general and the Office of Civilian Radioactive Waste Management (OCRWM) in particular to increase scientific literacy and to recruit and develop scientists and engineers. While this paper offers only a summary report on Departmental and OCRWM education activities, it is hoped that it will provide the basis for continuing discussions on the importance of scientific literacy to meeting the Nation's interrelated problems of high-level waste disposal, energy independence, environmental protection, and technological competitiveness.

INTRODUCTION

OCRWM has the unique mission of finding a permanent solution to the Nation's high-level radioactive waste and spent fuel management problems. The fulfillment of OCRWM's mission is contingent partially on it accomplishing two objectives: (1) developing and maintaining the scientific and technical manpower resources needed to establish the integrated waste management system comprised of a monitored retrievable storage (MRS) facility, a nationwide transportation system, and a permanent geologic repository for high-level waste and spent fuel, and (2) increasing public understanding and confidence in OCRWM's important and multifaceted mission. Given the technical complexity of radioactive waste management issues, greater public understanding will depend, at least in part, on enhancing the public's general scientific literacy.

SCIENCE EDUCATION ACTIVITIES

Departmental Initiatives

Recent studies have shown that the number of college students majoring in science, mathematics and engineering disciplines is declining. Several factors have been identified as contributing to this unfavorable situation: (1) an overall decline in the scientific literacy of the Nation; (2) fewer college-age students, except for minority students; (3) a greater need for qualified science teachers at all educational levels, not just college; and (4) a failure to encourage minority and women students to become scientists and engineers.

Secretary of Energy James Watkins has stated that there is growing evidence that DOE will lack the sufficient scientific and technical personnel necessary to perform its multiple missions in the future (1). In response, Secretary Watkins has committed DOE to establishing and maintaining science education initiatives which are comprised of specific activities primarily designed to recruit and develop

scientists and engineers (2). Initiatives currently in place include:

1. Providing incentives and opportunities for under-represented minorities, including women, to pursue careers in science and technology;
2. Supporting opportunities for students and their teachers to improve their scientific and technical skills and knowledge; and
3. Utilizing the unique resources of the Department's national laboratories, primarily by providing hands-on research experience, to support and assist in the education of young people for careers in science, mathematics, and technology (3).

Six national laboratories are currently designated as Laboratory Science Education Centers. Each center is responsible for the planning and administration of a range of national, regional, and State and local science education programs. These centers, along with a number of other DOE facilities, conduct a range of pre-college and university science education programs that vary by laboratory. Their curricula is designed to enhance the basic scientific problem-solving skills of students.

OCRWM Initiatives

To effectively implement the Nuclear Waste Policy Act (NWPA), as amended, will require the involvement of significant numbers of trained scientists and engineers in determining the suitability of sites, constructing and operating a repository, and developing a safe and efficient transportation system. OCRWM is actively implementing programs to ensure that it continues to have the necessary human resources required to support its multifaceted technical and scientific activities well into the next century. The OCRWM fellowship program, for example, supports highly capable students in one or more of the following academic areas related to the management of spent fuel and high-level radioactive waste: earth sciences, engineering, materials science, transportation, chemistry, and radiation sciences.

The program is also designed to encourage universities to support and improve research activities and academic programs related to the management of spent fuel and high-level radioactive waste. Eighteen universities are currently participating in this program.

The development of scientific manpower, however, will not be sufficient to ensure the success of the waste management program. If the public continues to harbor significant fears concerning the transport, storage, and disposal of radioactive materials, it will continue to be very difficult to site either a geologic repository or an MRS.

Many public concerns stem from an assessment of the relative risks and benefits of siting a particular facility; however, others can be traced to scientific illiteracy and innumeracy. The NWPA states that "...State and public participation in the planning and development of repositories is essential in order to promote public confidence in the safety of disposal of such waste and spent fuel;..."(4) To promote greater public understanding and effective participation, the United States, as well as other nations, has come to realize that certain basic skills and knowledge levels must be present or developed for a citizenry to understand, identify, and address issues associated with radioactive waste management.

Increasing public understanding is a long-term process that will involve several generations. In this respect, this generation is not necessarily the generation that will select a repository site or build a facility or transport the waste. The next generation(s) may have this responsibility. To build an informed, science-literate citizenry, therefore, long-term education initiatives must be created and, in fact, are being developed and implemented.

OCRWM is supporting general science literacy in grades K through 12 through the development of specialized curricula within existing scientific programs. College-level curricula are being developed, tested, and evaluated. OCRWM is participating actively in In-Service Training programs for high school teachers and involving teachers and curricula developers in the review of materials. This curricula is designed to enhance scientific problem-solving skills and increase understanding of the high-level radioactive waste-management program and associated environmental issues.

OCRWM educational initiatives also include cooperative agreements with various civic, public, and international organizations to develop basic information about the program. In addition, OCRWM is attempting to expand public understanding through various outreach activities that encourage direct participation and the two-way flow of information.

CONCLUSION

OCRWM's programs will encourage bright young scientists and engineers to enter the high-level radioactive waste-management program as well as contribute to the public's ability to effectively assess the relative risks and benefits of waste management. However, these and other DOE programs are not adequate to ensure that sufficient scientific and technical personnel are available to meet the varied and evolving needs of this program. Moreover, DOE alone cannot significantly increase scientific literacy.

Ultimately, the success of the high-level radioactive waste management program, as well as the general scientific well-being of the Nation, will depend on forging innovative partnerships between the Federal Government, academia, industry, and professional associations. Only then will there be (1) sufficient resources available to ensure that adequate numbers of scientists, mathematicians, and engineers are produced, not only to staff radioactive waste management programs, but also to ensure that the United States retains its scientific and technical preeminence; and (2) a scientifically literate citizenry to ensure the protection of the environment through responsible, publicly acceptable waste management.

These partnerships could also make important contributions to developing general scientific literacy through the cooperative development and diffusion of curricula that is palatable to the general student population. This is a worthwhile goal with many ancillary benefits. Greater scientific literacy appears to be a necessary condition for building the public understanding necessary to move forward the Nation's radioactive waste disposal programs. This understanding will also enable our society to make environmentally-sound decisions regarding the mix of technologies necessary to meet the Nation's energy demands as we enter a period of increasing international uncertainty and challenge.

REFERENCES

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3. Department of Energy, Office of Energy Research, Division of University and Industry Programs, "Science Education Programs". 1989. p.1.
4. Nuclear Waste Policy Act of 1982, Sec. 111 (b)(6).