ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT EDUCATIONAL ACTIVITIES STATUS

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ABSTRACT

This paper provides an overview of the Department of Energy, DOE, education mission and how the education mission of Environmental Restoration and Waste Management, EM, implements these goals. The projected shortfall for EM's human resource needs mandates the education activities underway in the Office of Technology Development, OTD. Academic partnerships, national university interactions, and pre-college outreach programs are summarized.

INTRODUCTION

The White House's goals for national education state that sweeping, fundamental changes in our education system must be made. Educators must be given greater flexibility to devise challenging and inspiring strategies to serve the needs of a diverse body of students. This is especially important for students who are at risk of academic failure, and is not the responsibility of the educators alone. Communities, business and civic groups, and state, local and federal government each have a vital role. We must work to ensure that a significant number of students from all races, ethnic groups, and income levels are among our top performers.

The Department of Energy (DOE) supports these goals. Admiral Watkins, in his Notice regarding Support for Science, Mathematics and Engineering Education (SEN-23-90) established a DOE policy to utilize fully all of DOE's resources to assist in the critically important national effort to strengthen and improve mathematics and science education. This education is fundamental to the production of qualified mathematicians, scientists, engineers and technicians. DOE is uniquely qualified to address these needs because of its collection of scientific laboratories, facilities and experts in the cause of improving math and science literacy in the nation. All of DOE's organizational elements are charged to take appropriate steps to use their resources in a way that supports science and mathematics education at both the pre-college and university levels.

The Secretary's goals are that the Nation's youth have a strong technical foundation for building success in higher education, particularly in science and mathematics careers; that the Nation's teachers of science and mathematics in particular have current, in-depth training so that they can present concepts to capture the interest of students; and that special efforts be directed towards encouraging and supporting more women, minority, disabled and disadvantaged students in mathematics and science at all levels of the education system.

To accomplish these goals, as number of specific activities will be undertaken. All laboratory and research facilities are expected to make an institutional commitment to participate in science and mathematics education programs, including providing hands-on research experiences for teachers, students and faculty. All DOE facilities and offices are to provide technical assistance and support to science and mathematics education improvement through the loan of scientific equipment to pre-college schools involved in formal partnerships with DOE, and through the use of DOE scientists, engineers and other staff, including development of pre-college science and mathematics education activities tailored to local and regional needs, such as inner city or rural schools. The DOE community is asked to work within the local areas to improve science and mathematics education by encouraging volunteerism within each DOE community, and by providing opportunities for participation in laboratory research and related education programs to teachers, students and concerned groups and individuals. Cooperative programs, such as science alliances, should be developed to ensure sustained and long-term improvement in science and mathematics education, involving DOE and its laboratories with private sector, universities, professional associations, other Federal agencies or other relevant groups. Science and engineering professionals, including retirees, should be supported and encouraged to pursue second careers as science and mathematics teachers through alternative certification and a streamlined process for obtaining credentials. A special office within the Office of Energy Research (the Office of University and Science Education Programs) was established to coordinate the implementation of all DOE programs evolving from this policy.

In addition to supporting the new, broad national education goals, DOE has for many years supported an education mission of its own, in order to supply the nation with energy resources, technologies, and information needed for economic progress and national security. The Secretary of Energy has recognized that we must be able to staff the Department with highly qualified mathematicians, scientists, engineers and technicians, and to rely upon a scientifically and technologically informed citizenry to help chart a course for public energy policy.

The Office of Energy Research, OER, continues to have responsibility for the overall education mission, to ensure the continued energy production and related public policy matters. This responsibility is derived from the

Secretary's National Energy Strategy, SEN-23-90, the goals of the Berkeley Conference, and the aims of the Education and Human Resources Committee of the Federal Coordinating Council for Science, Engineering and Technology.

It is important to distinguish the unique role of EM in this educational enterprise from complementary activities already established within OER. While EM shares Departmental responsibility for increasing and enhancing the national literacy and resource base (number and skill mix) in mathematics, science, and technology; its education activities must be directed toward stimulating knowledge and capability in supporting the mission goals of EM.

While supporting the Secretary's broad goals for improvement of the national education system and participating with outreach programs, EM has specific needs to meet. In order to accomplish the environmental effort to which the Department has committed, EM will require certain type of scientists and engineers, ones whose skills and interests are oriented towards environmental management activities. Thus, its activities in support of the Secretary's goals will include elements of waste management and environmental restoration--information to interest and attract precollege students as well as post-secondary students.

