PROGRAM OVERVIEW OF THE OFFICE OF TECHNOLOGY DEVELOPMENT

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ABSTRACT

The Office of Technology Development (TD) supports research and development of innovative technology that will lower the costs and improve schedules associated with defense waste management and environmental restoration. To this end, TD has developed and applied research, development, demonstration, testing, and evaluation plan. This plan is incorporated into DOE's Five Year Plan for Environmental Restoration and Waste Management.

Technology roadmaps are being developed for major DOE facilities to identify existing technology solutions, the development strategy for new solutions, and needs for applied research. They will provide the basis for selecting future research and development investments to ensure timely and acceptable solutions. In 1990, the technology roadmap for the Rocky Flats Plant was completed, and roadmaps at five additional facilities are under development.

TD has initiated several programs to provide the framework to accomplish its mission. These programs direct TD's efforts to furnish the users with better, faster, cheaper, and safer technologies. This is accomplished through the simultaneous demonstration, testing, and evaluation of multiple technologies as an integrated system focused on a single technical issue.

INTRODUCTION

The Secretary of Energy established the Office of Environmental Restoration and Waste Management (EM) in November 1989 to effectively coordinate and manage the Department's activities to remediate the DOE Defense Complex and to properly manage waste generated by current operations. This new office combines nuclear waste management and the environmental clean-up elements that were spread across four offices. It is the EM goal to ensure that risks to human health and safety and to the environment from past, present, and future operations are either eliminated or reduced to prescribed, safe levels by the year 2019.

EM is divided into three major divisions. The Office of Waste Operations (WO) is responsible for the treatment, storage, and final disposal of currently generated waste. The Office of Environmental Restoration (ER) is responsible for the remediation of sites no longer in use. Waste Operations will process remediated wastes. The Office of Technology Development (TD) is responsible for the development of technologies to address the needs identified by three customers: Waste Operations, Environmental Restoration, and, in the case of waste minimization techniques, the Office of Defense Programs.

The mission of the Office of Technology Development (TD) is to facilitate this 30-year goal by developing and implementing new technologies which will assist DOE in achieving compliance with all applicable statutes and regulations. The TD program is designed to make new, innovative, and effective technology available for use and transfer it to users. New technology is sought to meet legal requirements and to reduce risks, operating costs, operating time, and the generation of new waste. This program (1) establishes the management process for funding technologies at their various stages of development and implementation; (2) conducts an innovative, aggressive technology development program for waste management, waste minimization, waste treatment, storage, and disposal; (3) develops more effective remediation technologies for restoration of contaminated sites and facilities; (4) develops technologies to reduce occupational and public exposure; (5) establishes a coordinated education program involving universities, DOE national laboratories, and industry to train the people needed to address DOE's EM program, and (6) promotes technology transfer and outreach among the Department, private sector, and other agencies.

In fulfilling its mission, TD is organized into the following divisions, shown in Fig. 1: Research and Development (R&D); Demonstration, Test and Evaluation (DT&E); Institutional and Technology Integration; Program Support; and Transportation Management. The R&D division identifies innovative technologies and is responsible for the generation of data to support engineering decisions to proceed to the DT&E phase. The DT&E division acts as the conduit to full-scale implementation through demonstration and testing of technologies. The Institutional and Technology Integration division is responsible not only for technology transfer in and out of the DOE Complex, but also development of scientific criteria for kindergarten through high school curricula to educate the next genera-

