**U.S. Department of Energy
Office of Environmental Restoration
and Waste Management
Office of Technology Development**

ENVIRONMENTAL EDUCATION AND DEVELOPMENT PROGRAM

**Office of Technology Integration and
Environmental Education and Development**

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MASTER

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EXECUTIVE SUMMARY

Introduction

The Office of Environmental Restoration and Waste Management (EM) initiated the Environmental Education and Development Division (EED) and its programs in late 1989 to focus on current and future workforce needs and to ensure that the Department of Energy (DOE) would have the proper skills mix and experience base to meet its clean-up mission. Since its inception, EED has done much to begin and implement the process of training and retraining the DOE workforce for the changing DOE mission. EED has also provided a solid baseline for environmental literacy among adults and children in the public and private sectors. By the end of 1993, EED and its programs under the Office of Technology Development (OTD) had directly influenced over 100,000 students and faculty from kindergarten through graduate levels. This document records the EED program's many activities, how it measured and evaluated its successes, and provides a snapshot of its many accomplishments. OTD acknowledges the assistance received from the many groups (Operations Offices, Headquarters personnel including supporting staff, and project Principal Investigators) and their dedication to the program's activities.

Overview

The EED Programs, established in FY 1990, are components in the effort to accomplish EM's goal of environmental compliance and cleanup of the 1989 inventory of inactive DOE sites and facilities by the year 2019. The programs were designed to stimulate the knowledge and workforce capability necessary to achieve EM goals while contributing to DOE's overall goal of increasing scientific and technical literacy and competency, thereby ensuring a steady supply of appropriately trained and educated human resources, including women and minorities, to meet EM's demands. To accomplish its goal, EED developed three strategic program elements that focused on training or retraining the current workforce, enhancing the quality of our educational system, and making the public environmentally literate.

Program Structure

The Division of Environmental Education and Development, one of three divisions comprising the Office of Technology Integration and Environmental Education and Development (TIEED), is responsible for the development, implementation, evaluation, assessment, and oversight of programmatic efforts to effectively fulfill EM environmental education, training, and literacy goals. EED has to blend environmental restoration and waste management concerns into U.S. educational curricula at all educational levels, assess the future magnitude of need for human resources, fulfill the more immediate needs by attracting more personnel outside DOE and its contractors, and develop curricula to support EM's need for people trained for such work. DOE personnel and contractors provides the technical management support for EED programs, while a Program Coordination Office (PCO) at the Albuquerque Field Office assists EED with planning, administration and oversight. To more effectively coordinate education activities, EED also interfaces with professional elements both internal and external to DOE.

Program Management

The EED management system 1) integrates all primary elements of the DOE management cycle, including planning, budgeting, funding and execution, and evaluation, 2) dovetails with overall EM and OTD management processes and schedules, and 3) supports the needs and responsibilities of EED's mission. The EED Division formulated its program through strategic issues retreats attended each year by Field Program Managers, PCO representatives, national lab personnel, and contractors. The retreats functioned to match expectations for current year activities with the identification of goals and the determination of outcomes for out-year activities. Although EED provides the programmatic direction and guidance for each approved project, the administration of each project (including the allocation of funds) was assigned to the field office that submitted the proposal,

resulting in a closer monitoring of individual projects.

To demonstrate its commitment to the defined goals, EED implements tracking and evaluation processes to improve programs and projects as they develop and to determine the effectiveness, quality, and the short and long term impacts of their products, including their positive and negative side-effects.

Program Elements

Academic Partnerships Program. Academic partnerships were aimed at increasing the number of scientists, engineers, and other professionals educated in relevant technical and non-technical disciplines to resolve the Nation's environmental restoration and waste management challenges and increasing the participation of minority and educationally disadvantaged students. EM funds Partnerships up to five years to infuse and institutionalize an environmental restoration and waste management focus into existing curricula and other environmentally focused activities, with the understanding that the partnerships become self-sufficient. Five comprehensive Academic Partnerships have been established with EM: Historically Black Colleges and Universities/Minority Institutions (HBCU/MI); South Carolina Universities Research and Education Foundation (SCUREF); Waste-management Education and Research Consortium (WERC); the Partnership for Environmental Technology Education (PETE); and a Cooperative Agreement with the University of Tennessee (UT).

ERWM Employment Program. The Environmental Restoration and Waste Management Employment Program (ERWM-EP) was established during FY 1992, as authorized by Congress through the National Defense Authorization Act for Fiscal Years 1992 and 1993 (PL 102-190), to provide EM with highly talented individuals appropriately trained in the management of hazardous, radioactive, and mixed wastes and in environmental restoration. The program supports highly talented students in graduate and undergraduate study related to the mission goals of EM and includes a 3-month work experience at a DOE facility. After completion of their academic study, the participants are required to work one year with EM for every year of educational support provided to them.

Community College Program. Community Colleges serve EM as a vital link in the educational chain in their ability to provide an inexpensive, local post-secondary education for women and minorities; act as a bridge from high schools to four-year institutions; retrain and upgrade the skills of current employees; and attract and train the next generation of technicians near DOE facilities where their skills are needed. This program supported selected community colleges in developing curricula relevant to EM's needs, established an information exchange database network, provided internship opportunities at DOE national labs, and initiated coursework articulation agreements with four-year institutions to provide the students with a bridge to a bachelor's degree. Hundreds of students benefitted from programs such as Summer and Transfer Achievement Readiness Program (STAR) and the Community College Network (C²NET).

Scholarships/Fellowships Program. To help reverse the serious downward trend in the numbers of American science and engineering graduates, EM provided financial awards to undergraduates, graduate students, and faculty to study at colleges and universities across the nation. From the program's inception, EM sought to increase the number of underrepresented students in pursuit of a science education through financial incentives. The program's financial "carrots" have been in the form of tuition scholarships and fellowships, stipends, faculty awards, and internships.

Outreach/Environmental Literacy Program. EED initiated the K-12 outreach program as part of a comprehensive effort to achieve a well-rounded public knowledge of environmental restoration and waste management. Infused into the program were activities that specifically targeted women, economically disadvantaged, and culturally diverse populations.

Outreach activities were directly related to meeting EM's environmental compliance and cleanup mission. To avoid reinventing the wheel, many existing outreach programs were modified to include environmental restoration and waste management components, while new initiatives also led to innovative and exciting projects in math and science education. These programs have enhanced the environmental awareness of the community, academia, and industry by providing hands-on informational programs and laboratory experiences for students, adults, and faculty and have provided teachers with the impetus

to create innovative and exciting teaching methods in the classroom.

Development and Assessments Program. The Department of Energy's commitment to bring its facilities into compliance with regulations and to restore the environment of sites under its control by the year 2019 is realized through the goal of workforce development and assessment programs to promote the development, retention, training, and retraining of the EM workforce.

In the development and assessment programs, EED addresses concerns regarding the availability of workers with appropriate technical skills and the prospect of retraining workers from other programs to meet EM's needs. Development initiatives provided information and follow-up workforce planning processes to identify the current needs of the EM workforce. Assessment programs focused on setting the foundation for the development of a capable EM workforce by identifying the skills needed and training necessary for an effective employee.

I. OVERVIEW

The Environmental Education and Development Program is a component in the effort to accomplish the Office of Environmental Restoration and Waste Management's (EM) goal of environmental compliance and cleanup of the 1989 inventory of inactive Department of Energy (DOE) sites and facilities by the year 2019. Education and Development programs were designed specifically to stimulate the knowledge and workforce capability necessary to achieve EM goals while contributing to DOE's overall goal of increasing scientific and technical literacy and competency. The primary implementation criterion for Education and Development activities involved a focus on programs and projects that had both immediate and long-range leveraging effects on infrastructure. This focus included programs that yielded short term results (one to five years), as well as long-term results, to ensure a steady supply of appropriately trained and educated human resources, including women and minorities, to meet EM's demands.

Mission

The mission of the Environmental Education and Development Division was to ensure that DOE's current workforce had the skills, knowledge, and training to carry out its environmental restoration and waste management mission and that an appropriately educated workforce would be available to conduct future EM activities.

The EM Workforce Pyramid

Goals

Short Term

- (1) Assess the EM current and near-term demand for, and the national supply of, people appropriately trained and educated to achieve DOE's goals of compliance on an accelerated basis and cleanup of the current inventory of sites by the year 2019;
- (2) Implement programs based on the initial assessment to create an adequate manpower supply, particularly the supply of underrepresented groups (women, minorities, educationally disadvantaged);
- (3) Reassess this manpower demand and supply annually as part of EM's Five-Year Plan process and tailor its programs accordingly;
- (4) Institutionalize programs as soon as possible;
- (5) Establish relationships with government, academia, and private industry to avoid duplication and gain their support for the institutionalization of the programs.

Intermediate Goals 5 - 10 Year Goal:

- (1) Establish an education and development infrastructure to supply EM with the appropriately trained and educated workforce it needed to bring facilities into compliance and to achieve Records of Decisions (RODs) for its inactive sites;
- (2) Stimulate the current workforce to concentrate their career transitions toward environmental fields;

Long-Term Goal 15 - 30 Year Goal:

- (1) Play a primary role in collaborating with the education and training communities to develop a scientific, technical, and educational infrastructure that not only achieved DOE's compliance and cleanup goals, but that could prevent most DOE environmental problems and routinely solve the rest.

Environmental Education and Development: Customer Base

Program History

The Department of Energy's support for environmental education and development stemmed from national need, public policy, and EM's program requirements. Federal agencies have organized support at all levels. For example, the Department of Energy (DOE) was an active member of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), formed to develop and to coordinate Federal budget strategies in improving education in science and mathematics. The Council called for partnerships with state and local governments, educators and parents, and business, industry, professional, and community-based organizations and associations.

Congress enacted several statutes as well. PL 101-510, the DOE Energy Science Education Enhancement Act of 1990, encouraged continued support of Departmental efforts to aid science, mathematics, and engineering education, especially through DOE's national laboratories. PL 101-619, the National Environmental Education Act of 1990, made it a firm U.S. policy to establish and to support a program of environmental education.

In concert with these national initiatives, the Secretary of Energy, through Secretary of Energy Notice (SEN) 23-90, established as policy that the Department "... shall use, to the extent practical and available, its resources to help strengthen science and mathematics education in the U.S." In SEN 21-90, the Secretary committed the Department to recruit, train, and develop the technical and managerial talent needed to run its complex operations.

During the first years of the Environmental Education and Development Program, management was deeply involved in defining the program's organization, direction, and implementation. Program processes, strategies, and initiatives were designed to meet the regulatory requirements cited above while also fulfilling EM's mission requirements. These requirements were first, to develop faster/better/safer/cheaper and regulatorily acceptable technologies to solve the problems associated with achieving rapid compliance and steady cleanup; and second, to produce enough trained and educated people to develop and to implement the needed environmental solutions over the next 30 years.

To accomplish its part of the EM mission, the Environmental Education and Development Program addressed three strategic elements:

- (1) Educate, train and retrain the **current workforce**.
- (2) Meet **future workforce** demands by increasing the flow and enhancing the quality of people coming out of the nation's education pipeline (kindergarten through graduate school).
- (3) Create and maintain an **environmentally literate public**.

Two elements were directly relevant to the education and development missions; while the third — environmental literacy — took on a public involvement perspective and was intended to be a DOE-wide activity.

Education and Development Strategy: Investment Now for the Future

The Environmental Education and Development program was considered an investment; one that allowed accelerated creation and application of technology through knowledge transferred by academic programs to all levels. It fostered improved community relations and, through field-based pre-college outreach programs to teachers and students, addressed the national priority given to mathematics and science education. The benefits of and opportunities for using academic and community connections for outreach and for expanding faculty/student interactions with DOE/EM programs dictated that creative mechanisms in these programs be explored and implemented.

Investment Opportunities

The Environmental Education and Development Program invested in six broad education and development opportunities:

1. Development and Assessments
2. Academic Partnerships
3. Environmental Restoration and Waste Management (ERWM) Employment Program
4. Community College Support
5. Scholarships and Fellowships
6. Pre-College Outreach and Public Environmental Literacy

Development and Assessments provided information and follow-up planning processes to identify current and/or evolving needs of the EM workforce. It also strove to identify the skills needed by the EM workers to perform current and future jobs, and the training necessary to provide those skills. Development and Assessment activities worked to engage educational communities and public/private organizations in joint efforts to authenticate EM workers' skills and establish baseline data on education, training, and professional development.

Academic Partnerships were designed to increase the number of scientists, engineers, and other professionals, especially technicians, educated in relevant technical and non-technical disciplines to resolve the nation's environmental restoration and waste management challenges. The intent of the program was to expand the support of infrastructure in science and engineering programs which supported EM programs, with particular attention to institutions having a significant percentage of the student population drawn from underrepresented groups.

The ERWM Employment Program was designed to support highly talented students interested in pursuing undergraduate and graduate study in academic areas related to environmental protection and restoration, and waste management. The program's goal was to provide EM with highly educated and appropriately trained individuals in the management of hazardous, radioactive, and mixed wastes, and environmental restoration. Selected graduates/undergraduates were expected to work with EM for one year for every year of educational support.

Community College support activities provided a low cost, easy access alternative for current workforce continuing education, training, and retraining. EM Community College projects: 1) provided site-specific training and the upgrading of environmental skills of the current workforce; 2) attracted and educated the next generation of workers, especially technicians, at the sites; 3) developed academic bridges from high schools to four-year institutions; and, 4) provided local, affordable post-secondary education for women and minorities re-entering the workforce and minorities.

Scholarships and Fellowships Program identified and supported candidates drawn from the nation's spectrum of demographic and cultural diversity to enter professions supporting the EM mission. The goal of this program was to increase the pool of individuals available to EM and its contractors for support in environmental management work.

