LA-UR-93-113

Making Progress in Cleaning Up DOE's Weapons Complex: Issues of Organization and Management

Report Submitted by:
MIT-LANL Research Team
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Los Alamos National Laboratory is operated by the University of California for the United States Department of Energy under contract W-7405-ENG-36. The Massachusetts Institute of Technology served as a subcontractor to the Los Alamos National Laboratory for the work reported herein. Opinions expressed in this report are those of the authors and do not necessarily reflect the opinions of the Department of Energy, the Los Alamos National Laboratory, or the Massachusetts Institute of Technology.

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EXECUTIVE SUMMARY

ABSTRACT

This report presents the results of a research study that identified the perceptions of stakeholders about the main issues of organization and management (O&M) confronting the Department of Energy (DOE) in carrying out its program of environmental restoration and waste management (EM) at the nuclear weapons complex. A framework for those issues was developed to help understand their origin and their consequences.

The perceptions of stakeholders were obtained chiefly through in-depth open-ended confidential interviews by senior researchers from the Massachusetts Institute of Technology (MIT) and the Los Alamos National Laboratory (LANL). Of 149 stakeholder interviewees, 57 were contractors, 55 were DOE (field and HQ), and 37 were others (state officials, Congressional staff, federal agencies, activists, etc.). Interviews were held with stakeholders in the Washington, DC area, at most major sites in the complex, and at several other locations.

Analysis of the interview data led to a framework of change for EM. That is, the main issues of O&M reported could be tied to the large changes experienced during the last few years by the DOE and contractor people, most of whom formerly produced weapons, who are now carrying out the EM program. Three types of change were inescapable when DOE took on in 1989 the new mission of complex-wide cleanup: a change in culture (assumptions, beliefs, and self-image of the workforce); a change from secrecy and legal immunity to intense outside public and legal scrutiny and accountability; and a change from clear-cut tasks and schedules to tasks characterized by uncertainty and lack of knowledge. Another three types of change were imposed by DOE/EM on itself with the objective of carrying out the new cleanup mission more effectively: a change to headquarters control through centralized decision-making and review; a change to increased formalization with many new detailed rules, orders, requirements, plans, and other bureaucratic procedures; and a rapid growth of staff of DOE and supporting contractors to develop and implement the new management systems. Still other changes, and prospective changes, continue.

Each change has had major impact on the workforce. There is a widespread belief in the field workforce that the difficulties of bringing about all these changes were greatly underestimated and thus given insufficient attention by "DOE management." The fallout has led to many issues with consequences that usually impair EM's effectiveness. These reported consequences include:

Attitudinal/Behavioral Consequences	Structural/Organizational Consequences
• Sense of a punitive environment	• Little progress in physical cleanup
• Low external credibility of DOE	• More outreach effort but mixed results
• Unfavorable view of EM's O&M	• Many changing or unclear priorities
• Unrealistic expectations by external stakeholders	• Deteriorating relations with contractors
• Morale impairment at sites	• Poor HQ/site communication
• Acceptance by workforce of EM mission legitimacy	• Dramatic increase in oversight/review
	• Difficulty in recruiting and retention
	• Long times for decision-making
	• Confusing multiple paths for reporting to HQ

The direct connections between consequences and changes can be illustrated by "sense of a punitive environment," which leads to low initiative and to risk-avoiding behavior. That punitive sense results both from the change to public and legal accountability (and the threat of personal liability) and from the change to headquarters control (with low tolerance for site "mistakes").

Underestimating the difficulties of accomplishing change explains, at least in part, why stakeholders inside and outside DOE often express disappointment in EM's performance to date. We believe that some stakeholder expectations were unrealistic and thus could not have been met even if DOE/EM had been organized and managed impeccably.

As the final step in this study, we selected seven topics to consider for further research in depth. Three or four of those topics will be chosen after further discussions with EM about which could contribute most to increasing EM's effectiveness.

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Major facilities of DOE's weapons complex cover about 3300 square miles at sites from northwest Florida to southeast Washington state. The complex is an "industrial empire" which has released vast quantities of hazardous chemicals and radionuclides to the environment at thousands of sites during 45 years of production of nuclear weapons.

No serious effort to clean up the total complex began until 1989 when the EM organization was established within DOE. The effort was a response to growing public awareness of the damage and risks due to past contamination resulting from weapons

production. Continued revelations of environmental insult have increased public concern and scrutiny. At present, there is a widely held perception that progress has been slow despite large expenditures.

Questions thus arise about whether EM is organized and managed as well as it could be to do its work effectively. To help answer those questions, EM has been funding this study of stakeholder concerns. The study was carried out collaboratively by researchers at the Massachusetts Institute of Technology (MIT) and the Los Alamos National Laboratory (LANL).

Research Methods

The major issues of organization and management in EM are seen differently by different groups of stakeholders. Even when there is agreement that a particular O&M issue exists, there may be disagreement among stakeholders about the importance of the issue and how it should be dealt with. One unusual characteristic of DOE's weapons complex is the number and diversity of stakeholder groups and their ability to affect operations in the complex. Therefore, our starting point has been to understand the perspectives of those stakeholder groups. Our basic tool for obtaining stakeholder views was the personal confidential interview.

We interviewed individuals in the following groups of stakeholders:

- Department of Energy, headquarters and field offices
- Contractors (and their subcontractors) to DOE
- Congressional staff and federal agencies (OTA, GAO, DNFSB)
- State officials
- Activists, labor, local people.

Of the 149 interviewees, 55 were DOE and 57 were contractor personnel. Those two stakeholder groups had the most direct view of O&M issues in the complex. Most of the interviews were held in the field or adjacent communities; we interviewed at most major facilities except the weapons laboratories (LLNL, LANL, and SNL). Interviewees were selected to give us an inventory of the issues, not a poll, and therefore there is no statistical validity to our sample.

Interviews were typically one-on-one, one senior MIT or LANL researcher and one interviewee in the latter's office. Participation was voluntary. The interviews were audio tape-recorded with the interviewee's permission and lasted about an hour, on average. All interviewees were assured of permanent confidentiality of their identities. Those identities ranged from corporation president to entry level professional, and from Senior Executive Service to union operator. The interviews were open-ended. Interviewees were invited to discuss issues of organization and management that they thought important and of which they had first-hand knowledge. The discussions followed the leads that developed from that approach.

Tape transcripts were prepared (tapes were then erased) and quotations were extracted by the researchers for views regarded as significant. The extracts were then coded, i.e. categorized by the type of issue covered in the extract. Extracts and codes were entered into a software data base. That enabled us to retrieve the extracted quotations on particular subjects (as coded), with particular key words, or for particular stakeholder groups or locations--in any combination of those parameters.

Further reduction and analysis of the data (i.e. the contents of the interviews) began by selecting thirteen topics that appeared to be of broad concern to interviewees. Searches of the extracts on those topics were made. The extracts were then organized into groups, condensed or paraphrased in some cases, and presented as a "topical summary" of stakeholder positions on each topic; data on the topic from previously

published work were also included. These topical summaries served as working documents that were useful in selecting and preparing the material included in this report.

In addition to the interview data, two other broad sources of information were used in conducting this study. One source was the literature on the weapons complex including published reports by groups such as the National Research Council, Advisory Committee on Nuclear Facility Safety, General Accounting Office, and Office of Technology Assessment. The other source was other experiences in direct contacts with stakeholders, such as attendance at State and Tribal Government Working Group and National Workshop on the Environmental Priority System meetings and "shadowing" a DOE manager at HQ for a week.

EM and Change

The characteristics of the organization and management problems facing EM in its cleanup are not separately unique. Each has been faced separately by other organizations in other circumstances. For example, other organizations have had to cope with major changes in technical tasks (say, DOD's shift to "low-intensity conflict") or in major new environmental constraints (say, oil companies' shift to lead-free gasoline). But we know of no US venture having to deal with so many large simultaneous changes applied on so large and diverse a scale. That is what is unique about EM, and that is what becomes evident after an even cursory examination of the data. People who are now in the EM workforce (DOE and contractor), most of whom previously produced weapons, have been subjected to this unparalleled series of changes. They have told us about changes, about efforts to cope with changes, and about the consequences of changes. Change provides a framework for thinking about the O&M issues and for helping to understand them and their consequences.

The major changes experienced by EM fall into two groups. The first group consists of inherent changes, changes that came inescapably when DOE took on the new mission of serious cleanup. Those changes were not simply the changes in the physical task to be accomplished, shifting from weapons production to cleaning up. There were three other mission-associated changes that came with the new task: culture change, outside scrutiny and accountability, and task uncertainty.

Culture change, as we use the term, means the assumptions, beliefs, and self-image of the people in the EM workforce. People who were formerly regarded by the public as mysterious but valuable contributors to national security came to be regarded as willful despoilers of public lands who were untruthful about that despoliation. People who knew about the environmental insults but were told by DOE that the insults had lower priority than weapons production are now expected to give their highest allegiance to correcting the insults. And people who had a strong personal cold-war rationale for making weapons now undertake cleanup tasks whose costs are perceived to be incommensurate with the consequent reduction of risks (even though they broadly accept the principle that cleanup is necessary); therefore, their current personal rationale is weaker.

Outside scrutiny and accountability to the public and to legal authority is a profound change to a workforce accustomed to the protections of military secrecy and to legal immunity from otherwise applicable environmental and safety constraints. This change means that EM now is ultimately measured by how effective it is with its constituents at the sites (where the scrutiny and accountability occur) rather than with only DOD and the Joint Committee as in the era of weapons production.

Task uncertainty is the third inherent change from weapons production. In making weapons, DOE could count on unambiguous and stable tasks laid out for years in advance with the authority of the President. DOE could organize and manage its work accordingly. The cleanup task is different. Now, many stakeholders exist whose views

must be considered and whose views may conflict. Thus, simply *defining* the task is a critical part of the task. Furthermore, there is often uncertainty or lack of knowledge about the number of sites to be cleaned up, about the physical problems at each, about the technology that can be used, about the money and time available, and about the target cleanup standards to be reached.

The second group of changes has been imposed on DOE by itself. These are the changes in organization and management introduced by Secretary Watkins and Leo Duffy into DOE beginning in 1989 and intended to accomplish DOE's missions, including cleanup, more effectively. Three important self-imposed changes to EM are headquarters control, formalization, and staff growth.

Headquarters control has meant the assumption of more decision-making authority and detailed review by HQ, with corresponding loss of autonomy by the sites. This issue, usually called "centralization," was the issue most frequently raised among all groups of stakeholders. This change has demoralized many people at the sites and leaves them unclear about the prospect of future changes. They are uncertain about whether the increase in HQ control will continue, stabilize, or reverse. And they are uncertain about the management consequences of the expected near-future departures of Messrs. Watkins and Duffy who have left their strong imprints on the organization.

Formalization is the change introduced by DOE as the primary mechanism for bringing about the change to HQ control. "Formalization" means the development and promulgation by HQ of new detailed written rules, regulations, orders, procedures, report requirements, and other bureaucratic instruments designed to cover all activities at the sites over which HQ wishes to exercise control--by making or reviewing site decisions, or by specifying the exact ways in which the site should operate. Formalization has resulted (in the sites' perceptions) in many impediments to getting "real work" done. The impediments result from diversion of effort to satisfy bureaucratic requirements whose

value is questioned, or from imposing those requirements inappropriately on sites or situations that should have more flexibility to accommodate local conditions.

