Overview and Findings 1

The Manhattan Project-the secret effort to invent and build the first atomic bomb-was accomplished in less than 4 years at a cost of approximately $2 billion.[1] The project was backed by the resources of America's largest and most advanced corporations and engineering fins, and employed the talents of thousands of the world's best scientists, technicians, and workers.

A half century later, the institutional descendant of the Manhattan Project, the U.S. Department of Energy (DOE), cofronts a new mission: cleaning up the environmental pollution left by cold war nuclear weapons production. This new mission presents DOE with daunting technical and organizational challenges as it strives to revise policies that led to widespread pollution throughout the Nuclear Weapons Complex and to restore contaminated environments to safe conditions,

It is estimated that cleanup of environmental contamination from nearly **50** years of nuclear weapons manufacture will cost more than $100 billion and require more than 30 years to complete. The cost and length of the cleanup are uncertain because the true extent of pollution and the means to remedy it areas yet only dimly understood, Some areas of the Weapons Complex may never be restored to pristine conditions.[2]

DOE is responsible for protecting those who will do the work of cleaning up

The tasks involved in the cleanup of environmental contamination are unfamiliar to DOE. Indeed, the entire field of hazardous waste management and environmental remediation is in its infancy. Methods of characterizing contaminatedsites are highly uncertain,[3] and approaches to cleaning up are largely unproved at both waste sites owned by private industry and government-owned facilities such as DOE reservations.[4 5]

It is clear, however, that cleaning up the 14 facilities in **13** States that make up the Nuclear Weapons Complex (NWC) will

demand the application of great talent and resources. The tens of thousands of people who will be engaged in cleanup of the Weapons Complex will join a large and growing industry devoted to the characterization and restoration of contaminated environments. It is estimated that over the next 5 years, DOE's Office of Environmental Restoration and Waste Management could require the services of as many as 25,000 scientists, engineers, and technicians.[6]

Some workers will be involved in collecting environmental samples, studying groundwater movement, and designing remediation projects. Others will be operating earth moving equipment; handling, inspecting, and repacking waste drums; or building dams, digging trenches, and constructing complex waste treatment facilities. Still others will be plant operators, maintenance personnel, and technical experts at vitrification plants, wastewater treatment facilities, and incinerators. Municipal firefighters, police, medical experts, and other emergency response personnel may be called on in the event of fire, explosion, or accidental release of toxic materials.

The NWC cleanup will be one of the largest environmental remediation efforts ever, and very likely the largest undertaken by the Federal Government at taxpayers' expense. If conducted effectively, the DOE cleanup could serve as a model of how workers engaged in hazardous waste and emergency response operations should be protected from work-related illness and injury. DOE's past refusal to acknowledge its obligation to comply with environmental laws and regulations means that the Department is starting environmental characterization and remediation activities more than a decade after the private sector began cleaning up Superfund and Resource Conservation and Recovery Act (RCRA) sites. During those years, much has been learned about how to protect the health and safety of cleanup workers; DOE could apply these lessons to great advantage.

As DOE turns its attention toward its new mission of environmental restoration and waste management, the Department assumes responsibility for providing safe and healthful working conditions for those who will do the work of cleaning up. The vigor and success with which DOE implements health and safety programs for cleanup workers will be a signal of its willingness and ability to embrace the "new culture" spoken of by the Secretary of Energy—a culture that honors protection of the environment, health, and safety as a fundamental priority.[8] If effectively conducted, the DOE cleanup could serve as a model of how workers engaged in hazardous waste and emergency response operations should be protected from work-related illness and injury.

Environmental restoration and waste management activities at DOE provide an opportunity to advance the state of the art of occupational health and safety programs for cleanup workers. DOE's stated commitment to attain a new culture that respects the environment, health, and safety; its search for new ways of incorporating effective worker protection programs into contract agreements; and its intent to pursue cleanup in a responsible and cost-effective manner-all place DOE in a position to become a major force in advancing the programs and technologies needed to adequately protect workers from safety hazards and from the adverse effects of exposure to toxic materials.

Achieving such a leadership position in occupational health and safety will require DOE to adopt policies and undertake actions now only in their incipient stages. To apply management lessons gleaned from experience at non-Federal cleanup operations, DOE must first recognize the need for strong management commitment to the occupational safety and health (OSH) of its cleanup workers. Comprehensive, DOE-wide OSH policies, objectives, programs, and means of assessing progress must be developed. The cooperative efforts of line managers and health and

safety professionals will be required along with input from experienced workers. Consultation and interaction with other government agencies and organizations with expertise in worker protection issues will also be needed if DOE is to formulate a timely and effective approach to cleanup worker protection. The policies adopted then will have to be implemented and enforced. Finally, truly independent oversight of OSH policies will be necessary at DOE facilities, with mechanisms developed to reward or penalize adherence to or violation of these policies.

