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Western Governor's Association

***Federal Advisory Committee
To Develop On-Site
Innovative Technologies***

COORDINATING GROUP REPORT

January 1994

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INTRODUCTION

In December 1992, western governors and four federal agencies established a Federal Advisory Committee to Develop On-site Innovative Technologies for Environmental Restoration and Waste Management (the DOIT Committee). The purpose of the Committee is to advise the federal government on ways to improve waste cleanup technology development and the cleanup of federal sites in the West. The Committee directed in January 1993 that information be collected from a wide range of potential stakeholders and that innovative technology candidate projects be identified, organized, set in motion, and evaluated to test new partnerships, regulatory approaches, and technologies which will lead to improved site cleanup.

Five working groups were organized, one to develop broad project selection and evaluation criteria and four to focus on specific contaminant problems. A Coordinating Group comprised of working group spokesmen and federal and state representatives, was set up to plan and organize the routine functioning of these working groups¹. The working groups were charged with defining particular contaminant problems; identifying shortcomings in technology development, stakeholder involvement, regulatory review, and commercialization which impede the resolution of these problems; and identifying candidate sites or technologies which could serve as regional innovative demonstration projects to test new approaches to overcome the shortcomings.

This report from the Coordinating Group to the DOIT Committee highlights the key findings and opportunities uncovered by these fact-finding working groups. It provides a basis from which recommendations from the DOIT Committee to the federal government can be made. It also includes observations from two public roundtables, one on commercialization and another on regulatory and institutional barriers impeding technology development and cleanup. Reports from these working groups and the roundtables, bound separately, are an integral part of this Coordinating Group Report.

In keeping with the intent of the DOIT Committee, this report has been developed from and informed by the views of a broad array of public and private sector sources. As such, it is a composite of many diverse opinions, and does not necessarily reflect the views of any single agency, group, or individual.

THE CHALLENGE

The challenge of cleaning up federally owned or managed lands (military bases, defense production and research facilities, and park, forest, and range lands) is immense. The Department of Energy (DOE) has approximately 4,000 sites encompassing thousands of acres contaminated with both radionuclides and hazardous wastes². It has more than 250,000 cubic meters of transuranic

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¹A listing of the Coordinating Group members is included in Appendix A.

²*Environmental Restoration and Waste Management Five-Year Plan, Fiscal Years 1994-1998, Volume 1, Pg. iii, Department of Energy, January 1993.*

waste and millions of cubic meters of low-level radioactive waste.³ The Department of Defense (DoD) has 18,795 sites at 1,800 installations included in the Installation Restoration Program,⁴ while the Department of the Interior (DOI) lists 422 sites on the Federal Facilities Hazardous Waste Compliance Docket. The total number of abandoned mine sites on federal lands is unknown but estimates run as high as 500,000.⁵

The contamination at these sites resulted from disposal and waste handling practices that were employed from the beginning of this century through the early seventies. It has only recently been acknowledged that many of these practices were environmentally unsafe and unsound. The federal government is committed to the cleanup of these sites at a cost estimated to range from \$250 billion to over \$400 billion. Adding in the further cleanup costs of state and private waste sites, the nation's cleanup estimates may well exceed \$750 billion.⁶

There is a growing sense of urgency to remediate these sites more quickly. As a result of the end of the Cold War, DoD is remediating contaminated sites at closing military bases in order to turn them back to civilian use. DOE's mission has changed as well, and efforts are shifting rapidly from weapons production to remediation of contamination and the effective management of wastes at DOE facilities. Finally, increased migration and population growth in the western U.S., coupled with increased interest in recreation (mountain biking, hiking, etc), are bringing more people in contact with abandoned mine sites and current and formerly used defense sites where safety concerns abound.

The need for action is clear. However, the nation's environmental technology efforts (including development, testing, evaluation, deployment, and widespread application) have historically lacked critical linkages and public acceptability. For example:

- government technology development efforts have not been well coordinated or linked to community acceptance, regulatory approval, or commercial potential;
- federal and state site cleanup managers have had little incentive to consider and select innovative technologies. Even if they did, independent and reliable information about these technologies is too often not readily available;

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³ *ibid.*

⁴ *Annual Report to Congress for the Fiscal Year 1992, Defense Environmental Restoration Program*, Pg. 5, April 1993.

⁵ James Lyon, et al. *Burden of Gilt*, Mineral Policy Center, June 1993.

⁶ *EPA Needs to Better Focus Cleanup Technology Development*, General Accounting Office, September, 1992.

- the types of information generated in evaluating technology do not always satisfy the information needs of engineering firms, venture capitalists, insurance companies, and others who will be critical to the eventual commercialization of those technologies; and
- the citizens around waste sites have rarely been consulted regarding the deployment of technologies at sites in their community. As a result, they have lost confidence in federal, state, or private site owners regarding the site cleanup process.

Establishing these linkages will enhance public discussion of the best ways to select and develop environmental technologies and make cleanup decisions. With this discussion, the various parties involved or affected by decisions regarding new technologies will better understand other viewpoints. Enhanced communication will also serve to increase the public understanding of innovative technology solutions and build trust in the government agencies performing site remediation.

The challenges are great and the opportunities substantial. Clearly what is needed is to "reinvent" the way the nation approaches innovative technology development and site cleanup. Western governors and their federal counterparts at DoD, DOE, DOI, and Environmental Protection Agency (EPA) have recognized this need and created the DOIT Committee as the vehicle to test (on a regional level) the new partnerships and approaches critical to expedited technology development and environmental cleanup.

THE DOIT COMMITTEE - GOALS AND PROCESS

The DOIT Committee is comprised of four western governors, the Secretaries of DoD, DOI, and DOE, the Administrator of EPA, and ex officio members from the Office of Management and Budget (OMB) and the Western Governors' Association (WGA). The DOIT Committee's organizational structure is seen in Figure 1. The Committee's vision is one of expanded consultation and partnership with all the interested stakeholders in order to:

- expedite the commercialization (development, testing, evaluation, deployment, and commercialization) of promising new technologies in a manner which is acceptable to all stakeholders;
- clean up federal waste sites in the West more rapidly;
- improve competitiveness of U.S. technology and remediation firms in world markets;
- facilitate education, retraining, and development of opportunities in the field of environmental technology and site remediation; and

- convert present waste sites to productive future use through reduction of remediation time and effective land use planning.

To achieve its vision, the DOIT Committee in April 1993 created four working groups around waste issues of concern. The working groups are: the Mine Waste Working Group, the Mixed Waste Working Group, the Military Munitions Waste Working Group, and the Waste Contaminants at Military Bases Working Group. To guide the technology and site screening activities of the working groups, an Ad Hoc General Criteria Group was also formed to develop criteria to guide the working groups' discussions on identifying candidate demonstration projects.

The working groups' memberships are broadly representative of key stakeholders concerned with environmental cleanup and include representatives from: federal, state, tribal and local agencies; regulatory bodies; service and manufacturing industries; academia; public interest and environmental groups; technology developers; and venture capitalists. These working group representatives mirror what the DOIT Committee expects will be replicated on a state-by-state basis. If these dialogues and partnerships are created, the doors will open to employing innovative new technologies and processes which will lead to faster, less expensive, and safer cleanup of waste sites in the region. If these new ideas prove successful, they could be adopted nationally.

The DOIT initiative has been divided into two phases. The first phase has covered the period during which the working groups were formalized, the goals and objectives of the program defined, barriers to regulatory and commercial acceptance identified, the criteria for selecting candidate demonstration sites established, and the initial identification of candidate demonstrations completed. The second phase, which will fully commence after the working groups' findings are reviewed by the DOIT Committee, will involve the implementation of the selected demonstration projects.

During the second phase, the working groups will explore public involvement, regulatory acceptance, and commercialization enhancements that can be integrated into demonstration projects approved by the DOIT Committee. Most significantly, working groups will also identify new technology demonstration projects not necessarily connected with any on-going federal technology demonstration for consideration by the DOIT Committee and potential funding by its member agencies.

PHASE I - CREATING THE DIALOGUE AND IDENTIFYING THE OPPORTUNITIES

A letter was mailed in March 1993 to individuals in the region who had expressed interest or concern about technology and site cleanup issues. The letter announced the formation of the DOIT Committee and requested nominations for working group membership or names of individuals who wanted to be kept informed about the project. From the nominations, a balanced and representative membership was selected as working group members and a stakeholder mailing list was established. Each of the four working groups convened in May 1993 marking the first time that all interested parties were at the table at the same time. The working groups met several more times between May and October 1993. In addition to the obvious benefit of bringing together the various interest groups, the meetings provided federal agency representatives and state regulators with the opportunity to exchange ideas with their respective counterparts. Working groups reported initial findings to the DOIT Committee in June 1993.

Working groups invited other interested parties to their meetings to broaden the range of perspectives and draw upon additional expertise in developing their reports. Other stakeholders have been kept informed of the groups' progress on a bi-monthly basis. In addition, two public roundtables were held — one in August and one in October 1993 — to identify potential solutions to overcoming regulatory and institutional barriers to new technologies and to ensure wider application of successfully demonstrated technologies.

Over the course of the last six months, the working groups and public roundtables have identified opportunities for improving the way federal and state governments go about technology development and deployment. The working groups then took the criteria for identifying candidate pilot demonstration projects developed by the Ad Hoc General Criteria Group and further refined them to address concerns unique to that group. Using these criteria, working groups have identified federal technology demonstrations slated for testing in 1994 at which working groups are prepared to work with site managers and local stakeholders to refine, test, and evaluate better ways of developing and commercializing innovative technologies. This process of "piggy-backing" on existing technology demonstrations will allow the DOIT Committee to move quickly to obtain better understanding of the barriers to regulatory and commercial acceptance and to develop strategies to overcome these barriers.

Findings and Candidate Regional Innovative Demonstration Sites

What follows is a summary of working group and roundtable findings, and options to consider. The findings are followed by discussions of candidate demonstrations. The individual working group reports and roundtable reports should be consulted for a more complete discussion of these issues.