Staff Growth is the rapid change experienced in the number of people required to implement the strategy of headquarters control, and to develop and operate the new formalized management systems. Growth has occurred among DOE's own people at HQ and field offices, and also among contractor people supplying support and other services to EM. The change in growth has put more stress on the organization as it tries to hire, train, absorb, and retain new people. The use of contractors to do jobs that "DOE should be doing" causes complaints from other contractors and outside stakeholders. And there have been further changes in organization and management needed to accommodate larger staffs.

Although the preceding changes are the major changes that accompanied the birth and infancy of EM, changes have not ended. HQ continues to generate new orders, requirements, reviews, priorities, procedures, and budgets, and the sites continue to grumble about coping with the changes. In addition, there are major site-specific changes in management or organization. For example, there were the 1989 changes in M&O contractors from duPont to Westinghouse at Savannah River and from Rockwell to EG&G at Rocky Flats. In the near future there will be a new contractor at Sandia (replacing AT&T) and perhaps new contractors in ERMC roles at other sites.

Stakeholders are aware that EM has been subjected to major changes and that more changes are likely. Many are realistic about the difficulty of bringing about change rapidly and successfully. But they also doubt that "the front office" has appreciated that difficulty and has managed change effectively.

Underestimating the difficulties inherent in accomplishing change leads to two important results. One result is failure to devote sufficient effort to the human and

organizational effects of change, i.e. to do an adequate job of managing change. The other result is disappointment. Many stakeholders inside and outside the DOE family express disappointment about EM's performance to date. Those expressions often arise out of EM's failure to meet expectations and commitments that were unrealistic from the beginning. For example, DOE promised, however sincerely, too much too soon. Expecting EM to function efficiently and effectively, even if it were impeccably organized and managed--and no interviewee or published evaluation has made that charge--seems quite unrealistic in the short life of EM to date.

Change and the Issues of Organization and Management

Our characterization of EM as an arena of change is important because the O&M issues and consequences reported result wholly or partially from change or from efforts to cope with change. Seven of those issues are discussed in depth in this report in "issue papers," which are stand-alone discussions of particular issues includinge supporting data available from our research to date. There is some inevitable overlap among the issue papers. The seven are:

1. Organizational Design and Fit is a wide-ranging discussion that examines the perceptions of misfit expressed by stakeholders. How effective is the match between individual and organizational goals, between task demands and organizational skills, between task uncertainties and organizational structure, and so forth?

Some of the more serious expressions of misfit result from change. Examples include frustration about personal goals and tasks (culture change); shortage of expertise (staff growth change and mission change); centralization needs in conflict with site-specific needs (headquarters control change); and inappropriate project management systems (task uncertainty change).

2. *Credibility and Trust* looks at credibility problems both within the DOE extended family (which includes the contractors) and between the family and outside stakeholders.

Within the family, the shift to headquarters control and the growth of staff are the two key aspects of change that contribute most to existing frictions at HQ and between HQ and the sites.

Headquarters control also contributes to friction at the sites with outside stakeholders (through delays, reviews, vetoes) but two other changes probably are more important. The change to public oversight and accountability, exposing past neglect or errors or untruthfulness, leaves a bitter legacy. The change to task uncertainty makes it difficult to specify and fulfill clear commitments to the regulators and the public about cleanup.

3. *Impediments* examines three of the main factors that have slowed progress in cleaning up. Those three are a lack of appropriate priorities for the work to be done, a lack of standards for the work, and a lack of adequate technologies to conduct some of the work.

All three factors arise directly from the changes inherent in accepting the new cleanup mission. The lack of priorities and standards reflect the change to what is now a set of tasks that are neither clear nor certain. The lack of technology reflects the fact that EM is now asked to do a technical job that has never been needed or done before; there has been no reason to have technology available previously.

4. *Project Management* considers the systems that DOE uses to develop, budget, execute, and monitor large projects. The systems are traditional and were developed for projects that yielded well-defined products--a particular piece of construction or hardware, for example. However, the traditional project management system does not always cope well with EM projects which tend to be processes that are not easy to define completely in advance.

Once again, the difficulty here arises out of the fact that the cleanup mission charges EM with tasks that have high levels of uncertainty and lack of information. A project management system that recognizes that inherent change should better fit EM's needs.

5. *DOE-Contractor Relationships* summarize several of the aspects of the relationships including liability, ERMC and support service arrangements, oversight style, and the general linkages.

Liability issues grow directly out of the change to public and legal scrutiny and accountability. Support service contractors exist because of the change to staff growth and the need to provide more services than DOE can provide with its own people. And issues of oversight and general linkages arise out of the changes to headquarters control and formalization; those changes manifest themselves in more oversight and review of the contractors and the development of a more adversarial relationship (which also exacerbates liability issues).

6. *Delays* focuses on the fact that the change to headquarters control carries with it the need for HQ reviews and approvals. Those HQ actions cause delays in making decisions and in getting work done at the sites.

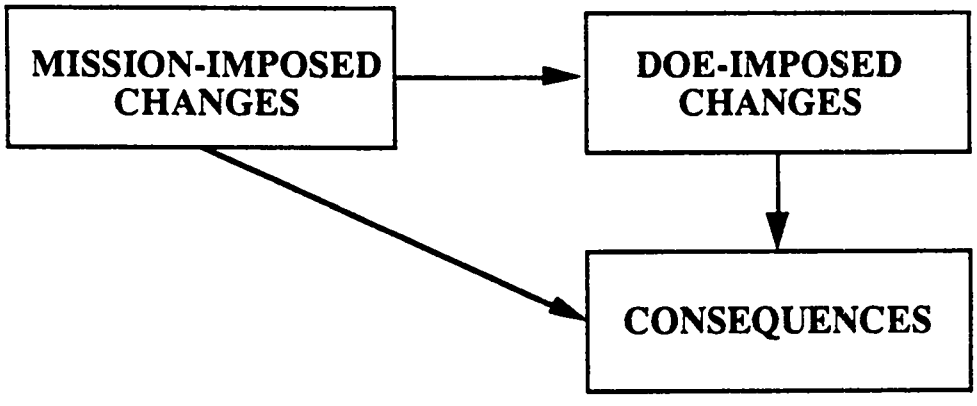
From the sites' perspective, delays are harmful in causing work inefficiencies and credibility losses with outsiders at the sites, aside from giving more evidence of the loss of autonomy at the sites. There is little recognition in the field that delays can have a positive value in allowing time for decisions to be considered in a national context and in getting a broader range of stakeholders on board.

7. *Compliance Agreements* covers legally binding agreements between DOE and the regulators at individual sites. The very existence of these agreements is a result of the change in mission with its change to public and legal scrutiny and accountability.

The concerns expressed by stakeholders about compliance agreement suggest three needs for EM: the need to negotiate achievable and nationally equitable agreements with both site and HQ participation, the need to manage the resources required for compliance with broader acceptance of the uncertainty inherent in cleanup, and the need to develop a constructive relationship with overseers--a corollary of the need for greater trust and credibility.

Consequences for EM

Analysis of the issue papers and interview data led us to two lists of important "consequences," outcomes which affect EM's effectiveness, usually adversely. Some consequences were direct observations of stakeholders and some were our inferences from those observations. The consequences, like the topics of issue papers, could also be linked directly to change, as this simple diagram of our logic shows:



The two randomly-ordered lists are as follows:

Attitudinal/Behavioral Consequences

- Sense of punitive environment in DOE
- Low external credibility of DOE

- Unfavorable view of EM's organization and management
- Unrealistic expectations of EM by external stakeholders
- Morale impairment at sites
- EM workforce regards mission as an important and legitimate activity

Structural/Organizational Consequences

- Feeling of little progress in physical cleanup at sites
- Progress in efforts at outreach to stakeholders, but mixed results
- Changing and unclear priorities for many missions
- Deteriorating relations with contractors
- Poor communication between HQ and sites, and poor understanding of roles
- Dramatic increase in oversight and reviews
- Long times for decision-making
- Confusing multiple pathways for reporting to HQ
- Difficulty in recruiting and retaining capable people

In general, the consequences listed are weighted toward expression by the sites of problems attributed at least in part to HQ behavior. The converse attribution was expressed less frequently.

Each of the consequences finds its origin, in whole or in part, in the basic changes that EM has experienced--the changes inherent in the new mission, or the changes self-

imposed by DOE, or both. Therefore, a broad conclusion is that the management of change deserves much higher priority if EM is to improve its effectiveness.

Topics for Further Research

The last task for this study was to use the results to identify promising topics for further research in depth. The three criteria for selecting research topics included: (a) topics addressing issues of organization and management important to EM, (b) topics on which research could reasonably be expected to help EM increase its effectiveness, and (c) topics appropriate for the MIT/LANL research team to study. Seven topics are now under consideration, of which about three will be undertaken after further consultation with EM. The seven are:

- Develop a ***systems dynamics*** model of a segment of EM to help understand the many nonlinear feedback paths for information and influence among groups and how those paths affect the system's response to policy initiatives.

- Study how ***field office roles*** are and could be carried out in fulfilling often-conflicting obligations (to HQ, contractors, and site constituencies) so as to maximize EM effectiveness.

- Analyze EM and non-EM experience with ***compliance agreements*** to aid in negotiating realistic and nationally equitable agreements, and in implementing them acceptably despite inevitable surprises, changes, and disappointments. "Realistic" agreements mean that commitments should reflect uncertainty and lack of knowledge forthrightly.

- Examine alternative ***project management systems*** to see if systems are available, or could be developed, that are better suited than traditional systems to dealing with the uncertainty and change that are characteristic of EM projects.

- Evaluate how the lack of ***national standards*** for cleanup has affected technology development and priority-setting. What standard-setting process could provide adequate protection, could be funded, and could be acceptable locally?

- Construct a ***staff growth*** model for EM based on existing human resource planning models and stakeholder views about allocation of person-power; extend the model to help make prioritization decisions using multi-attribute decision theory.

- Identify and assess the ***unintended consequences of accountability*** that result both from legal devices to ensure compliance as well as from managerial systems designed to exercise oversight.