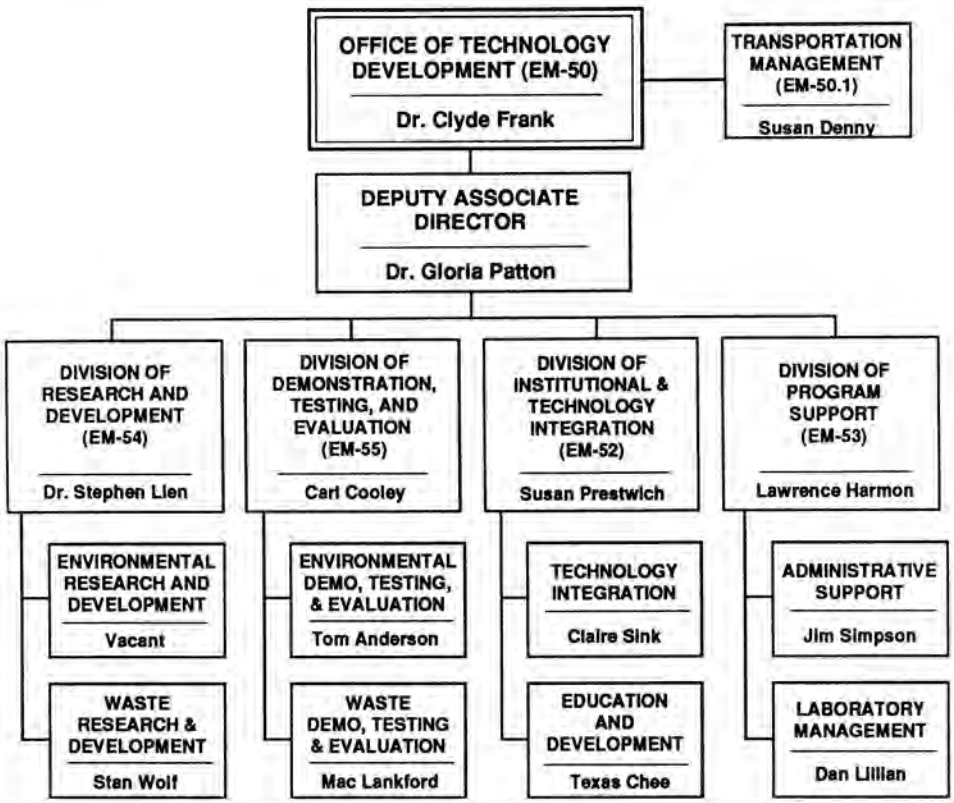

Fig. 1. The Office of Technology Development Organization.

tion of scientists. Program Support, as the name suggests, provides support to TD and acts as an interface between technology development and the Federal system administration. The Transportation Management division ensures that all radioactive material or waste will be transported in accordance with Federal, state and local regulatory requirements.

In order to organize user needs, EM is currently developing Roadmaps for many of the intractable problems. Roadmaps are derived from a planning process that focuses on issue identification, root-cause analysis, and issue resolution. This process forms the basis for EM strategic planning to carry out waste management operations and environmental restoration in a manner that achieves regulatory compliance within budget and on schedule (Fig. 2). Documentation that logically displays activities, issues and commitments is generated during the process.

One product of the Roadmap process is the identification of specific technology needs to meet scheduled compliance milestones. Users can evaluate their needs based on the information from the roadmaps and communicate these requirements to TD. Once these priorities are established TD can request internal and external institutions to submit technical task plans (TTPs) and proposals, respectively, to execute its program.

TD has developed its Research, Development, Demonstration, Testing, and Evaluation (RDDT&E) Program to promote the resolution of major technical issues and the rapid advancement of the current technology beyond what is now available for environmental restoration and waste management operations. The RDDT&E Program has been designed to satisfy needs of the ultimate users: DOE Installations, the Office of Environmental Restoration, the Office of Waste Operations, and Defense Programs. To accomplish this goal, the RDDT&E program is executed in three phases: Innovative Technology (IT), Research and Development (R&D), and Demonstration, Testing, and Evaluation (DT&E). The purpose of the IT phase is to identify and evaluate new technologies for application to DOE environmental and waste problems. Applied R&D supports research to prove the readiness of technologies for transition to an engineering evaluation phase. DT&E validates technologies by demonstrating effectiveness, cost savings, improvements, and risk-reduction potential.

High-risk, high-payoff tasks are introduced to the RDDT&E Program through the Innovative Technology Program. New technology or innovative technology applications are reviewed, analyzed, and evaluated for their potential to solve user problems. Tasks center around short-term experiments and data collection to demonstrate that a technology is feasible, applicable, and acceptable. To