Through the activities of its working groups and the Commercialization and Regulatory Barriers Roundtables, barriers to progress and specific strategies for overcoming them have been identified. (Reports on the commercialization and regulatory barriers workshops are included in Appendix B.) These critical barriers and strategies can be organized into the following categories: (1) maximizing public involvement, (2) building a regulatory process based on interstate reciprocity, (3) enhancing the commercialization process, and (4) promoting regional economic development.

Public Involvement

Facilitating the development of innovative cleanup technologies requires considerable federal interagency cooperation and unprecedented partnerships between federal, state, and tribal governments, and members of the public. Due to distinct agency missions and organizational structures, however, the approaches to technology development taken by DoD, DOI, DOE, and EPA have differed in many ways. These different approaches have made it difficult to share information among agencies and with non-federal parties such as states or local environmental groups.

This lack of communication and cooperation among federal agencies has been echoed by a lack of mutual cooperation and trust between the federal government and the states, indian tribes, and the public. Lack of trust has direct consequences on the long-term success of environmental cleanup by creating obstacles to accepting the development and implementation of innovative technologies. Both the Commercialization and Regulatory Barriers Roundtables as well as the individual working group reports, have emphasized the development of effective stakeholder relationships as absolutely critical to the timely and effective implementation of environmental technologies and site cleanup. Figure 2 identifies strategies for enhancing public involvement that are consistent with new stakeholder involvement models such as those included in a report released in 1993 by the Federal Facilities Environmental Restoration Dialogue Committee⁷ and new models being developed by the Colorado Center for Environmental Management.

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⁷ "Interim Report of the Federal Facilities Environmental Restoration Dialogue Committee," *Recommendations for Improving the Federal Facilities Environmental Restoration Decision-Making and Priority-Setting Processes*, February 1993.

Public Involvement

Findings

- Historic lack of communication and cooperation among Federal agencies and between Federal government and the public.
- Lack of public involvement in all phases of technology development and selection process.
- Lack of understanding by stakeholders of the technical, cost, and regulatory features of innovative technology development.

Options

- Aggressively seek to increase and expand the scope and size of stakeholder participation in the design, development, and evaluation of DOIT demonstrations to ensure stakeholder awareness and buy-in during the testing, permitting, and commercialization stages.
- Using Federal funds provided for the DOIT process, fund stakeholder participation, especially public interest groups, so they can be full and active participants in demonstration permit and other approval reviews.
- Fund Technical Advisory Groups (TAGs) for all demonstrations starting with the permit pre-application stage.
- Have stakeholders more involved in site planning and cleanup decisions, particularly in the earlier stages, to help ensure successful development and acceptance of cost-effective cleanup strategies.

Figure 2

Regulatory Barriers

The DOIT Committee sponsored a roundtable on October 20, 1993, on the regulatory and institutional issues and barriers constraining the testing and development of innovative environmental restoration and waste management technologies. The roundtable participants discussed a wide range of regulatory and institutional issues and barriers they felt inhibited the testing and deployment of innovative technologies.

Much of the discussion focused on the potential for the candidate demonstrations to: address the lack of standardized and validated cost and performance data on innovative technologies; smooth the development pathway from successful demonstration of a technology to fully permitted deployment; demonstrate new ways to ensure adequate resources and trained staff are devoted to regulatory review; test new methods of reducing or offsetting the costs and time of the regulatory process incurred by technology developers; enhance public trust in the technology demonstration and deployment process; and change the incentives and disincentives within the federal and regulatory agencies that limit timely and adequate consideration of innovative technologies.

Figure 3 identifies barriers to potential strategies for overcoming regulatory barriers.

Commercialization

The DOIT Committee sponsored a roundtable on August 19, 1993, on how to incorporate commercial considerations into waste technology demonstration projects and the broader deliberations of the DOIT Committee. The roundtable discussion yielded a consensus that the DOIT demonstrations should:

- demonstrate not just technology performance but also the development of markets for those technologies, especially new approaches to procurement and clear procurement paths for successfully-demonstrated technologies;
- test new approaches for obtaining independent, standardized data for technology cost and performance across government agencies and in the private sector; and
- explore new approaches to addressing long-standing concerns about liability.

Figure 4 identifies critical barriers to commercialization that were identified during the roundtable and by the working groups. The figure also relates those barriers to different types of strategies and options for overcoming those barriers.

Regulatory

Findings

- Differing and conflicting permitting requirements, creating uncertainty that successful technology demonstrations results achieved in one state will be accepted by another state.
- Failure to use existing waiver and other innovative permitting authorities.
- Inability to incorporate enough flexibility into each permit for testing of innovative environmental technology.
- The lack of flexibility in compliance schedules and in use of innovative enforcement remedies that works against technology development.
- Small and start-up companies that have to compete in the permitting process with well-financed applicants who also have enormous technical resources at their disposal and well-established relationships with regulatory agencies.
- A public, often not well-informed and properly consulted by regulatory agencies considering demonstration of innovative technologies, which contributes to a lack of public confidence.
- High staff turnover at federal facilities and regulatory agencies from inadequate financial compensation leading to permitting delays.
- Time and resource demands that create disincentives for site managers and regulators to take the time to investigate new innovative technologies.

Options

- Test standard or modular format for validated performance and cost data emanating from the demonstrations, for use by regulators across jurisdictions.
- U.S. EPA, other affected federal agencies, the States and affected local agencies could test mechanisms for expedited joint and concurrent review of technology approval applications (including for permits).
- Test a process for interstate permitting reciprocity - Demonstrations could involve a number of regulators from key states as well as federal regulators.
- Establish multi-agency (federal, state, local) permit teams that could provide "one-stop shopping" for permits across all affected media.
- Institute a system of federal and state incentives, new accountability measures, and training and support to retain experienced state and federal site managers, technology experts and permit writers.
- Encourage the adoption of uniform standards for states with interstate regulatory conflicts.
- Use results from human resources pilot programs developed from Phase I demonstrations (and later demonstrations) to develop a more permanent program designed to increase staff retention and quality of the regulatory approval process.
- Create test and evaluation (T&E) capabilities at appropriate DOE and DoD facilities, and mandate that such certifications must be accepted across regulatory jurisdictions.
- U.S. EPA could promulgate a rule to establish certain minimum hazardous constituent concentration levels below which waste would no longer be hazardous (i.e., de minimis levels).
- An inverted fee system (i.e., permit or other approval fee is reduced if unreasonable delays in review process are encountered) should be examined.
- With a proposed Interagency Policy Group on Federal Facilities Cleanup, an opportunity is provided to develop a comprehensive, coordinated approach for handling major crosscutting Federal Facilities cleanup issues.
- Department of Energy Contract Reform Initiative: The DOE is taking several steps internally to remove at least some institutional barriers. Findings currently being consolidated could be especially helpful to the implementation of Phase II procurement processes within the DOIT effort.

Figure 3

Commercialization

Findings

- Need for independent, standardized performance and cost data about innovative treatment technologies.
- A government procurement process that's cumbersome, erratic, and specification-driven.
- An overly lengthy permitting process for new technology demonstrations.
- Standards for regulatory decisions which can vary over time or among cognizant state regulatory authorities on permitting requirements.
- Need for information concerning future federal and state funding priorities.
- Need for a clear procurement plan for successfully demonstrated technologies.

Options

- Develop market research data – to come up with accurate market size projections.
- Establish performance procedures for technology certification.
- Coordinate involvement at demonstrations of federal, state, and local regulators so that multi-jurisdictional regulatory acceptance may result.
- Educate technology users and developers to use existing technology demonstration mechanisms and exemptions which currently exist under RCRA and CERCLA.
- Test a simplified procurement process and link demonstration success to procurement.
- A privatized technology certification process could be established to generate performance data that will be accepted by U.S. EPA and the states.
- A model technology clearinghouse could be created for improved dissemination of technology information.
- Explore innovative ways to limit liability/increase indemnification.

Figure 4

Regional Economic Development

Economic development is especially important to areas adversely affected by the recent dramatic changes in U.S. national security needs. In particular, the end of the Cold War and the break up of the Soviet Union have led to major reductions in U.S. military force levels, the closure of military bases, and the shutdown of nuclear weapons facilities.

This rapid decline in defense expenditures has had a disproportionately adverse effect on the economies of western states where many of these defense facilities are located. Furthermore, many of the affected regions are not only facing increased unemployment levels, but have large tracts of land that are currently contaminated with hazardous and radioactive wastes, making them unsuitable for civilian economic activity.

The DOIT initiative offers the prospect of addressing both the issue of environmental contamination and the problem of economic dislocation. In fact, for many of the DOIT demonstration projects, stimulating regional economic development will be an important measure of their ultimate success. Specifically, developing and testing of innovative environmental remediation technologies through demonstration projects can enhance economic growth by fostering the establishment and/or expansion of the environmental technology sector and restoring contaminated lands so that they can become economically productive. Technology development activities will also support development of a skilled labor force necessary to conduct cleanup and waste management activities nationwide. Figure 5 depicts economic development issues and options.

Candidate Demonstration Projects

The following discussion focuses on the processes followed by the working groups to identify prospective technologies and/or demonstration sites. Figure 6 below depicts the geographical distribution of priority sites identified by the working groups during Phase I as well as other sites identified by the coordinating group representatives in consultation with the working groups. These additional sites may require further reviews by the working groups.

Mixed Waste Working Group

Mixed radioactive-hazardous waste is primarily the result of weapons production at DOE sites, although significant amounts of mixed, low-level radioactive waste have been generated by commercial activities. Much of this waste is extremely hazardous and there are few suitable, cost-effective, and publicly accepted methods currently available for treating or disposing of these wastes. In 1992, Congress passed the Federal Facility Compliance Act which mandated that DOE establish schedules for developing technologies necessary to treat these wastes. This mandate led the Mixed Waste Working Group to identify sites and technology demonstrations where new approaches could be tested and evaluated beginning in 1994.