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms

ACNFS	Advisory Committee on Nuclear Facility Safety
AEC	Atomic Energy Commission
ASDP	Assistant Secretary of Defense Programs
BRC	below regulatory concern
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
D&D	decommissioning and decontamination
DAS	Deputy Assistant Secretary
DNFSB	Defense Nuclear Facilities Safety Board, the "Conway Board"
DOD	Department of Defense
DOE	Department of Energy
DOJ	Department of Justice
DP	Defense Programs
EDF	Environmental Defense Fund
EEG	Environmental Evaluation Group
EH	Office of Environment, Safety, and Health
EM	Office of Environmental Restoration and Waste Management
EPA	Environmental Protection Agency
ER	Environmental Restoration
ERDA	Energy Research and Development Administration
ERMC	Environmental Restoration Management Contractor
ES&H	environment, safety, and health
FO	field office
FTE	full time equivalent
FY	fiscal year
GAO	General Accounting Office
GNP	gross national product
GOCO	government-owned contractor-operated
HQ	headquarters, usually used as DOE HQ
ICE	Independent Cost Estimating
INEL	Idaho National Engineering Laboratory
INPO	Institute of Nuclear Power Operations
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
M&O	Management & Operations
MIT	Massachusetts Institute of Technology
MSA	major systems acquisition
NAS	National Academy of Science
NE	nuclear energy
NEPA	National Environmental Policy Act
NRC	National Research Council
NRDC	Natural Resources Defense Council

NWSM	Nuclear Weapons Stockpile Memorandum
O&M	organization and management
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PNL	Pacific Northwest Laboratories
R&D	research and development
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SEN	Secretary of Energy Notice
SNL	Sandia National Laboratories
STGWG	State and Tribal Government Working Group
SWOOPE	Students Watching Over our Planet Earth
TPA	Tri-Party Agreement
TSCA	Toxic Substances Control Act
TWRS	Tank Waste Remediation System
US	United States
WERC	Waste Management Education and Research Consortium
WIPP	Waste Isolation Pilot Plant
WM	waste management

1. Introduction

This report presents the results of an intensive study aimed at identifying the special management problems perceived to confront the Department of Energy (DOE) in carrying out its program of environmental restoration and waste management (EM). The problem of cleanup of the nuclear weapons complex sites has become a key issue for the DOE and the nation. The Department has already invested over $10 billion in the effort and has budgeted over $5 billion for FY93. The General Accounting Office's recent estimate (GAO 1992a) places the total cost of cleanup at $160 billion; some privately expressed estimates are much higher.

The management of programs of the magnitudes anticipated is a challenge in any context, but it is particularly difficult for DOE at present, in the early stages of development of the EM program. The Department has undergone major changes in its mission and major changes in its *modus operandi*. In particular, production of weapons is no longer as dominating an activity of the Department. Environmental cleanup has become of comparable importance. Further, a new level of public interest and scrutiny has emerged which profoundly influences the management and operations of the Department. Finally, in response to the changes being imposed upon the Department, there have been changes in internal operations, such as centralization of authority at headquarters, that have changed relations between DOE and the contractors conducting much of its work.

The characteristics of the organization and management problems facing EM in its cleanup are not separately unique. Each has been faced separately by other organizations in other circumstances. For example, other organizations have had to cope with major changes in technical tasks (say, DOD's shift to "low-intensity conflict") or with new environmental constraints (say, oil company shift to lead-free gasoline). But we know of no US venture having to deal with so many large simultaneous changes applied on so large and diverse a scale. *That* is what is unique about EM.

The leaders of the EM office are well aware of the complexity of their task and are sponsoring a collaborative research program involving the Massachusetts Institute of Technology (MIT) and the Los Alamos National Laboratory (LANL) to investigate both technological and managerial opportunities for improved conduct of the cleanup. The management-related portion of the collaborative program is structured in two phases. Phase one is aimed at developing an understanding of the management problems, including the root-causes, or driving forces, and consequences of those problems. The results of phase one are the subject of this report. Phase two, to be undertaken after phase one is complete, will focus on specific research tasks to generate new knowledge which can assist EM in carrying out its own program.

More specifically, the phase one project was designed to (a) elicit the perceptions of stakeholders about the main issues of organization and management confronting EM, (b) establish a framework to help understand the origin of those issues, (c) state the consequences of those issues for EM's effectiveness, and (d) identify topics for further management research in depth that could assist EM in carrying out its mission.

It is important to reiterate that phase one is a research effort designed to develop insight and understanding regarding the organization and management of the EM program. It is not intended as a critique or evaluation of the program to date nor as a management consultation. Thus, the conclusions of phase one do not include specific recommendations for program managers.

The management and organizational issues that EM faces are important because the effective protection of public health and safety is a fundamental responsibility of the Department of Energy. Restoration of the environment and handling of waste are key factors in providing that protection. It is incumbent upon the Department to manage well the enormous amounts of public funds required to carry out those responsibilities. The program will extend over many decades at high levels of expenditures. In order for the needed resources to be made available, it is crucial that Congress and the public believe the program is managed in an exemplary manner.

There have been numerous recent reviews of the Department and its EM activities. These reports, and others, are valuable contributions to understanding the scope and scale of the cleanup effort.

The research presented in this report is distinct from the other studies in three dimensions. First, the work reported is focused entirely upon EM and the problems of organization and management of the EM program. Other studies have focused on different EM issues or on non-EM issues in addition. Second, the work is being carried out as a research program whose approach is understanding rather than evaluation or prescription. The third distinguishing feature is in the locations and staffing of the research. Both MIT and LANL are institutions with a long history of research. All of the investigators are associated

with either MIT or LANL and are career research professionals rather than current practitioners or consultants.

The first phase of the research was carried out in the traditional modes of data collection, data reduction, data analysis, and data synthesis. The data collection activities were designed to acquire insight and observations about the EM program from a large variety of stakeholder groups such as: DOE employees at headquarters and field offices, contractor personnel, state and local officials, public interest groups, etc. The fundamental vehicle for data acquisition was a confidential interview with individual stakeholders who had detailed personal knowledge of the EM program. Our hypothesis was that the perceptions of a large number of informed persons would provide us with a reasonably complete set of views on management problems, management failures, management responsibilities, and related matters, to help understand the breadth of difficulties that EM faces. Our purpose was to develop an inventory of views and not to count votes on issues.

A second vehicle for identifying real or perceived difficulties was previous studies, both by external groups and by DOE's internal Tiger Team Assessments of individual sites that were alluded to previously. Although some of those assessments were focused upon matters relating to environment, safety, and health (ES&H), the insights and findings were useful in our research context. And a third vehicle consisted of other contact activities described in Section 2.4.

The procedures and protocols used in the data collection process are described in detail in Section 2.1.

The data analysis was designed to reveal a set of underlying management issues that are inherent in the EM program. In order to identify the issues, the

basic interview data were coded for content analysis. The coding scheme involved cross-relating general managerial categories such as policies and goals, budgets and schedules, etc., against EM activity categories such as compliance, contractor relations, etc. The resulting data base was then analyzed in several ways to identify management issues that were recurrent themes in the interviews. The processes of data reduction and data analysis are described in Sections 2.2 and 2.3.

Our framework for helping to understand the data is presented in Section 3, which describes the arena in which EM is operating--an arena of change. Section 3 traces the changes experienced by EM during the last few years and how those changes contribute to current management problems. Major changes were inherent in the change of mission from production to cleanup; they include changes in culture, accountability, and task uncertainty. Additional changes were imposed by DOE in creating a new organization; they include changes in headquarters control, formalization, and growth. There have been important consequences of a failure to recognize the impact of all these changes.

From the many issues we identified, seven were chosen for discussion in "issue papers" in Section 4. The papers covered issues observed and discussed by many stakeholders. Those issues can be categorized in three areas. In the first area, traditional organization and management, there are issue papers on DOE-contractor relations, organizational design and fit, and project management. The second area considered externalities that must be reflected in the management of EM. Issue papers in this area include compliance agreements and impediments to progress such as the need for new technology. The third area might be termed perceptions which reflect attitudes toward DOE and its ability to manage. Issue

papers included here are the trust and credibility of the Department and the timeliness and receptiveness of the Department in its decision-making.

Section 5 focuses on the consequences that have arisen from the issues identified above and that are reported by interviewees or in other reports. Those consequences, which include both directly reported observations and our inferences, usually impair EM's effectiveness and can be linked directly to change in EM.

We have not included recommendations for policies, practices, or procedures that EM might adopt to improve management. It would be premature to offer such recommendations at this time. However, there is a set of research questions which have emerged from this study, whose resolution should contribute to improved organization and management. In Section 6 we include a brief discussion of those research topics we feel would be most important in their potential to assist DOE.

This report represents the work of a collaborative effort among researchers at MIT and LANL. Tasks were undertaken without organizational distinctions. The report should be regarded as a product of all the researchers involved (see Section 2.1) acting jointly although the primary author of each part of Sections 3 and 4 is listed under the title of that part.

2. Research Methods

The major issues of organization and management at DOE's nuclear complex that affect environmental restoration and waste management are seen differently by various stakeholders. Even when there is agreement that a particular issue exists, there may be disagreement among stakeholders about the importance of the issue and how it should be dealt with. One unusual characteristic of the DOE complex is the number and diversity of stakeholders and their ability to affect operations in the complex. Therefore, our starting point has been to understand the perspectives of different stakeholder groups. Our basic tool for obtaining stakeholder views was the personal confidential interview, tape-recorded in most cases.

Interview data, once collected, were subjected to a data reduction and data analysis process. In data reduction, significant quotations were extracted from the interviews, content coded, and entered into a data base for later retrieval. In detailed analysis, extracts were studied to discern patterns, root causes, and interrelationships that will help us understand how the system works in practice and how the stakeholders perceive it to be working. Details of each of these steps are given below.

2.1 The Interview Process

Development of an interview protocol and conducting interviews took place over an eleven-month period from July, 1991, through May, 1992.

2.1.1 The Interviewers

From its inception, the management study has been a truly collaborative effort between LANL and MIT. Thus, the interview team consists of researchers from both institutions (four from MIT and two from LANL). In all cases, interviewers were senior-level people; no graduate students were permitted to conduct interviews or to analyze interview data.

Because one of our fundamental assumptions is that the multiple demands of managing waste operations poses a combined challenge to managers that cannot be dealt with most effectively using only existing knowledge in the management sciences, the background of the team members is multidisciplinary in nature. The individuals were selected for the particular skills each brings to the program:

- Dr. John Carroll is Professor of Behavioral and Policy Sciences in MIT's Sloan School of Management. He is an authority on managerial behavior in organizations and heads the research on management sciences in MIT's current international program on safety in nuclear plants.

- Dr. Heidi Hahn is Group Leader of LANL's Systems Performance and Analysis Group. Her specialty is in the analysis of human performance in complex systems, including the impacts of organizational dynamics on human performance.

- Dr. Kent Hansen is a Professor in MIT's Department of Nuclear Engineering. He is an expert on nuclear technology and is the overall principal investigator of MIT's current international program on safety in nuclear plants.

- Mr. Jerome Morzinski is Deputy Group Leader of LANL's Systems Performance and Analysis Group. He has a background in systems analysis of complex systems, as well as in statistical analysis and data integration.

- Dr. Constance Perin is an independent scholar who specializes in the study of American social and economic institutions and in the anthropology of organizations and work. She has been involved in research at the MIT Sloan School of Management over the last nine years.

- Dr. Malcolm Weiss, until recently co-director of MIT's Energy Laboratory, has broad experience with energy and environmental issues. He was formerly a senior executive at Exxon with responsibility for development and application of a wide range of chemical and petroleum technologies in the U. S. and abroad.

Dr. Hahn headed the work at LANL and also served as LANL's University Technical Representative for monitoring the work of MIT under its subcontract with LANL. Dr. Weiss directed the work at MIT.

In general, assignment of an interviewer to a particular interviewee was done simply on the basis of proximity and availability. Thus, most of the eastern interviews were conducted by MIT and the western interviews were divided about evenly between MIT and LANL.