CLEANUP WORKER HEALTH AND SAFETY RISKS

In addition to many of the safety hazards associated with conventional construction operations, such as manual lifting, operation of heavy machinery, electrical hazards, exposure to extreme heat and cold, and confined space operations, workers involved in characterizing or remediating toxic waste sites may encounter fire and explosion hazards, as well as the health threats associated with exposure to toxic chemicals and radiation.[9,10] Stress-related illness can also afflict cleanup workers because of the unusual demands and uncertainties associated with this work.[11] Finally cleanup workers at DOE facilities will confront-in addition to all of the usual risks encountered in hazardous waste work—other hazards, such as high-level radioactive waste and mixed waste, that are unique to the Weapons Complex.

PHOTO CREDIT: THE WORKPLACE HEALTH FUND.

Cleanup workers face safety hazards associated with traditional construction tasks as well as health risks from exposure to toxic chemicals and radionuclides.

It is not known what specific health risks cleanup workers face.[12] No prospective studies have been done of health effects among workers employed in the new industry of environmental remediation. It is highly uncertain what, if any, specific biologic effects result from exposure to toxic substances encountered during work with hazardous waste. The health outcomes associated with exposure to most of the chemicals in commercial use are poorly understood,[13] and the health consequences of exposure to low doses of radiation are in dispute.[14-17] The long-term consequences of exposure to chronic, low dosages of toxic materials, radiation, or mixtures of these—the types of exposures most likely to be encountered by cleanup workers—remain largely uninvestigated.

The construction trades, which include many workers engaged in environmental cleanup, are among the most hazardous occupations in the United States and have long been associated with a high rate of worker injuries.[18,19] An estimated $8.9 billion is spent annually on costs related to construction accidents.[20] Indirect costs, including reduced productivity, schedule delays, and damage to equipment or facilities, account for most of this amount.

A number of useful objective measures of past safety performance have been developed, and research has demonstrated several ways of reducing workplace injury rates, including effective worker health and safety training, and the planning and enforcement of safe work practices. An analysis by the Business Roundtable concluded that site owners can effectively influence job safety and that strong construction safety programs are cost effective.[21]

Workers employed in the construction industry also suffer higher rates of some cancers and increased overall mortality compared to the U.S. population as a whole.[22] The causes of these increased rates of nontraumatic deaths among construction workers are not understood; possible relationships between work-related risks and health outcomes among construction workers have not been well studied.

The large number and variety of toxic chemicals present at many hazardous waste sites, the potential interaction of contaminants, and the "disorderly physical environment" of cleanup work make it difficult, and sometimes impossible, to accurately assess all potential chemical or radiologic hazards. In many cases, site contaminants are unidentified and loose in the environment or "uncontrolled." These factors result in work situations that:

- "may include numerous and varied hazards that may pose an immediate danger to life or health;
- Ž may not be immediately obvious or identifiable;
- may vary according to the location on site and the task being performed;
- may change as site activities progress."[23]

Because of these features, the application of traditional approaches to worker protection—namely, a reliance on industrial hygiene data to identify potentially dangerous worker exposures and the use of engineering controls to reduce or eliminate such exposure-is often precluded during environmental cleanup work. Instead, cleanup workers must depend on less certain strategies for identifying site-specific hazards, such as environmental monitoring and medical surveillance, and must rely in large measure on respirators, impermeable clothing, and other personal protective equipment to prevent exposure to toxic materials.[24]

The demographics of much of the private sector hazardous waste work force—youth, frequent turnover, high proportion of minorities[25]-serve to lessen the power of individual employees. The realities of workers' compensation laws in most States restrict a worker's means of legal recourse in the event of injury or adverse health effects. The burden of proof in cases of alleged work-related health problems is on the worker; pervasive scientitic uncertainties about the health impacts of environmental toxicants often make it difficult to prove that a given ailment is work related.

Many health professionals believe that in most cases, cleanup workers can be protected from the harmful effects of exposure to toxic substances.[26-28] However, achieving such protection requires that managers pay vigilant attention to identifying and anticipating potential site hazards and devote adequate resources to design and implementation of the occupational health and safety programs needed to mitigate such hazards. In addition, workers must be trained to recognize unexpected dangers when they are encountered and must be knowledgeable in the use of personal protective equipment.