Outreach/Environmental Literacy directed its efforts toward increasing public knowledge of environmental issues and providing all persons with an awareness of available opportunities to pursue environmental careers. Literacy activities were designed to promote environmental education and careers in a manner that would attract workers from all backgrounds to the EM sites as well as increase citizens' knowledge of the basic principles of radioactivity, risk and risk management, waste management, and other science and environmental issues.

II. PROGRAM STRUCTURE

EED Functions and Responsibilities

The Division of Environmental Education and Development (EED) is one of three divisions comprising the Office of Technology Integration and Environmental Education and Development (TIEED) within the Office of Technology Development (OTD). EED is responsible for the development, implementation, evaluation, assessment, and oversight of programmatic efforts to effectively fulfill EM environmental education, training, and literacy goals. EED functions included the following:

- (1) Establishing policy for EM education programs and perform program planning and development, management oversight, and program evaluation in accordance with enabling legislation and Departmental policy and regulations.
- (2) Defining problems associated with future human resource needs and manage the performance of detailed studies and the coordination of external reviews to determine future employment and skill mix requirements for EM and its contractors.
- (3) Managing programs and activities to fulfill immediate resource needs by developing skilled employees within the agency, re-educating employees working in other areas, and attracting skilled employees outside DOE and its contractors.
- (4) Managing pre-college outreach and environmental literacy programs, including the development and implementation of activities to interest students from kindergarten through high school in environmental science careers; and providing students, teachers, and the community access to and experiences with the DOE facilities.
- (5) Managing nation-wide academic activities that provide support for curriculum development, scholarships, fellowships, research traineeships, internships, and cooperative educational programs at community colleges, colleges, and universities.
- (6) Managing an academic consortia program directed toward environmental restoration and waste management through charters established for undergraduate and graduate curriculum development, intern programs, minority outreach programs, technology transfer activities, distinguished scientist and faculty programs, and graduate research in user facilities at national laboratories.
- (7) Coordinating education and development activities with other Departmental and governmental elements to ensure compatibility and avoid duplication.

Organization of Assistant Secretary for Environmental Restoration and Waste Management

Technical support to EED was provided by:

HQ Program Managers: Federal staff who managed the development of program elements for the EM education and training effort, including establishing program controls (budget, schedule, reporting), implementation strategies, monitoring, and evaluation;

HQ Technical Support: OTD contractors who conducted assigned tasks in support of the Division Director and HQ Program Managers, including liaison, integrated contractor staff supervision, and QA of all deliverables;

Field Technical Program Officers (TPOs): Federal staff who acted as the single point of contact for field management of OTD activities, including Technical Task Plan (TTP) and Program Tracking System (PTS) review, contract management, industry interface, and public relations;

Field Program Managers (PMs): Federal staff who coordinated and provided management oversight of EED funded field projects, including developing TTPs, daily monitoring of projects, reporting milestone and financial status in PTS, evaluating projects, and managing contractors in support of field projects;

Field Technical Program Managers (TPMs): Field federal staff, national lab scientists, or contractors who managed the technical aspects of a set of projects, including providing technical advice and counsel, monitoring, evaluation, and reporting;

Field Principal Investigators (PIs): Federal staff, national lab scientists, field office support contractors, or grantees who proposed and implemented projects that supported EM education and development goals, including managing project direction, preparing budget and technical proposals, documenting project evaluation, progress, and impact.

A Program Coordination Office (PCO) was established at the Albuquerque Field Office to assist EED with the planning, administration, and oversight of EM educational programs. The PCO worked to coordinate other field office education activities with EED, regarding procurement, planning, initiation, and evaluation. All support organizations were part of the EED network and implemented various aspects of the Environmental Education and Development Program.

Organizations Involved in EM Environmental Education Management and Coordination

Research and Development Groups

Four groups were convened under the auspices of the Waste Policy Institute (an independent, third party, not-for-profit organization affiliated with Virginia Polytechnic Institute and State University) to provide internal and external recommendations for the development of EM education and development programs. These groups are describe below:

- (1) **The Task Force on Education (TFE)**, comprised of people involved with DOE laboratories and academic programs, had a charter to study ways to enhance the overall effectiveness of EED activities.
- (2) **The Science and Engineering Education Research Group (SEER)** included members from academia, industry, and non-DOE Federal agencies involved in education. SEER reviewed the output of the TFE specifically, EM's education activities generally, and provided feedback on ways to integrate these activities with those of other agencies and institutions.
- (3) **The Manpower Research Group (MRG)** involved the National Research Council's Office of Scientific and Engineering Personnel, the Commission on Professionals in Science and Technology, the Bureau of Labor Statistics, the Hazardous Waste Action Coalition, the EPA Office of Human Resource Management, and other internal and external participants. MRG was charged with making recommendations for strategies and approaches for processes to quantify EM human resources and to determine trends for both manpower and training needs.
- (4) **The Minority Strategy Group** was sponsored by the TIEED Office Director and involved 9 individuals (HQ and Field federal staff and contractors) who embodied demographic and cultural diversity. The Minority Strategy Group was tasked to build an extension to the existing Education Strategy Plan to incorporate women and minorities into the Environmental Restoration and Waste Management workforce. The Group's intent was to design a comprehensive set of programs to reach the traditionally underrepresented sectors and to successfully bring them into the DOE complex and culture.

Departmental Interfaces

EED interfaces on program and functional matters with various DOE elements, including the following:

- (1) **Other EM Elements** — Since the Office of Environmental Restoration (EM-30), the Office of Waste Management (EM-40), and the Office of Technology Development (EM-50) are EED's principal customers, EED worked to involve these HQ elements in all workforce development decisions affecting their ability to carry out their respective missions. EED also worked with the Office of Quality Assurance and Quality Control (EM-20) on matters affecting QA/QC training and efforts to effectively measure the results of environmental education and development programs. The Division interfaced with the Office of Planning and Resource Management (EM-10) to coordinate ERWM training and to implement the ERWM Employment Program.
- (2) **Other DOE Elements** — EED coordinated and cooperated with all appropriate DOE HQ elements that had oversight responsibilities or assigned functions that affected or were affected by EED's mission and program responsibilities. These elements included: the Office of the Secretary for Defense Programs; the Office of the Assistant Secretary for Nuclear Energy; the Office of the Assistant Secretary for Environment, Safety, and Health; the Office of Energy Research; the Office of Civilian Radioactive Waste Management; and the Office of Minority Economic Impact.
- (3) **National Laboratories and Other Research Facilities** — Wherever possible, EED built upon the internal knowledge and experience base at the DOE labs to provide accurate environmental science information and to make assistance and resources available to enhance science, engineering, and mathematics programs at all educational levels.

External Interfaces

Because many other governmental, academic, and industrial entities were involved both in environmental cleanup activities and environmental education and training, EED established a wide variety of relationships with many non-DOE organizations, including the following:

- (1) **Other Federal Departments and Agencies** — The Departments of Defense, Education, Interior, Labor, and Transportation; the Environmental Protection Agency; the Nuclear Regulatory Commission; the National Aeronautics and Space Administration; the Bureau of Indian Affairs; the National Science Foundation; the National Institute of Environmental Health Sciences; and the National Academy of Sciences.
- (2) **Various States and Native American Tribes** — State, local, and Tribal governments, State and Tribal education agencies, and other community based organizations affected by EM missions.
- (3) **Academic Organizations** — Various public and private elementary, junior and senior high schools, community colleges, colleges, universities, academic consortia, and academic associations.
- (4) **Industrial Organizations** — Various nuclear and environmental firms and industrial/trade organizations.
- (5) **Professional Societies** — Various nuclear, environmental, engineering, educational, and professional societies and associations.

EED Internal: Customer Base

EED External: Customer Base

III. PROGRAM MANAGEMENT

The EED management system features three characteristics. First, it integrates all primary elements of the DOE management cycle: planning, budgeting, funding and execution, and evaluation. Second, it dovetails with overall EM and OTD management processes and schedules. Third, and perhaps most importantly, the EED management system supports the needs and responsibilities of EED's mission.

Program Formulation: Planning

EED convened strategic issues retreats each year to establish an understanding of the expectations for current year programs, to identify goals, and to determine outcomes for outyear activities. The participants varied, but usually included the principal stakeholders: HQ and Field program managers, PCO representatives, national lab personnel, and contractors. Resulting strategic information was documented for EED's input to the annual EM Strategic Plan and the OTD Program Plan. The OTD Program Plan estimated outyear needs and fed the EM Five-Year Plan. The current year EM Strategic Plan set upcoming fiscal year program needs for OTD and provided a call for proposals in support of OTD activities, including those of EED. Once the initial proposals were reviewed, budgets were identified, and guidance for the preparation of full Technical Tasks Plans (TTPs) was developed and published.

Program Execution: Project Initiation

Specific activities/projects for implementing the strategic investment components of the Environmental Education and Development Program can be initiated in several ways. Projects are proposed: (1) by a Field Office in a TTP; (2) in response to a specific invitation from EED; or (3) independently by an outside organization. The three types of proposals are described below:

- (1) **TTPs:** TTPs from the Field Offices are called for, submitted, and reviewed annually for new activities or for continuation of existing activities. TTPs described activities, milestones, and deliverables in detail; identified the responsible person(s) and the funding requested; and documented how the funds would be used throughout the projected life of the activity.
- (2) **Solicited Proposals:** Activities are generated through a solicitation mechanism that invited persons and organizations to address specified DOE/EM needs. There are several ways to solicit proposals. A Request for Proposal (RFP), a Program Research and Development Announcement, or a Solicitation for Cooperative Agreement could be issued; a Notice of Program Interest (NOPI) could be published in the Federal Register or Commerce Business Daily; or an existing procurement (contract or cooperative agreement) might be amended to obtain additional services. Proposals responding to an invitation are, according to established DOE merit review procedures, evaluated by the selecting office. Funding is awarded to the organization(s) deemed most appropriate for meeting the specified need. Solicited proposals are usually prepared in response to a Field Office RFP.
- (3) **Unsolicited Proposals:** Individuals or organizations could submit (or another DOE program office might refer) a proposal either to EM HQ or to the Field Office, describing an activity that the proposer believed to be useful to the Environmental Education and Development Program. These unsolicited proposals were screened for (a) relevancy to an EED need, (b) non-duplication of existing work, and (c) sufficiency of detailed activity and funding information to permit evaluation. Proposals that passed this initial screening went into merit review. If an unsolicited proposal is accepted, the project is assigned to a Field Office TPO, who prepared a TTP and submitted it to EM HQ in the prescribed fashion.

Upon review and authorization by EED of the proposed TTP, projects are initiated by the Field Offices' TPOs. Any proposed effort has to fit within the scope of the EED program and has to adhere to the guidance set forth by the HQ program manager.

Project Administration

Once EED authorizes a proposed activity/project for implementation, funding is then provided under contract or under the terms of a grant or cooperative agreement, as appropriate. While EED continued to provide programmatic direction and guidance, administration of each approved activity/project, including the allocation and commitment of funds, is assigned to the DOE Field Office that submitted the authorized proposal or TTP. This decentralized project administration allowed closer monitoring of individual projects than could be possible were they administered by EM HQ. To the maximum extent practicable, the Field Office managing the project was responsible for any procurement activities associated with the TTP for the project.

Program Controls and Tracking

EED has demonstrated accountability and measured progress toward its defined goals by following a six-step process designed specifically for program control.

- (1) **Establish Program Elements:** To fulfill its strategic program requirements, EED established six program elements, plus goals/objectives/functions, which worked in concert with EM policy and mission requirements. These program elements included: the Development and Assessments Program, the Academic Partnership Program, the ERWM Employment Program, the Community College Program, the Scholarships/Fellowships Program, and the Outreach/Environmental Literacy Program (Each element is described later in detail).
- (2) **Establish Baseline for Measurement:** EED established baseline information on all of its education and development activities. This baseline information provided a "snapshot" of the current activities of EM HQ and the Field Offices. The baseline information was presented in the form of an inventory of projects, fact sheets, and a project directory that was updated annually.
- (3) **Establish Criteria for Success:** Crucial indicators of success for each program element were determined, disseminated, and checked regularly to monitor and control program health. Milestones for each project (chosen according to criteria agreed upon by EED and the Field Offices) were the measurable near-term steps that were tracked to determine progress toward program element goals.
- (4) **Project Tracking and Reporting:** Project tracking and reporting took place at the individual Field Offices through use of the Progress Tracking System (PTS). Information provided in PTS provided a consolidated project report which included accomplishments, successes, problems and issues, and recommendations for adjustment. Annual project reports were prepared by the principal investigators in compliance with field office procurement requirements. Annual project reports described project milestones and accomplishments for that fiscal year. Headquarters consolidated the information in an Annual Program Report.
- (5) **Program and Project Evaluation:** Program/project progress and success were determined by comparing success criteria with regularly updated baseline information and by conducting both formative and preliminary summative evaluations. Both technical and cost performances were considered.
- (6) **Program Reviews:** EED held program reviews, working sessions, and site visits to provide EM HQ and the Field Offices with an opportunity to fully interact, exchange information, make contacts, and to understand the directions of EM education programs within the framework of EM's mission and needs. Reviews allowed HQ program managers to examine project accomplishments, milestones, budget information, performance data, planned activities, and issues for further management action.

Evaluation

The DOE Idaho Field Office was assigned the responsibility for the coordination of EED program evaluation activities. Idaho's charter was to develop an overall comprehensive evaluation strategy draft to be fully implemented in FY 1994. A major consideration in the development of the strategy was to build upon current evaluation efforts and to avoid unnecessary duplication by using proven methods to improve both formative and summative evaluation.

The evaluation process 1) identified the objectives, strategies, and standards according to best research practice to successfully accomplish stated program goals; 2) designed a formative evaluation process for program development according to stated goals and a summative evaluation process to document the impact of the program and projects; 3) implemented these evaluation processes on specific projects and program elements in the Environmental Education and Development Program; and, 4) provided documentation of outcomes of the EED evaluation efforts.