Regional Economic Development

Findings

- Economic development is especially important to areas adversely affected by the recent dramatic changes in U.S. national security needs.
- The rapid decline in defense expenditures has had a disproportionately adverse effect on the economies of western states where many defense facilities are located.
- Many of the affected regions are not only facing increased unemployment levels, but have large tracts of land that are heavily contaminated with wastes, and thus not usable for civilian economic activity.
- The DOIT process offers significant opportunities for regional economic development.
- Developing and testing of innovative environmental remediation technologies through demonstration projects can enhance economic growth by: fostering the establishment and/or expansion of the environmental technology sector and restoring contaminated lands so that they can be economically productive.

Options

- Expedite the commercialization of innovative technologies and the development and growth of technology-based firms. Market the technologies on a national and international basis.
- Designate selected sites as National Test Beds. Such sites in fact could become demonstration, test, or evaluation centers where new technologies are field tested and transferred.
- Facilitate economic growth by expediting the restoration of contaminated lands so that they could be used for economically productive purposes.
- Provide workforce training to ensure adequate supply of workers with necessary skills.

Figure 5

Between May and November of 1993, the Mixed Waste Working Group brought together stakeholders from around the West and the Nation to jointly review the technology demonstration process for mixed waste technologies. The Mixed Waste Working Group identified several areas where improvements could be made, including: the quality of the technology testing and evaluation process; stakeholder participation; regulatory mechanisms; and permitting and deployment practices leading to commercialization.

The Mixed Waste Working Group jointly reviewed over one hundred technologies that DOE was developing to address mixed waste. From that list, the working group identified nine technology demonstrations scheduled to begin during 1994 as candidates for testing improvements to the technology development process. The prospective candidates include:

Characterization Technologies:

- Radiological and Hazardous Material Measurement System
- Rapid Transuranic Monitoring Laboratory
- Dig Face Characterization

Treatment Technologies:

- Fixed Plasma Hearth Treatment
- Thermal Desorption
- Minimum Additive Waste Stabilization (MAWS)
- Microwave Solidification
- Two-Stage Advanced Oxidation Unit

Disposal Technology:

- Advanced Landfill Cover Demonstration

All of the technology demonstrations will be conducted in western states and could involve a number of DOE installations that include, but are not limited to, Rocky Flats, Idaho National Engineering Lab (INEL), Los Alamos, Pantex, and Hanford. As soon as the DOIT Committee approves any or all of these sites as regional innovation projects, the working group will begin development of a mechanism to work with site-based stakeholders, develop a demonstration implementation plan at each test site, and develop a standardized technology evaluation template. The group will also begin evaluating pilot approaches for: achieving broader solicitation of innovative technologies; streamlining regulatory guidelines governing demonstrations; identifying the mixed waste marketplace in order to encourage private investment; and enhancing worker training.

Waste Contaminants at Military Bases Working Group

Over the past six months, the Waste Contaminants at Military Bases Working Group employed a multi-stage process to screen the following six potential demonstrations:

- the McClellan Air Force Base Demonstration Project is testing three innovative remediation technologies: Dual Vacuum Extraction/Steam Injection, Soil Vapor Extraction, and a Bioventing System;
- the Williams Air Force Base Demonstration Project is evaluating the effectiveness of horizontal extraction wells in containing and remediating petroleum-contaminated ground water;
- the Air Force Center for Environmental Excellence⁸ Bioventing Initiative assesses in situ bioventing as an alternative to pump-and-treat methods for the remediation of petroleum-contaminated sites to be tested at Hill Air Force Base and other sites around the country;
- the Kirtland Air Force Base Advanced Landfill Cover Demonstration Project tests three alternative landfill cover designs against the present conventional design required by the USEPA: the Los Alamos bio-engineered cover, the Sandia dry barrier design, and the USEPA advance composite design;
- the Air Force Center for Environmental Excellence Intrinsic Bioremediation Initiative is developing a protocol for the evaluation of fuel contaminant destruction rates in ground water; and
- the March Air Force Base Demonstration Project is testing two alternative in situ treatment technologies to treat contaminated ground water.

The working group identified the strengths and weaknesses of each demonstration and grouped the demonstrations into two categories: good matches with DOIT selection criteria and close matches. The Air Force Center for Environmental Excellence Bioventing Demonstration, the McClellan Air Force Base, and the Williams Air Force Base demonstration projects are designated as good matches by the work group. These sites fully meet all the key criteria established by the working group, including a high level of interest in testing new approaches, significant regulator/stakeholder support, high level of technical innovativeness, and high commercialization potential. They also provide opportunities to test new approaches to regional permitting and innovative public involvement models.

The Air Force Center for Environmental Excellence Intrinsic Bioremediation Demonstration, the March Air Force Base

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⁸ The Air Force Center for Environmental Excellence is located at Brooks AFB, Texas.

Demonstration, and the Kirtland Demonstration are classified as close matches. These demonstrations did not score as high on certain criteria. However, it should also be noted that Kirtland Air Force Base demonstration is a candidate project for the Mixed Waste Working Group.

The working group is developing a strategic plan and process for both current and future demonstration projects to meet the DOIT Committee's vision. The working group is also outlining a process for screening additional demonstration projects, establishing internal peer review subgroups, and integrating existing DoD demonstrations, including the National Test Bed concept into the program. One project under consideration is the Port Hueneme Naval Construction Battalion Center. The Navy project involves the testing of ex situ and in situ treatment technologies for remediating fuel hydrocarbon-contaminated soil and ground water. In addition, Ellsworth Air Force Base has expressed interest in the DOIT program.

Once the DOIT Committee approves any or all of these sites, the working group, in collaboration with site managers, will assist site stakeholder teams in identifying new regulatory approaches, and explore ways to integrate technology selection and deployment with future use considerations.

Military Munitions Waste Working Group

Military munitions waste presents both a physical hazard and the potential for environmental contamination. Historically, little concern was paid to munitions wastes because they were located in remote areas or secured military facilities. However, a number of factors, including the closing of facilities, increased population migration into western states, and expanded recreation in remote areas on former and current defense sites has increased the potential for contact with munitions. Consequently, there is a need for better technologies and techniques for detecting, locating, and remediating these wastes.

The Military Munitions Waste Working Group has found that the regulatory and institutional mechanisms for defining and guiding the technologies for the cleanup of munitions waste needs to be updated or promulgated. The working group also agreed that because of the wide array of distinct issues associated with munitions waste, it would initially limit its focus to unexploded ordnance, contaminated media, and the demilitarization of munitions.

The working group has concluded that it can add the greatest value by focusing on the process for developing and deploying innovative technology rather than on efforts to develop a few promising technology "enhancements." The current technology efforts underway at both the DoD and DOE were deemed satisfactory to encourage the development of innovative technologies. However, the working group identified the lack of stakeholder participation

as a weakness in current technology development programs. Specifically, stakeholders involved in the cleanup of sites were not present during the development and testing stages of the technologies and methodologies to be employed.

The working group has initially identified four sites in the West where DoD will be conducting technology demonstrations in 1994 at which it would like to test stakeholder participation in the demonstrations and one site outside the region which, as a test bed, will serve as a source of new technologies applicable in the West. The initial sites identified for DOIT Committee consideration are:

- Black Hills Ordnance Depot, South Dakota
- Jefferson Proving Ground, Indiana
- Fort Ord, California
- Kaho'olawe Island, Hawaii
- Yuma Proving Ground, Arizona

The three potential Phase II sites are the Sierra Army Depot and the Castle Air Force Base in California and the Sunflower Army Ammunition Plant in Kansas.

Additional sites will be identified as necessary in Phase II to develop enough information to validate stakeholder models and to obtain stakeholder views on the relationship between acceptable risk and future land use, and to provide a variety of geophysical and environmental settings in which to demonstrate technologies. It is envisioned that these sites will be part of a national system of test facilities for the demonstration of innovative technologies.

Mine Waste Working Group

It has recently been estimated that there are about half a million abandoned mine sites in the U.S. Many of these sites contribute to contamination of surface and ground water, air, and soils impacting people as well as wildlife, including endangered species. Acid mine drainage is one of the biggest contributing to contamination. These sites, often located in remote areas, also present physical hazards to recreational users in the form of unmarked shafts and dangerous mine workings. Most of these sites are located on or directly impact federally owned land in the West.

Identification of potential technology demonstrations at mine waste sites was hampered by several factors unique to abandoned mine waste remediation, including the following:

- There is currently no comprehensive program for cleanup of these sites. There appears to be growing concern about this problem and there may be some progress towards such a program with current congressional initiatives.

- Without a strong lead to ensure cleanup of these sites, the potential market for cleanup technology is soft, discouraging private investment in mine waste cleanup technology development and delivery systems.
- The lack of a comprehensive site inventory makes it impossible to accurately define the extent and type of contamination problems at abandoned waste sites. This confounds the discussion of relative priority of mine waste problems at the national and state levels, affects the targeting of technology development efforts and interferes with the marshalling of resources. In addition, the market cannot be defined for potential technology developers and cleanup firms.
- Unlike the other DOIT waste areas that have comprehensive cleanup initiatives and problem inventories, mine waste technology development initiatives have not been as clearly focused on broadly applicable and defined cleanup needs. Thus, there were relatively few ongoing projects identified that could meet the Phase I criteria and many projects that could meet the Phase II criteria.
- Mixed land ownership patterns associated with abandoned mine sites typically result in more than one responsible party. Implementation of demonstration projects, therefore, requires substantial coordination and cooperation among site owners and regulators.
- Another factor hampering program implementation is the lack of proven and effective stakeholder models for mining sites.

Given the above situation, the Mine Waste Working Group (MWWG) has identified a need for an inventory of existing abandoned mine sites and the development of a mine waste-specific stakeholder model as immediate needs.

The Group has found that the inventories of abandoned mine sites are already well underway within the various states and federal agencies. The Group believes these efforts should be coordinated and linked to existing and emerging state inventory efforts to avoid duplication. Additionally, the basic purpose and principles underlying an inventory effort should be discussed among a broad set of stakeholders to ensure that the inventory is useful and effective.