The Office of Technology Assessment found that there is sufficient evidence to question the adequacy of existing provisions for protecting cleanup workers from occupational illness and injury. Concerns about cleanup worker health and safety have arisen during operations at non-Federal cleanup sites. These concerns are also salient to environmental restoration of the Nuclear Weapons Complex. Some features of the DOE cleanup may intensify worker protection problems encountered at non-Federal facilities.

CONSEQUENCES OF FAILURE TO PROTECT WEAPONS COMPLEX CLEANUP WORKERS

The failure to adequately protect cleanup workers now can have effects that range from near-term public dissatisfaction to future claims of liability against the Federal Government. The linkage between worker health and safety and off-site health impacts is well recognized by communities surrounding hazardous waste sites, as experience with Superfund has shown.[29] 30 If worker health and safety is perceived by the public to be neglected or poorly protected, public confidence in the overall cleanup effort could be undermined. Public doubts about the adequacy of worker protection, the accuracy of site characterization, the hazards of proposed remediation plans, and the reliability of emergency response capabilities could lead to strong pressures to repeat characterization studies, revise planned cleanup strategies, strengthen emergency response plans, or take other measures that would delay cleanup schedules and increase costs.

Given the extent and complexity of contamination at the NWC, the projected size of the cleanup work force, and the expected decades-long duration of cleanup activities, work-related accidents and illnesses are bound to occur.[31] Occupational illnesses are also likely in view of the volume and nature of hazardous materials known to exist on weapons plant reservations .32

In addition, uncertainties about the health hazards associated with characterization and restoration of contaminated environments are pervasive; existing regulatory mandates governing cleanup worker health and safety are ambiguous; and significant weaknesses characterize DOE's and its contractors' occupational health and safety programs for cleanup workers. These features suggest that the Federal Government could face significant liability claims in the future if large numbers of the cleanup workers develop work-related diseases or suffer injuries that might reasonably have been prevented, or if future investigations demonstrate that DOE or its prime contractors failed to exercise prudent judgment in occupational health and safety matters during cleanup. Inadequate attention to OSH issues during cleanup of federal facilities may leave the government vulnerable to lawsuits and claims akin to those now being made by veterans of atomic bomb tests,[33] by citizens living downwind of nuclear tests,[34] and by DOE workers and others alleging radiation-related illness and damages .35-39

APPROACH USED IN THIS STUDY

This OTA background paper was written after review of available government documents and published articles that chronicle cleanup worker health and safety issues.[40] OTA also consulted numerous government officials involved in oversight or regulation of cleanup worker safety and health, as well as DOE contractor employees, DOE and private sector workers involved in hazardous waste operations, labor representatives, academic experts, and health and safety managers from environmental and engineering firms.

Two workshops were held to discuss issues raised in this background paper. The first, referred to as the "OTA Workshop on DOE Cleanup Workers,"[41] included employees of DOE, the Environmental Protection Agency (EPA), and the Occupational Safety and Health Administration (OSHA); workers at DOE weapons facilities; representatives of labor unions engaged in cleanup work; and health and safety professionals from academia and the private sector. The second workshop, the "OTA-HWAC Workshop,"[42] included OTA staff and members of Hazardous Waste Action Contractors (HWAC), a national association of engineering and science firms practicing in hazardous waste management.

In the course of this project, OTA staff visited all of the facilities in the DOE Nuclear Weapons Complex. The EPA-Labor Health and Safety Task Force, a group that includes representatives

from several government agencies and labor organizations convened to address controversial issues surrounding cleanup worker health and safety, allowed OTA staff to attend several of its meetings and to review the minutes of other meetings. OTA staff benefited greatly from the opportunity to accompany representatives from OSHA, EPA, the Army Corps of Engineers (ACE), and the EPA-Labor Health and Safety Task Force on a tour of a (non-DOE) Superfund site. This tour was part of an interagency effort to establish an OSHA inspection protocol for Superfund incineration sites.[43 44]

There is no comprehensive documentation of the successes or problems associated with worker health and safety programs at hazardous waste sites either in the private sector or at DOE facilities. The government does not categorize workers engaged in environmental remediation or hazardous materials emergency response actions in ways that allow accurate analyses of occupational health and safety statistics in this industry.[45] Further, much of the activity at hazardous waste sites thus far has involved characterization studies aimed at mapping pollution pathways and short-lived emergency removal projects.[46 47] Only recently have actual remediation and cleanup activities become a prominent aspect of work at Superfund and RCRA sites. This is also the case at DOE facilities, where site characterization efforts are ongoing and environmental cleanup work is just getting underway.[48]