Project Evaluation. The depth and scope of the project level activities depended on the individual project and its funding level. Project level formative evaluation activities were the responsibility of project personnel. These evaluation activities were conducted by in-house personnel, local external evaluation consultants, and any other available source. Technical assistance was available for projects conducting their own evaluations. Typical support included technical advice on evaluation instruments (or assistance with their design and development), a review of project evaluation plans, and potential evaluation questions.

Program Evaluation. Program evaluation activities were conducted by teams of experts and were coordinated by EM HQ. Program evaluation is the systematic collection of information about the activities, characteristics, and outcomes of programs for use by program managers to reduce uncertainties, improve effectiveness, and make decisions about what these programs are doing and affecting. Comprehensive program evaluation included program monitoring, technical assistance, formative evaluation during program development, and summative evaluation to assess intermediate and long-term effects.

Monitoring

All EM projects are tracked with respect to documentation, budgets, and progress toward milestones. The Progress Tracking System (PTS) was an important formal reporting system in which all project managers were required to submit both fiscal and activity milestone information. The monitoring activity is the responsibility of the Program Coordination Office (PCO). This monitoring activity focused not only on universal information, but on the collection of performance data as well.

Technical Assistance

Technical Assistance is provided by external program evaluation consultants as specific needs are identified. Special assistance was provided on technical issues likely to be problematic across all EED program types. Some categories requiring special assistance were: implementation of evaluation plans, instrument development, question development, target population issues, and internal evaluation. Collaboration between Labs having similar evaluation goals was encouraged to help provide EED with comparable data across projects. Site visits were made for evaluation of project level needs and priorities.

Formative Evaluation

The purpose of formative evaluation was to improve EED program/projects which were still developing. Formative evaluation fed information to program/project staff, who made changes as needed. The evaluation strategy provided for a good balance between program operation (formative evaluation activities) and program effectiveness (summative evaluation activities). The strategy made provisions to enhance the internal, formative evaluation activities. Technical assistance and collaboration were used to strengthen the quality and amount of formative evaluation information collected.

Summative Evaluation

Summative evaluation takes an independent look at a program/project and asks whether it is any good; what is the quality of the products, the effectiveness of the interventions, the short term outcome and long term impact produced, positive and negative side effects, transportability and utility in other settings, and critical competitors (i.e., alternatives that achieve the same ends only better, cheaper, or with fewer negative side effects). Good formative evaluation also addresses many of these same questions; in some instances, the best formative evaluation is an anticipatory summative evaluation. Unlike questions addressed in formative evaluation that allow for improvement of the program, the objective of the questions in summative evaluation is to render decisions about continuation, termination and dissemination. Summative evaluations were conducted by external evaluators according to an identified need.

Accomplishments

Peer Panel Reviews

During its history, EED conducted several peer panel reviews on educational activities. The purpose of the peer panel review activity was to provide a systematic assessment of program coverage and delivery and to provide rapid and continuous feedback about EED projects. The objectives of the peer panel review process were:

- (1) To provide adequate program monitoring to determine the extent that EED programs were being implemented as intended;
- (2) To determine the extent in which a given program was reaching the appropriate target population;
- (3) To estimate the effectiveness and benefits of these programs;
- (4) To provide a cost-effective approach that would provide EM HQ with important feedback about their programs from experts having no connection to these programs;
- (5) To obtain immediate recommendations on how the various programs could be improved; and
- (6) To provide the necessary follow-up on the panel's recommendations and take the appropriate steps to improve the programs and the overall evaluation activities.

The recommendations provided by the panel were used by program managers and Headquarters staff to improve their EED

MONITORING	TECHNICAL ASSISTANCE	FORMATIVE EVALUATION	SUMMATIVE EVALUATION
Program Tracking System (PTS)	Consultive Support (TEST, PCO), other recognized authorities in Program Evaluation	Internal Reviews, Developmental Trials	Comparative Field Studies
Program Coordination Office (PCO) Weekly Highlights	Training Sessions nad Workshops	Comparative Studies, Interview and Observation Studies	Longitudinal Impact Studies
Annual Program Reviews	Development/Acquisition and Dissemination of Evaluation Materials, Guides, and Tools	Documentation Analysis, Surveys	Independent Expert Reviews

programs, to increase overall coordination of programs, and to strengthen the overall evaluation function. Although EED did not accept all panel recommendations, they were required to respond in a memo of record to all recommendations and issues that were identified by the panel.

Pre-College (K-12 Outreach) Programs. In May 1992, a three-member panel reviewed selected Pre-College K-12 Outreach programs. The purpose of the review was to obtain general observations and recommendations concerning project quality, focus, cost, and evaluation for use in project improvement and planning. The panel categorized the projects as teacher enhancement projects, student enhancement projects, and minority projects.

In summary, the panel was impressed with the overall commitment and quality of the educational projects. Their recommendations were aimed at improving the design and implementation of the projects, the effectiveness of DOE coordination of the projects, and evidence of project impact.

Academic Partnership Programs. In June 1992, a review of the three academic partnership programs (SCUREF, HBCU/MI, and WERC) by a three-member panel was organized and conducted by the PCO of the Albuquerque Field Office. None of the reviewers had direct connections with either DOE or the universities and colleges in the DOE partnerships.

The programs within the Academic Partnerships were categorized by the populations reached and the types of activities conducted. The population-based programs were categorized as pipeline, current workforce, and environmental literacy. The activity type-based programs were categorized as: 1) faculty development, post-secondary education and training; 2) outreach; 3) recruitment/retention; and, 4) technology transfer. Since the Partnerships develop their own priorities for the categories, the review panel based its evaluation of the programs on the quality of the activities in each area.

The panel concluded that DOE's efforts to develop human resources and a knowledge base for ERWM activities were laudable and that such efforts should be continued and expanded. They praised DOE's efforts to enhance minority and underrepresented participation in the ERWM field and recommended that the efforts be expanded through the use of models developed at other Federal agencies, such as NIH, NSF, and NASA. The panel also concluded that DOE's educational programs could provide models to other Federal agencies to (1) promote post-secondary education in areas of defined national need and (2) enhance participation by minority and underrepresented groups by documenting and transferring their experiences in these programs.

Ideal Process of Program Evaluation

Students Watching Over Our Planet Earth (SWOOPE). A peer review of the Los Alamos National Lab SWOOPE project, (environmental science education for K-12), was conducted in October, 1992 at Sandia National Laboratories in Albuquerque, NM by a panel of four experts in curriculum development, elementary and secondary science/math education, minority outreach, and program evaluation. The panel conducted a management review of the curriculum development process and the materials produced to determine the quality of the instructional products and their maturity for national dissemination. The review also assessed the preliminary impact of the SWOOPE project as a precursor to application for national dissemination. The panel performed the monitoring review to advise EED on possible next steps for the project. The findings of the review panel were divided into five major sections: Materials, Cultural Diversity, Evaluation, Cost, and Dissemination.

As a result of the review and its findings, it was determined that the SWOOPE project had many more improvements to be made and greater maturity to be attained before the program could attempt national distribution. Technical instructional items still remained to be completed before the curriculum was complete. And, several issues related to SWOOPE's management and its proposed plan for separation from the lab needed further development and delineation before EM could continue its support of the program.

As a side note, it was discovered during the review process that having one national lab evaluate or even participate in the development of a review of another lab, may not produce the most **objective** assessment. Because of the very competitive nature of the labs, especially in New Mexico, accusations were made that the review was biased, and therefore, invalid. EED took all the Sandia findings and the Los Alamos responses to the review findings into consideration before making a fair determination on the future of the project. As a lesson learned, EED decided that future **program evaluations** would be conducted by outside resources having little or no affiliation with DOE and the national labs.

EM Scholarships and Fellowships. A panel of education experts and evaluators conducted an evaluation of the Scholarships/Fellowships Program at its annual program review in May, 1993 in Washington D.C. This review was more for informational purposes across projects, with evaluation being of secondary importance. The objectives of the evaluation panel were to: (1) review and comment on the goals of the individual projects as they relate to EM's mission and goals; (2) provide critical feedback to EED about the current status of the Scholarships/Fellowships projects; (3) make a pre-assessment or evaluability assessment of the type of evaluation activities that are now in place and how the evaluation process can be improved; and (4) provide perceptions on the program strengths, as well as recommendations for improving the program. Therefore, part of the review was to assess the probable impact of the Scholarships/Fellowships projects as they were presented at the review in terms of the likely effect they would have on the number of well-trained workers in the field, and in particular, on increasing the number of newly trained workers from underrepresented groups.

Findings of the review provided information on the level of student/faculty support each project made compared to the total amount of dollars funded to the project. The review also provided statistics on the amount of involvement from underrepresented groups within each project and in the program as a whole. But most importantly, it was discovered that when the amount of funding for scholarship/fellowship activity in the Academic Partnerships was folded in with the funding of the Scholarship/Fellowship Program, the total amount of funding for scholarship/fellowships support was **three** times that which EED had believed they were providing. After further analysis by federal staff, it was determined that the activities in the Academic Partnerships and the Scholarships/Fellowships Program were almost synonymous. Therefore, portions, and perhaps most, of the Scholarships/Fellowships Program could be phased out and terminated to allow the transfer of funds to other Education and Development activities.

IV. PROGRAM ELEMENTS

- A. Academic Partnerships Program**
- B. ERWM Employment Program**
- C. Community College Program**
- D. Scholarships/Fellowships Program**
- E. Outreach/Environmental Literacy Program**

IV-A. ACADEMIC PARTNERSHIP PROGRAM

F. Development and Assessments Program

Academic partnerships were aimed at increasing the number of scientists, engineers, and other professionals educated in relevant technical and non-technical disciplines to resolve the Nation's environmental restoration and waste management challenges. The objectives of this program were to infuse an environmental restoration and waste management focus into existing curricula and to increase the participation of minority and educationally disadvantaged students. Academic Partnerships represented a cross-cutting mechanism for linking and focusing the commitment and resources of government, private industry, and the professional and academic communities in a common effort to efficiently accomplish the collaborative initiative of a massive national cleanup problem. EM funded Partnerships up to five years to institutionalize the curricula and other environmentally focused activities, with the understanding that the partnership becomes self-sufficient. Five comprehensive Academic Partnerships have been established with EM: Historically Black Colleges and Universities/Minority Institution; South Carolina Universities Research and Education Foundation; Waste-management Education and Research Consortium; the Partnership for Environmental Technology Education; and a Cooperative Agreement with the University of Tennessee. The established consortia share some commonality in curriculum development, faculty and teacher development/recruitment, and student recruitment and career counseling.

Activities

The Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) Technology and Waste Management Consortium

Formed in 1990, this consortium is the historic union of seventeen minority-serving graduate institutions. The HBCU/MI Consortium was formed to respond to national research and development, policy formulation, and minority needs in hazardous materials management, environmental restoration, environmental health, and waste management. The program includes curriculum development and enhancement, student scholarship and internship opportunities, faculty development, research opportunities, and outreach activities aimed at increasing environmental literacy. The seventeen members include Alabama A&M University, Clark Atlanta University, Florida A&M University, Florida International University, North Carolina A&M

Academic Partnerships: Customer Base

University, Hampton University, Howard University, Jackson State University, New Mexico Highlands University, North Carolina A&T State University, Northern Arizona University, Prairie View A&M University, Southern University (Baton Rouge), Texas A&I University, Texas Southern University, Tuskegee University, University of Texas at El Paso, and Xavier University.

South Carolina Universities Research and Educational Foundation (SCUREF)

Clemson University, the Medical University of South Carolina, South Carolina State University, and the University of South Carolina at Columbia and Aiken combined forces in 1990 for the development of education and training initiatives, for research and development in environmental restoration and waste management, and for technology transfer with a focus towards the needs at the Savannah River Site. Working with the State's 16 technical schools to create associate programs, the consortium is designed to increase the number of scientists, engineers, and technicians preparing for careers in environmental restoration and waste management fields. SCUREF also targets South Carolina middle and secondary school students and teachers in an innovative outreach program to attract and encourage educationally disadvantaged students to careers in science and technology. SCUREF sponsors a Distinguished Scientist Exchange Program.

Waste-management Education and Research Consortium (WERC)

WERC is the nation's first waste management education and research program that provides an integrated approach to the increasingly critical need for efficient and safe disposal of hazardous, solid, and radioactive waste materials. This program provides a national resource of educational and research programs, develops, transfers, and implements new technologies; and increases the human expertise and sensitivity to environmental issues. WERC goals are accomplished through K-12 math and science enrichment activities, scholarships and fellowships, curriculum and program development, and professional seminars. New Mexico State University, the University of New Mexico, the New Mexico Institute of Mining Technology, and the Navajo Community College are member institutions in WERC. The WERC partnership works in cooperation with the Los Alamos National Laboratory and Sandia National Laboratory. The laboratories provide opportunities for WERC students.

Partnership For Environmental Technology Education (PETE)

The Western PETE Academic Partnership in ER/WM

PETE was originally established as a regional partnership in five western states and includes the community college systems of Arizona, California, Hawaii, Nevada, Utah and the Navajo Nation. The objective of PETE is to link community colleges to the technical resources of the Department of Energy, the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration Laboratories (NASA), professional societies, and private industry. PETE's overall goal is to significantly enhance the number of graduates emerging from the education pipeline in disciplines related to environmental science, engineering and management, with an emphasis on technicians. The PETE methodology is currently being extended nationally in five other regional partnerships.

University of Tennessee

The Cooperative Agreement with the University of Tennessee and Martin Marietta Energy Systems is primarily a joint educational program in environmental restoration and waste management that focusses educational resources to examine key technical disciplinary decisions facing the Department of Energy, as well as their impact on state, regional, national, and international policy in environmental restoration and waste management. A second objective of the program is to build a sound environmental restoration and waste management educational infrastructure near Oak Ridge that will directly benefit the environmental and technology transfer missions of DOE Oak Ridge Field Office, Martin Marietta Energy Systems, and other Oak Ridge contractors. Activities include: joint policy studies on key environmental restoration and waste management issues, joint technical studies on key environmental restoration and waste management issues, expedited curriculum development, more credit courses and new short courses taught in Oak Ridge, accelerated minority recruitment, and planning for an expanded academic partnership with DOE and other educational institutions.