EM will involve the nation's educational system to develop an educated and trained workforce of the numbers and skill mix needed to meet the 30-year goals of DOE sites. To accomplish this, we will contribute to the national mathematics, science, engineering and technology education reform in coordination with other DOE and other agencies programs, especially where EM topics can be used to interest and motivate students at all levels to participate and gain competence in math, science and technology. We must include in the educational programs those population segments that are currently underrepresented in math, science, technology and EM fields. We expect that, as we conduct educational activities, we will also increase general public interest and understanding of EM issues and technologies so they can be better informed participants in the national decision-making process.

ASSESSMENT OF SKILL SHORTAGES

The U.S. is experiencing a decline in numbers of scientists and technicians, and a declining interest in science and engineering on the part of students generally. Population demographics indicate that those who have traditionally comprised this sector of the workforce, white males, will become a minority of the entry workforce within the next ten years. These factors combined are expected to result in a serious shortfall of technical personnel unless successful intervention occurs.

The alarming concern of the shortage of skilled personnel is expected to directly affect the capability for DOE clean-up operations over the next thirty years. In order to have the necessary personnel available, innovative activities are designed to attract persons to science and engineering while recognizing the need to attract those populations which have been traditionally underrepresented; women, minorities and the educationally disadvantaged.

REDIRECTION OF FACILITIES MISSIONS

The DOE will also need to direct its attention to focus on its existing personnel capabilities for waste minimization or prevention and remediation. Thus, sites will require their workers to obtain different skills than those currently used. EM will need to support professional development opportunities for the existing workforce to become knowledgeable about minimization and prevention avoiding creating future EM problems. The existing workforce provides the resources to perform future EM activities with minimal incremental education to their existing science and engineering backgrounds. This will allow the orderly transition from production operations to accommodate the revised EM mission, e.g., Fernald.

Training Resources and Data Exchange, TRADE, under the Oak Ridge Associated Universities, supports EM by surveying needs and existing capabilities, directing attention to development issues and maintaining a network throughout DOE and its contractors to share information on emerging concerns. An EM special interest group of TRADE is developing two data bases--of regulatory terms and of facility-level information--for use in training DOE managers, contractor personnel and the public. We anticipate that additional continuing education and professional development programs will be developed.

HOW TO ACCOMPLISH THE MISSION

DOE has a long history of links with academia to provide the specialized knowledge needed to carry out its mission. EM is building on this history by working with the academic community to initiate an EM linkage. Through partnerships with several university consortia, EM will support programs to attract and retain students in pertinent disciplines, to initiate innovative research programs and support students in those programs, and to develop curricula to support one-year certificate programs, two- and four-year degrees as well as advanced degrees with specialities in EM.

THE NEW CHALLENGE

The new challenge for DOE is to accomplish minimization, management and cleanup of waste generated from DOE operations both past and future. The mandate to minimize wastes from existing and new facilities, to improve waste management at all sites and to provide environmental remediation at DOE facilities will require enormous human and fiscal resources.

The Environmental Restoration and Waste Management Five Year Plan (1991-96), issued in June 1990, affirms compliance with environmental laws and establishes and structures EM programs. It also provides programs to improve training of new scientists and engineers as well as continuing professional education for those already working in the field. These programs are designed to direct interest in science and engineering careers and to emphasize attracting women and minorities to EM fields.

As part of the overall EM Five Year Plan and in the November 1990 Research, Development, Demonstration, Testing and Evaluation (RDDT&E) Plan, EM is responsible for identifying DOE's human resource needs for waste operations and environmental restoration and developing innovative programs, including programs for mid-career training, to ensure the required human resources are available to meet the 30-year goal of compliance on an accelerated basis and cleanup of the current inventory of inactive sites.

The three major components of this education mission are 1) increasing and enhancing the flow of appropriately trained and educated people from the education pipeline (kindergarten through graduate school); 2) creating and maintaining an informed public through outreach and professional societies; and 3) training and retraining the current workforce. Given that by the year 2000, approximately two-thirds of the entering workforce will be women and minorities, all EM education initiatives place strong emphasis on these target populations.

PRELIMINARY ASSESSMENT

Our preliminary assessment of the clean-up requirements, indicates a need for significantly more personnel with environmental related skills at all post-secondary education levels. To accomplish the clean-up mission, the EM Five Year Plan proposes to meet EM needs with aggressive and broad-based education initiatives. These initiatives will include partnerships with academia, support for education of individuals, support for programs to establish and strengthen EM education programs, outreach to the historically educationally disadvantaged (including women and minorities), and enhancement of joint education activities with industry, public schools and post-secondary schools.

DOE is using input from both internal and external groups to provide a balanced perspective in developing innovative and creative education efforts, to build on the success and effectiveness of other programs (DOE, other Federal and private-sector) and to prevent duplication of resources and effort. Near term efforts are intended to ensure that DOE personnel are trained to efficiently and effectively operate its facilities in compliance with the nation's environmental laws and regulations. Long-term initiatives will affect the educational infrastructure from kindergarten through graduate school to ensure highly skilled technicians, engineers, scientists and regulators are available to meet DOE's goal of compliance and cleanup goal.