OTA's analysis of DOE's capacity to protect cleanup worker health and safety draws on a number of documents reviewing DOE's management of environment, safety, and health issues. (See, for example, work cited in footnotes 49-64.) Some of these reports were compiled by expert independent panels, many convened at the request of the Secretary of Energy. These reviews, although focusing primarily on the DOE weapons production work force and not on cleanup workers, provide useful information about the Department's general approach to worker health and safety. OTA also examined DOE documents pertinent to occupational safety and health policies and practices, including internal memoranda and drafts of proposed OSH orders and programs. The DOE Office of Environmental Restoration and Waste Management (EM) and the Office of Environment, Safety, and Health (EH) reviewed and commented on a draft of this OTA background paper.

Because of the limited data documenting health and safety risks or health outcomes among cleanup workers, the lack of reliable surveys of work conditions at hazardous waste sites, and the absence of any comprehensive or prospective studies of the occupational illnesses or injuries encountered during environmental cleanup work at private sector sites or at government facilities, some of the information presented in this OTA background paper is necessarily anecdotal. Nonetheless, several themes and issues were raised consistently and repeatedly in the course of OTA's investigation; these are discussed here. There is also considerable consensus among the diverse participants in the EPA-Labor Health and Safety Task Force on the major health and safety problems at private sector waste sites—although individuals have differing ideas about the sources and solutions to these problems.

SUPERFUND AND RCRA EXPERIENCE: WORKER PROTECTION LESSONS

The experience accumulated in the course of nearly two decades of Superfund and RCRA activities provides valuable lessons on how to establish effective occupational health and safety programs during hazardous waste operations and environmental remediation. As the environmental restoration industry continues to grow and hazardous waste operations shift from characterization studies to actual cleanup, new problems are identified and the regulatory response to these emerging issues continues to evolve.

Some of the problems that plague efforts to establish sound OSH programs during environmental cleanup operations are technical in nature and

result from the difficulties associated with efforts to identify site contaminants and worker exposures, and from the pervasive uncertainties regarding the human health consequences of exposure to environmental pollutants. However, *the overriding problems that hinder worker protection efforts during hazardous waste cleanup result from a lack of emphasis on* OSH *issues in Superfund and RCRA procedures, and inadequate management commitment to or accountability for cleanup worker health and safety.*

The next section of this chapter introduces some of the reasons why cleanup workers in the private sector are not better protected against occupational injury or illness. Chapter 2 of this OTA background paper addresses these matters in more detail. Chapter 3 discusses cleanup worker health issues within the context of cleanup of the Nuclear Weapons Complex.

Management Commitment and Accountability

Management commitment to worker health and safety is increasingly recognized as a critical element of all good occupational health and safety programs.[91,92] The environmental laws and regulations that drive most cleanup operations do not however, assign OSH matters a high priority. Cleanup managers who are compelled to devote great attention to complying with environmental laws and other competing priorities, sometimes neglect the need for aggressive and sustained management involvement in developing and implementing effective worker protection strategies.

Moreover, cleanup operations are characterized by a diffuse managerial structure that makes it difficult to maintain clear chains of command or to determine who is accountable for occupational health and safety. Cleanup workers have been endangered because health and safety experts were unavailable on-site; lacked the seniority, training, or authority to interrupt production schedules when worker safety was threatened; or were not familiar enough with site operations to recognize potential hazards.[93,94]

Site owners and prime contractors often "push down" responsibility and accountability for worker health and safety to subcontractors[95]—even though subcontractors frequently have less experience, can devote fewer resources to hazard identification and worker protection, and command less access to trained occupational safety and health professionals than the prime contractor.[96] Fear of legal liability has made some managers reluctant to intercede in worksite health and safety problems that do not directly involve their own employees-even when they are aware of obvious exposure hazards or unsafe work practices.[97] Furthermore, the lack of rigorous enforcement of OSHA standards during hazardous waste operations and emergency response leaves employers unaccountable for the adequacy of worker protection measures.