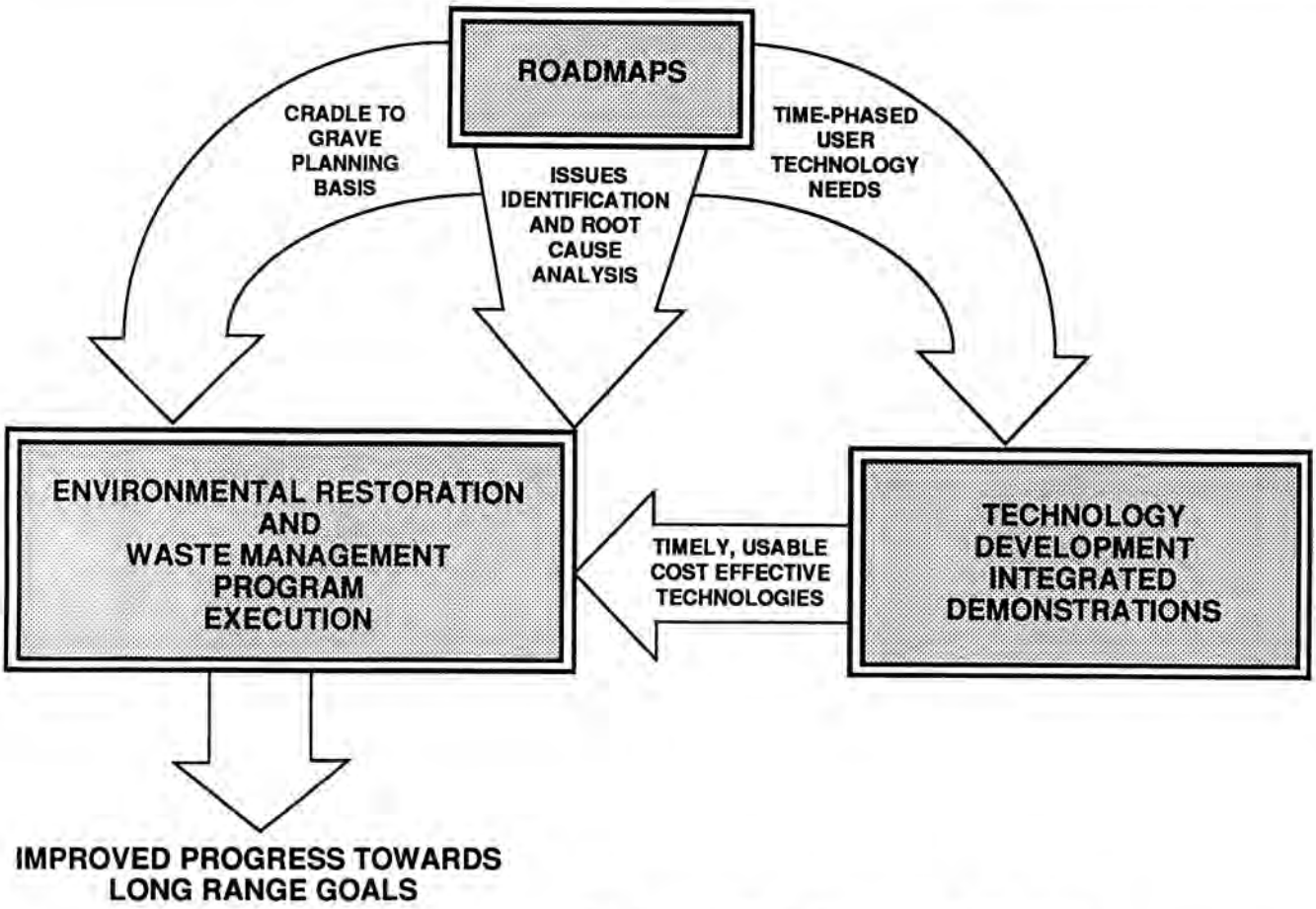

Fig. 2. The Office of Technology Development Charts its Course with Roadmaps.

accomplish this goal, tasks are structured to provide quick (within 18 months), cost-effective (1-2 FTE-equivalent) conclusions. Selected innovative technology tasks may become Applied R&D tasks or move directly to DT&E.

Applied R&D constitutes a major portion of TD's RDDT&E Program. Critical tasks are planned and conducted to provide the technical, regulatory, and economic base for the decision-making process to transfer technologies to DT&E. Most tasks focus on the collection of experimental data to support the development of engineering specifications for full-scale technology implementation. Other activities concentrate on the identification of critical engineering issues for full-scale testing. As selected technology efforts transition to the DT&E phase, relevant applied R&D activities might continue if required to resolve application-specific technical issues.

DT&E identifies technologies that are promising for transition to the demonstration arena. Tasks are designed to develop cost-effective, efficient programs for demonstration, testing and evaluation of promising technologies and to rapidly advance those technologies to full-scale implementation on a schedule to meet compliance requirements.