A primary criterion for EM education activities is to focus on programs that have both immediate and long-range effects on infrastructure; that is, programs that not only yield immediate results but will also be sustaining to ensure a steady supply of people to meet the demands of EM's goal. EM education activities are designed to address the root cause of problems of what we perceive to be a genuine human resource crisis. These problems are scientific illiteracy in the general population, declining interest in scientific and technical careers, and lack of participation of women and minorities in the science disciplines. These activities fall into the following categories, as explained below.

The Department has formed partnerships with academic institutions. Three of these partnerships are already in place and more are expected. We have established national university interactions by providing fellowships to graduate students in EM studies and scholarships for undergraduate students. There are also minority scholarships and fellowships in EM areas. We have established faculty awards for non-tenured faculty. Third, we are supporting pre-college outreach programs through the various Operations Offices, encouraging the development of new approaches to attract students to science careers and environmental management in particular.

Partnerships

Three partnerships have been established, one in New Mexico, one in South Carolina and one with Historically Black College and Universities and Minority Institutions. Each of these partnerships is unique and is comprised of a consortium of academic institutions linked with a DOE facility to educate the technicians, scientists and engineers and professionals in supporting disciplines which will be needed to accomplish the EM mission.

Two of the existing partnerships will be described in more detail in other papers later in this session. These are the South Carolina Universities Research and Educational Foundation (SCUREF), which is a consortium of universities including the University of South Carolina in Columbia; Clemson University; the University of South Carolina, Aiken; the Medical University of South Carolina; and South Carolina State College in cooperation with DOE's Savannah River Operations Office and its field sites, and the Waste Management and Education Research Center (WERC) in New Mexico, the New Mexico Institute of Mining Technology and the Navajo Community College in Shiprock, NM. The WERC also involves the active support and participation of the Department (Albuquerque Oper-

ations Office), Los Alamos National Laboratory and Sandia National Laboratory.

The third partnership is with Historically Black College and Universities/Minority Institutions (HBCU/MI) Hazardous Materials and Waste Management Consortium. The HBCU/MI Consortium is comprised of Alabama A&M University, Clark Atlanta University, Florida A&M University, Hampton University, North Carolina A&T State University, Northern Arizona University, Prairie View A&M University, Southern University at Baton Rouge, Texas A&I University, Tuskegee University, University of Texas at El Paso and Xavier University in Louisiana. Its focus is on pre-college, post-secondary and undergraduate educational components, and involves curriculum development, student and faculty development and other outreach activities.

National University Interactions

The national university interactions include fellowships, scholarships and faculty awards. Through programs operating at various DOE Operations Offices, we are supporting graduate fellows in research supporting the EM mission. Some of these are at the institutions participating in the partnerships and some are at other institutions. One such program is the Internship program in radioactive waste management at Vanderbilt University, where students intern under a Distinguished Scientist for environmental restoration related studies. Scholarships have been awarded to undergraduate students majoring in EM related disciplines at two- and four-year institutions; practicums at DOE facilities are required as part of these awards. The EM Minority Scholarship/Fellowship Program is designed to ensure DOE's access to a pool of talented minority scientists and engineers with bachelors and graduate degrees in disciplines supporting the EM mission, and to encourage talented students to pursue either associate or bachelors degrees in disciplines supporting the EM mission through careers as scientists, engineers and technicians.

The Young Faculty Award Program is structured to encourage and support education and research efforts on EM topics and to attract the most promising students toward research and professional mission-related careers, while strengthening academic and technical EM programs.

Outreach

Each Operations Office supports programs in educational outreach to attract pre-college students and teachers while emphasizing minorities and women and other traditionally underrepresented groups. Numerous variety of efforts have been initiated, mentoring programs, direct funding to school districts, science learning laboratories, "Family Math," development of science kits for classroom use, technical enhancement opportunities for teachers, students and curricula and bridge/articulation programs to encourage students into community college and to continue into undergraduate programs in EM related activities. There are projects which involve volunteers from DOE and contractor staff along with the local community. Most programs involve career counseling and opportunities for student exposure to laboratory and other research-related experiences.

The SWOOPE (Students Watching Over Our Planet Earth) program is intended to provide a model adaptable for national implementation. In this program, students record environmental data which is collected for a nationwide database.

SUMMARY

We have accomplished a tremendous amount in the past year. Most of these concepts which were laid out in the draft RDDT&E Five-Year Plan have been implemented. We will continue those projects and add additional innovative approaches to work towards a positive change in the educational system. We also have a commitment to full accountability in the conduct of these programs and a commitment to maximum progress in meeting the human resource needs to accomplish the EM goals.