Inadequate Characterization Data

The Remedial Investigation/Feasibility Study (RIFS) process in Superfund cleanups and RCRA Facility Investigation (RFI) efforts are supposed to provide information about the presence, location, and concentration of hazardous contaminants at a site. These data are then analyzed to produce assessments of baseline health risks posed by site contaminants and devise appropriate engineering responses to the pollution.[98] Unfortunately, the data gathered by the engineers and environmental scientists who design and conduct characterization studies typically fail to provide the type of information needed to evaluate potential worker health and safety threats.[99-103] In some cases, characterization studies are incomplete when requests for cleanup proposals are sent out for bid or when remediation work begins. In other instances, site assessment activities may have been carried out years before actual remediation gets under way; thus assessment reports do not represent the site conditions existing when cleanup work begins.

Site characterization activities are generally not designed to produce the information needed to "engineer" a cleanup. Most professionals with experience in environmental cleanup anticipate that remediation activities will uncover "surprises" not revealed during the site characterization phase. These surprises are usually unpleasant and may include, for example, more extensive zones of subsurface contamination or additional "hot spots" with high contamination levels.

These realities have led many environmental remediation specialists to endorse the so-called observational approach to cleanup. The observational approach is a method for staging data collection and remedial action so as to account for the uncertainties inherent in assessing environmental contamination. The approach involves initiating response action early to prevent migration of contaminants and then collecting the additional information necessary to design the final remedy. Contingency plans are developed to define actions that will be taken if additional areas of contamination are found or if remedial actions are not as effective as planned.

The quality and focus of site characterization data are important because these data are the basis of site health and safety plans (HASPs).[104] HASPS are legally mandated by HAZWOPER, the OSHA standard governing worker protection during hazardous waste site operations and emergency response. HASPS must present a written blueprint of health and safety hazards associated with proposed work plans at contaminated sites and must establish the personal protective gear, work practices, medical surveillance, and health and safety training required to conduct the cleanup and respond appropriately to any emergencies that might arise.

When characterization data are inaccurate or incomplete, there is no sound basis from which to craft effective site-specific health and safety plans or to determine the level of worker protection required in performing specific work tasks. To address this deficiency, the basic premise of health and safety practice must be to "expect the unexpected" and to train workers to identify unforeseen contamination problems.

Poor Contracting Practices

The lack of flexibility in many cleanup contracts contributes to the difficulties of creating effective occupational health and safety programs for cleanup workers. Contractors bidding on cleanup jobs are placed in a difficult position as a result of the large uncertainties inherent in all environmental restoration work, the errors and omissions that distinguish most characterization data, and the failure to include provisions in cleanup contracts that allow changes in original HASPS or renegotiation of worker protection costs. Managers are often forced to choose between either assuming "worst-case" scenarios and planning for elaborate worker health and safety provisions in their bids; or hoping that no new hazards come to light in the course of cleanup (a hope that experience has shown is usually unrealized) and budgeting less money for worker protection.

Employers engaged in cleanup work command widely differing levels of expertise in occupational health and safety matters. Even large firms that possess significant technical abilities vary widely in the amount of attention paid to implementing and enforcing principles of worker safety and health protection.[105] In an effort to better assess work-related hazards, some large environmental firms have tried to include costs of additional characterization studies in the cleanup bids submitted, but they have not always succeeded, especially when negotiators lack health and safety backgrounds or are unfamiliar with the hazards of environmental cleanup work. The practice of awarding contracts for environmental cleanup solely on the basis of a low bid may militate against firms that incorporate strong worker protection programs into contract proposals.

Difficulties in Interpreting OSHA'S Hazardous Waste Operations and Emergency Response Standard

The regulation that protects hazardous waste workers is vague and difficult to enforce. In 1990, the Occupational Safety and Health Administration promulgated a regulation to protect workers engaged in hazardous waste operations and emergency response, the so-called HAZWOPER standard.[106] Other OSHA regulations, such as standards governing construction worker protection, use of respirators, and exposure to certain regulated materials, also apply to environmental cleanup work, but HAZWOPER is the most comprehensive and important regulation applicable to cleanup worker health and safety.

HAZWOPER is a "performance-based" regulation. The standard sets forth a number of goals and approaches that employers must adopt, but does not prescribe how cleanup worker protection programs should be designed or implemented. Some aspects of HAZWOPER are ambiguous. OSHA has not issued guidance documents that would aid employers in interpreting and applying the standard. Also, different OSHA regional offices have offered contradictory interpretations of some HAZWOPER provisions.[107]

Consequently, there is significant controversy about how elements of the standard should be implemented, and wide variations exist in the rigorousness of cleanup worker protection programs at hazardous waste sites. To respond to such controversy in a more timely manner than its bureaucratic procedures usually allow, the OSHA Directorate of Compliance Programs recently published a compilation of letters and memos from OSHA headquarters that respond to specific queries on HAZWOPER interpretation.[108]