2.1.2 The Interviewees

In selecting interviewees, our intention was to talk to individuals whose views would be representative of the major positions of all the important stakeholder groups. The important stakeholder groups include:

- DOE, both headquarters and field offices

- Congressional staff (i.e., OTA, GAO)

- Federal agencies other than DOE and Congress (such as the Defense Nuclear Facilities Safety Board)

- On-site personnel at EM facilities--all of the major DOE EM sites, except the three major weapons labs (LANL, LLNL, and SNL) were visited; this category generally refers to DOE's on-site contractors and subcontractors, also referred to as the M&O contractors

- Public interest and advocacy groups, usually on a local level but also including national organizations such as the Sierra Club
- Corporate headquarters of contractors
- State and local governments
- Labor and business groups, usually on a local level.

Selection of a particular individual to interview proceeded based on previous knowledge that the person held a position that would give him/her a broad view (i.e., through references in the literature), from that person's position on an organizational chart--individuals with oversight responsibility for waste operations at sites, for example, were logical choices, or through references from other interviewees. At many sites, knowledgeable site representatives identified all interviewees for us.

Table 2.1 lists the location, number, and stakeholder category of all interviews conducted. In all, 149 individuals were interviewed. The greatest numbers of interviews were conducted with DOE (55 interviews) and contractor personnel (57 interviews) This mix was intentional, as we believe that those stakeholder groups had the most comprehensive view of the organization and management problems facing DOE. Other stakeholders (37 interviews), particularly those at the local level, often had strong views about the site actions they observed, but had much less to say about organization and management issues. We believe that the positions discussed in the issue papers found in Section 4 are representative of the views of the stakeholder groups interviewed, but we make no claim as to the statistical validity of the sample.

2.1.3 Interview Protocol

Prior to our beginning to conduct interviews, a preliminary interview protocol was developed. Initial inputs regarding potential issues of interest were obtained through a review of previous assessments of the DOE weapons complex, including those done by the Tiger Teams, OTA, GAO, the Conway Board, and the National Academy of Sciences.

We began the interview process by conducting "scoping interviews" with individuals that we had identified as having a very broad view of the problems facing DOE. These were free-form meetings, in which the interviewee was simply asked to provide us with guidance about what he or she thought were the important questions that we should be addressing.

Based on what we learned in our review of the literature and in the scoping interviews, we decided on a quite open-ended approach to our interviewing. Each interviewee was asked to comment on the following areas:

- His/her position relative to the DOE complex--what role he/she plays, his/her interests and expertise
- The organization and management issues that he/she sees as either helping or hindering DOE in its ability to accomplish its EM mission--respondents were asked to use their personal experiences as their frame of reference
- What changes he/she would make, if he/she could, to improve the system.

Additionally, if it was appropriate given the particular interviewee, we also asked:

- The usefulness, in terms of identifying important issues, of existing assessments

- Other people who we might interview.

Ample opportunities were allowed for the interviewer to follow up with specific questions on the organization and management issues raised by the respondent. However, there was no set list of questions developed for follow-up; the interviewees' interests and expertise served to guide this portion of the interview. The following are given as examples of the types of questions that were asked. Keep in mind that they were generally asked in the context of the interviewee's previous response:

- *Do your [contractor] people very often get direction directly from headquarters that bypasses the field offices? And how do you try to handle things like that?*[1]

- *All the oversight, whether it's just visitors or levels of review or delegation of authority, thinking of the problem broadly, what do you think all this is originating from? What is causing it? When did it start? What's been happening?*

- *Do you get any part in formulating these DOE orders or do you get a serious opportunity to comment before they're promulgated?*

Protocol development and refinement was planned as an iterative process. Periodically, throughout the interview phase, the researchers stopped to assess the process to ensure that the range of stakeholders being questioned was broad enough and that the information being obtained in the interviews was sufficiently rich to enable us to draw meaningful conclusions.

In addition to the actual conduct of the interviews, our protocol covered how interview arrangements were made. DOE FOs received a memo from Leo Duffy (shown as Appendix A) soliciting their cooperation. This memo presented a concise written description of the project that proved

[1]Italics are used throughout the document to denote a direct quote from an interviewee or interviewer.

useful in explaining our goals to other stakeholders. In some cases, site representatives made all interview arrangements for us. When we made arrangements directly, we first contacted potential interviewees by telephone and explained the purposes of the study, our desire to audio tape, and the confidentiality arrangements. A date and time for the interview was agreed upon, and security requirements for bringing a tape-recorder to the meeting were discussed. The Duffy memo was often faxed to potential interviewees outside DOE FOs in advance of the interview.

2.1.4 Description of a "Typical" Interview

Although there were some variations, noted below, the typical interview set-up was as follows:

- Interviews were generally conducted at the interviewee's work location, usually in his/her office, but sometimes in a conference room or other informal setting.

- Interviews generally lasted 3/4 to 1-1/2 hours. Due to interviewee time constraints, though, a few very short interviews (20 - 30 minutes) were conducted.

- Interviews were generally a one-on-one situation, with just one interviewer and one interviewee. Some early interviews had as many as three interviewers, because we viewed these as a training experience. Also, 15 interviews had multiple interviewees (never more than four).

- Interviews were audio-taped with the interviewees' permission. One interviewee declined any taping. A few others requested that taping be stopped during specific portions of their comments. In a few cases, security regulations prevented us from using tape recorders, so we relied on interviewer notes.

2.1.5 Confidentiality and Data Handling

In arranging for and conducting the interviews, each interviewee was assured in advance that his or her identity, either by name or position, would

never be revealed to any individual other than the researchers at MIT and LANL actively participating in this project. Further, care was taken to protect the privacy of individuals other than the interviewees themselves who may have been named during the course of an interview. Therefore, this report has deleted all names except those of Secretaries Watkins and Duffy, and all other specific information that might identify an interviewee or a subject of comment. The sponsor (DOE) was informed of this assurance of confidentiality and, in addition, was told that DOE would have no access to the names or specific positions of the people interviewed. These assurances were clearly understood and accepted by all parties involved.

Most interviews were tape-recorded. As described in more detail in the following section, transcripts of the tapes were made, and extracts from the transcripts were selected and entered into a data base for further analysis. For interviews not tape-recorded, extracts from the interviewer's notes were extracted and data based. We have agreed to handle the tapes, transcripts, and notes as follows to ensure privacy, and have provided this protocol, in writing, to DOE:

- Each audio tape will be erased after completing and correcting the draft transcript.
- Copies of the transcripts, with a separate cover page identifying the interviewee, will be available only to the LANL and MIT researchers actively participating in the Phase I project.
- Interviewer notes will be handled the same as transcripts.
- Interview extracts will not be identified either by the name or specific title of the interviewee.
- The extracts will be expurgated to delete identification of specific individuals or small groups named during the interviews.

- No later than one year after completing the final report of Phase I, all copies of the original complete interviewee lists, transcripts, notes, and extracts will be destroyed; we will retain only documents that have been edited to delete identification of interviewees or subjects of comments by interviewees. The modest delay after Phase I is intended to make the original transcripts and notes available to project researchers if they are helpful in beginning the Phase II research effort.

- This general protocol will be followed by both LANL and MIT researchers.

2.2 Data Reduction

Shortly after the first interviews were conducted, data reduction began. The purpose of this activity was to translate interview data into a form that would both protect the interviewees, as described above, and provide information amenable to analysis to the researchers. Data reduction was a four-step process, involving transcription of the audio-tapes, identification of passages (segments, extracts) in the transcripts that were regarded as significant, coding of those passages, and extracting data in a meaningful form. These steps are described below.

2.2.1 Tape Transcription

Both LANL and MIT took responsibility for having their own audio-tapes transcribed by skilled transcriptionists. When interviews were conducted by interviewers from both institutions, MIT handled the transcription.

The original tapes and the transcripts were returned to the responsible interviewer, who checked the transcript for accuracy and made necessary corrections. Transcripts were then distributed to all researchers, and the tapes erased.

2.2.2 Identification of Significant Passages

As interviews were transcribed, the analysts began reading the transcriptions and identifying what they thought were extracts containing significant organization and management information (interesting or important points, illustrations, and quotations), worth preserving in the data base. This initial set of interviews formed the basis for development of a coding scheme, described below.

2.2.3 Coding of Transcripts

After reading a subset of the interview transcripts, the analysts began the development of a coding scheme that would allow for content analysis of the transcripts. The purpose of this step was to devise a method for organizing significant extracts from the interview data in ways that would enable the researchers to focus their attention on a particular issue and/or stakeholder group during the analysis process.

After several iterations, we developed a matrix-based taxonomy that incorporates general management science dimensions as well as topic categories unique to DOE EM. DOE-specific categories included:

A. Programs--waste minimization, treatment, storage, shipping, disposal, remedial actions, decontamination and decommissioning, etc.

B. Technology Development--research and development for new technologies, including technology transfer and education.

C. Compliance Agreements--with regulatory, judicial, or political bodies; these may or may not have the force of law.

D. Prioritization--choosing and/or ranking ER/WM activities in the face of limited resources.

E. Nationwide Standards--development and implementation of standards on acceptable risk, "how clean is clean," and other technical criteria.

F. Contractor Relations--between DOE and its contractors.

G. EM--matters pertaining to EM as a whole, not specific to any part above.

H. Other--miscellaneous category, for topics not covered above.

The management science dimensions were defined in language that would make them meaningful to DOE EM. These categories included:

1. Policies and Goals--the existence and clear expression of strategies, policies, and goals for EM.

2. Planning and Budgeting of Resources--steps taken to define and allocate needed resources.

3. Using Resources--including personnel, existing technology, and other resources.

4. Organization, Structure, and Responsibilities--who does what on site, at the site vs HQ, and at HQ.

5. Management Systems--including conduct of operations and quality assurance, integration and coordination, reporting, and transition and commitment to change.

6. External Relationships--other interactions, including negotiations, on-site and by HQ; also includes issues of credibility.

7. Oversight and Assessment--both internal and external.

8. Other--miscellaneous category, for topics not covered above.

Comparisons of the coding of the same transcripts by different individuals showed that the system is satisfactory in terms of coding reliability. Subsequent to our reliability check, each interview was analyzed by one researcher. Generally speaking, analysis was performed by a researcher other than the original interviewer to minimize the introduction of bias based on personal like/dislike, etc.

For each important segment, the analyst assigned a two-digit code denoting the matrix grid referred to by the interviewee's comment. For

example, the code "G3" would mean that the comment referred to EM's use of resources. In some cases, multiple codes were used, indicating that the marked comment contained information pertinent to more than one coding category. Additional codes, taken from the transcript cover sheet, included the interview number, stakeholder category, stakeholder location, and the interviewee's level in the organization.

2.2.4 Data Extraction

In order to enhance our ability to retrieve and meaningfully group the coded extracts, a data base of the extracts was developed using a commercial software package. This data base consists of a master table, listing all the interviews, and a basic report for each interview. The master table includes the following information for each interview conducted: interviewee number, name, location, FO affiliation, stakeholder category, interviewee's job title, interviewer, and interview date. Each basic report lists the interviewee number as well as a segment number, code(s), analyst comments, and transcript page number for each coded segment. Only the coded portions of a particular interview are contained in the data base.