Accomplishments

Curriculum Development

During FY 1992, thirteen member institutions of the HBCU/MI Consortium (Alabama A&M, Clark Atlanta, Florida A&M, Florida International, Howard, New Mexico Highlands, Prairie View A&M, Southern University, Texas A&I, Texas Southern, Tuskegee, UTEP, Xavier) developed undergraduate minors or options in the environmental area by infusing the contents into the existing curricula. Three member institutions developed graduate programs:

- Jackson State University - Ph.D. program in Environmental Science;
- Hampton University - Ph.D. program in Nuclear Physics;
- Texas A&I University - graduate courses in Environmental Engineering.

Clark Atlanta University is in the planning stages of developing Masters and Ph.D. programs in Environmental Health Sciences & Toxicology.

Clemson University conducted a summer field camp for undergraduate and graduate students from SCUREF institutions at the Field Geohydrology Experimental Site on the Savannah River Site. The experimental site is an outdoor laboratory for geohydrology experimentation. It was developed from a well field at a site formerly proposed for waste burial but never used for that purpose. Students and professional geohydrologists use the well field to conduct experiments that will improve the methodology for groundwater sampling, thus aiding in the cleanup or prevention of contamination. The Field Camp consisted of three phases: 1) studying sedimentary rocks, 2) conducting pump tests at the well field, and 3) classroom instruction on groundwater remediation techniques and geochemical analytical methods.

In conjunction with the field camp efforts, Clemson University developed a master's degree program in hydrogeology. Six courses were offered in the new degree program with 53 students enrolling in the initial courses. One student is expected to graduate with a master's degree in May 1993. Two more students are expected to graduate between August and December 1993. Clemson University also developed short courses for registered geologists in South Carolina. In September 1992, Clemson conducted a hydrogeology symposium for which eight hours of continuing education credit were allowed for registered professional geologists toward the requirements of the South Carolina State Board of Registration for Geologists.

During FY 1992, WERC institutions established the following EM-related programs:

- Master of Science in Environmental Engineering at New Mexico State University;
- Associate Degree Program at New Mexico State University at Carlsbad
- Associate Degree in Solid Waste Management Technology for Native Americans at Navajo Community College
- 16 courses per year in Engineering, Math, Computer Science, and Management on the interactive TV system.

WERC received two awards during the 1992 fiscal year, one for its overall performance and one for its Teleconference Series:

- Outstanding Engineering Achievement Award from the National Society of Professional Engineers, and
- Best Distance Learning Program for Higher Education Award from the TeleCon XII Conference.

Academia/Government/Industry Collaboration

In FY 1992, the HBCU/MI Consortium entered into partnership with select members of the public and private sectors of the environmental industry to develop a mutually acceptable and beneficial strategy for promoting national environmental career awareness activities, educational and training, contracting and employment opportunities within African American, Hispanic, and American Indian communities. Four subcommittees within the Consortium contributed their efforts to enable the consortium to "market" its capabilities and interests to industry through the 1993 National Congress for the Advancement of Minorities in the Environmental Professions held in February 1993 in Washington, DC. The 1993 National Congress, which presented a leadership model for developing partnerships between education, industry, and government in the education and training of underrepresented minorities in the sciences, research, and technology, was the initial session of a series of biennial gatherings that will include education, industry, and government leaders. DOE Secretary Hazel O'Leary addressed the National Congress as the keynote speaker.

During the week of April 18, 1993, WERC hosted "WERC for the Future Week" at NMSU in Las Cruces. The week-long activities included: The Environmental Design Contest for Universities and Community Colleges, the DOE Consortium Technology Transfer Conference featuring Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) and WERC, the WERC Industrial Affiliate Board Meeting, the WERC Executive Board Meeting, and Industry and Government Exhibits.

WERC and several private companies sponsor an annual National Environmental Design Contest at New Mexico State University in Las Cruces, NM. The 2nd annual Contest, held in April 1992, involved student teams from across the U.S., and one from Mexico, competing with demonstrations of processes and equipment to solve a soil pollution problem. The competition was created to challenge students to seek creative solutions to specified real-life environmental problems. WERC hosted the 3rd Annual National Design Contest on April 20 - 23, 1993 at NMSU in Las Cruces. The 1993 contest problem featured a realistic printed wiring board manufacturing waste remediation and minimization problem. More than 25 university teams from across the United States and Mexico competed for more than \$20,000 in cash awards.

Faculty/Teacher Development and Recruitment

WERC established the Environmental Fellows Program (EFP) in September 1992. The long range mission of the EFP is to expand the world's capability to address issues associated with the management of hazardous, radioactive and solid wastes by establishing a worldwide community of highly qualified administrators and scientists in the field of environmental management. There are four major components to the program's mission of training emerging leaders from government and industry: (1) An educational program for selected emerging leaders at the graduate and/or post-doctoral levels; (2) Seminars and conferences involving world-wide experts and visiting faculty; (3) Applications of technology to find solutions to world-wide environmental problems; and (4) An optional work experience program for the fellows at national laboratories for a short period following their educational program. These components will be implemented through the following activities:

- an International Fellows Training Program beginning in August 1993;
- a Student Exchange Graduate Program to begin in January 1993;
- a Monthly International Colloquium series; and
- an International Conference on Environmental Management in June 1994.

Technical Task Plan (TTP) Activity Matrix: Academic Partnerships

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY 90	FY 91	FY 92	FY 93
AL	Waste Management Education and Research Consortium (WERC)	1. Education by Courses/Laboratories 2. Education by Technology Development 3. Technology Transfer/Administration 4. Solid Waste Management 5. Teleconference Series	New Mexico State University University of New Mexico New Mexico Institute of Mining and Technology Los Alamos National Laboratory Sandia National Laboratory	x	x		x
AL	Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) Environmental Technology & Waste Management Consortium	1. Undergraduate/Graduate Curriculum Development 2. Faculty Development 3. Recruitment & Retention 4. Outreach Activities 5. Program Evaluation 6. Technology Transfer 7. National Congress	Alabama A&M University Clark Atlanta University Florida A&M University Florida International University Hampton University Howard University Jackson State University New Mexico Highlands University North Carolina A&T University Prairie View A&M University Southern University-Baton Rouge Texas A&I University Texas Southern University Tuskegee university University of Texas-El Paso Xavier University	x	x	x	x
AL	HBCU/MI Consortium Workshop					x	
AL	AIHEC Project PERMA				x	x	x

Technical Task Plan (TTP) Activity Matrix: Academic Partnerships

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY 90	FY 91	FY 92	FY 93
OR	University of Tennessee (UT) Cooperative Agreement	1. Joint Policy Studies 2. Joint Technical Studies 3. Curriculum Development 4. Short Courses 5. Minority Recruitment 6. Administration/Planning	University of Tennessee Martin Marietta Energy Systems, Inc.		x	x	x
SF	Partnership for Environmental Technology Education (PETE)	1. Environmental-Hazardous Materials Technician Curriculum 2. Resource Instructor Institute in the Environmental Sciences	California and Nevada Community colleges systems, LLNL, LBL, SNL-Livermore, Nevada Test Site, and EPA's Environmental Monitoring Systems Lab			x	x
SR	South Carolina Pilot Center (SCUREF) with Westinghouse Savannah River Corp.	1. Education & Training 2. Distinguished Scientist Program 3. Technology Transfer 4. User Facility 5. ERWM Research & Development	University of South Carolina-Columbia University of South Carolina-Aiken Clemson University Medical University of South Carolina South Carolina State University	x	x		x
SR	South Carolina Pilot Center (SCUREF) with DOE-Savannah River		University of South Carolina-Columbia University of South Carolina-Aiken Clemson University Medical University of South Carolina South Carolina State College				x
HQ	Medical University of South Carolina					x	x

IV-B. ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT EMPLOYMENT PROGRAM

Immediate Return on Workforce Investment

The Environmental Restoration and Waste Management Employment Program (ERWM-EP), also known as the ERWM Employment Program, was established during FY 1992. The establishment of the program was authorized by Congress through the National Defense Authorization Act for Fiscal Years 1992 and 1993 (PL 102-190). The goal of the ERWM-EP is to provide EM with highly talented and appropriately trained individuals in the management of hazardous, radioactive, and mixed wastes and in environmental restoration. The program will achieve its goal by supporting highly talented students in graduate and undergraduate study related to the mission goals of EM.

Program Activities

ERWM Employment Program participants were assigned to a 3-month practical work experience where they had the opportunity to gain practical, state-of-the-art, on-site experience at either a DOE facility, field office or headquarters to receive on-the-job training and development. They made a commitment to environmental management through their educational pursuits and to DOE through their participation in the program. EM was expected to offer employment in environmental restoration and waste management positions at DOE facilities after the graduate fellows and undergraduate scholars had completed their academic degree program. The participants of the ERWM-EP were expected to work one year with EM for every year of educational support provided to them.

Environmental Restoration and Waste Management Employment Program Orientation Workshop - Oak Ridge, TN - 1992.

Accomplishments

EM conducted ERWM-EP planning workshops and developed the program description, student/university applications, a practical work experience booklet, and a program marketing brochure.

The highlight of the activities was the selection of the first group of participants (18 academically talented graduate and undergraduate students from 13 universities) who will provide a cornerstone for the future. These student appointments became effective on September 1, 1992. Two additional awards were made in January 1993 to bring the total to 20 students (mandated by Congress) at 15 universities. The program plan called for the selection of 20 new graduate fellows and 20 new undergraduate scholars for FY 1993.

The initial eighteen ERWM-EP participants met in Oak Ridge, TN for the first Annual ERWM-EP Orientation Workshop. The purpose of the workshop was to provide the ERWM-EP participants with information about DOE's Environmental Restoration and Waste Management program activities and to introduce them to the federal system and the management and operating network. During the orientation workshop, DOE management reaffirmed the strategy and commitment of Admiral James D. Watkins to the importance of environmental activities at each EM site.

In June 1993, students that were scheduled to complete their education program and thereby become candidates for employment with EM were brought to Washington, D.C. for a meeting on the process of employment with the federal government. The first student under ERWM-EP to complete the academic requirements and program became a federal EM employee in October 1993.

IV-C. COMMUNITY COLLEGE PROGRAMS

Filling the Education Gap

Community Colleges have served EM well as a vital link in the educational chain in their ability to: provide an inexpensive, local post-secondary education for women and minorities; act as a bridge from high schools to four-year institutions; retrain and upgrade the skills of current employees; and attract and train the next generation of technicians near DOE facilities where their skills are needed.

Program Elements

In the Community College program area four distinct program elements were identified:

Two-Year Technical Associate Degree Development This activity assisted DOE Field Offices and National Labs to meet its need for technicians by working with local community colleges to develop specialized two-year degree programs in the area of environmental restoration and waste management.

Faculty Network and Curricula Database In order to aid the EM-affiliated community colleges across the country, networks were organized to facilitate the sharing of environmental science curricula, information exchange and problem solving. In addition, a database was established that contained each member school's technician curricula, student profiles and other relevant data.

Student Internships at DOE National Laboratory This activity targeted underrepresented minority students with career interests in math, science, engineering, and environmental restoration and waste management. It included university level science and math courses, summer work experience at Lawrence Livermore National Lab, and other technology transfer mechanisms.

Community College: Customer Base

Articulation Initiatives with Four-Year Institutions This element sought to develop coursework articulation agreements between two and four-year academic institutions in an effort to create a bridge for students to transfer completed coursework for credit. This activity was intended to encourage continued post-secondary education.

Activities

The EM Environmental Education and Development Program sponsored the development of 2-year degree technician programs in the area of Environmental Restoration and Waste Management (ERWM) near DOE Field Offices around the nation. These technician degree programs are summarized below:

The Environmental Engineering Associate Degree at Cincinnati Technical College, Cincinnati, Ohio. Faculty at Cincinnati Technical College (CTC) worked closely with EM and the M&O contractor at Fernald to develop curriculum for this associate program. This provided a means to improve the educational background of the existing staff at Fernald Environmental Management Project (FEMP) and to increase the number of qualified technicians available for the environmental restoration of the Fernald site. Courses required for this program included Solid Waste Disposal, Air Pollution Control, Regulations and Permits, Introduction to Bioremediation, and Hazardous Waste Disposal.

The Waste Management Technician Training Program at Columbia Basin College (CBC), in Pasco, Washington. In response to the need for trained waste management technicians, CBC developed and offered a limited number of waste management technology short courses within a two-year Applied Science Degree Program, which included a one year certification option. The program included scholarships and internships in Waste Management for disadvantaged students, development of curriculum materials, supply of equipment for classroom use, and faculty support.

The Environmental Restoration Technology Associate Degree at Community College of Southern Nevada (CCSN), Henderson, Nevada. This program was a cooperative venture between EM and CCSN to provide a foundation for ERWM specialization. EM supplied the pilot funding for curriculum development, as well as equipment, such as health and safety gear, monitoring and sampling lab equipment, and instructional materials. Classrooms and faculty were provided by CCSN. The faculty will continue to support the program using the curricula and materials that were developed during the first two years.

Course in Nuclear Waste Management for a 2-year degree technician program.

The Hazardous Materials Technician Associate Degree Program at Eastern Idaho Technical College, Idaho Falls, Idaho. This two-year Associate of Science Program entails courses designed to provide training in the handling, transportation, and disposal of hazardous waste. The program provided students with instruction in radiation safety materials monitoring, necessary Occupational Safety and health training, as well as courses in physics, chemistry, mathematics, and computer science. The goal of the program was to produce the technicians needed to accomplish environmental restoration and waste management work at the Idaho National Engineering Laboratory (INEL).