Especially controversial aspects of HAZWOPER implementation include the following:

- provisions for dividing waste sites into work zones categorized by the potential for worker exposure to hazardous materials within these zones;
- methods for monitoring worker exposure to potentially hazardous substances;
- methods for determiningg acceptable worker exposure levels during cleanup operations;
- the criteria that determine an individual worker's eligibility for inclusion in legally mandated medical surveillance programs and prescribe minimum hours of health and safety training;
- the content of medical surveillance programs and the qualifications of physicians who design and manage the activities; and
- the adequacy of emergency response preparations and capabilities during hazardous waste operations.

OSHA has also proposed a regulation that would establish certification criteria for cleanup worker health and safety training programs mandated by HAZWOPER.[109] Some aspects of the proposed rule (29 CFR 1910.121) have been criticized; in particular, the absence of any required certification for trainers or for the programs that train emergency response personnel have been cited.[110-112]

Weak Oversight of Occupational Health and Safety Rules by Regulators

The Occupational Safety and Health Act holds employers responsible for providing workers with "safe and healthful working conditions.'[66] HAZWOPER, the OSHA regulation enacted to protect cleanup worker health and safety, mandates a structured, but nonspecific, approach to worker protection during hazardous waste operations and emergency response.[67] Under this standard, critical decisions about how to identify and mitigate cleanup worker health risks are left to the judgment of individual employers.

The quality of worker health and safety programs implemented under HAZWOPER at Superfund and RCRA sites are reported to vary widely.[68,69] These inconsistencies are apparently a consequence of information gaps and uncertainties about necessary levels of worker protec-

tion; differences in the rigorousness with which different employers pursue worker safety and health; OSHA's failure to issue detailed guidance to help employers interpret and apply the broadly worded HAZWOPER regulation; and weak OSHA enforcement efforts.

OSHA and EPA have agreed to cooperate in developing an OSHA inspection protocol for incinerators at Superfund sites.[70] In general, however, OSHA enforcement of HAZWOPER has not been vigorous.[71,72] OSHA has about 1,000 inspectors (including supervisors and trainers) to enforce health and safety standards for nearly 3.6 million employers and 55 million workers .73 Aside from a few planned Superfund incinerator inspections, neither the more than 4,000 RCRA sites that require or have undergone remediation, nor the 1,354 sites on Superfund's National Priorities List[74,75] have been targeted as high priorities for OSHA inspections.

EPA is the Federal agency with the most expertise in hazardous waste operations, but EPA staff are not well prepared to assess or oversee worker health and safety during cleanup. Few of EPA's regional staff or project managers have occupational health and safety backgrounds. Currently, none of the staff members of EPA's Office of Solid Waste and Emergency Response (OSWER) Hazardous Site Control Division are occupational health or safety professionals, EPA maintains furthermore that it lacks the authority to enforce OSHA's HAZWOPER standards.[76]

EPA has, at times, neglected to consider worker risks when selecting cleanup options .77 EPA officials have acknowledged the need to weigh worker health risks against the benefits of particular remediation measures but have developed a formal means of doing so only in the past few months,[78]79 and the effectiveness of these proposed changes has yet to be tested.

To its credit, EPA's Office of Solid Waste and Emergency Response (OSWER) has established the EPA-Labor Health and Safety Task Force, consisting of employees from EPA, OSHA, the National Institute of Occupational Safety and Health (NIOSH), ACE, and representatives of labor unions whose members frequently conduct cleanup work. This Task Force has been constructive in identifying some of the more pressing and pervasive worker protection problems at RCRA and Superfund sites.

EPA's principal goals, however, which are largely a response to public and congressional pressures, are to reduce the time needed to complete the RCRA and Superfund processes, and to accomplish cleanup more economically. EPA's "new Superfund paradigm," is designed to speed up site assessment and initiate activity early in cleanup so as to reduce "immediate risks."[80,81] Some contend that these priorities may beat odds with worker protection needs, which might dictate a "go-slow" approach in unusually hazardous situations or in implementing innovative remedies.[82]

The Agency for Toxic Substances and Disease Registry (ATSDR) is responsible for determining the potential human health impacts of toxic materials released into the environment, and has broad statutory authority to intervene when environmental contaminants imperil human health,[83] ATSDR officials are rarely present during cleanup operations, however, and focus mostly on possible off-site health effects of Superfund and RCRA pollution.[84] In some circumstances, efforts to mitigate risks to off-site populations may actually increase the health and safety hazards faced by cleanup workers.[85,86]