To get a better handle on the types of issues and concerns associated specifically with development of new technologies to address mining site contamination, the working group conducted a quick survey, primarily of work group members, and identified over thirty projects. Some of these projects already have funding and will be moving into the field soon while others illustrate other aspects of the mine waste problem. Examples identified by the Group include:

- Water contamination at the Midnite Mine in Washington on the Spokane Reservation where the Bureau of Mines has been charged by Congress to investigate new water treatment technologies
- Heavy metal contamination of soils, water, and air and a pending disputed Superfund listing at the Triumph Mine, Idaho
- A low-cost technology for water contamination to be tested at the Pennsylvania Mine and a joint federal-state effort at the Nelson Tunnel in Colorado
- Two technologies to be demonstrated by the National Mine Waste Pilot Project in Butte; for acid mine drainage treatment at the Lilly-Orphan Boy Mine, Montana; and for treatment of cyanide contaminated water at a site to be identified
- Evaluation of a fifteen year old reclamation project at the Sheldon Mine, Arizona and testing of new technologies if found necessary
- Large watershed cleanup efforts in the Coeur d'Alene Basin, Idaho
- Test bed strategy for tailings and mine drainage at the Blackbird Mine, Idaho

Before identifying candidate projects for possible implementation, however, the MWWG felt it important to focus on improving coordination and developing stakeholder models. In light of the fact that the DOIT Committee's initial charter expires in 1994, and the length of time necessary to work with sites and local communities to discuss new approaches which could be tested, define project goals and how they fit with DOIT priorities, and establish project teams, the Coordinating Group believes the MWWG should move more rapidly to focus its efforts on testing new approaches at specific sites simultaneously with work on stakeholder models and inventory coordination.

As such, demonstrations planned by the U.S. Bureau of Mines (USBM) and the EPA/DOE National Mine Waste Pilot Project (NMWPP) offer the most promising possibilities to quickly move into the field. The USBM has a major mine waste technology development program with dozens of field trial/demonstrations underway at any given time and the National Mine Waste Pilot Project is charged with testing and evaluating promising mine waste technologies. New approaches, if successful, could become institutionalized within these major centers of activity on mine waste technologies.

The Midnite Mine and cyanide treatment projects associated with the USBM and NMWPP, respectively, are two projects the MWWG has identified that have received funding for work in 1994. These projects have been identified by state representatives of the Coordinating Group as the most promising projects that could be imple-

mented rapidly. The state of Nevada has suggested the FMC Gold Company Mine in Nevada as a candidate site for the NMWPP cyanide treatment technology demonstration. The states encourage the MWWG to consider these sites for immediate focus on their site efforts.

Primary federal land managers for abandoned mine waste sites are the Bureau of Land Management of the DOI and the U.S. Forest Service of the Department of Agriculture. The Department of Agriculture is not represented on the MWWG. For the purposes of advancing cleanup technology for abandoned mine waste, the Coordinating Group believes it is critical for the Department of Agriculture to become a member of the MWWG.

PHASE II - IMPLEMENTATION AND EVALUATION OF DEMONSTRATION PROJECTS AND IDENTIFICATION OF NEW DEMONSTRATION PROJECTS

During Phase II, the working groups will work with local site managers and stakeholders at those demonstration project sites approved by the DOIT Committee on January 31, 1994, to demonstrate new technologies and new processes/approaches identified in the reports of the working groups and the Coordinating Group. New approaches/processes include:

- a standardized cost and performance system such as the one being developed by EPA's Technology Innovation Office;
- regional permitting guidelines being developed by ten western states;
- new stakeholder involvement models such as those deployed through EPA's Federal Facilities Environmental Restoration Dialogue; and by Colorado Center for Environmental Management
- new technology demonstration implementation models such as those being developed by DOE and EPA.

The Coordinating Group will report to the DOIT Committee the progress and results of the demonstration projects and the new processes/approaches to cleanup technology development and deployment.

Further, working groups will identify additional demonstration projects that are not necessarily connected with any on-going projects of federal agencies. Unlike projects identified in Phase I which are being "piggy-backed" onto existing technology demonstrations, Phase II projects may be independent of any on-going

federal agency technology demonstrations. This will allow demonstration projects and new approaches to procurement which could lead to stronger entrepreneurial creativity and commercial success. During Phase II working groups may also identify new test beds, integrated demonstrations, and research laboratory opportunities which could help achieve the DOIT Committee's goals and objectives.

Institutionalizing Change

As Phase II proceeds, working groups will begin moving from a focus on testing new approaches at individual technology demonstrations in early 1994, to incorporating these new approaches throughout the complex governmental web of standards and incentives which send market signals to private companies and others involved in the development and deployment of new technologies and the remediation of sites. Areas for focus will be government procurement practices, liability, incentives for site managers to consider innovative approaches, land use planning, risk assessment, and training mechanisms.

A Procurement Roundtable and a Liability Roundtable will be held early in 1994 to gather information on obstacles and new approaches. The Procurement Roundtable will help develop broad policy options for procurement reform as well as specific models for possible testing in the context of Phase II identified candidate demonstrations.

Another broad area of inquiry could focus on establishing performance goals for technologies. The ability of citizens and government to agree on and establish measurable success criteria at the earliest stages of technology development is a key element for business planning and investment. Even if it is not always possible to hold to the initial performance agreements during a long technology development and testing effort, the act of setting (and changing) criteria in an open and collegial manner will create a climate for success. If done effectively, this will lead to faster and cheaper cleanups and increased regional wealth from more competitive remediation firms.

While well-defined regulatory requirements may increase the up front costs (in money and time, if not in people) of a technology, the end result may very well improve the developer's market position, establishing the technology as the best available for its time. Establishing cleanup goals at the outset of technology development will be one of the most important process improvements that the DOIT Committee can recommend.

Possible new approaches which could be tested in 1994-95 include: creating a public-private partnership to link public R&D grants with venture capital and to channel these funds to promising innovative remediation technologies; establishing a national system of test facilities with technology certifications; and integrating information across

federal agencies regarding site contaminants to better identify the market for new technologies.

A successfully reinvented technology development and commercialization effort will require the timely integration of stakeholders with technology, business, market, and regulatory factors. While technology development is already well underway, both in government and industry, an important objective of the DOIT Committee is to ensure that the community, business, market and regulatory factors keep pace with — and properly influence — technology development. Unless all factors are duly considered, a technology will not find community or market acceptance, nor widespread use. The synthesis of all these factors, when done properly, is the very essence of success.

Success To Date

The findings of the DOIT Committee's working groups and roundtables in 1993 suggest that the Nation must reinvent the way in which it develops its environmental technologies. The beginnings for this new model for doing business are already manifest in the relationships and dialogues taking place in working groups, among states, and between state and federal agencies as part of the DOIT Committee's fact finding efforts. Participants agree that strong inter-governmental and private-public partnerships are needed for success, partnerships where environmental protection and regional economic growth are mutually reinforcing.

Progress is already evident by the willing cooperation that was exhibited by all the parties during working group meetings and roundtable discussions. Federal site managers have expressed willingness to try new approaches and the four working groups have shown their resourcefulness in suggesting those possible new approaches. Stakeholder groups, while cautious that streamlining does not lead to by-passing public review, see promise in the possibility of participating more fully in discussions regarding technologies. Industry has shown a new eagerness to participate based on the anticipation of new and improved ground rules.

The DOIT Committee's efforts are also being informed by and benefiting from the considerable good work that the signatory agencies and National Laboratories have already been able to accomplish. Related efforts of the agencies will be monitored, evaluated, and, where appropriate, integrated. Examples of these efforts include: the emerging National Test Bed concept; DOE's contracting and procurement reform efforts; EPA's public-private technology demonstration partnerships at federal sites; and OMB/White House efforts on improving technology deployment. The DOIT Committee has a structure already in place at the regional level to provide feedback on these efforts and, if warranted, to pilot test ideas.

NEXT STEPS

While the opportunities created thus far constitute progress, much more needs to be done. Immediate efforts are needed to build on the current and planned environmental technology demonstrations, already budgeted by the agency partners. Recommendation of a site by the DOIT Committee to serve as a regional innovative demonstration site will empower the DOIT Committee working groups and local site managers and stakeholders to create, test, and evaluate new processes/approaches that are needed to catalyze successful commercialization of candidate technologies. Further, working groups will identify additional demonstration projects that are not necessarily connected with any on-going demonstration projects of federal agencies for consideration by the DOIT Committee.

To help achieve these objectives, three additional roundtables will be held in early 1994 covering procurement, liability, and demonstration infrastructure/implementation issues. Additional efforts will focus on identifying new technologies that can be added to the demonstration program and testing the public participation models discussed earlier in the report. Figure 7 shows sites nationwide that are currently serving, are proposed, or could be investigated as demonstration projects testing similar new approaches and new technologies. As can be seen in the Figure, the sites are distributed throughout the U.S. and are thus no longer confined just to the western states.

In sum, much has been accomplished during the past year, but the program faces significant new challenges that must be met to ensure that the program's objectives are fulfilled. Critical to the success of these demonstration projects will be the full involvement of site-specific advisory groups. Moreover, the working groups will play a critical role in providing technical assistance when requested, monitoring and reporting on progress, and facilitating the transfer of information among demonstration projects. Working groups have contributed to the evolution of cooperative relationships among state regulators, stakeholders, federal officials, and technology developers over the past six months. Consequently, the working groups can also be expected to facilitate the institution of critical regulatory and commercialization reforms.

The individual working group reports are presented, under separate covers, for DOIT Committee consideration. Each report is designed to provide a more complete evaluation of identified demonstrations in terms of preestablished selection criteria and to assist the DOIT Committee in selecting high-priority demonstrations. For example, a project that requires few or no permits may not be suitable to test new approaches to overcoming regulatory barriers but may be an excellent candidate to test the viability of stakeholder models. Figure 8, which is currently left blank, will summarize how priority and other prospective demonstration projects being reviewed by the working groups initially match up with various types of process enhancements. These categories will be completed in consultation with regulators and local stakeholders.