The Associate Degree in Environmental Restoration Technology at Mesa State College, Grand Junction, Colorado. This degree program provided courses in basic math and science, technical communication skills, and the industry work process, its environment, and vocabulary. The program involved industry partners such as AT&T, Autodesk and US West. The goal of the program was to develop a technical work force (technicians and technologists) who have the basic education and applied background to augment the anticipated short supply of scientists and engineers required for DOE environmental restoration work.

Two-year curriculum in Earth and Environmental Sciences (EES) at Navajo Community College, Shiprock, New Mexico. The EES curriculum was designed in accordance with Navajo educational philosophy. The program included: rigorous courses in basic science, specialized courses in environmental geology, analytical chemistry, hazardous materials handling, dryland botany, and soil and range sciences, and in addition, a summer field or laboratory internship. The Navajo Dryland Environments Laboratory (NDEL), an environmental research and education facility, was used extensively as a training facility. Graduates of the program were able to gain employment as environmental technicians or managers, or to transfer to baccalaureate programs in a wide range of science and engineering fields.

The Waste Management Technician Associate Degree Program at Wilbur Wright College, Chicago, Illinois. This was the most recent EM-sponsored effort in conjunction with Wright College, to develop and implement a high quality ERWM technician training program. Classes for this program began in the Fall of 1993. Plans remain to continue recruitment efforts through a 2+2 program with Taft High School in Chicago. A new linkage between Wright College and Argonne National Laboratory will provide secondary teachers with a chance to sharpen their skills in teaching environmental topics.

In addition to the above curriculum development programs, EM sponsored the following innovative community college efforts:

Summer and Transfer Achievement Readiness Program (STAR)

The STAR Program targeted underrepresented minority students with career interests in math, science engineering, and environmental restoration and waste management. It included university level science and math courses, summer work experience at a DOE National Lab, and programs that encouraged students to explore environmental sciences at the high school level. STAR was an innovative partnership that included Houston Community College, the Bronx College in New York, Contra Costa College in California, the University of California at Berkeley, and Lawrence Livermore National Lab.

Community College Network (C²NET)

C²NET activities helped to facilitate and accelerate the development of EM/community college partnerships which were primarily concerned with developing a workforce to meet DOE's 30-year environmental restoration goals. To support these partnerships, C²NET provided a network for the affiliated colleges to share environmental science curriculum, exchange information and solve problems. C²NET consisted of the following 15 member colleges:

- Aiken Technical College, Aiken, South Carolina
- Amarillo College, Amarillo, Texas
- Cincinnati Technical College, Ohio
- Columbia Basin College, Washington
- Community College of Southern Nevada, Nevada
- Eastern Idaho Technical College, Idaho
- Front Range Community College, Westminster, Colorado
- Mesa State College, Colorado
- New Mexico State University, Carlsbad, New Mexico
- Northern New Mexico Community College, Espanola, New Mexico

- Roane State Community College, Harriman, Tennessee
- Sinclair Community College, Dayton, Ohio
- St. Petersburg Junior College, St. Petersburg, Florida
- Technical Vocational Institute, Albuquerque, New Mexico
- Westchester Community College, Valhalla, New York

Accomplishments

Seven ERWM 2-year degree programs located at or near DOE facilities were developed and implemented. These programs have proved to be a vital training resource to their surrounding community, operating at full capacity to provide asound technical education at a low cost.

The Navajo Dryland Environments Laboratory was established at Navajo Community College, Shiprock Campus. It functions as an environmental research facility on the Navajo Reservation to enhance students' learning experiences.

The Community College Network (C²NET) was organized as a coordinating and information exchange alliance for community colleges that offer ERWM technical degrees. Over 16 colleges nationwide benefit from the resources provided through C²NET.

A successful bridge program known as STAR was developed. It served to recruit at-risk minority high school students to pursue a higher education in the environmental sciences. Through STAR, over 100 students have received hands-on experience at a National Laboratory.

Technical Task Plan (TTP) Activity Matrix: Community College

TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY 90	FY 91	FY 92	FY 93
Community College Network (C2Net)	Information exchange, Dbase network of affiliations, curriculum exchange	US West, Autodesk, AT&T, Pacific Northwest Lab, Colorado Governor's Office. See text for list of member colleges.		x	x	x
Mesa State Curriculum	Technician training	Mesa State College	x			
Wright College Waste Management	Curriculum development	Wilbur Wright College			x	
HAZMAT Technical Degree (Eastern Idaho)	Technician training	Eastern Idaho Technical College		x	x	
Native American Technician Training		U.S. Environmental Protection Agency			x	x
Navajo Community College	Curriculum development	Navajo Community College, Shiprock Campus	x		x	
Environmental AAS Program : CBC Training	Technician training	Columbia Basin College		x	x	x
Summer Transfer and Achievement (STAR)	Research experience, technician training	Houston Community College, Contra Costa Community College, and Bronx Community College		x	x	x
Community College Initiative for Environmental Engineering Degrees	Technician training	Cincinnati Technical College				x

IV-D. SCHOLARSHIPS AND FELLOWSHIPS

The Carrots of Higher Education

To help reverse the serious downward trend in the numbers of American science and engineering graduates, EM provided financial awards to undergraduates, graduate students, and faculty to study at colleges and universities across the nation. From the program's inception, EM sought to increase the number of underrepresented students in pursuit of a science education through financial incentives. EM also encouraged student and faculty researchers to design and implement technologies in working to solve its environmental restoration and waste management (ERWM) problems. The program's financial "carrots" have been in the form of tuition scholarships and fellowships, stipends, faculty awards, and internships.

Program Elements

Four basic subprogram elements formed the foundation of the Scholarship and Fellowship Program. Those elements were:

Student stipends: This incentive generally consists of a monthly cash payment to the student as long as he/she maintained the stipulated grade point average in a designated field of study.

Tuition and fees: The majority of awards fall into the category of college tuition and associated fees for chosen applicants for one academic year, with the opportunity to apply for renewal.

Faculty support: Activities related to this program element includes research grants to university faculty to establish direct involvement of these faculty in educational and technology development and applied research in the ERWM area.

Internships (or Practical Work Experience): To create this opportunity, EM enlisted the help of the National Labs to provide the necessary facilities to give undergraduate and graduate students a chance to apply their knowledge to real world applications in some of the most advanced scientific laboratories in the world.

National Environmental Incentives

National Hispanic Scholarship Fund (NHSF)

The National Hispanic Scholarship Fund facilitated the identification and selection of DOE/NHSF scholarship recipients through its national network. Students were selected on the basis of background, need, and interest in the environmental sciences. Special emphasis was placed on community college coursework articulation for students pursuing environmental restoration and waste management credentials. The goal of the program was to increase DOE's access to the pool of emerging, talented Hispanic-American scientists, engineers, and technicians via scholarships.

Environmental Management Career Opportunities for Minorities (EMCOM)

This project, administered by Associated Western Universities (AWU), supported both undergraduate and graduate education in the ERWM fields and provided students with an opportunity to receive practical training at DOE facilities. Minority students gained an increased awareness of, and sensitivity to environmental technology and management issues. Minority groups are traditionally underrepresented in many of the educational opportunities available at DOE laboratories. Numerous DOE facilities and the majority of the Historically Black Colleges and Universities and Minority Institutions (HBCU/MI) participated in the program.

Environmental Management Career Opportunities Research Experience (EMCORE)

EMCORE, an AWU administered program, had a primary goal to increase the number of trained scientists and engineers to augment the manpower requirements of EM. Faculty members and undergraduate students formed teams for their summer practicum at a DOE facility. The team worked with at least one scientist from the DOE host Laboratory. The graduate program was very competitive with 14 applications received for each award available in 1992.

ER/WM Scholarship Program

This program was designed to encourage talented students to pursue associate degrees supportive of the EM clean-up mission. On behalf of EM, the Oak Ridge Institute for Science and Education (ORISE) recruited and selected highly trained students for the ER/WM Scholarship Program. Since its inception in 1990, 587 student applications have been received and 53 scholarships have been awarded. A total of 74 academic institutions participated in this program.

ER/WM Graduate Fellowship Program

This program was developed to meet expected personnel needs for EM's ongoing activities in environmental protection, restoration and in the management of hazardous, mixed and radioactive wastes. Fellowships were awarded for one year with a one year renewal, in support of graduate study and thesis or dissertation research within the U.S. in the designated technical areas. The program included a practicum period at a DOE-designated facility during the summer after the first year of academic work. This program was administered for EM by Oak Ridge Associated Universities (ORAU).

ER/WM Distinguished Junior Faculty Award

The ER/WM Distinguished Junior Faculty Award provided the opportunity for collaborative educational research among EM, select DOE laboratories, university/college and technical school faculty members, and the faculty members' academic institutions. In addition, the program served to enhance cooperation between EM and the academic community by helping to develop new ideas that are important to the nation's environmental restoration and waste management programs.

Vanderbilt National Scholarship

The Internship Program in Radioactive Waste management offered through Vanderbilt University provides technical education and training. Students in the internship program complete two years of academic classes related to environmental restoration and were then enrolled in a summer practicum. Gifted undergraduate and graduate students receive hands-on experience in preparation for leadership positions. DOE sites hosting practicums included Savannah River, South Carolina; Hanford, Washington; Oak Ridge, Tennessee; Grand Junction, Colorado; West Valley, New York; and Sandia National Laboratories, New Mexico.

Accomplishments

Three ERWM-specific academic award programs were developed in partnership with Oak Ridge Associated Universities (ORAU). These programs served to increase the number of young talented students graduating in the environmental science fields.

Through collaboration with the National Hispanic Scholarship Fund, 84 community college scholarships and 49 university scholarships were awarded on behalf of DOE.

The minority student program, EMCOM, was enhanced with 25 undergraduate and 19 graduate awards made since 1991.

The EMCORE Program, which provided 82 scholarships and fellowships on behalf of DOE, was sponsored.

Scholarships/Fellowships

	Student Stipends	Tuition and Fees	Faculty Support	Practical Work Experience	Student Research Assistance	Faculty Research Support	Summer Academic Enrichment	High School Teacher Support
EMCORE	X	X	X	X	X			
EMCOM	X	X	X	X	X			
EMPAC			X	X			X	X
STAR	X		X	X			X	
VANDERBILT	X	X		X				
ERWM FELLOWS	X	X		X				
ERWM SCHOLARS	X	X		X				
JUNIOR FACULTY			X	X	X	X		

Matrix of Program Elements and Projects

Technical Task Plan (TTP) Activity Matrix: Scholarships/Fellowships

FIELD OFFICE	TTP TITLE	PARTICIPANTS	FY 90	FY 91	FY 92	FY 93
AL	Additional Minority Scholarships			x		
AL	National Hispanic Scholarship Fund (NHSF)			x	x	
AL	Environmental Fellows Program			x	x	
CH	Technician Training Clark University			x		
ID	EM Partnerships in Education, Research, and Technologies	Associated Western Universities		x	x	x
ID	AWU EMCOM Program	Associated Western Universities		x	x	
OR	ER/WM Scholarship Program	Oak Ridge Associated Universities	x	x		
OR	Fellowship Training Program/MI Faculty					x
OR	Graduate/Fellowship Program	Oak Ridge Associated Universities	x	x	x	x
OR	National Scholarship (Vanderbilt)	Vanderbilt University	x		x	x
OR	ER/WM Junior Faculty Award Program	Oak Ridge Associated Universities	x	x	x	x
OR	ER/WM Technical Degree School and Faculty Fellows		x	x	x	x
RL	WSUTC Environmental Science Program					x

IVE-OUTREACH/ENVIRONMENTAL LITERACY

THE HISTORY OF SUCCESS

Charged with capturing and channeling students and teachers toward Environmental Restoration and Waste Management (EM) related activities, EED initiated the K-12 outreach program. This program was launched in FY 1990 through the DOE field offices of Albuquerque, Chicago, Idaho, Nevada, Oak Ridge, Richland, Rocky Flats, Savannah River, and San Francisco. Infused into the program were activities that specifically targeted women, economically disadvantaged and culturally diverse populations.

The EM Outreach/Environmental Literacy Program was a part of a comprehensive effort for environmental education and development. The DOE's support for this effort derived from, and is rooted, in national need, public policy, and Departmental environmental management requirements. The activities under this program were very diversified, focusing on the specific needs of their administering site and community. The activities were innovative, incorporating successful teaching elements with national environmental and waste management issues. All activities were directly related to meeting EM's goal of environmental compliance on an accelerated basis and cleanup of the current inventory of inactive sites and facilities by the year 2019. To avoid reinventing the wheel, many existing outreach programs from around the country were modified to include environmental restoration and waste management components. Experimentation with new initiatives also led to innovative and exciting projects in math and science education.

The original goal of the outreach program was to capture and channel precollege students, especially those underrepresented in the scientific and technical workforce, toward math, science and engineering related careers.

The initial pre college the outreach program centered around educational objectives recommended by the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET). This council, formed by the White House Office of Science and Technology Policy, developed and coordinated Federal budget strategies to improve science and mathematics education. The publication of FCCSET's Committee on Education and Human Resources (CEHR) *By the Year 2000: First in*

Outreach/Environmental Literacy: Program Evolution

the World was a landmark achievement, explaining the FY1992 strategy and budget for mathematics, science, and engineering education across the Federal complex. CEHR was chaired by Secretary of Energy, Admiral Watkins. The CEHR strategy at the precollege level was structured around four program elements: teacher preparation and enhancement, student incentives and opportunities curriculum reform, and organizational reform.

Teacher Enhancement: EED projects for K-12 teachers provided content and methodology instruction for teaching environmental science and mathematics, stipends, travel expenses, and teaching materials to improve upon their instruction capability.

Student Incentives: EED student incentive projects provided students with an opportunity to better understand the need for mathematics and environmental science and their role in today's environment through student camps, field trips, and classroom activities.