Neither the assessment of cleanup worker health and safety risks nor the evaluation of worker protection programs has high priority for the regulatory agencies most involved in implementing Superfund and RCRA, The OSHA regulatory officials who are most knowledgeable about worker protection issues generally are not familiar with environmental cleanup work and are rarely present during cleanup operations, whereas the EPA regulators who are most familiar with hazardous waste work know little about occupational health and safety matters and refuse to enforce OSHA standards. The net result is that

the interpretation and implementation of cleanup worker OSH standards are highly variable and are left, essentially, to the voluntary efforts of employers.[87-90] Consequently, the forces that drive cleanup operations—particularly the need to comply with environmental regulations and the need to address concerns about off-site health impacts of pollution-may, in practice, overshadow questions and actions aimed at possible risks to cleanup workers,

CLEANUP WORKER PROTECTION IN THE DOE NUCLEAR WEAPONS COMPLEX CLEANUP PROGRAM

The task of cleaning up environmental contamination throughout the Nuclear Weapons Complex presents greater technical and political challenges than cleanup at private hazardous waste sites, DOE must grapple with the challenges of cleanup, even as it confronts other difficult and unfamiliar missions such as nuclear weapons dismantlement. Accomplishing these missions is likely to require significant changes in DOE's priorities, organizational structure, and approach to problem solving.

The Secretary of Energy has acknowledged that DOE and its predecessor agencies have historically embodied an institutional culture that valued weapons production over the protection of human health and the environment.[113] Multiple expert and government reports have documented DOE's past inattention to occupational health and safety and to environmental protection, DOE's past failures in these realms have been pervasive and serious.114

In efforts to alter this record, DOE initiated a number of reforms and issued directives in 1991 and 1992 aimed at improving health and safety programs at its facilities,[115-119] Management responsibility for worker protection has been reemphasized within the DOE organization; its Office of Environment, Safety and Health (EH) has been restructured; [120] and DOE's contractors have been told to devote more resources to health and safety matters.

The Occupational Safety and Health Act of 1970 exempted Federal agencies from the authority of OSHA to the extent that those agencies exercised independent authority over worker safety and health,[121] DOE, granted such authority under the auspices of the Atomic Energy Act, is the only Federal agency that claims such an exemption. DOE Order No. 5483 requires DOE contractors to obey and implement all OSHA standards. [122] However, OSHA does not have right-of-entry or inspection at DOE weapons facilities, nor can it issue citations at DOE facilities or impose financial or criminal penalties if DOE contractors fail to comply with these standards.[123]

The DOE Office of Environmental Restoration and Waste Management, which has line management responsibilities for cleanup of the NWC, is struggling to establish OSH policies applicable to DOE contractor employees engaged in environmental remediation and waste management. EH, the DOE office charged with providing independent oversight of occupational health and safety programs within DOE and among its contractors, has reorganized, added new safety and health staff, and is in the process of revising and updating DOE orders, some of which are relevant to cleanup worker protection.

These and other proposed and accomplished actions indicate that DOE has taken a number of positive steps to improve worker health and safety at its facilities. However, DOE and its contractors continue to operate under an organizational structure that presents serious obstacles to progress in safeguarding worker health and safety. OTA notes three major organizational issues that must be confronted if DOE is to institutionalize a "new culture of accountability in environment, safety, and health."

First, *managers and workers throughout DOE and its contractor corps must be convinced that occupational health and safety is truly a top priority of the Department.* OTA analysis indicates that this is not now the case.[124-131] In 1990,

OSHA found that "pressures to get the job done often overrule safety and health concerns." Some top managers openly derided the significance of the "new culture," and workers also indicated skepticism of health and safety as a serious priority. Today, assertions that DOE management is aggressively pursuing staunch worker protection policies are undermined by delays in addressing inadequate OSH practices documented by Tiger Teams,[132] 133 as well as delays in official adoption of proposed OSH orders; by the failure of DOE managers to impose penalties on contractors who do not enforce sound worker protection policies; and by reports that DOE facility operations have continued or been resumed before appropriate safety training and procedures were completed.[134] [135]

Second, *DOE line organizations require significantly more staff and more resources devoted to OSH matters. The* DOE approach to worker health and safety protection calls for its line organizations, such as EM, to develop OSH policies within the purview of their program missions and ensure that contractors implement these policies adequately. In practice, there are far too few OSH professionals in DOE to accomplish this. DOE staff trained or experienced in OSH matters are scattered throughout the line organizations and are frequently found in "advisory" positions with no real influence.