Additional Site Candidates Being Investigated for Future Demonstrations

Figure 7

- KEY:**
- Base Closure Model Program (P.L. 102-172)
  - DERA High Priority Sites
  - * Expedited Clean-up (P.L. 102-396)
  - △ DOE Integrated Demo Program
  - ◇ States with Planned EPA S.I.T.E. Demonstrations for FY1994

**Matrix for Matching Priority and Other Potential Demonstration Sites
and Technologies Against Process Enhancements**
(To Be Completed In Consultation With Stakeholders)

Process Enhancement Areas	Facilitating Commercialization of Technologies Removal of Regulatory Barriers Enhancing Public Involvement Promoting Regional Economic Development				
Contaminants at Military Bases Working Group					
McClellan AFB, CA					
Williams AFB, AZ					
Air Force Center for Environmental Excellence (AFCEE) Bioventing Project (e. g., Hill AFB, UT)					
AFCEE Intrinsic Remediation (Headquarters Brooks AFB, TX)					
Port Huenueme Navy Construction Battalion Center, CA					
March AFB, CA					
Ellsworth AFB, SD					
Mixed Waste Working Group					
Radiological and Hazardous Measurement System (INEL, ID)					
Rapid Transuranic Monitoring Laboratory (INEL, ID)					
Dig Face Characterization (INEL, ID)					
Thermal Desorption Process Treatment System (Rocky Flats, CO)					
Two-Stage Advanced Ox/Red Unit (Los Alamos, NM)					
Microwave Solidification (Rocky Flats, CO)					
Plasma Hearth Process (INEL, ID)					
Minimum Additive Waste (Pantex, TX/Hanford, WA)					
Kirtland AFB Advanced Landfill Cover Demonstration* (Kirtland, NM)					
Military Munitions Waste Working Group					
Black Hills Ordnance Depot, SD *					
Jefferson Proving Ground, IN					
Fort Ord, CA					
Kaho'olawe Island, HI					
Yuma Proving Ground, AZ					
Sierra Depot, CA					
Sunflower Army Ammunition Plant, KS					
Castle AFB, CA					
Mine Waste Working Group					
Midnite Mine, WA					
FMC- Gold Company, NV					

Legend

- Direct/Strong Contribution to DQIT Understanding
- Indirect Contributions
- Potential Future Contribution
- X No Apparent Contribution

* Also covered in the Contaminants at Military Bases Working Group Report

Figure 8

APPENDICES

Appendix A – Group Membership List

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Please note that the findings of the Coordinating Group do not necessarily reflect the views of every member of the working group. Some members were not able to participate in the development of the report, nor were they able to fully review its contents. The report does not represent the official view of any federal agency or department, state or other group.

Appendix B – Final Reports from the Commercialization and Regulatory/Institutional Barriers Workshops

COMMERCIALIZATION ROUNDTABLE

FINAL REPORT

FEDERAL ADVISORY COMMITTEE TO DEVELOP ON-SITE INNOVATIVE TECHNOLOGIES

September 16, 1993

COMMERCIALIZATION ROUNDTABLE
FINAL REPORT
FEDERAL ADVISORY COMMITTEE TO
DEVELOP ON-SITE INNOVATIVE TECHNOLOGIES

SUMMARY

The Federal Advisory Committee to Develop On-site Innovative Technologies (the "DOIT Committee") sponsored a roundtable on August 19th, 1993 on how to incorporate commercial considerations into waste technology demonstration projects and the broader policy deliberations of the DOIT Committee. Information contained in this report provides ideas for the DOIT Committee, its working groups, and other interested parties on how to integrate commercial participation and market acceptance into the site and technology selection process for potential demonstrations. The following document provides a brief summary of the objectives and dynamics of the meeting, a summary of the chief concerns of the participants, proposed solutions and programs the DOIT partners could undertake to foster commercialization of new remediation technology, an analysis of the current DOIT site and technology selection criteria, and suggestions on how the working groups can use the results of the commercialization roundtable to guide their selection recommendations.

The roundtable discussion yielded a consensus that to the extent possible, DOIT demonstrations should:

- demonstrate not just technology performance but also the development of markets for those technologies, especially new approaches to procurement and clear procurement paths for successfully-demonstrated technologies;
- test new approaches for obtaining independent, standardized data for technology cost and performance, across government agencies and in the private sector;
- explore mechanisms for integrated interstate permitting reciprocity of technologies; and
- demonstrate new approaches to addressing long-standing concerns about liability.

The clear message was that the DOIT Committee should concern itself just as much if not more with developing the market for innovative technologies as with developing the technologies themselves.

MEETING BACKGROUND, OBJECTIVE AND SETUP

At early working group meetings in Denver in May 1993, it was apparent that more information was needed about how to integrate the commercialization potential for remediation technologies into the selection and conducting of demonstration projects. Of the two main DOIT Committee objectives of more rapid cleanups and contributing to economic development of the states, seemingly only the first was being adequately addressed by the working groups.

To fill this information gap, a commercialization working group or workshop was suggested to ensure that the working groups fully understood the challenges faced by private sector remediation companies and to ensure maximum participation from remediation contractors, technology developers and their investors in the demonstration selection and implementation process. A commercialization roundtable was agreed upon as a good way to generate this information, and it occurred August 19 in San Francisco.

There were three main categories of private sector participants: environmental engineering/consulting (E/C) firms (typically the contractors who perform site investigations/assessments, remedial design, project management etc.), remediation technology vendors and developers (typically the manufacturer and seller of a piece of equipment or process that the E/C firm integrates into the remedial solution), and venture capital (VC) firms (who typically invest in the latter or technology/hardware-based as opposed to service-based businesses).

The meeting was held around a large square table arranged with 8-10 representatives of each industry group on different sides of the table. Representatives of the DOIT Committee members (WGA, DOE, DOD, and EPA), facilitators, and presenters made up the other side.¹ A section of observers brought the gathering to over 100 people. The meeting was conducted to be as interactive as possible to encourage candid input from the private sector.

MEETING PROGRESSION

The meeting was structured with welcomes and introductions by Jim Souby of WGA, Gary Voelker of DOE, and Gordon Davidson of EPA. Presentations on current federal demonstration programs followed to stimulate discussion. This was followed by interactive response from participants about the programs and new federal technology demonstration models. A familiar set of commercialization issues surfaced during this discussion.

Attempts were then made to reach some sort of consensus on the definition of successful commercialization. It was clear that participants held different views about what constituted commercial success. All views were bounded by a definition of successful commercialization as achieving consistent revenue growth moving towards profitability, or, somewhere between just getting a device tested to a tenfold return on investment.

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¹Presentations providing a review of current federal technology demonstration programs were made by Steve Stein (DOE), Sandy Clavell (DoD), and Linda Fiedler and Annette Gatchett (EPA). An EPA model to stimulate private investment was presented by Mike Mastracci.

Lunch time presentations were made by two key regulators, EPA's Gordon Davidson and CalEPA's Bill Soo Hoo, who both demonstrated a strong willingness toward regulatory flexibility. Davidson urged demonstrations that address expedited characterization to speed up and lower the cost of assessments. He also presented ideas on flexible RODs to allow for technology innovation. Soo Hoo described a number of regulatory reform initiatives underway or under consideration in California.

In the afternoon, breakout groups sought to prioritize the main barriers to commercialization of innovative technology that had surfaced earlier and to come up with possible barrier-busting solutions to test in the demonstrations. The three breakout groups also reviewed the Ad Hoc General Criteria Working Group's criteria lists (general, site selection, technology selection, and evaluation criteria) to offer some commercialization guidance or create an overlay for the working groups' deliberations on demonstration recommendations.

ROUNDTABLE PARTICIPANTS' CONCERNS

Discussion was certainly lively. As an August 30 editorial about the Roundtable in the Engineering News Record (ENR) put it,

Players in the estimated \$250-billion federal cleanup did more than voice frustration with government procurement policies. Technology developers sniped at engineers who stick with tried-and-true cleanup methods. Engineers chided technology developers for flashing unrealistic cost-and-performance data. And potential investors threatened to walk away, unless others reduce the time needed for commercialization of government-sanctioned technology.

Technology developers seemed the most beleaguered industry group. Representatives of this group expressed doubt that DOE/DOD would ever really make significant purchases of innovative technology. Even if these agencies decided to do so, developers found procurement to be a nightmare ("What took two weeks in the industrial sector took 10 months" and "We were told we had to hire a consultant just to fill in the forms properly"). Technology developers also felt that E/C firms have a vested interest in studying problems to death, and then were averse to using anything new once they got started with a cleanup. They also complained that VC firms show little interest in funding innovative technologies because of their limited track record, absence of milestones for commercial success, and perhaps most important, lack of evidence for a large predictable market for their equipment.

E/C firms countered that technology developers provide them with little usable data about the technical performance of their systems. In particular, they fail to provide adequate information on the associated costs that must be included in a project bid. They also expressed concern about taking on some or all liability at the sites they work on, which leaves little or no room for trial and error.

VC firms indicated that they only want to be involved in large uniform markets with high growth potential, and they haven't seen enough evidence of this in remediation to justify investment. They also need accurate market data, which they say is lacking, to be able to

calculate capital needs and then potential return on investment. VC firms also stated that they shouldn't be expected to fund technology demonstrations per se -- their interests lie in commercially operating firms with high profit potential.

All three industry groups referred to the need for uniform regulatory acceptance or permitting reciprocity for new cleanup and related processes, since in the current setting, successful demonstration at one site in one state would often make no difference in deploying that technology at a similar site in a different state.

PROPOSED SOLUTIONS

The commercialization roundtable revealed that, in the view of private sector environmental firms and potential investors, the development and demonstration of innovative technology is secondary to the development of actual markets for those technologies. The following specific solutions were proposed for the DOIT Committee and its working groups to consider as they review potential demonstrations to ensure a demonstration process that is supportive of both market and technology development.