From these codes, the data base can be queried and extracts can be retrieved and grouped together in any way thought useful by the analyst, i.e., not only based on the matrix described above, but also by stakeholder group, by location, or by key word searches.

Appendix B shows a sample coded extract. These are a few of the extracts retrieved by code or by key words on the subject of "Human Resources."

The data base also provides an easy mechanism for obtaining frequency counts of the numbers of comments in certain grid categories. Table 2.2 shows the number of times each code was used, broken out by stakeholder group. Note that a particular segment may have had multiple codes, so the total number of codes exceeds the number of segments coded.

2.3 Data Analysis

Our researchers have searched the data base to find extracts relating to selected topics and have summarized their findings in brief reports, called topical summaries. We consider this to be a final bridge between data reduction and serious analysis. Topical summaries and our analysis of other published studies on the DOE complex served as the input for our detailed analyses, called issue papers. Both the topical summaries and issue papers are described below.

2.3.1 Topical Summaries

The objective of writing topical summaries was to further reduce the data from a series of extracts to a number of reports that would convey themes found in the extracts, note divergences on those themes by different stakeholder groups, and present representative quotes from the extracts to support the stakeholders positions on various themes. Where possible, data on these themes found in other literature pertinent to the DOE complex were also included. This, then, is a first-level analysis of the raw data contained in the extracts.

The format and content of the reports were allowed to vary, based on the ideas of the writer, as a deliberate experiment in finding the most helpful approaches for the issue papers and final report. Because there was no

attempt at uniformity and because the topical summaries were intended only as a tool for the researchers, the topical summaries do not present the type of "neat package" that we would feel comfortable with providing as part of this report. However, readers interested in obtained a particular topical summary can do so by contacting Dr. Hahn. One example, a topical summary dealing with "Communication," is included as Appendix C.

In all, thirteen topical summaries were written. Topics were selected based on mutual agreement by the researchers that a particular subject represented a major theme found throughout the transcripts, and one that was potentially important to DOE's ability to accomplish its environmental management mission. No attempt was made, at this point, to eliminate overlaps and redundancies. Assignment of a topic to a particular researcher was made on the basis of the analysts' interests and background. Summaries were written on the following subjects:

- Delays
- Change
- Orders and requirements
- Assessment and audits
- Standards
- Credibility and trust
- Centralization/Decentralization
- Liability
- Communication
- Prioritization
- Technology development

- Headquarters - field - contractor relations
- Human resources.

Topical summaries were distributed to all researchers for further distillation into issue papers, described below.

2.3.2 Issue Papers

In the assignment of issue papers, a conscious attempt was made to minimize overlaps and redundancies and to identify overarching issues that would draw on themes identified in one or more of the topical summaries.[2] Further, our intention was that issue papers would be a detailed enough presentation of a particular subject to be used in a stand-alone form. Here, format has been standardized. Thus, each issue paper contains: (1) a 200-word (approximate) abstract; (2) a short introduction; (3) a description of the comments we have heard on the issues and our interpretation of those comments; and (4) a statement of the implications of the issue to DOE/EM.

Issue papers were written on the subjects listed below. Again, assignments were based on the interests and expertise of the researchers. Complete issue papers are contained in Section 4 of this report:

- Organization design and fit
- Credibility and Trust
- Impediments
- Project management
- DOE-Contractor relationships

[2] Although, from the titles it is clear that all overlaps may not have been eliminated. For example, while standards, prioritization, and technology development were combined to form a paper on impediments, impediments and delays, while not combined, seem related.

- Delays
- Compliance agreements.

Potential Phase II activities, shown in the final section of this report, were selected from the many ideas generated by the researchers as being those that we feel are most useful to DOE/EM (as reflected in the EM Strategic Plan) and those that we feel most able to perform. These ideas will be discussed with DOE to determine which are most relevant.

2.4 Other Activities

In addition to the major research tasks described above, members of the project team engaged in various other activities that were designed to deepen our understanding of both stakeholder perspectives and technical and programmatic pressures facing DOE. Lessons learned from these activities also became data used in the writing of topical summaries and issue papers. These activities included:

- Attendance at a meeting of the State and Tribal Government Working Group. STGWG was created by DOE in 1989 to review the Five-Year Plan and to discuss related issues brought up either by DOE or STGWG members. It is made up of representatives appointed by governors and tribal leaders from state and tribal lands on which DOE facilities and waste sites are located. STGWG members also include representatives of the National Governor's Association, the National Conference of State Legislatures, and the National Association of Attorneys General (DOE, 1990).

- Attendance at the National Workshop on the Environmental Restoration Priority System. At these meetings, some STGWG members as well as representatives of the Environmental Protection Agency (EPA), the Natural Resources Defense Council (NRDC), and the Environmental Defense Fund (EDF) work with DOE in developing a risk-based methodology for prioritizing compliance and cleanup activities (DOE, 1990).

- Attendance at the Environmental Remediation '91 Conference, sponsored by DOE, at which presentations related to programs underway and completed between May 1990 and September 1991 were given. The preface of the Proceedings (1991) stated: "Presentations by DOE-HQ Senior Management and staff ensured that the personnel and organizations who would be affected by new policies had an opportunity to hear about them from the policy makers themselves. Presentations by DOE FOs provided an opportunity for both DOE-HQ and the contractors to learn about, and discuss, how these policies are implemented. Presentations by DOE contractor personnel discussed the specifics of ER projects, encouraging technical information exchanges. Presentations by Federal and State regulators allowed DOE and contractor personnel to understand more fully the constraints under which regulators operate. Presentations by universities and industry encouraged DOE and contractors to consider technologies and idea which were developed outside the DOE complex--to ensure that DOE does not become internally focused and exclude innovative approaches."

- "Shadowing" a high-ranking manager in the DOE headquarters EM organization. One researcher spent a week in Washington literally sitting with and walking alongside this manager to gain a better understanding of the day-to-day pressures of his job, the kinds of crises and technical issues that arise, and how activities get re-prioritized as situations change.

- Attending a three-day retreat of senior managers of the Tank Waste Remediation System (TWRS) project. The meeting brought together senior personnel from DOE HQ, DOE Hanford, Westinghouse Hanford, Pacific Northwest Laboratory (PNL), and consultants to review and plan for the Hanford Waste Tanks remediation. In the course of the meeting, all attendees had an opportunity to contribute to a clarification of roles and responsibilities and evolve the management plan of the project into the future.

2.5 Advisory Committee

An advisory committee, tasked with giving broad-view suggestions for our current and ongoing research on management issues, was convened by MIT. Members of the advisory committee were selected because their backgrounds give them the ability the see the "big-picture" that we, as researchers, might miss by being too close to the research. Advisory committee participants include:

- Dr. John F. Ahearne, Sigma Xi
- Prof. Michael S. Baram, Boston University
- Prof. Henry D. Jacoby, MIT
- Prof. Roger E. Kasperson, Clark University
- Prof. Richard K. Lester, MIT
- Prof. David H. Marks, MIT.

The first meeting of the advisory committee was held on June 26, 1992. At this meeting, MIT and LANL researchers made short presentations of the work that we had done to date, and discussed the options that we are considering for future work. Committee comments were both numerous and constructive.

It is our intention to continue to convene advisory committee meetings, on an as-needed basis, throughout the Management Research activity.

Table 2.1 Stakeholder Interviews

Number of Interviewees	Location of Interviews	Stakeholder Category Interviewed at Location
7	Rocky Flats & Denver, CO	DOE Office Contractor State Official
14	Washington DC	DOE HQ
5	Washington, DC	Congressional Staff
9	Washington, DC	Federal Agencies (GAO, OTA, DNFSB)
17	Richland, WA	DOE Office Contractor
17	Idaho Falls, ID	DOE Office Contractor
6	Albuquerque & Carlsbad, NM	DOE Office State Official Contractor
8	Fernald, OH	DOE Office Contractor State Official
11	West Valley, NY	DOE Office Contractor State Official
6	Pantex, TX	DOE Office Contractor
16	Oak Ridge, TN	DOE Office Contractor State Official
16	Savannah River, SC	DOE Office Contractor
17	Various locations	National and Local Activists, Corporate HQ, Labor, Local Business, Local Official
149	TOTAL	

Notes: (a) In a few cases, interviews were held with two or more interviewees present.
(b) "Stakeholder Category" listing may include more than one group at a location, e.g. more than one contractor. Some categories (see last entry in table) are not listed under the specific locations of interviews.

Table 2.2 NUMBER OF TIMES EACH CODE WAS USED

In each box: DOE / CONTRACTOR / OTHER	1 Policies & Goals: Strategies, policies, and goals exist and are clearly expressed.	2 Planning & Budgeting (of resources) Steps to define and allocate needed resources.	3 Resources (using) a: Personnel b: Existing technology c: Other resources	4 Organization (who does what) Structure and responsibilities a: On site b: Site vs. HQ c: At HQ	5 Management Systems a: Cond. of Ops, QA b: Int coordination c: Reporting d: Transition & Commit to Change	6 External Relationships other interactions (e.g. credibility) a: On site b: by HQ c: Negotiating	7 Oversight & Assessment Internal & External, e.g. Tiger Teams, Conway, Ahearne	8 Other	SUBTOTALS	TOTALS
PROGRAMS	15	22	20	28	44	16	5	7	157	
A Waste min, treatment, storage,	17	23	12	18	33	18	6	2	129	337
shipping, disposal; remedial	6	3	5	7	13	11	2	4	51	
action:, D&D, etc.										
TECHNOLOGY Development:	8	14	3	2	7	0	0	1	35	
B R&D for new technologies,	5	9	6	2	5	0	1	1	29	81
including technology	7	1	2	1	2	2	0	2	17	
transfer and education.										
COMPLIANCE & Agreements	12	15	6	6	21	40	2	3	105	
C With regulatory, judicial, or	8	19	9	9	34	30	12	5	126	283
political bodies. May or may not	2	4	1	3	11	26	2	3	52	
have force of law.										
PRIORITIZATION	4	15	3	2	5	16	2	3	50	
D Choose and/or rank	5	17	6	3	3	2	0	1	37	114
ER/WM activities in the	2	5	3	0	2	8	0	7	27	
face of limited resources.										
NATIONWIDE STANDARDS:	12	5	1	3	8	14	4	2	49	
E Develop & implement standards	9	5	3	2	10	8	5	5	47	121
on acceptable risk, "how clean is	5	3	0	0	2	7	1	7	25	
clean", & other technical criteria.										
CONTRACTOR RELATIONS:	3	9	27	32	54	3	11	11	150	
F Between and among DOE and	12	12	27	49	77	7	19	12	215	460
its contractors.	2	2	27	20	15	14	3	12	95	
EM: Matters pertaining to	40	20	65	128	120	34	30	32	469	
G EM as a whole, not specific	34	15	15	36	56	19	20	2	197	802
to any part above.	16	14	10	21	24	44	6	1	136	
	19	5	10	33	31	40	8	18	164	
H OTHER	13	7	11	22	32	34	16	18	153	489
	26	3	11	12	16	67	12	25	172	
DOE	113	105	135	234	290	163	62	77		
Subtotals CON	103	107	89	141	250	118	79	46		
Other	66	35	59	64	85	179	26	61		
Totals	282	247	283	439	625	460	167	184		2687

Note: These are numbers of times the codes were used. Code A1, e.g., was used 15 times on DOE transcripts, 17 times on contractors, 6 times on others. Code A was used a total of 337 times.