RDDT&E tasks are organized into Integrated Programs and Integrated Demonstrations that focus technical activities toward the solution of critical DOE environmental problems. Integrated Programs and Demonstrations provide a means to move the technology products from the universities, industries, governmental agencies, international agencies, and DOE laboratories to the user.

An Integrated Program (IP) is a group of research, development, and/or demonstration tasks that relate to a single class of environmental restoration or waste management issues or functions. IPs were phased into the RDDT&E program to address cross-cutting technological issues and to sustain RDDT&E input into the Integrated Demonstrated process.

The Integrated Demonstration is the cost-effective mechanism that assembles a group of related and synergistic technologies to evaluate performance individually or as a complete system in correcting environmental restoration and waste management problems.

IPs and IDs fall into three program areas: Groundwater and Soils Cleanup, Waste Retrieval and Waste Processing, and Waste Minimization and Waste Avoidance.

Groundwater and Soils Cleanup: Technologies are investigated and advanced through the RDDT&E process that remove or reduce hazardous and/or toxic materials from contaminated groundwater and contaminated soils underground or on the surface; remove or reduce the radioactivity levels; and/or provide interim or temporary measures to retard migration or contain hazardous or radioactive materials until a suitable technology can be developed or until agreements can be reached on the applicable compliance requirements.

Waste Retrieval and Waste Processing: Technologies are investigated, developed, and advanced through the RDDT&E process that (1) remotely, or otherwise, excavate or remove contaminated material from the site or tank, (2) process contaminated material into a suitable form for shipping and/or disposal, (3) treat and dispose of waste arising from operations, and (4) decontaminate and decommission materials, equipment, and facilities.

Waste Minimization and Waste Avoidance: Waste Minimization and Waste Avoidance is defined as reduction at the source in toxicity or amount of hazardous materials resulting from a process or operation. As such, the primary responsibility for waste minimization in the DOE weapons complex lies with Defense Programs. They have the legal obligation to ensure the manufacturing and supporting processes produce minimal quantities of hazardous wastes as far as is technically and financially feasible. EM provides support to the development of waste minimization technologies because waste minimization is the most effective means of reducing the long-term cost of waste management. Technical approaches include substitution of solvents to reduce or eliminate the use of hazardous chemicals; development of alternative metal-forming processes that consume less stock and yield less waste; and recycling of scrap. Minimization goals for reducing waste generation range from 50 to 80 percent.

Many of the technologies that TD will seek to implement will have a variety of applications across the TD program. As a result TD has established a Cross-cutting Technology Program that addresses issues such as developing analytical chemistry methods for mixed waste, designing real-time field analytical instruments, providing automated laboratories, investigating permitting and compliance processes which encourage application of developmental technology, and devising a robotics program to reduce worker exposure and increase safety through remote operation. These issues affect all phases of the program. For example, robotic systems can support waste sampling, retrieval, and tank decontamination for the Waste Retrieval and Waste Processing Program, as well as provide production operations which can reduce generation of wastes for the Waste Minimization and Waste Avoidance Program. The Cross-cutting Technology Program will provide TD with an efficient, cost-effective mechanism to integrate these efforts across the various technology programs.

TD has also established the Technology Integration Program. Technology integration is the process of transferring technology into, within, and out of the DOE Complex. Technology integration occurs in all steps of the RDDT&E innovations process. Integration results from consistent, systems-oriented problem solutions and enhances collaboration of participants in successful implementation of the new technology products. Achieving and maintaining regulatory compliance is a major element of the Integrated Demonstration and a necessary element of technology integration. Beginning with the very first review of a candidate technology, successful regulatory compliance is planned based on economies of scale, reduction of documentation, and national implementation across the complex. This process begins with the initial compliance review and culminates with the successful, permitted, full-scale implementation of the technology by the user. At the completion of DT&E, technology integration achieves the smooth transition of operational responsibility from TD to the user with the successful implementation of the technology product.

Overall, EM intends to infuse faster, better, cheaper, and safer technology into the DOE complex to facilitate its 30-year cleanup goal, while also achieving and maintaining environmental compliance. EM also is undertaking transfer of cleanup technology to interested users from other agencies, industry, or appropriate international users. In addition, successful technology will be shared among the DOE weapons complex sites to accommodate more rapid and cost effective environmental cleanup.