Test a simplified procurement process and link the demonstration to procurement -- Less bureaucratic procurement at federal sites likely would induce more companies to become interested in cleanup opportunities at federal facilities, including demonstrations. Innovative procurement through streamlined and standardized procurement programs (e.g. ROAS, SBIR, ARPA) should be showcased in one or more DOIT demonstrations. Also, rigorous estimates of the market potential for the demonstrated technology should be developed as an integral part of the demonstration, tied where possible to available cleanup budget or spending projections. Market size forecasts could also link to private sector market information as well as international opportunities for remediation.

Test new approaches to standardized performance and cost data -- A standard or modular format for performance and cost data emanating from the demonstrations would help streamline permitting and market acceptance (i.e., communication between technology developers and E/C's). Demonstrations should be coordinated with, and move beyond, current federal and state efforts in this area. Demonstrations can also link initiatives in this area to efforts underway regarding uniform regulatory acceptance and new presumptive remedy policies.

Test a process for interstate permitting reciprocity -- Demonstrations should involve a number of regulators from key states as well as federal regulators and explore opportunities for interstate permitting reciprocity. This would create a larger regional market and remove a key source of market uncertainty.

Test ways to limit, share, or indemnify liability -- Demonstrations should explore new approaches to limiting, sharing, or indemnifying technology developers and E/Cs for testing new technologies or combinations of technologies at demonstration sites.

ANALYSIS OF SITE AND TECHNOLOGY SELECTION CRITERIA LISTS

The most important commercialization criterion from the **general criteria list** was "Does the project offer the potential to further the business objectives of the private partners?" Unfortunately the special considerations suggested in the general criteria to provide incentive for private funding may not come into play until those with the money are convinced of the size of the market following a successful demo, which relates directly the issues of widespread regulatory acceptance and market analysis. In other words, it will be difficult to mobilize private capital to help fund the demos until more concrete evidence of a substantial market is presented.

The most important criterion from the **site selection criteria list** was "The site is representative of critical site problems at government and other sites" and "there is an ability of selected demonstration sites to account for site-to-site variety and establish the range of effectiveness and cost for a technology." These related criteria again pertain to the selected site having the greatest potential to represent the greatest number of other sites, public and private, and the greatest dollar volume for the remediation companies and their investors.

It was hard to single out the most important criterion from the **technology selection criteria list** (except the general "timely commercialization"). Important criteria included "broad applicability," "...supported by federal, state and local governments, responsible parties, the broader community and all stakeholders," and "the technology has expected outcomes that are measurable and clearly understood." In other words, private companies seek demonstrations that will have buy-in across-the-board if possible and a considerable market to apply their process to once a successful demonstration is completed. The "measurable and clearly understood outcomes" criterion has importance particularly for the e/c firms who typically specify technology for cleanups (and often feel forced to pick "old" processes because of liability and lack of performance data concerns).

The most important items from the **evaluation criteria list** for commercialization were again "broad applicability" and "furthering the business objective of the private partners" but also "provide adequate information for user adoption." Again, companies are most concerned with the acceptance (and purchase) of the technology following the demonstration. It was agreed that technical evaluations are equally important, but that the commercial concerns needed to be heightened.

FURTHER COMMERCIALIZATION IDEAS FOR WORKING GROUPS

The charge to the working groups to guide the demonstration selection process has not fundamentally changed as a result of the commercialization roundtable. Rather, the simple message was that development and demonstration of innovative technologies is not enough. More attention needs to be given to the development of the market for these technologies, and demonstrations need to occur within a clear context of future procurement to attract private participation and funding from investors.

Site selection should focus on sites that are representative of as many other sites as possible in the public, private and international markets. Barring any immediate improvement in market information about the number of similar sites, working groups will have to rely on their own knowledge and that of the DOIT Committee member agencies on the characteristics and

distribution of sites. Federal and state staff can assist working groups with estimating the market potential of federal sites and possibly private and international ones as well.

Site selection also should consider the potential for facilitating interstate permitting of the technology/process used, and location of the demonstration in a state whose regulatory system is highly respected by other states. The possibility for a demonstration to be part of some sort of technology certification program (such as that under consideration in California) should also be considered.

Technology selection should also strongly consider market potential. Key factors include the relative costs of the proposed solution and evidence of a strong market outside the demonstration to attract the best companies and most funding. Specific types of technologies surfaced as those most needed to cut remediation costs. Characterization or assessment and monitoring systems to prevent time-consuming off-site lab analysis are a good candidate to be tested, especially in the context of the adjustable ongoing remediation strategy of the "flexible ROD." Destructive technologies that remove any potential threat of further contamination are also needed and have a greater appeal to industrial buyers since they eliminate liability concerns. Containment/solidification technologies that prevent contamination from causing problems off site also are expected to be important in federal cleanups, particularly in relatively remote locations.

NEXT STEPS

A DOIT Committee Regulatory and Institutional Barriers Roundtable discussion is scheduled for October 20, 1993 to further examine regulatory aspects of the findings described above. Interstate/interagency reciprocity or acceptance of technology demonstration results, "flexible RODs", and the use of field screening for preliminary characterization are examples of topics that will be explored in detail by state and federal regulators and the regulated community. Expedited procurement will also be discussed as ways are sought to break the gridlock of regulatory and administrative barriers.

Each of the DOIT Working Groups -- Abandoned Mine Waste, Mixed Waste, Waste at Military Bases and Munitions -- will prepare reports of their deliberations and findings by the end of October 1993. These reports will include potential demonstration projects which factor in the concerns and proposed solutions from the Commercialization and Regulatory roundtable discussions. The working group reports will be used by the DOIT Committee to recommend specific demonstrations later this year to test proposed solutions to barriers impeding the development and deployment of environmental restoration and waste management technology, to stimulate commercialization, and to expedite cleanup.

**REGULATORY AND INSTITUTIONAL
BARRIERS ROUNDTABLE**

FINAL REPORT

**FEDERAL ADVISORY COMMITTEE
TO DEVELOP
ON-SITE INNOVATIVE
TECHNOLOGIES**

DECEMBER, 1993

REGULATORY AND INSTITUTIONAL BARRIERS ROUNDTABLE

FEDERAL ADVISORY COMMITTEE TO DEVELOP ON-SITE INNOVATIVE TECHNOLOGIES

SUMMARY

The Federal Advisory Committee to Develop On-Site Innovative Technologies (the "DOIT Committee") sponsored a roundtable on October 20, 1993 on the regulatory and institutional barriers constraining the development, testing, demonstration and deployment of innovative environmental restoration and waste management technologies. The purposes of the Roundtable were to identify the most important issues and barriers and to propose possible solutions that could be tested in the context of technology demonstrations selected by the DOIT Committee. The Roundtable was also convened to identify longer-term legislative, policy, or systemic institutional issues or solutions that the DOIT Committee might choose to address outside of the context of the demonstrations.

This report describes the genesis and dynamics of the Roundtable and summarizes the issues, barriers and solutions discussed. This information may be useful to the DOIT Committee, its working groups, and other interested parties.

The Roundtable participants discussed a wide range of regulatory and institutional issues and barriers they felt inhibited the testing, demonstration and deployment of innovative technologies. The roundtable discussion yielded a consensus that to the extent possible, DOIT demonstrations could be "testing grounds" for new approaches to:

- increase the level of regulatory predictability in the technology demonstration and approval process;
- address the lack of standardized and validated cost and performance data on innovative technologies;
- strengthen the incentives and eliminate disincentives within federal and state regulatory agencies to encourage the use of more flexible approaches for demonstrating and approving innovative technologies;
- reduce or offset the costs and time incurred by technology developers in the regulatory process;
- enhance public trust in the technology demonstration and deployment process; and
- ensure adequate resources and trained staff are devoted to regulatory review.

The clear message was that the DOIT Committee could play a critical role in breaking down institutional and regulatory barriers in the innovative environmental technology demonstration and deployment process.

Four breakout groups composed of Roundtable participants and other attendees generated lists containing both short-term and longer-term actions that might accomplish these goals. Some of the suggestions included:

Predictability

- establishing a technology certification process, including testing centers;
- eliminating interjurisdictional regulatory conflicts wherever possible;

Data

- developing better technology evaluation protocols in order to yield reliable, consistent cost and performance data;
- establishing a model technology information clearinghouse;

Incentives for Regulatory Flexibility

- redefining success and measures of merit for improved consideration of innovative technologies by regulators;
- ensuring the participation of internal advocates of innovative technologies in intra-agency reviews;
- encouraging high-level political and administrative support for the DOIT demonstrations;
- negotiating cleanup schedules to allow for adequate stakeholder participation and consideration of innovative technologies;

Costs

- employing expedited joint and concurrent multi-agency reviews of technology approval applications, including earlier public involvement;
- giving highest priority in the regulatory approval process to innovative technology approval applications;
- changing permitting procedural requirements to promote more efficiency;

Public Trust

- supporting earlier stakeholder involvement, particularly the public, in all phases of technology selection and evaluation;
- increasing the availability of public information and providing independent technical and financial support;
- providing independent monitoring of demonstrations;

Resources

- earmarking and prioritizing regulatory resources for innovative technology reviews; and
- providing better training for regulators on innovative technologies.

Procurement, contracting, and liability issues, which are related to the regulatory and institutional issues and barriers addressed in the Roundtable, were deliberately excluded from the focus of the Roundtable. These issues will be addressed in separate DOIT initiatives.

MEETING BACKGROUND, OBJECTIVES AND SETUP

Regulatory and institutional barriers have been a concern throughout the DOIT Committee's work. In May, 1993, the DOIT designees explicitly requested that a special forum be held to identify priority barriers and how they might be addressed under the Memorandum of Understanding in general, and in the technology demonstrations in particular. After the DOIT Commercialization Roundtable was conducted in August, and regulatory and institutional issues were again identified at that meeting as significant barriers to the commercialization of innovative technologies, planning began on a Regulatory and Institutional Issues Roundtable.