3. EM's Arena: The Experience of Change

Malcolm A. Weiss

Abstract

The arena in which EM finds itself functioning is an arena in which changes are pervasive and intense; they directly affect the ability to organize and manage effectively. Those changes include changes inherent in the shift of mission from production to cleanup, and changes in organization and management imposed by DOE in order to carry out its new mission.

Three broad changes inherent in the change of mission include a change in the attitudes, beliefs, and self-image of the workforce; a change in public and legal involvement (from secrecy and immunity to scrutiny and accountability); and a change in the clarity and certainty of tasks to be accomplished.

Three broad changes imposed by DOE on itself include a change to headquarters control by assuming new decision-making and review powers; a change to formalization by introducing new orders, plans, rules, budgets, and other bureaucratic procedures; and a change to growth of field, HQ, and supporting contractor staffs.

Stakeholders inside and outside DOE have underestimated the difficulties of dealing with those changes effectively. The consequences have been insufficient attention to managing change, and unrealistic expectations of what could be accomplished in the face of those changes with the time and other resources available. The organizational and management issues we observe can be linked to changes.

The purpose of this section is to provide an overview of the arena in which EM operates and to show how the specific issues discussed in the following section (Section 4, "Issue Papers") are linked to that overview. Our statement of the overview is informed by what we have heard from stakeholders, by the inferences

we have drawn from our contacts with them, and by the views of other groups who have published studies of EM.

In our overview the most conspicuous characteristic of EM is that of an organization coping with changes. Those changes include changes inherent in the shift of mission from production to cleanup, the externally imposed changes. But they also include internally imposed changes, namely, changes in organization and management imposed by DOE in order to carry out its new mission. The separate changes in each category are large, their impacts are large, and in total they both are huge.

Stakeholders inside and outside DOE have underestimated the difficulties posed by introducing those changes. The underestimates have two types of unhappy consequences. One type is insufficient attention within DOE to the problems of introducing and managing changes. And the second type is unrealistic expectations of what can be accomplished in the face of those changes with the time and other resources available. Those consequences account for much of the disappointment, inside and outside DOE, with progress of the cleanup effort.

After a brief description of EM's mission, this section describes the changes experienced by EM and their relationship to some of the organization and management issues facing EM--issues that are selectively expanded upon in Section 4.

3.1 EM's Mission

According to EM's current strategic plan, EM's mission is to:

- safely and acceptably prevent/minimize, handle, treat, store, transport, and dispose of DOE waste; and
- ensure that risks to the environment and to human health and safety posed by inactive and surplus facilities and sites are either eliminated or reduced to prescribed levels.

This will be done using the most technically effective and cost-efficient means possible and providing appropriate opportunities for public involvement.

DOE (1992)

EM's task is to achieve those broad objectives throughout a nuclear weapons complex that the OTA (1991) has called "an industrial empire--a collection of enormous factories devoted to metal fabrication, chemical separation processes, and electronic assembly... like most industrial operations, these factories have generated waste, much of it toxic. The past 45 years of nuclear weapons production have resulted in the release of vast quantities of hazardous chemicals and radionuclides to the environment. There is evidence that air, groundwater, surface water, sediments, and soil, as well as vegetation and wildlife, have been contaminated at most, if not all, of the DOE nuclear weapons sites."

OTA goes on to say that "At every facility the groundwater is contaminated with radionuclides or hazardous chemicals. Most sites in nonarid locations also have surface water contamination. Millions of cubic meters of radioactive and hazardous wastes have been buried throughout the complex, and there are few adequate records of burial site locations and contents. Contaminated soils and sediments of all categories are estimated to total billions of cubic meters.... Although facilities in the DOE complex have much in common, there is no *typical* facility. Each site has a unique combination of characteristics that shapes its particular waste and contamination problems and affects the way those problems are addressed." It is relevant to add that the degree of hazard associated with those problems also varies widely from site to site, ranging from minor (as

assessed by technical experts) to high to unknown; public perception of hazard is not always in accord with expert assessment.

Geographically, major facilities cover over 3300 square miles and are spread across the country from Florida to Washington state. Minor facilities are even more widely distributed. EM's environmental restoration program estimates that there are more than 3,700 hazardous waste sites (one facility may have multiple "sites") under its jurisdiction, aside from over 5000 other properties associated with uranium mill tailings or formerly utilized sites, DOE (1991a). The last public estimate of cleanup costs by GAO (1992c) was an ultimate total of $160 billion; informed observers believe the cost would be vastly higher if the nation insisted on restoring pristine conditions everywhere.

Even this brief description of the weapons complex is sufficient to show why the complexity, diversity, scale, and difficulty of EM's cleanup problems are so striking. Coping with those problems leads to an embarrassment of riches if a researcher is looking for organizational and management issues to examine. That is illustrated by the issues discussed in this report, some of which are well known but some of which may not have been recognized.

3.2 Changes Inherent in the New Mission

In taking on the new mission of cleanup, the obvious change accepted by DOE was a change of task--the physical task to be accomplished. Everyone agrees that digging up pond sediments containing mixed wastes and immobilizing them in "concrete" blocks is a change from precision machining of plutonium metal into components for nuclear warheads. And it seems to have been generally agreed that the total inventory of technical skills needed to produce those blocks (for example) was a change from the inventory of skills on hand to make weapons.

But what seems to have been less well recognized was the importance of other changes associated with the change of mission, changes that are discussed below and that were and still are barriers to organizing and managing EM to carry out its new mission effectively.

All of these changes, plus those further changes imposed by DOE itself, constitute changes from the arena in which the current EM workforce previously functioned. The people who carry out EM's work have expanded rapidly in numbers and have come from many previous assignments. Overwhelmingly they are people whose previous assignments were related to nuclear weapons: designing them, making materials for them, or manufacturing them. Most of those EM people, whose task is now cleanup, still work alongside colleagues whose task remains some aspect of the making of weapons.

The mission-associated changes that have impacted on those people fall into three categories:

- Culture: changes in attitude, perceptions, beliefs, self-image
- Public involvement: changes from secrecy and immunity to public and legal scrutiny and accountability
- Task uncertainty: changes in clarity and certainty of tasks to be accomplished.

Each category of change is discussed below.

3.2.1 Culture

The term "culture" has been used to convey many different meanings. As used here, culture means the assumptions, beliefs, and self-image--a definition close to that advocated by Schein (1985)--of the people in the EM workforce.

Secretary Watkins has often cited the need for a change in culture in DOE; for example, he has asked for "a new culture of accountability," Watkins (1989a); or he plans that "the new culture will emphasize an open-door philosophy and demand professional excellence" and he wants "a culture wherein constructive criticism from any source, external as well as internal, is encouraged and rewarded," Watkins (1989b).

These calls from the Secretary emphasize changes that he hoped would result from new ways of managing the EM workforce. However, our first emphasis here is on the changes that were inherent in taking on the new mission.

One culture change--a culture shock--comes from the way in which former weapons people now see themselves viewed by the public. Previously, working in the secret weapons complex during the cold war, they were regarded as people with mysterious skills and jobs who were contributing importantly to national security. Now, those same people in the exposed EM organization find themselves criticized by the public, by government officials, and at times by DOE management itself. As past errors and omissions are disclosed, they are accused of having been incompetent, of having concealed truth, or even of having lied, and of leaving a huge legacy of contamination for others to deal with. Those accusations affect not only the personal self-esteem of EM's people; they also result in another legacy, namely a mistrust of DOE's competence *and* truthfulness, and that seriously affects EM's ability to do its job well.

A second culture change is the shift of personal allegiance from making weapons to cleaning up. The fact that weapons production creates wastes, toxic or radioactive or both, is not a new discovery. Many people in the complex have been aware of the problem from the beginning, although they may have

underestimated the severity of the hazards or the difficulty of cleaning up. But until recently, dealing with those wastes had low priority. It was clear during the cold war years that if resources (people, money, time) were limited--and they always were--production had priority over waste barring an immediate safety hazard[1]. Now, people in the EM workforce are expected to give their highest allegiance to the cleanup activity that they were expected to regard as of secondary urgency for decades.

Third, there is change in what many workers regard as a strong rationale for what they do specifically. Presumably, people who had security clearances and who produced weapons for years accepted the basic posture of the nation about the cold war and defense strategy. It was then a short step to having an acceptable personal rationale for helping to make nuclear weapons. For those people who are currently in EM, there is now universal acceptance of the principle that contaminated sites have to be cleaned up. But there are widespread questions about the practice of the cleanup process. The values and methodologies of the technology-science culture in EM cause many to conclude that projects are undertaken and heavy costs incurred that are not reasonably commensurate with the reduction of risk to the public. The public, and the law, may disagree with that assessment but it is a discouraging assessment to some people in the EM workforce.

These changes in culture, that result from the change in mission, affect how people think about themselves and their jobs. They are major changes and

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[1]Public confirmation of this priority was provided by the Department of Justice (DOJ) in a March 1992 court memorandum on the sentencing of Rockwell International Corporation for environmental crimes at Rocky Flats. DOJ "described how the Department of Energy, the owner of the Rocky Flats Plant, established a prevailing culture that put production of plutonium triggers above any other concern, including care for the environment and public safety," *New York Times* (1992).

disconcerting changes. Workers cannot adjust to them quickly or easily even with concerted effort on the part of the organization.

3.2.2 Public Involvement

The change from weapons production to cleanup changed DOE customers from DOD (one national entity capable of clearly defining its requirements of DOE after consultation with the security establishment), to many public officials and private groups across the country who often advocate conflicting objectives for DOE and who have the power to influence DOE, directly or indirectly, through legal and political means. Dealing with all those groups is a new and often difficult experience for former weapons people.