Curriculum Development: Such projects were developed to compliment existing curricula and to address the cultural needs of underrepresented groups. Activities included experiential projects and hands-on materials in environmental science.

Organizational and Systemic Reform: These EED projects worked toward a redefinition and redesign of environmental science participation from parents and the educational communities, in an effort to increase the support and success of the projects.

In FY 1993, the pre-college outreach program's primary focus began to shift from the CEHR FCCSET committee recommendations to a broader sphere of environmental literacy. This change was due, in part, to the end of the "Cold War" and the Departments' renewed emphasis on restoring the environment. The goal of the Environmental Literacy program became two-pronged; 1) increase public knowledge of environmental issues, and 2) make all aware of the career opportunities within the environmental arena. EM believed that environmentally literate citizens, familiar with the basic principles of radioactivity, risk, waste management, and other science and environmental issues, were vital not only for a skilled workforce, but for public involvement and informed decision making regarding ERWM related issues. Such activities were not only mandated in environmental regulations, but were vital components to the clean up process. The scope of the Outreach/Environmental Literacy program broadened to address specific site needs, as well as the overall EM mission.

The goal of increased knowledge of environmental issues and associated career opportunities was achieved through the following Environmental Literacy program areas:

Audience Characterization

EM OUTREACH/LITERACY Rural/Economically Disadvantaged - 25%

- 1) **Promotion of ER/WM education and career opportunities.** This program element was designed to attract workers into environmental fields. Activities included the development of exhibits and publicity materials for the EM roadshow and other expositions, participation in promotional activities such as public service announcements, and the initiation of public and private affiliations to support and expand the awareness of ERWM education and career opportunities.
- 2) **Development and dissemination of literacy materials.** Such activities promoted the development of literacy materials that informed students, teachers, parents and the public about environmental issues and ERWM activities. These included, but were not limited to, instructional booklets, worksheets, posters, hands-on manipulative, bulletin board items, video tapes, and fact sheets. These materials were developed to compliment the existing science curricula for both formal and informal instructional settings.
- 3) **Involvement of students, adults and the public directly in ERWM technology/process development and activities.** These activities used the developed literacy materials, in settings that fostered direct involvement from students, teachers, and parents in the ERWM technology process. Specific activities included summer camps, workshops and internships at labs, science fairs, hands-on manipulative activities, field trips, and science bowl contests.
- 4) **Networking and coordination with existing Community-Based Organizations with participation of diverse populations.** This involved working with existing community based organizations (CBO) to gain greater participation, credibility, and public awareness of ERWM activities, especially among the culturally and demographically diverse populations. These CBO's represented business, government, service groups, educational groups, churches, professional societies, the scientific community, social clubs, special interest groups, and the media. Community involvement included mentorships, speakers bureau, and information campaigns. This activity also helped bring the non-environmental professional, or those individuals in professions that were more indirectly involved in ER/WM activities out of the woodwork and into the forefront, to help this nation solve its environmental problems.

The EED Outreach/Environmental Literacy program has accomplished some impressive feats. It has touched the lives of many aspiring young men and women from all walks of life, in math, science, and environmental studies. It has initiated hands-on science activities in schools and communities that did not have the means for such activities, communicated career opportunities as well as educating the general public in the important and challenging environmental issues of today.

Impact of Programs

(Note: Estimated individuals reached based on FY93 Field Office programs reporting in responding to Questionnaire)

The Successful Results

At all nine Operations Offices projects were expanded from site level projects encompassing schools, teachers, students, parents, tribes, and the public to intra and interstate projects, spanning across many communities. This expansion helped bring exciting vital math and science activities to underrepresented populations in schools in rural communities, inner cities, and areas not in the vicinities of DOE sites.

FY 1993 Impacts

56% community

42% Students

2% Teachers

Outreach/Environmental literacy programs across the DOE complex have enhanced the environmental awareness of the community, academia, and industry by providing informational and hands-on programs for students and adults, laboratory experiences for teachers and students, and interaction opportunities for the general public and concerned businesses and industry. These have helped broaden public understanding of environmental issues and as well as increasing the publics' participation in ERWM related issues leading to informed decision making.

Through classroom activities, workshops, instruments, and the hands-on manipulative activities, math and science was seen as interesting, fun, and maybe a little less challenging for the students, teachers, and parents. (At the Albuquerque Field Office parental involvement in math and science activities across the board increased by 50%.)

Outreach/Environmental Literacy projects such as those at Albuquerque, Idaho and Fernald received professional, state, or national recognition. Such encouragement acted to give the program legitimacy and was inspirational for the teachers, students, and communities involved.

The Outreach/Environmental Literacy Programs have given teachers an improved and broader understanding of environmental topics, including hazardous materials and nuclear energy, and aided them with innovative tools and exciting methods for teaching environmental sciences. This has equipped them to better teach and stimulate young people about math, science and engineering, including the career opportunities.

Science museums or discovery centers, have become committed to offering students and communities with science opportunities outside the traditional classroom, specially in the more rural communities which is where a majority of the field offices are a part of.

Programs at Nevada, Idaho, Albuquerque, and Rocky Flats environmental science activities were successfully fused into school curriculum through cooperation with the State Boards of Education.

Programs were leveraged to achieve maximum impact from the scarce dollars including those at Fernald, Oak Ridge and Savannah River.

Summer camps, extra-curricular, and classroom activities such as those at San Francisco, Richland, Savannah River, Chicago, Oak Ridge, and collaborative efforts under the Memorandum of Understanding with the National Collegiate Athletic Association, National Youth Sports Program were effective in reaching out to the at-risk communities of young people and excite them about their potential through math, science and environmental activities.

U.S. Department of Energy - 1993 Germantown - Headquarters Regional Science Bowl - Sponsored by EM-52.

U.S. Congressman Joe Skeen (NM-D) visits the Albuquerque Education Outreach Project in Belen, NM.

Clinch River Environmental Studies Organization (CRESO) - a field research project for High School Students sponsored through the Oak Ridge Field Office.

Summer science experiences offered through EM-52 and the Chicago Field Office.

Rocket Water Shoes: An "invention" by a 4th grade student from Idaho Falls, Idaho for the Invention Convention - sponsored through the Idaho Field Office and EM-52.

Post Register

WEDNESDAY, JULY 18, 1990

Making science fun

Students learn from field classroom

Stuart Englert
Post Register

RIRIE — Science education may start in the classroom, but it is nurtured in the field. Just ask the 7th-graders who chipped their way into geologic time Tuesday.

"This stuff is so unstable it has to be from the bottom of a river bed," said 12-year-old Rachel George, lifting a handful of peach-colored soil from a hillside southeast of Ririe Reservoir.

Rachel, who will attend North Bonneville Junior High in the fall, is one of 25 students participating in a weeklong educational program designed to stimulate interest in math and science education.

On Tuesday, the students began on Thunder Ridge east of Idaho Falls, where they learned

the origins of the Snake River Plain. They later visited Heise Hot Springs, where they were told about the region's geothermal features, and wrapped up the day by collecting rock samples on a hillside overlooking Ririe Reservoir.

"It's been a good program. Sometimes I wish everybody could have the opportunity," said K.C. Jones, a science teacher at Eagle Rock Junior High, who led Tuesday's field trip.

Sponsored by the Eastern Idaho Vocational Consortium, Eastern Idaho Technical College, the U.S. Department of Energy and Idaho National Engineering Laboratory, the \$65,000 program is designed to encourage students to take science and math courses in junior and senior high school and eventually pursue

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CLASS

From Page C-1

careers in those fields.

Studies have indicated American students are falling behind their counterparts in other developed nations in math and science education.

The four one-week sessions, which began in June, are being attended by 120 students from Bonneville, Firth, Idaho Falls, Ririe and Shelley school districts.

Over the course of a week, students also get to tour the Idaho Research Center and Computer Science Center at the Idaho National Engineering Laboratory, Idaho Falls' waste treatment and bulb turbine plants, the U.S. West offices, and snack food inventor Miles Willard's laboratories.

Jones said these field trips expose students to diverse scientific disciplines from geology to microbiology to physics, plus they get to savor such timely topics as waste management and energy production.

They also get to practice scientific skills such as observing, reporting, hypothesizing, charting and graphing. Jones said. All students are required to keep journals of what they see.

Nathaniel Brown, 11, who will attend Clair E. Gale Junior High in the fall, said science is more fun when it's taught outside the classroom.

"When you read it from a book, it's boring," he said, during lunch hour at Heise.

Kevin Stayner, 12, who also will attend Clair E. Gale, said he thinks he will pursue a science career. However, he was not looking forward to visiting the city's sewage treatment plant.

"I'm not very interested in seeing what we flush down our toilets," he said.

"Why not?" asked Brandon Loft-house, 11, who will attend Eagle Rock Junior High in the fall. "It will be educational."

"I'm not looking forward to the smell," Kevin responded.

"Take it like a man," Brandon advised.

"I'm not that old yet," said Kevin.

SWOOPE - Students Watching Over Our Planet Earth - sponsored through the Albuquerque Field Office.

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
AL	Additional Outreach Programs	<ul style="list-style-type: none"> - Environmental Science Education - Curriculum Development - Environmental Literacy - Teacher/Student Enhancement 	Sandia National Lab, Sciencetech/Lamb Associates		x	x	
AL	Spectrum '92 Solutions (Manpower Need Assessment)				x	x	x
AL	SWOOPE (AL)			x	x	x	
AL	AL Educational Outreach Program (Extended Education Program)	<ul style="list-style-type: none"> - Teacher training - K-12 curriculum intervention - Parent Orientation - Math/Science promotion - DOE/Albuquerque Public Schools Join-A-School Tutoring Program - Science Advisors (Red Badge) - Direct Funding to NM Schools - Amarillo Area Office Outreach (Voyage of the Mimi Program) - Dayton Area Office Outreach (New Futures) - Kansas City Area Office Outreach (WEB DuBois Learning Center) - Math and Science Teacher Enhancement - Pinellas Area Office Outreach 	NM Dept. of Education; Albuquerque Public Schools; NM Universities; Chama, Belen, Lordsburg, Zuni, Santa Rosa, Roy, Mora, Magdalena, Carrizozo, and Albuquerque School Districts; Amarillo Independent School District; Dayton Urban League; Dayton Middle Schools; Wilbur Wright and Roth; EG&G Mound Technologies; Pinellas School District; PIMEG Organization; National Association for the Advancement of Minorities in Engineering and Science	x	x	x	x
AL	SWOOPE (LANL)		New Mexico State University; New Mexico Highlands University; Environmental Protection Agency; Los Alamos National Lab; Sciencetech/Lamb Associates	x	x	x	x

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
AL	Grand Junction Outreach		Colorado Alliance for Science; Mesa State College; CO. Dept. of Ed.		x	x	
CH	Problem-Solving Through Innovative Thinking (BNL)			x	x		
CH	NCAA - National Youth Sports Program	- 16 Summer camps	National College Athletic Association (NCAA); U.S. Department of Health and Human Services; Canisius College; University of the District of Columbia; Mississippi Valley State University; University of Nevada; New Mexico Highlands University; Norfolk State University; North Dakota State University; Oklahoma State University; South Carolina State College; University of Southern California; Souther University; St. Ambrose University; St. Petersburg junior College; University of St. Thomas; Temple University; University of Wisconsin			x	x
CH	Ames Outreach - Problem Solving Through Innovative Thinking		Iowa State University, Ames Laboratory	x	x	x	x
CH	Argonne Outreach	- Teacher Research Activities - Create Teaching Materials/activities - Inter-school environmental monitoring projects - Summer Research for High School seniors in ERWM - Workshops for Teachers	Roberto Clemente Academy; Lindbloom Technical High School; Kenwood Academy; Hyde Park Career Academy; Teachers from suburban and Chicago Junior and Senior High Schools; and Wright Community College	x	x	x	x

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
CH	Minority Outreach: Environmental Education Outreach for Minorities (EEOM)	- Course in Environmental Science for Minority Students	Bronx Community College of the City; University of New York; Suffolk Community College; 6 Bronx High Schools; Wyandanch School District	x	x	x	x
FN	Precollege Education Outreach (FEMP)	<ul style="list-style-type: none"> - Minorities in Math, Science and Engineering (M2SE) - Partners for Terrific Science - Teachers at Federal Facilities (TAFF) - Environmental Training and Awareness Program - Solutions to Pollution - Environmental Exposition (SPREE) - Total Involvement for Minorities (TIMSO) - Science Seminar for Students (S3) - Environmental Camp for Youth - Chemical Education for Public Understanding Program (CEPUP) - Additional Teacher Enhancement Programs - Cincinnati Zoo - New Explorers - Technical Education - Council for the Advancement of Science 	Miami University; Coalition for Advancement of Science; Cincinnati Public Schools; Hamilton County Schools; M2SE; Cincinnati Zoo		x	x	x

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
ID	ID Science Education Outreach	<ul style="list-style-type: none"> - Butte Montana Science Laboratory - Teacher Skill Enhancement - Teachers Teaching Teachers - Teaching Hazardous Waste and Nuclear Topics - Project WET - Students Investigating Today's Environment (SITE) - Chemistry Education for Public Understanding Program (CEPUP) - Project SEED (Summer Education for Economically Disadvantaged Students) - Science Fairs - Budding Scientists - Junior Engineering Technical Society (JETS) Summer Camp - Progressive Summer Science Camps - Fort Hall Math and Science Camp - Waste Management 	National Engineering Lab; University of Idaho; Idaho State University; Eastern Idaho State College; ID Dept. of Ed.; Boise State University; +25 ID School Districts; ID Migrant Council; Division of Environmental Quality; American Chemical Society; Education Foundations; MT Power Co.; Project Partners; Butte School Dist.	x	x	x	x
ID	Science Bowl		35 DOE Facilities; Business and Industry Nationwide; 2,000 High Schools			x	x
ID	EMPAC: Environmental Management Precollege Analytical Chemistry		5 Majority Academic Institutions; 5 Minority Academic Institutions (HBCU/MI); 117 High Schools		x	x	x
NV	Nevada Outreach-Science and Technology Education Program (STEP)	<ul style="list-style-type: none"> - Job Awareness, counseling, recruitment of academically and economically disadvantaged students - STEP 	REECo; EG&G; University of Nevada System (UNS); Community College of Southern Nevada (CCSN); UNLV; Desert Research Institute; Nevada Department of Education; Local School Districts; Community Based Organizations	x	x	x	x