The objectives of the Roundtable were to:

- identify the critical regulatory and institutional barriers and issues inhibiting technology development, demonstration and commercialization;
- identify possible solutions to those barriers which might be tested as part of the DOIT Committee-selected demonstrations; and
- identify other issues, barriers, or potential solutions that could be addressed by the DOIT Committee outside of the context of the demonstrations.

Background materials, including a list of potential barriers and solutions, were developed from several important studies of the subject and participants were invited who represented federal and state regulatory agencies, technology developers, technology users (such as engineering/consulting contractors), public interest environmental groups, and other key stakeholders.

The Roundtable was held in San Francisco on October 20, 1993. The morning sessions of the meeting involved primarily the 40 invited participants around a large square table. Observers, who were invited to ask questions at the end of the morning session and to participate in the afternoon breakout sessions, brought the total number of attendees to more than 100.

MORNING SESSIONS

The meeting opened with a series of welcomes and introductory remarks from Jim Souby, Executive Director of WGA, Dick Green, Deputy Secretary of Cal/EPA, John Carter from the Idaho Governor's Office, Susan Prestwich from the U.S. Department of Energy, and Meg Kelly and Diane Lynne from U.S. EPA. Jim Souby gave an overview of the WGA/federal agencies memorandum of understanding and the DOIT initiative. He also summarized the major findings from the DOIT Commercialization Roundtable held in August and noted that representatives from several western states had met the day before this Roundtable to discuss information sharing on innovative technologies and the possibility of streamlining permitting through inter-state agreements.

Participants introduced themselves and the facilitators began the discussion by providing some background on the list of barriers and potential solutions that had been prepared as a starting point for the day's discussion. This led to an active dialogue among participants about the critical regulatory and institutional barriers and possible solutions. The paragraphs below focus on the issues and barriers raised; proposed solutions are highlighted later in this report.

The participants identified several key categories of barriers:

Predictability

Both developers and users of technology identified problems associated with the lack of clear performance standards and permitting requirements for new technologies and the uncertainty over whether successful technology demonstration results achieved in one state or under one regulatory program would be accepted by another state or program. These uncertainties limit the incentives for technology developers to offer solutions and for technology users to consider incorporating technologies with a limited track record into cleanup plans. Furthermore, potential investors may be hesitant to invest in a new technology where multiple jurisdictions create fragmented markets, because the potential investors may be able to capture only a small portion of the total available market and are thus restricted on their potential rate of return on investment.

Data

The lack of standardized and verified cost and performance data for new technologies was identified as a major source of the risk aversion of technology users and regulators. Some participants also noted that data on the composition and characteristics of the wastes being tested or treated are also insufficient in many cases.

Incentives for Regulatory Flexibility

Several participants expressed support for streamlined processes already in place for approving the demonstration and use of innovative technologies (i.e., RCRA RD&D permits and CERCLA 121(e) approval process), but were concerned that incentives did not exist to encourage the use of these existing authorities. Several participants also expressed concern with the lack of flexibility and incentives for permit writers and enforcement personnel to incorporate provisions in permits and enforcement agreements to use innovative technologies.

Costs

Technology developers in particular expressed concerns about the costs in time and money of getting through the bureaucratic hurdles of the regulatory processes and receiving either a permit or some other approval to test or deploy innovative technologies. Government regulators also lamented the costs and time associated with reviewing permit applications for new technologies, due to the extensive information requirements and, in some cases, failure of developers to supply the necessary data in their applications. Some of the unnecessary costs and time associated with the process were attributed to inefficient communications between permit applicants and regulators -- for example, the reliance on certified mail versus facsimile or electronic mail and the traditional "sequential" communications between regulators and applicants (i.e., submittal-response-resubmittal-response).

Public Trust

There was general consensus that the lack of public trust in the technologies, the developers and users, or the regulatory system often hampered technological innovation by slowing the permitting process and generally discouraging risk-taking among technology users and regulators. Public interest group representatives at the Roundtable pointed out that the permitting system often provides the only opportunity for interested members of the public to participate in the decisionmaking about new technologies and to assure themselves that technologies will really do what they are intended to do -- control or prevent pollution without harming the public or environment. They suggested that the permitting process might be less burdensome if alternative opportunities existed for meaningful participation.

Resources

Many of the participants expressed concerns about the limited resources -- in terms of the number of personnel and their level of training -- available to state and federal regulatory agencies to adequately consider innovative technologies. High staff turnover at regulatory agencies also impedes the kind of "institutional memory" that might encourage a longer term view of innovative technology evaluation and selection. For developers, resource shortages -- i.e., lack of capital -- were also seen as a significant barrier to commercialization.

Several important cross-cutting issues were raised during the discussion:

- 1) Some participants expressed concerns about the anecdotal nature of the evidence for the barriers and issues discussed. It was suggested that solutions should flow from a more rigorous analysis of the permitting processes to determine where the delays and bottlenecks truly existed. The possibility of the DOIT Committee sponsoring a study was raised.

- 2) The point was emphasized on several occasions that, in part, the perception of barriers resulted from conflicting objectives of the participants; in other words, the process exists to serve an important goal -- protection of public health and the environment from releases of hazardous substances. What is to some stakeholders in the process a barrier to the demonstration or deployment of innovative technologies is to another set of stakeholders an assurance of adequate environmental safeguards. The DOIT Initiative was highlighted as an important opportunity to find common ground between these two viewpoints.
- 3) The distinction was made between barriers and issues that inhibit demonstration of technologies, versus those that inhibit deployment or commercialization. The DOIT Committee has an obligation to tackle both.

LUNCHEON PRESENTATIONS

During the lunch break, participants heard brief presentations from Dick Green, Deputy Secretary of Cal/EPA and Gordon Davidson of Capital Environmental, formerly Director of U.S. EPA's Office of Federal Facilities Enforcement. Dr. Green discussed the recent passage and plans for implementation of California's Assembly Bill 2060, which establishes a certification program for environmental technologies. He also discussed the progress of California's permitting reform initiatives.

Mr. Davidson discussed the pending reauthorization of Superfund and its potential impacts on the development of the nation's environmental technology industry. He noted that the current discussions in Congress about reliance on less-than-permanent remedies and institutional controls based on future land use decisions at Superfund sites may result in laws and policies that undermine the continued development of a competitive environmental technology industry in this country. He recommended a set of short and long-term actions for the DOIT Committee to consider and noted that the DOIT Initiative offers an alternative to the land use controls approach.

AFTERNOON SESSIONS

After lunch, the participants broke into four smaller groups to identify possible solutions to the major barriers identified in the morning sessions.

- Group One addressed the issue of lack of good cost and performance data.
- Group Two addressed the issue of inadequate resources.

- Group Three addressed the issues of public trust and institutional incentives for regulators and users to be flexible and creative in considering innovative technologies.
- Group Four addressed the issues surrounding the costs and time associated with the approval process itself and the barriers created by the overall legal framework.

PROPOSED SOLUTIONS

Although there was some unavoidable overlap among the breakout groups, a diverse and useful set of ideas for the DOIT Committee was generated. The following summary groups the proposed solutions by type of barrier and by time frame for implementation. Some of the proposed solutions could be tested by the DOIT process in "phase one" demonstrations. Others probably cannot be incorporated until later phases, and still others may take regulatory or legislative action by Congress or federal or state agencies.

Predictability

Establishing a government-sanctioned technology certification process was identified as a key way to overcome the lack of predictability in obtaining broad regulatory approvals for innovative technologies across federal and state jurisdictions.

Phase One:

Under the authority granted the California EPA by a new law (A.B. 2060, signed by Governor Wilson in October 1993), a model technology test and evaluation certification center or process could be established at one of the California Federal facility demonstration sites being considered by the DOIT Committee. The regulations and procedures being written to implement this new California law could be field-tested at a California demonstration site. Because California's standards and permitting requirements are often the most rigorous in the country, other WGA states and Federal agencies involved in the DOIT process could agree through a MOU to accept cost and performance data generated at the California technology certification center.

Later Phases:

A privatized technology certification process could be established, whereby the technology demonstration applicant pays a "neutral" laboratory or testing center for a test of its technology that will generate performance data that will be accepted by U.S. EPA and the states. It is unclear whether this would require new legislation, but if not, such a

third-party certification program could be tried on a pilot basis at later phases of demonstrations to be considered by the DOIT Committee.

Legislative/Regulatory:

- 1) Test and evaluation (T&E) facilities/capabilities could be set up at appropriate DoD/DOE facilities and orphan CERCLA sites for certifying environmental remediation technologies, and it could be mandated by law and/or policy that such certifications must be accepted as credible from a technical standpoint nationwide and across regulatory jurisdictions. Congress and the Administration could consider establishing such T&E facilities as part of RCRA and CERCLA reauthorizations (see Section 2), with accompanying development of national standards for collecting, reporting and verifying technology cost and performance data. Depending on its initial success, the California law and program could be looked to as a model.
- 2) States with intrastate regulatory conflicts could adopt statewide standards.
- 3) Interstate regulatory conflicts could be eliminated and, wherever possible permitting requirements could be consolidated. Nine Western states are designing a pilot interstate permitting/information sharing protocol emphasizing innovative technologies for testing at demonstrations early next year. Western states, particularly California, have underway intrastate regulatory reform initiatives to overcome this regulatory barrier.

The DOIT Committee or WGA could recommend formation of a taskforce to study what differences in standards exist between states and programs. This study could then serve as the baseline data needed to provide more consistent standards nationwide.

- 4) U.S. EPA could promulgate a rule under RCRA Subtitle C to establish certain minimum hazardous constituent concentration levels below which wastes would no longer be hazardous. Technologies which can demonstrate that they reduce concentrations of hazardous constituents below those levels could then be marketed with more certainty as to their applicability and benefit to users. This issue is currently being addressed in a separate consensus-building process that includes U.S. EPA, the Hazardous Waste Treatment Council, environmentalists, and other interested parties.

Data

Better technology evaluation protocols could be created in order to develop reliable, consistent cost and performance data for regulators and end users to use in making decisions.