A simple diagram (Figure 3-1) illustrating the primary influences in the weapons complex under AEC, ERDA, and earlier DOE cognizance looks like this:

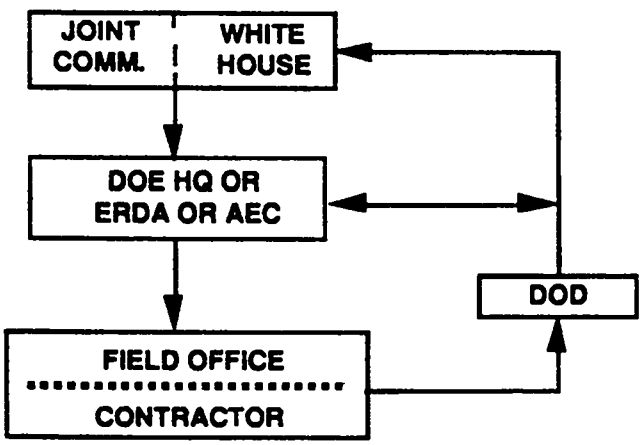


Figure 3.1 WEAPONS PRODUCTION PRE-EM

Starting at the center, the AEC (later, ERDA or DOE HQ) gave instructions to the private contractors at the sites. Although some field officers were influential, offices at the sites were often rudimentary and were not major forces in the

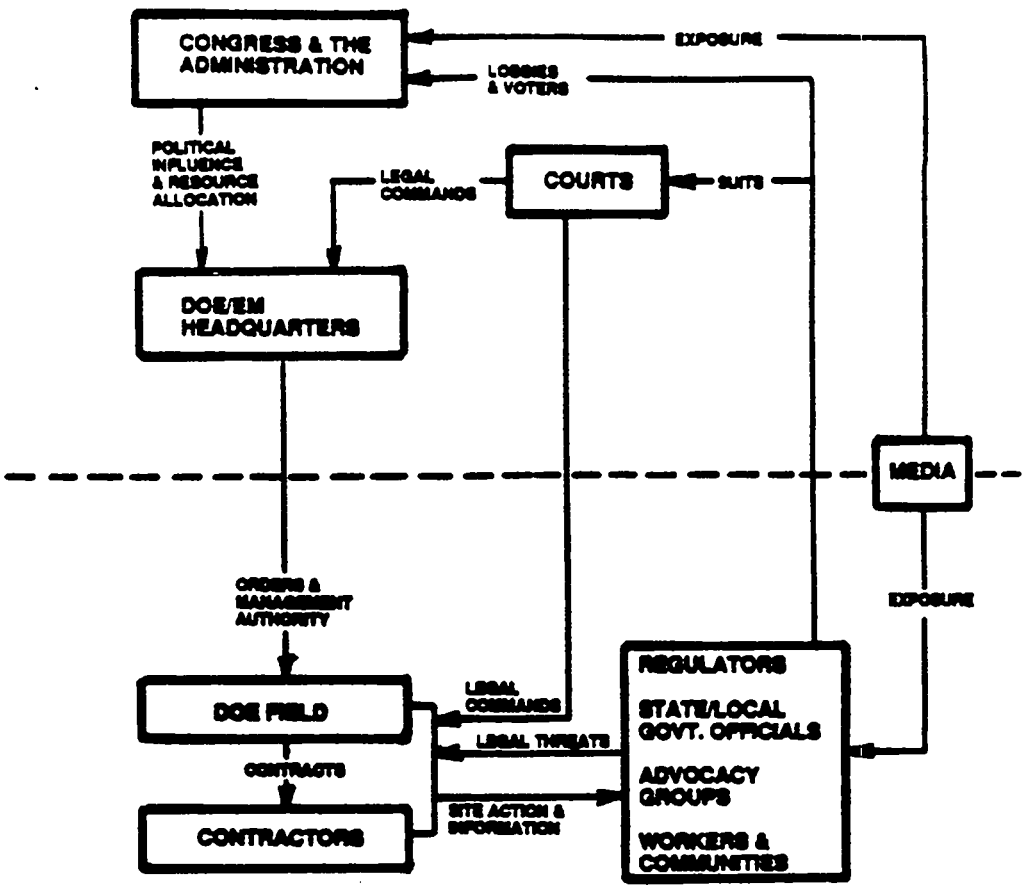
influence chain. The contractors, collectively, delivered their product to the sole customer, DOD. DOD's reactions were influenced by the quality, quantity, and timeliness of that product. DOD's reactions and needs were transmitted to DOE but perhaps more importantly to the White House and the Joint Committee on Atomic Energy in Congress who served as a sort of outside board of directors *cum* bankers in overseeing the AEC. And around the circuit again.

The weapons complex was, unlike the present EM complex, relatively free of party or jurisdictional or intercameral disputes in Congress and the White House, and it was sheltered by military secrecy and statute from public scrutiny and accountability; much legislation/regulation/audit would otherwise have been imposed. For example, here is a quotation from a manager at a large site:

> *Under the Atomic Energy Commission type operation, we had a management system that was fairly consistent. When the administration changed, we really didn't change anything within the Atomic Energy Commission. We were running like a large corporation. ...But the people who really ran the agency from the general manager on down were career employees. In general, very, very smart people who had grown up with the agency and gotten promoted up the ladder and knew the business. Like a good business would run.... The budgets were sent in and the program directors argued the budget and were very effective with Congress. We had one committee to deal with. And that committee was very effective in making certain that the Atomic Energy Commission business was not hampered by politics to a very great extent... [But later] we started the politics of political appointments....*
>
> *DOE FO*

The environment in which EM now must operate is open and accountable to many publics, as many of our interviewees have observed. EM is struggling to adapt. Another simple diagram (Figure 3.2), shown below, illustrates the current flows of influence as we understand them based on our interviews and observations.

Figure 3.2 CURRENT EM COMPLEX



Starting again at the center, DOE/EM HQ has primary influence over the field offices. The field offices are charged with managing the contractors although there is no broad agreement among interviewees on the extent to which they effectively do so. One aspect of the DOE-contractor relationship that is primarily the responsibility of field offices is determination of the award fees that contractors get. Some contractor interviewees were explicit that, as a result, field office priorities get more attention than HQ priorities.

Another increasingly powerful direct influence on the contractors (and the field offices) is the legal influence. Legal influence can take the form of direct orders from the courts, or of threats to seek court action to punish civil or criminal liability. Thus,

> *When you go out and talk to some of the people who are actually doing these waste operations, you find that they do treat DOE orders differently than they would environmental regulations RCRA, CERCLA regulations.... [M]anagers have now concluded that they should not exercise ... discretion when it's a regulation enforced by another agency. That they could be personally liable and be in trouble. And that's why they give priority to those regs over their own internal orders.*
>
> *Federal Agency*

> *What I do on a daily level, quite frankly the things that impact me the most, are the regulations that come from EPA and the State, all right? So my order of priorities to my folks are, you take care of things that result in fines and penalties. Then come DOE orders.*
>
> *Contractor*

What happens at the site--the information, agreements, actions that are the outcomes of field office and contractor behavior--influences the site stakeholders. "Site stakeholders" encompass many groups who interact in complex ways that are not even suggested by the single box at the lower right corner of Figure 3.2. Those groups include federal and state regulators with cognizance at the site; other state, local, and tribal government officials; workers; community residents; business groups; environmental and other advocacy groups who may have national links; cognizant members of Congress; and perhaps others at some sites. The site stakeholders give their priority to what they observe at the site; events in Washington are not of great interest except to the extent that they directly affect events at the sites.

The site stakeholders exert their influence in two ways. One newer way is through civil or criminal action in the courts initiated by government officials or by

private groups. (The threat of such action is taken seriously by some interviewees, as noted previously.) The other way is the more traditional approach to Congress and to members of the executive branch by lobbyists and voters.

The latter influence is applied to the box in the upper left corner of Figure 3.2. Once again, that single box represents complex relationships, this time involving cognizant committees and subcommittees in both houses of Congress; Congressional agencies such as OTA and GAO; other federal agencies such as OMB, EPA, DOD, and DNFSB (Defense Nuclear Facilities Safety Board, the "Conway Board"); and the White House.

That box, in turn, is the primary influence on DOE HQ (along with court orders) through its control of budgets, manpower, political appointments, and other specific requirements that can be imposed on DOE legislatively or administratively.

An almost independent actor in this diagram is the media. The media get their information from many sources in the diagram. They are not obviously or strongly influenced by any of those sources under ordinary circumstances, and they have the power to influence directly the site stakeholders or the Washington establishment or both.

A final observation on Figure 3.2 is that the chart is divided by a dotted line into an upper half of interactions at the national level and a lower half of interactions at the local (site) level. As a generalization, people who interact with each other at the local level--even when the interaction is adversarial in a formal sense (such as local regulators vs. DOE field or contractors)--report that they can work out problems together better than with involvement by HQ.

If Figure 3.2 is a reasonable representation of reality, then the consequences for DOE HQ seem obvious: HQ cannot satisfy *its* overseers directly; the overseers can be satisfied only by DOE's constituents at the sites who, in turn, can be satisfied only by what happens at the sites. As one stakeholder put it:

> *[DOE's credibility in Congress] is correlated with what's going on in the districts and the states of individual Congress people. And if DOE has promised to do something and didn't do it in that state, then it's credibility is very low with that person and therefore that may be reflected in the subcommittee that that person--I think it would be hard to say what Congress as a whole, you know, believes about DOE at this moment. It's really individual committees and subcommittee.*
>
> *Federal Agency*

The change--the new challenge for HQ--is to satisfy multiform groups of public and government customers at each of its sites rather than a single DOD. And these customers must be satisfied within the constraints of national equity, national resource limitations, and broader national policy. As noted in the preceding section, the challenge is much more difficult because of the widespread mistrust of DOE by DOE's putative customers--a mistrust of DOE's competence and a mistrust of DOE's truthfulness.

3.2.3 Task Uncertainty

Satisfying even the diverse group of customers shown in Figure 3.2 would be feasible, if not easy, if it were clear what exactly needs to be done. But it isn't.

The change in task faced by EM is not simply a change in technical task from producing weapons to cleaning up the mess left by that production. It is also a change from a single customer/constituent to multiple public, regulatory, government and other customers/constituents at thousands of sites in 32 states. The fact that many constituents (who frequently disagree with each other) must be simultaneously brought to a state of "detente," in Nelkin's (1980) words, if not of

consensus, means the process of *defining* the task is now an essential part of the job. This is difficult on political and technical grounds.

DOE's people in the weapons business could (and still do) anticipate receiving each year a Nuclear Weapons Stockpile Memorandum (NWSM), approved by the President, transmitting orders for the production, maintenance, and retirement of US nuclear weapons. The NWSM traditionally contains production approval for three years and planning guidance for five more years. The NWSM is the basis for annual Production and Planning Directives prepared by DOE which "assign to the field responsibility" and "provide the guidance, authority, and direction necessary to achieve and maintain the Presidentially approved nuclear weapons stockpile," DOE (1984). Thus, DOE (or the AEC until 1976) weapons people could count on unambiguous and stable tasks laid out for them, and could organize and manage accordingly.

EM's tasks are not remotely as clear or stable. The uncertainty and absence of knowledge start at the very top of the task list. The Office of Technology Assessment (1991) points out:

> DOE's stated goal--to clean up all weapons sites within 30 years--is unfounded because it is not based on meaningful estimates of work to be done, the level of cleanup to be accomplished, or the availability of technologies to achieve certain cleanup levels. Neither DOE nor any other agency has been able to prepare reliable cost estimates for the total cleanup.

The criticisms by OTA have root causes, in part, in the absence of or contradictions among some of the technical standards that must be used to define EM tasks. Some concerns we heard expressed about standards included:

- The need for DOE to adopt a set of radiological standards that are based upon a recognized external authority such as national or international radiation protection committees.

- The need to establish a *de minimis* level of risk so that a "below regulatory concern" (BRC) level of contamination can be defined.

- The need to resolve discrepancies in standards and regulations among the NRC, EPA, states, and other agencies.

- The need to clarify the rules for dealing with mixed wastes--treating, storing, shipping, and disposing of them.