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
OR	Oak Ridge Outreach	<ul style="list-style-type: none"> - K-6 Science Museum Program - Teacher Summer Research in Environmental Management - Clinch River Environmental Studies Organization (CRESCO) - ER/WM Scholarships for Associates Degrees - Summer Educational Experience for the Disadvantaged (SEED) - Summer Teacher/Student Workshops - Curriculum Development - American Museum of Science and Energy - ERWM MathQuest Summer Camps - Grand Junction Area Outreach 	Analysis; Anderson County, Clinton, and Oak Ridge Public School System; Oak Ridge National Lab; Oak Ridge Associated Universities; Roane State Community College; American Chemical Society; Oak Ridge National Environmental Research Park	x	x	x	x
OR	AAAS Activities Commitment	- Develop an environmental encyclopedia for elementary and middle school children			x		
RL	Science Enrichment/Elementary School					x	
RL	Outreach Activities to Stimulate Educationally Disadvantaged	<ul style="list-style-type: none"> - OPTIONS Science Program - Environmental Education Grants to High Schools - Migrant Summer School Outreach - Invent America 			x		
RL	ER/WM Outreach Education Programs Columbia Basin College/Central Washington University		Columbia Basin College; Central Washington University		x	x	
RL	Grants				x	x	

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
RL	Yakima Valley/Tri-Cities MESA 9th Grade Transition Program		Yakima, Wapato, Toppenish, & Pasco School Districts; Hanford Contractors; and other local industry and businesses				x
RL	Options in Science, Engineering, and Technology	- OPTIONS Workshops for Teachers - OPTIONS Pipeline Support/Magnet Awards and Internships				x	x
RL	Environmental Summer Science Camp		Columbia Basin College; TRI-DEC; Washington State Department of Ecology; Math, Science, Engineering Achievement (MESA)		x	x	
RL	Outreach DEPTH	-DEPTH - Development of Environmental Education Program by Teachers and Hanford	Westinghouse Hanford Co.; BCSR		x		
RL	Outreach Activities-Invent America	- Inventing solutions for everyday environmental problems to develop analytical and problem solving skills				x	x
RL	Native American Technician Training		Columbia Basin College		x	x	
RL	Native American Employee Training	- Employment and Training activities in response to Admiral Watkins commitment to support employment and adult education among Native Americans	Environmental Protection Agency			x	x
RL	Richland Outreach	- Invent America - Options - Migrant Elementary School SAC - Central Washington University Education Outreach Program	Yakima Valley, Portland, Seattle, and Spokane school districts; Kennewick, North Franklin, Pasco, & Prosser School Districts;	x	x	x	x

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
RL	Outreach in Response to Admiral Watkins' Commitment to Indian Education	- Yakima, Umatilla, and Nez Pierce Indians education programs				x	
RF	Rocky Flats Outreach Program	- Technology Centers at Adams District 12, and Jefferson County Schools - Teachers Teaching Teachers (T-3) Program - Community Radiation Monitoring Program (ComRad) - Exhibit supplies for educational expos - Minority Career Exposition - Expanding Your Horizons - SMaRTeam-mentors, Students at Risk Science Fairs, etc. - Minority Summer Science Camps - DOE National Science Bowl	Denver Public Schools; University of Colorado; University of Northern Colorado; Colorado School of Mines; Colorado State University; Metro State College; Front range Community College; Adams County School District 50; Jefferson County Schools; Colorado Center for Environmental Management; Colorado Alliance for Science	x	x	x	x
SF	San Francisco Educational Outreach	- EM-Curriculum and Training Development for Minorities in Early Childhood Education (Bilingual) - Indian Young Scholars Program in Math and Environmental Science (Indian Scholars)	State Indian Centers; Lawrence Berkeley Laboratory; La Escuelita	x		x	x
SF	Project Star - Summer and Transfer Achievement Readiness Program		Lawrence Livermore National Lab; Bronx Community College; Laney Community College; Contra Costa Community College; University of CA, Berkeley; D-Q University; Lawrence Berkeley Lab; Southmost Community College	x	x	x	x

Technical Task Plan (TTP) Activity Matrix: Outreach/Environmental Literacy

FIELD OFFICE	TTP TITLE	SUBTASKS/PROJECTS	PARTICIPANTS	FY90	FY91	FY92	FY93
SF	ER/WM Curriculum Development/Training Minorities in Early Childhood Education		Lawrence Livermore National Lab; La Escuelita Elementary School; Lawrence Hall of Science	x	x		
SR	American Indian Young Scholars Program in Math, Science, and Engineering		American Indian Education Centers; CA State Dept of Education		x		
SR	Spectrum '94 Nuclear and Hazardous						x
SR	Savannah River Outreach (WSRC)	<ul style="list-style-type: none"> - Earth Science for Elementary School Teachers - Integrative Learning Workshop - Project JEDI Training - Summer Teacher Employment - Math Excellence Workshop - Summer Engineering Workshop - Scholarship for Governor's School - Mentor Program - SRS NCAA/NYSP Sports Camp 	South Carolina State College; Clemson University; NCAA; University of South Carolina, Salkahatchee; Savannah River Site;	x	x	x	x
HQ	EPA Supported Education Programs				x		
HQ	EPA Education Programs (HQ)				x		
HQ	League of Women Voters Primer	Update of the Nuclear Waste Primer and conduct public information seminars	League of Women Voters Education Fund		x	x	x

IV-F. DEVELOPMENT AND ASSESSMENT PROGRAM

The Department of Energy has committed to bringing its facilities into compliance with regulations and to restoring the environment of sites under its control by the year 2019. Responsibility for accomplishing this goal is vested with the Office of Environmental Restoration and Waste Management (EM). Concerns regarding the availability of workers with the necessary technical skills and the prospect of retraining workers from other programs within DOE or other industries are addressed by the Office of Division of Environmental Education and Development (EED). EED addresses concerns that fall under two main program elements: development and assessment. The goal of workforce development and assessment is to promote the development, retention, training, and retraining of the EM workforce for full implementation of the ER/WM mission.

Development: Ensuring an Appropriately Trained and Diverse Workforce

The focus of the Development program is to ensure skilled EM workers. The goal of this program was to provide information and follow up workforce planning processes to identify current and/or evolving needs of the EM workforce. There were four Development functions: 1) to support workforce planning efforts, focusing on sites to provide the human resources supportive of EM activities; 2) to develop projects which engage educational communities and public/private organizations in joint efforts to authenticate EM worker skills; 3) to recommend and develop interventions that promoted the hiring and career development of women and minorities in the EM workforce to ensure diversity and quality; 4) to participate in and support efforts which coordinated workforce development with the Department of Defense, the Environmental Protection Agency, the Department of the Interior, state governments, and industry.

Workforce Development: Customer Base

Technical Task Plan (TTP) Activity Matrix: Development and Assessments

FIELD OFFICE	PROJECT TITLE	SUBTASK/SUBPROJECTS	PARTICIPANTS	FY 90	FY 91	FY 92	FY 93
OR	ERWM Employment and Education Assessment	<p>Assess types of occupational employment required in ERWM work.</p> <p>Identify education programs available.</p> <p>Quantify and quality the student pipeline.</p>	Oak Ridge Associated Universities (ORAU)	X	X	X	
OR	Technical Training Support to the Office of Technology Development	<p>Collect and analyze the training needs of the EM workforce.</p> <p>Conduct TRADE conferences.</p> <p>Develop and update EM SIG products.</p> <p>Plan/coordinate EM SIG workshops.</p>	Oak Ridge Institute of Science and Education (ORISE)			X	X
RL	ERWM Manpower Assessment	<p>Conduct manpower needs assessment.</p> <p>Develop a common occupational classification system.</p> <p>Establish education programs and agreements with the education community.</p> <p>Assess workforce demand and supply.</p>	<p>Pacific Northwest Laboratories (PNL)</p> <p>Oak Ridge Institute of Science and Education (ORISE)</p>			X	X
RL	Environmental Workforce Study	<p>Develop data collection instrument and methodology.</p> <p>Conduct data analysis.</p> <p>Develop report "Education, Training, and Professional Development Profile: Analysis Report for Hanford and Rocky Flats."</p>	Basic Technologies Inc. (BTI)				X

Workforce Planning Processes

Under the first Development function, EM assessed the current and near-term demand for and the national supply of personnel trained and educated to achieve DOE environmental compliance and cleanup goals. The study entitled, "Environmental Restoration and Waste Management Manpower Needs Assessment Study" (MNAS; Holmes, Lewis, Hunt, and Finn, 1992), was conducted by Pacific Northwest Laboratory (PNL), with support from Oak Ridge Institute for Science and Education (ORISE) and Associated Western Universities (AWU), and assessed the supply and demand for scientific, engineering, and technical occupations relevant to DOE-EM. The study involved the examination of budget projections and interviews of program/project and human resource managers throughout the DOE Complex. The managers predicted a 45% increase over the 1991 base figures over the five-year period covered by the 1993-1997 Five-Year Plan. Budget driven figures projected 49% and 87% increases for constrained and unconstrained budget scenarios, respectively.

As a result of the manpower needs assessment study, EM recognized that a common taxonomy of occupations would facilitate planning, make the various needs for people across the Complex more understandable, permit a more efficient and equitable investment of training and education dollars, and enhance coordination between DOE and its contractors. The goal was to develop a system that cross-referenced the various job categories used across the Complex to a common set of categories.

Roadmaps highlighted obstacles to program success at the installation and project levels because they were based on "bottom up" planning at the installation or project level and focused primarily on issues that hinder progress and the strategies for resolving them. Since an estimate of human resource requirements (Federal and contractor) needed to support EM programs for the projected cleanup period (through 2019) was required for credible program planning, the human resource projections should be based on site roadmap desired activities diagrams.

Workforce Study Comparisons

Also under the first Development function, workforce planning efforts, centered around a report on workforce study comparisons. This report, "Workforce Planning for DOE/EM: Assessing Workforce Demand and Supply," examined five studies that provide a bank of data to facilitate EM's planning. However, these data were not directly comparable because the sponsoring organizations had different concerns, missions, and options available to them. The workforce studies varied considerably in terms of the occupations they studied, the time frames they examined, and the questions each was to answer.

The studies examined in the report were:

- DOE-EM Roadmaps Human Resource Projections sponsored by DOE-EM-140,
- Environmental Restoration and Waste Management Manpower Needs Assessment Study (MNAS; Holmes, Lewis, Hunt, and Finn, 1992) sponsored by DOE-EED,
- Educational Needs and Employment Trends of Environmental Hazardous Materials Technicians and Related Workers (EHM Tech; Hudis, Garland, Matlof, and Vork, 1992) study co-sponsored by the Department of Education Office of Vocational and Adult Education and the DOE Office of Contractor Human Resources,
- Hanford Site 30-year planning exercise (Hanford 30-year); and
- Environmental Restoration and Waste Management: An Occupational Assessment for the Oak Ridge Area (ORAU).

Authenticating EM Worker Skills

The Training Resources And Data Exchange (TRADE) Environmental Management Special Interest Group (EM SIG) met authentication requirements of the second Development function. The purpose of the EM SIG was to focus on the environmental training needs and resources of the DOE system in order to improve DOE environmental management programs by emphasizing excellence rather than compliance only and to encourage reliance on training as a tool to improve performance. The EM SIG

facilitated the identification of compliance, competence, and excellence levels of DOE training efforts. The SIG assisted in the integration of environmental training with complementary requirements. The EM SIG produced training products to meet DOE system needs for today and tomorrow by ensuring that the products will be:

- technologically sound,
- technically correct,
- cost-effective,
- recognized as meeting the need of corporate and contractor management, and
- complementary to DOE initiatives.

Women and Minorities in the EM Workplace

The Environmental Workforce Study met the requirements of the third Development function to address the issue of women and minority underrepresentation in the EM workforce. EM's Office of Technology Integration and Environmental Education and Development (TIEED) has a long term strategy to make an assessment of its current workforce demographics as well as its knowledge, skills, and abilities (KSA) requirements. In support of this strategy, it was determined that the DOE, its supporting education and training groups, as well as the environmental industry would benefit from additional data on projected EM workforce needs.

Two parallel efforts were initiated in 1991 to respond to that need. Utilizing different approaches, both the industry and DOE-driven efforts generated results which in some respects complemented and in other ways contradicted each other. Nonetheless, they both underscored the need to define a uniform data collection approach which would be supported and implemented by all parties.

A preliminary survey was directed by the Executive Committee of the National Congress for the Advancement of Minorities in the Environmental Professions (National Congress) to be conducted to identify prospective environmental industry workforce requirements (new hires) and their supporting academic degree prerequisites. The data was intended to enhance the National Congress planning and policy processes.

This study conducted by Basic Technologies International (BTI) reported in April 1992 a suggested trend towards a greater demand for higher degrees in the 2003, with the largest increase expected in the Ph.D. category. The trend suggested that demand for new hires with only a Bachelor's degree will shrink significantly over the same period. The survey included eight responding corporations with a total employee workforce of 96,339 employees. More environment-oriented occupational specialties were identified by industry over the next ten years than were the types of science and engineering programs presently offered by U.S. academic institutions.