Phase One:

Existing technology measurement protocols (SITE, Batelle, etc) could be reviewed and refined in order to develop a common and standardized technology evaluation formula or template which addresses the key decision-maker criteria.

- a. Key technology selection decision-makers could be interviewed to determine precisely those criteria or cost-performance data around which their decisions typically hinge.
- b. Once a common technology evaluation template is developed, it could be applied and tested to determine its feasibility in the application, evaluation and eventual permitting and commercialization of the demonstrations scheduled to take place in 1994. WGA and U.S. EPA are working cooperatively on this.

Later Phases:

A model technology clearinghouse could be created for improved dissemination of technology information by assessing existing database and information transfer mechanisms. Phase Two demonstrations could be used as testing grounds for this clearinghouse, which could later be expanded nationwide by U.S. EPA.

Incentives for Regulatory Flexibility

Demonstrations could be used as testing grounds to build accountability and incentives into the technology approval process in order to encourage regulators to be more creative and responsive in reviewing technology applications. The enforcement process could also be utilized to promote acceptance of innovative technologies.

Phase One:

1. Better feedback and accountability systems could be put into place by U.S. EPA to encourage and track use of already-existing innovative permitting authorities. Demonstrations being considered by the DOIT Committee could be used as testing grounds for trying out such feedback and accountability systems, and for utilizing already-existing innovative permitting authorities.
2. Technology users and developers could be better educated on the opportunities to use existing technology demonstration mechanisms via exemptions which currently exist under RCRA and CERCLA, and encouraged to use such mechanisms.
3. A model program could be established at demonstration sites being considered by the DOIT Committee to reward and create incentives for permit writers to take appropriate risks and be creative with permitting of innovative technologies. The NACEPT TIE Committee Report *"Permitting and Compliance Policy: Barriers to U.S. Environmental Technology Innovation"* (EPA 101/N-91/001, January 1991, pp. 85-90) should be reviewed for specific suggestions before designing such a program. If successful, such a program could later be implemented throughout U.S. EPA and the States.
4. Permit writers could be authorized and strongly encouraged from top decisionmakers on down to include in innovative technology permits risk-based assessments of worst-case scenarios resulting from use of the innovative technology. Such assessments would provide clear disclosure of the possible downsides from using such technologies and might lessen the permit writer's sense of being on his/her own in approving such permits.
5. Where not already provided for, U.S. EPA and the states could amend cleanup schedules and Federal Facility Agreements (FFAs) at demonstration sites to build accountability by allowing for adequate stakeholder participation, especially the public.
6. U.S. EPA could consider the issuance of policy guidance to the Regions and the States to require Federal Facility Agreements to include incentives for utilizing innovative remediation technologies, where appropriate.
7. U.S. EPA could issue policy guidance to the Regions and the States to consider the inclusion of incentives for utilizing

innovative remediation technologies consistent with EPA's policy on the use of Supplemental Environmental Projects (SEP's).

Costs

U.S. EPA and the States could work together to streamline and coordinate their technology approval processes to provide more up-front decisionmaking, give priority in the permitting process to innovative technology applications, and engage the public earlier in the process to reduce later misunderstandings.

Phase One:

1. U.S. EPA, other affected federal agencies, the States and affected local agencies could establish a mechanism for expedited joint and concurrent review of technology approval applications (including for permits) across federal, state and local authorities, with contemporaneous public hearings where possible. Pre-application review by the public could be attempted. A lead agency and/or state could be designated for each review. This concept could be tried on a pilot basis at one or more of the demonstrations being considered by the DOIT Committee. Future federal agency funding for the DOIT demonstration process could take into account the increased resource needs of the States and localities in carrying out expedited concurrent and joint review (i.e., increased staff and travel expenses).
2. U.S. EPA, the States and affected local agencies could establish permit teams that provide "one-stop shopping" for permits across all affected media at the demonstrations being considered by the DOIT Committee. This would also allow for careful tracking of permits and less disruption when one team member leaves. In particular, this approach could be tried in California, where Cal/EPA has already established one-stop permitting centers.
3. Regulatory agencies could adopt policies giving highest priority to innovative technology permit applications. Such policies could be adopted in time to affect Phase One demonstrations being considered by the DOIT Committee. One variant of such policies could be to give preference to private sector technology developers who provide up-front resources or risk company capital in order to advance the technology demonstration process.
4. A "fast-track" review process for innovative remediation technologies could be established on a pilot basis at one or more

of the demonstrations being considered by the DOIT Committee. A pre-approval application screening step involving a public meeting of the key stakeholders could be added in order to build public confidence in the demonstrations being considered by the DOIT Committee (see also discussion below on building public trust). Future federal agency funding for the DOIT Demonstration process could take into account the increased resource needs of the States and localities in carrying out this "fast-track" review process.

- a. Different forms requiring differing levels of information (i.e., less data required for technologies deemed "less risky" after initial screening) could be developed and tried on a pilot basis.
  - b. Cal/EPA's tiered permitting program for hazardous waste permits (which matches permitting requirements to level of risk) could be examined as a possible model. Michigan apparently also has a process that could be examined.
5. U.S. EPA and the States could provide specialized regulatory and technology promotion assistance to assist the demonstration and permitting of environmental technologies. The DOIT process could be used to develop common sense ideas for providing such assistance in the likely absence of new funding.
6. A model checklist for obtaining approvals to demonstrate/use innovative remediation technologies could be developed and tested at one or more demonstrations being considered by the DOIT Committee. Idaho has developed a checklist that may serve as a useful model.

Legislative/Regulatory:

An inverted fee system (where a permit or other approval fee is reduced if unreasonable delays occur in the review process) could be examined. Conversely, a system of increased payments for expedited permit reviews could be examined. At a minimum, U.S. EPA and the states could charge enough fees to cover costs of processing, thus, removing a budgetary disincentive to timely review of innovative technology demonstration applications.

Public Trust

The DOIT Committee could aggressively increase and expand the scope and size of public participation in the design, development and evaluation of DOIT demonstrations to ensure broad stakeholder awareness and buy-in during all stages of the demonstration and approval process. Some of the technology developers expressed concern with possible time delays resulting from expanded public participation. The demonstrations being considered by the DOIT Committee provide pilot opportunities for trying to build public trust in favor of demonstrating and testing innovative technologies. Some of the issues that could be addressed are (1) limited time for tests, (2) corrective action requirements, (3) disclosure, (4) earlier public participation, and other measures that assure necessary protection, such as independent monitoring or oversight of demonstrations.

Phase One:

1. Using Federal funds provided for the DOIT process, the DOIT Committee could fund increased stakeholder participation, especially public interest groups, so they can be full and active participants in demonstration permit and other approval reviews. This solution also relates to the human resources barriers described below.
2. Decisionmakers could be encouraged to better understand the public's view of risks, especially the non-mathematical considerations. The public could be given the opportunity to explore how risks are affected by changes in variables and assumptions.
3. Accessible information repositories could be created for public use.
4. Public forums on the process could be held and should involve the media.

5. Other active outreach efforts could be conducted, with the awareness that the public has limited time and resources for participation.
  - a. Meetings and hearings could be combined when possible.
  - b. Clear "charters" for participation could be established.
  - c. Feedback loops could be created. Responsiveness documents and records of the decisionmaking process could be created.
6. Technical advisory groups could be funded for all demonstration sites at pre-application stage. The DOIT Committee could consider using such groups for independent monitoring of demonstrations in order to build public trust and input.

Resources

U.S. EPA and the States could institute a system of incentives, new accountability measures, training and support to retain experienced state and federal site managers, technology experts and permit writers who participate in decisions involving innovative environmental technologies. A pilot program could be established in conjunction with the demonstrations being considered by the DOIT Committee.

Phase One:

1. U.S. EPA could clarify that State grant funds can be used to process RD&D permits or HSWA reviews. Apparently, some regional EPA offices do not allow this in the annual work plans for RCRA/CERCLA. Where possible and appropriate, other funds for innovative technology permitting could be earmarked.
2. U.S. EPA and the States could encourage the use of college and university staff, and graduate students as technical support staff in demonstration oversight and approval processes.
3. A centralized peer review or technical review cadre could be created and staffed collectively by U.S. EPA and the States, to be available to support permit/approval reviews in the Phase One demonstrations. This group could also act as a central clearinghouse for information on Phase One. This centralized peer review or technical review cadre could be created under the auspices of a WGA MOU. U.S. EPA permit writers could

receive extended technical support from laboratory personnel knowledgeable on environmental technology issues (as currently exists in U.S. EPA Region 9).

4. Specialized licensing/training of regulatory staff involved in overseeing the innovative technology demonstration process could be established on a trial basis, with concomitant rewards/incentives for staff involved in the process to encourage staff retention and strengthen staff morale.

Later Phases:

The DOIT Committee or WGA could commission a study to better pinpoint where the resource needs in the technology demonstration approval and oversight process are most critical and where extra or different kinds of resources would help. The study could be commissioned in time to make recommendations on improving resource allocation for Phase Two demonstrations.

Legislative/Regulatory:

1. State and Federal regulatory agencies could use the results from the human resources pilot program developed for Phase One demonstrations (and later phases) to develop a more permanent program designed to increase staff retention and the quality of the regulatory approval process.
2. State and Federal regulatory agencies could establish non-supervisory, senior technical positions for technology experts within regulatory agencies to provide incentives to specialize in innovative technology permitting and improve staff retention.

NEXT STEPS

Each of the DOIT Working Groups -- Abandoned Mine Waste, Mixed Waste, Waste at Military Bases and Munitions -- is preparing a report of its deliberations and findings for consideration by the DOIT Committee in January, 1994. These reports will include potential demonstration projects which factor in the concerns and proposed solutions from the Regulatory (and Commercialization) roundtable. The DOIT Committee also will directly consider the issues, barriers and solutions raised at the Regulatory roundtable in recommending specific demonstrations later this year. These demonstrations will be used to evaluate the viability of selected solutions to regulatory and institutional barriers impeding innovative technologies. Their evaluation will serve as a basis for more widespread changes in policy and practice.

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