As in the private sector, actual cleanup at DOE facilities is just beginning. EM, the line organization directly responsible for cleanup, has laid an important foundation for the DOE cleanup effort and may, in time, develop effective and innovative occupational safety and health programs. However, OSH issues have been neglected by EM thus far, and the Office does not have the staff needed to create or monitor a robust worker health and safety program for the cleanup. EM managers, preoccupied with other priorities, address OSH issues only reactively.

Third, *DOE has no reliable or credible process for rewarding or punishing managers' performance in matters of safety and health. The ability of EH to properly monitor DOE and contractor performance in OSH matters is inadequate* and is likely to remain so despite progress in formalizing contractor assessment protocols, because of the small numbers of qualified field staff. Actual enforcement of OSH orders is haphazard, and the only penalty levied DOE or contractor managers for failure to comply is embarrassment. EH, which is charged with providing independent oversight of OSH activities, is not truly independent. Its policy recommendations must, in practice, receive the concurrence of other DOE program managers. The EH role is advisory only; this Office has no authority to enforce its own stated policies.

These three structural flaws in DOE's approach to worker protection—lack of strong management commitment to OSH priorities; lack of sufficient OSH staff and resources in DOE program offices to carry out stated OSH responsibilities; and lack of independent oversight or enforcement of OSH policies and orders at DOE facilities-are likely to impede efforts to ensure protection of workers engaged in cleanup of the Nuclear Weapons Complex.

In addition, DOE's decentralized internal organization and the diffuse, multilayered structure of DOE-contractor relationships are likely to intensify the difficulties with accountability, efficient communication, and chain of command that have hampered the protection of cleanup workers during other hazardous waste operations.

Finally, because of the scope and complexity of environmental contamination throughout the NWC, *worker protection issues encountered at non-Federal cleanup sites, including inadequate characterization of site OSH hazards, poor contracting procedures, and controversial and variable implementation of HAZWOPER, are likely to be not only revisited but magnified during the DOE cleanup. The* DOE institutional structure that will frame OSH policy and practice for the cleanup is poorly suited to address many of these matters.

SUMMARY OF FINDINGS

Opportunities for DOE

The challenge of environmental restoration and waste management at the DOE Weapons Complex provides an opportunity both: to advance the state-of-the-art of occupational health and safety programs for the cleanup workers who will carry out DOE's new mission of environmental restoration; and to create a model for keeping the thousands of workers engaged worldwide in this task safe and healthy.

Current DOE Approach Inadequate

DOE's current approach to worker health and safety is marked by three major weaknesses:

- the Department has not established an institutional culture that honors protection of environment, safety and health as fundamental priorities;
- the DOE Office of Environmental Restoration and Waste Management (EM) has not developed effective OSH policies and programs for the cleanup or ensured that contractors are implementing appropriate worker protection programs;
- the DOE Office of Environment, Safety and Health (EH) does not have the field staff necessary to oversee cleanup worker health and safety and does not have sufficient authority to enforce OSH policies and orders among DOE line managers and contractors.

Draw From Experience

Experience in protecting cleanup workers during RCRA corrective actions and Superfund operations has revealed a variety of problems that have ranged from inadequate health and safety planning, to poor training to lax enforcement of cleanup worker protection standards. DOE could learn from this experience by participating in the EPA/Labor Superfund Health and Safety Task Force, and by initiating additional consultations and interactions with other government agencies and with labor representatives.

Focus Now

The need to focus high-level management attention and increased resources on protecting those who will do the work of cleaning up is urgent. Some needed provisions, such as worker training programs, medical surveillance strategies, and emergency response plans, will take time to develop and implement and must be in place when cleanup commences.

Areas Needing Attention

Key areas where concerted management efforts could bring needed results are:

- improving characterization data for contaminated sites in order to prepare good health and safety plans;
- improving contracting practices to ensure proper incentives for protecting workers at all contracting levels;
- interpreting and implementing OSHA worker protection standards and supplementing these with rigorous management attention to safety and health, including outside oversight;
- providing for informed and active worker participation in protection programs.

Consequences of Failure

Failure to prudently and adequately protect cleanup workers at Nuclear Weapons Complex could have serious consequences. Individual workers might experience illnesses or injuries that could have been avoided had effective OSH programs been in place. In addition, concerns about worker protection might result in schedule delays, increased costs, and erosion in the public's faith in proposed cleanup plans.

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