Data in the June 1992 study, "Environmental Restoration and Waste Management Manpower Needs Assessment Study" (MNAS; Holmes, Lewis, Hunt, and Finn, 1992) sponsored by DOE-EED, suggested that the skills mix needed to accomplish the DOE's environmental restoration and waste management (ERWM) mission will not differ markedly from the ones presently in existence within the DOE complex. The study also suggested that staffing and retention difficulties are due less to a lack of supply and more to largely organizational and institutional barriers.

It is U.S. population projections that suggest women and minorities will have a significant role in the future workforce of this country in that they are the largest and fastest growing sector of the labor pool. The information developed as a result of the Environmental Workforce Study will enable DOE management to expand its options to recruit, train, and retain women and minorities as participants in the technical and non-technical aspects of environmental management and restoration.

Coordinated Workforce Development and Training Efforts

One of the components of the workforce development efforts was to coordinate Complex-wide training programs for the appropriate technical training of the environmental workforce. EM's Office of Technology Development Environmental Education and Development Division (EED) does not specifically conduct training programs. The Environmental Education and Development Division participates in the mechanisms that were established to coordinate the training efforts across the DOE Complex for both Federal and contractor employees. This maximizes the application of DOE's limited resources and minimizes management and training redundancies.

The Environmental Protection Agency and the Departments of Energy, Defense, and Interior are involved in a process, the Federal Facility Environmental Improvement Initiative (FFEII), to identify and overcome the barriers that inhibit a speedy realization of EM goals in the cleanup of Federal Facilities. The Accelerated Training Subgroup (ATS), one of four subgroups in the Environmental Restoration Workgroup of the FFEII, is co-chaired by DOE/TIEED and EPA. The ATS is an example of the fourth function of the Development program element.

Accomplishments

Workforce Planning Processes

The manpower needs assessment study entitled, "Environmental Restoration and Waste Management **Manpower Needs Assessment Study**" (MNAS; Holmes, Lewis, Hunt, and Finn, 1992), was completed in June, 1992. The purpose of the assessment was to validate existing educational programs and to establish a baseline for future programs, especially those that address long leadtime skills. The results of the study underscored the need for the current educational programs as well as the need for DOE to support pre-college math and science education as "vital" for long term goals, to be involved in college level programs related to DOE cleanup requirements at an early stage, and to focus on two- and four-year college programs for the high demand, low supply occupations. The report identified the lack of a common occupational classification scheme as a primary obstacle to assessing the workforce readiness of the DOE Complex.

In April, 1992, Association Western Universities (AWU) completed a report entitled, "**Educational Programs and Related Agreements** between DOE EM-Designated Sites and Education Community," as an annex to the manpower needs assessment study. The information provided in the report on education programs indicated a direct effect on workforce development. By fully utilizing education programs in a pipeline sense (connecting programs in a logical progression from precollege to professional levels within DOE), more people could be brought into the EM community. Heightened interaction between academe, National Laboratories, and EM-designated sites, would bring together the flow of ideas and research (academe) and technology development (labs) with technology validation and use (DOE technical staff). Therefore, National Laboratories could bridge academe and EM's field efforts through the interface of EM education programs.

The University of Tennessee completed a **draft report on ER/WM workforce needs** in the Oak Ridge area. The draft report was built on the methodology developed in the PNL 1992 national study. A Masters of Science option was established by the University of Tennessee in the Oak Ridge area specifically to address the need to upgrade and/or retain science and engineering personnel to meet the environmental engineering needs of DOE ORO. More than 100 students have already been admitted into the program. The numbers are expected to reach 200 to 250 students within a year.

A **Common Occupational Classification System** was completed in September, 1992. This system provides a common taxonomy for reporting human resource data across the DOE Complex to allow the cross-referencing of job titles and, by extension, the set of knowledge, skills, and abilities associated with each position and job title. The system reduced, by over half, the number of job titles and their descriptions to 88 common ones within nine families (engineers, scientists, technical, management, professional, administrative, crafts, operators, and laborers). The Common Occupational Classification System was used by four sites to selected fast-track human resource projection development: Hanford, Rocky Flats, Fernald Environmental Management Project, and Idaho National Laboratory.

Workforce Study Comparisons

The report, "**Workforce Planning for DOE/EM: Assessing Workforce Demand and Supply**," was completed in FY 1993 and addressed the workforce concerns in several ways. First, various workforce projections relevant to EM occupations were compared to determine common findings and to resolve inconsistencies. Second, case studies, interviews, and published data were used to examine the potential availability of workers for these occupations due to occupational mobility rates and training/retraining options. Third, demand and supply factors were integrated in a framework useful for structuring workforce analyses. The analyses demonstrated that: 1) workforce skills are not anticipated to change due to the mission transition; 2) the analyses demonstrated that science, engineering, and technician occupations tend to be mobile within and across occupational categories; 3) experience and on-the-job training are more crucial to issues of worker supply than education. Most importantly, the clarity of an organization's mission, the budget allocation process, work implementation and task assignment systems, and other organizational and institutional factors are the critical determinants of both workforce need and supply.

Authenticating EM Worker Skills

Because environmental management is an area heavily influenced by laws and regulations that produce their own special vocabularies, the Training Resources And Data Exchange (TRADE) **Environmental Management Special Interest Group (EM SIG)** deemed a **Training Reference Manual** to be a valuable first product. The manual contains:

- a glossary of environmental management terms,
- a regulatory baseline of personnel training requirements in federal regulations and DOE Orders, and
- a matrix for identifying necessary training for workers whose tasks have environmental implications.

Another EM SIG product that was updated is the **Instructional Resources for Environmental Laws and Regulations**, a six volume set of training resource materials covering the major environmental laws. Also, EM SIG members developed and piloted the Reciprocity Training Program and a site/facility access program, sharing their work with other interested EM SIG members.

HAZWOPER (Hazardous Waste Operator) issues and concerns crosscut many TRADE SIGs. The EM SIG organized a **HAZWOPER taskforce**, whose membership comes from three SIGs: Emergency Management Information, Industrial Hygiene, and Radiation Protection, in addition to the EM SIG. The taskforce met as needed by conference call to discuss HAZWOPER issues and to share solutions to problems. The taskforce produced a matrix of HAZWOPER issues and concerns for EM-40's consideration in the development of the new HAZWOPER order.

Women and Minorities in the EM Workforce

The goal of the **Environmental Workforce Study** conducted by Basic Technologies International (BTI) is to obtain education, training, and professional development data essential to the identification of viable interventions for the entry, retention, retraining, and career advancement of the DOE workforce with particular interest in women and minorities in the Department of Energy's Environmental Restoration and Waste Management activities at selected EM sites.

Participants from DOE and EM contractor human resource personnel from Hanford, Washington and Rocky Flats, Colorado, and Headquarters met at a Focus Group A meeting to review and finalize the draft of the **Education, Training, and Professional Development (ETPD) Profile Data Collection Tool**, one key component of the multi-phased study. The data collection tool will be utilized to develop an accurate profile of the education, training, and professional development of the DOE/Contractor workforce at the following sites: Hanford - Richland, Washington and Rocky Flats - Colorado. Participants at the Focus Group A meeting also refined and critiqued the data collection methodology and quality control mechanisms, and refined and critiqued the data analysis plan and report format.

Coordinated Workforce Development and Training and Training Efforts

As an TIEED initiative, a **planning and coordination group** met in August, 1992 to work out details and responsibilities for training among various offices within EM. A draft charter was crafted for review and approval by senior management.

In October 1992, a joint effort between the U.S. Environmental Protection Agency (EPA) and EM concluded with the completion of a manual and accompanying video and audiotape on **Federal Facilities and the Resource Conservation and Recovery Act (RCRA)**. The manual and tapes presented introductory material on waste management at DOE sites. These materials provided an overview of relevant portions of RCRA under which EPA regulates nonhazardous solid waste and hazardous waste at both government and private facilities. These materials were distributed to Federal and contractor training managers throughout the DOE complex to be used as is by themselves or to be included in introductory courses to RCRA.

Throughout FY 1992, EED support was maintained for the **Training Resources and Data Exchange (TRADE)**. This valuable organization, run by the Oak Ridge for Science and Education (ORISE), facilitates the flow of useful training and development information among over 200 trainers and training managers DOE-wide, both Federal and contractor.

The Federal Facility Environmental Improvement Initiative (FFEI) **Accelerated Training Subgroup (ATS)** met quarterly (November, March, May, and August) to exchange ideas among the member agencies and to inform participants of the major environmental training developments in their agencies. Recent agenda items included detailed briefings on each agency's environmental education and training programs and on collective electronic training data bases and bulletin boards. The central effort was the creation of an electronic bulletin board system for listing the environmental training resources of potential interest to all agencies. The base for the system is **CLU-IN, the EPA's Cleanup Information Bulletin Board**. A Special Interest Group (SIG) was formed with representation from the training community of each agency to compile a listing of pertinent training information. In accordance with EPA procedures, the mechanism to enhance the flow of training information. The need to duplicate the information in the public sector is minimized because the training resources are available to a much wider audience of users, thus capitalizing on the effort already paid for by tax dollars.

Assessment: The Foundation of Workforce Development

The focus of the Assessment program element was to identify skills and training needed by the EM workforce. The goal of this program element was to identify the skills needed by EM workers to perform current and future jobs, and to identify the training necessary to provide those skills. There were two Assessment functions: 1) to support data gathering and analysis functions by conducting workforce needs assessments; 2) to establish baseline data on education, training, and professional development.

Workforce Needs Assessments

With the mission of DOE evolving, the transfer of formerly defense-related sites to EM, and a Secretarial directive to retain and retrain the displaced workforce to meet EM's mission when feasible, it has become an EM priority to develop training programs that address the skills and knowledge needs to accomplish the EM mission. Analysis of training needs of current and projected staff for DOE and its contractors provides information that is needed to develop comprehensive training programs in environmental restoration and waste management for current staff, new hires, and staff transitioned from other programmatic areas.

In support of the mission of EM's Office of Technology Development, the Environmental Education and Development Division (EED) established programs to ensure that the number and skills mix of employees were adequate for the level and scope of DOE's waste management and cleanup activities. Toward this end, EED completed an initial EM workforce analysis to identify current and expected staffing needs in selected occupations. The analysis facilitated the development of policy decisions related

to ensuring an adequate supply of personnel to accomplish EM's mission. Based on the findings of this and related studies conducted by EM, an analysis of the training needs of current and projected staff was planned to ensure that training programs for current staff, new hires, and staff transitioned from other programmatic areas impart the knowledge and skills these employees need to function effectively. This training needs analysis was conducted by the Oak Ridge Institute for Science and Education (ORISE).

Establishment of Baseline Data

The Training and Management Systems Division of the Oak Ridge Institute for Science and Education gathered and analyzed data from EM headquarters, field office, and contractor personnel and reported the data to EED for use in designing and directing training programs that addressed the skills and knowledge needs of the highest priority to EM mission accomplishment. The data collection, analysis, and reporting included:

- a) analyzing the results of current workforce planning and other studies to focus the training analysis,
- b) identifying performance problems affecting current EM staff,
- c) identifying new knowledge and skills needs of DOE and contractor staff who may be transitioned to EM functions from other programmatic areas,
- d) identifying specific needs of new hires,
- e) identifying those priority areas where training would have the greatest impact,
- f) recommending training interventions and a plan of initial training coordination and development to address the most frequently identified and critical performance problems and retraining needs.

All tasks were based on the findings of related assessment activities, including current ORISE assessment activities for the Savannah River and Albuquerque field offices and HR-70's functional analysis conducted for DOE contractors.

Accomplishments

Workforce Needs Assessments

Documents describing problems and issues relevant to the EM mission were selected from recommendations of DOE and contractor personnel, including ORISE personnel who conduct related analyses for other DOE offices. During the last five years, the focus of Congress and Executive Branch agencies on Federal agency performance in environmental cleanup and in the protection of the environment, safety and health has led to a large number of studies and assessments of DOE programs and facilities. Documents analyzed for this study included reports from DOE Tiger Teams, the General Accounting Office, and the Office of Technology Assessment, as well as internal DOE and contractor studies and periodicals, such as the Operating Experience Weekly Summaries.

Documents were analyzed for problems and issues that these various assessments, audits, and evaluations had found at DOE and DOE contractor facilities. The primary concern was to identify those problems and issues for which training was a component. When available, the causes, results, and any remedies suggested by document authors were included.

Once identified, problems were sorted based on areas of continuing significance to the Department of Energy, including management and oversight, transportation, radiation protection, the environment, safety, and health. ORISE staff used keyword searches and review of these records to identify trends and problem clusters.

In FY 1993, approximately 5200 problems have been identified and entered in a database. These problems were found in over 150 documents. In the training practice area, the majority of issues identified were in training programs (35%), followed by performance-based training (29%), and training administration/organization (26%). The problem and issues in training programs

were lack of formality, cross training, general employee training (GET), job-specific training, lessons learned, on-the-job training, retraining/remedial training, and subcontractor/visitor/vendor training. The key tenets of performance-based training most often found lacking included analysis, training design and development (training plans, lesson plans, performance objectives, and materials/equipment), and training evaluation (examinations and drills and exercises). The problems and issues in the area of training administration/organization include centralization, definition, policy and procedures, updating, training resources, and training program oversight

Of the training content issues identified, the majority were in safety and health (45%), followed by environment (21%). The problems and issues related to safety and health include confined space, electrical safety, lockout/tagout, fire protection, laboratory safety, personal protection, toxic and hazardous chemicals, construction safety, radiation protection, and transportation. The problems and issues focused on environmental restoration and compliance include waste management, environmental data collection, waste minimization, emergency response, and environmental technologies.

In terms of the regulatory noncompliance training issues, in many cases no specific regulation was cited, but reviewers identified broad deficiencies in training programs that arose from inadequate understanding or application of regulatory requirements.

Of the training practice issues identified, the majority of the regulations cited were DOE Orders (62%) followed by other federal regulations (35%). Of the training content issues identified, the majority of the regulations cited were other federal regulations (59%) followed by DOE Orders (34%).

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