Comments on the absence or contradictions of some technical standards reflect EM's yearning for uniform, unambiguous, and quantitative targets for tasks. That is the viewpoint to be expected from a technology-dominated culture like DOE's. As Brown (1992) describes it:

> Technical rationality trusts scientific methods and explanations, appeals to expertise, depersonalizes risks, and takes seriously only those risks that can be specified and measured.

But many non-DOE stakeholders have a different viewpoint. Brown explains:

> Cultural rationality trusts democratic processes more than scientific ones, appeals to folk authority and community traditions, personalizes risks, and dwells on unanticipated hazards.

The following two examples illustrate the issues posed by these different perceptions of what EM's tasks and priorities should be. The first, from a field office manager, notes the value of prioritizing by cultural rather than technical rationality in a particular case:

> *Of ten operable units, off-site contamination got priority number ten. [Initially] we had agreed with the regulators on that priority and it was done on the basis of risk. [But public comment was overwhelming to increase that priority. So we finally agreed to the regulators' request to respond to the public.] Off-site contamination is now number three on our list... One of our more knowledgeable environmental people here made the comment to me--that we probably made as much gains and credibility by that one agreement... as we'll do on everything else.*
>
> DOE FO

This outcome illustrates the dilemmas faced by DOE. DOE's change of position in order to (successfully) accommodate the public flatly contradicts the policy that GAO thinks should be followed in dealing with environmental problems:

> Federal budget priorities should reflect an understanding of relative risks to the environment and public health, as well as the feasibility and cost-effectiveness of various approaches to reduce these risks, rather than relying so heavily on public perceptions of risk.
>
> GAO 1991a
> (emphasis added)

The second, broader example is the hostility of non-DOE stakeholders to the proposal by Environmental Restoration (ER) to introduce a formal prioritization system for ER projects. The proposed system was obviously a serious and thoughtful attempt to introduce a rational but elaborate system for choosing among tasks when resources were limited. But it got essentially no support from non-DOE stakeholders who opposed it on a variety of grounds. Not the least of those was an unwillingness to have local interests overruled by a system, however rationally advertised, that still left much to the discretion of DOE or that did not make legal commitments paramount.

On the issue of standards and priorities (and thus, on the basic issue of what EM's specific task really is), not much help can be expected from Congress in the foreseeable future:

There is a little more willingness to entertain concepts of priorities, although on a legislative basis, I mean, we still fight that issue tooth and nail in Congress, just anathema to discuss the concept of priorities in any, in any legislative sense, in doing this. The view is that, you know, this is an absolute. We will clean up, and when you talk about standards they don't want to talk about standards. Just anything you can find that, you know, with now or future science you should clean up.

Congressional Staff

The uncertainty of the task for an organization whose mission is "cleaning up" is exemplified by the ubiquitous question "How clean is clean?" The fundamental answer to that question is "as clean as it needs to be." But how clean it *needs* to be is primarily a political-social decision, not a technical-rational decision. That is, the nation must decide on the way in which a cleaned-up site will be used (or isolated). That will determine the exposure of humans (or other fauna, or flora) to hazards originating at the site, and that in turn will determine the permissible level of residual hazard at the site, i.e. how clean is clean. The challenge, then, is to develop a broadly acceptable political-social decision-making process.

Following this type of reasoning, Ahearne (1991) believes that "the key to a workable environmental cleanup policy is land use planning." But it is not within DOE's power to turn that key alone. Congress must do it, and until it does DOE will continue to face uncertainties in the technical targets for achieving cleanup levels satisfactory to DOE's constituents. Suggestions by the National Research Council (1989) and OTA (1991) about more scientifically-supported risk-based approaches to clean up targets and priorities are helpful, but they remain subsidiary to the fundamental policy decisions about land use.

Standards aside, and how-clean-is-clean questions aside, there is simply a lack of knowledge about sites yet to be discovered that will need cleaning up, and

about the extent and nature of contamination of each. Even when problems have been broadly identified, there is sometimes uncertainty about the technology that can be used to clearly define the problem and to solve it. Although new technologies are under development for use at many sites, they (like all R&D) have inherent uncertainties about timing, cost, and efficacy.

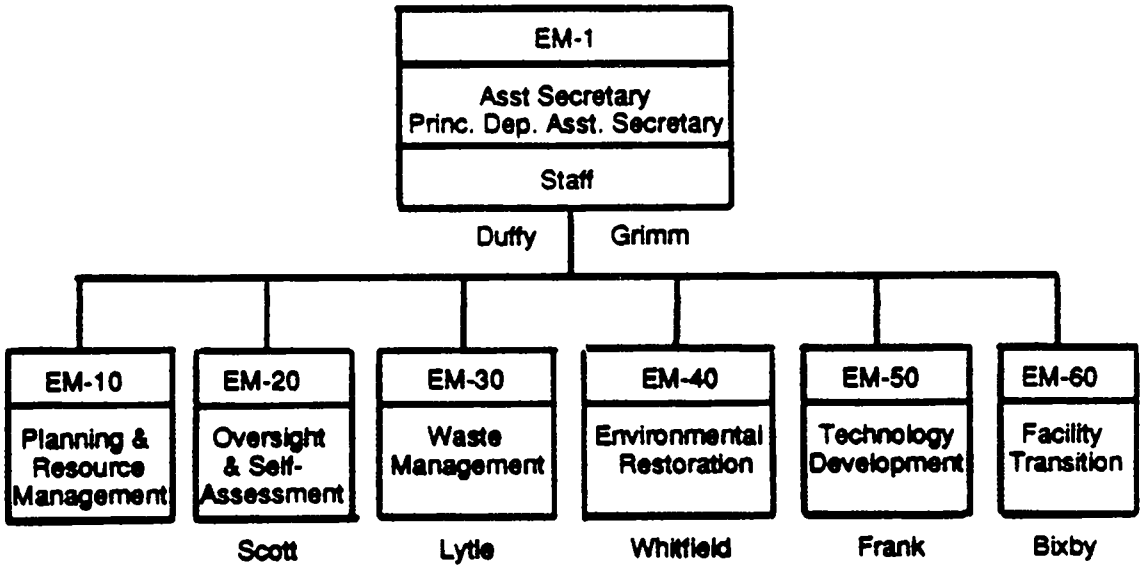
Stakeholders broadly agree that, in the last analysis, the tasks undertaken by EM will depend on the resources allocated to EM. Restoring all contaminated sites to pristine condition could absorb the total GNP of the United States for years, even if that restoration were possible technically. Stakeholders also agree that this is an issue that has not been confronted openly by Congress, DOE, and other stakeholders even though it is not news to any informed person. What fraction of society's resources should be dedicated to cleaning up rather than to other social benefits?

To sum up, stakeholders seem slow to understand or to accept the fact that EM's tasks are, as the previous discussion illustrates, subject to widespread *inherent* uncertainty and lack of knowledge. The consequences are the establishment or continuation of organization and management practices that may be traditional (and effective) for carrying out well-defined projects and other activities. But some of those practices are less well suited for dealing with uncertainty and change. Different ways of planning, budgeting, managing, implementing, iterating, and auditing could be more effective--not only in conducting DOE's own operations but in dealing with other stakeholders.

3.3 Changes Imposed by DOE

Cleanup of the weapons complex is the responsibility in DOE of Environmental Restoration and Waste Management (EM), an organization

established by Secretary James Watkins in November 1989. Its head has been Leo Duffy, initially as director of the EM office and subsequently as assistant secretary since November 1991. EM's formal organization chart in January 1993 was as follows; the names shown are the cognizant deputy assistant secretaries:



Messrs. Watkins and Duffy have acted vigorously to introduce organization and management changes into DOE that they believed would accomplish DOE's missions, including cleanup, more effectively. Those actions are manifested in organizational changes, expansion, orders, directives, and personnel actions which continue in a steady stream. In addition to these complex-wide changes, there are site-specific changes in management. The recent past has seen the 1989 changes in M&O contractors from duPont to Westinghouse at Savannah River and from Rockwell to EG&G at Rocky Flats. The near future will see a new contractor at Sandia (replacing AT&T) and perhaps new ERMC contractors at other sites.

The complex-wide changes introduced by Watkins and Duffy can be considered in three categories:

- Headquarters control: the assumption of more decision-making and detailed review by HQ, authority that previously resided at the sites.
- Formalization: the exercise of that control through development and promulgation of new plans, rules, procedures, reviews , and other bureaucratic documents.
- Growth: the increase of DOE and contractor staff at HQ and the sites to develop and operate the new management systems.

Each category of change is discussed below.

3.3.1 Headquarters Control

The most frequently raised issue among all large groups of stakeholders we interviewed was centralization. That was no surprise since headquarters control is the most conspicuous change in organization and management introduced by the Secretary. Compared to the administrations of previous DOE secretaries, this administration has acted overtly and strongly to give HQ more authority and oversight over the field offices and contractors. This change of strategy has manifested itself in many specific changes of organization and management. And those changes have imposed large changes on the way the field offices and contractors work, on the way they think of their own roles, and on the way they think they are perceived by others.

Although ultimate authority within DOE has always resided at HQ--for example, through the annual Planning and Production Directives issued by HQ to

direct weapons production--the large changes have been in increasing the level of detail and review now demanded by HQ, and in decreasing the decision-making authority formerly delegated to the sites.

The change to headquarters control is ascribed by stakeholders to various major motives, none of which is calculated to improve the morale of the field offices. One motive is that HQ could thus demonstrate to its constituency (Congress and the Administration) that it was taking control of a system that was out of control or, at best, ineffective. Another motive is that HQ has not had confidence in the field's ability to perform effectively and therefore is trying to control that performance itself. And a third motive is that some individuals at HQ are simply empire-building in a good old-fashioned bureaucratic tradition.

There can be other motives for HQ control; it may be driven by the potential legal liability of individuals at HQ, or by Congress pointing the finger of accountability to the Secretary. But regardless of its causative motives, the change to headquarters control generates widespread uncertainty and instability for another reason: people see no clear statement about where the organization is headed and where the change of control will stop. People do not know whether the trend will continue (clue: HQ staff and HQ demands on the sites keep building) or will reverse (clue: much NEPA authority was returned to the field from EM HQ). Is there an organizational objective? Is that organizational objective to build strong permanent centralized authority and detailed expertise at HQ, is it to return authority to the sites once site competence has been increased and site credibility has been established, or is it something else?

Compounding that uncertainty is the universal belief that the changes now under way depend importantly on the imprint of two strong individuals, Messrs.

Watkins and Duffy. EM people widely expect both those men to leave DOE by early '93, whatever the results of the '92 election. The identities or policies of their replacements are not predictable. Past and projected turnover in DOE management and policy encourages resistance to change by the B-team:

> *I have to fight the B-team. And in this complex the B-team are those who say: "I be here before you got here and I be here after you're gone." ...[A] lot of the people out there feel like they are going to be here, in their own van pool seven years from now, and [I probably won't be].*
>
> *Contractor*

We have heard the wistful desire of some managers to institutionalize some of the changes made rather than have them depend so importantly on people in place now.

At the sites, the change to headquarters control upsets managers in both field office and contractor organizations. They often feel frustrated or angry because they are being paid (well-paid, they say themselves) to manage but they no longer have the authority to manage.

> *We cannot go to the bathroom without calling headquarters and asking if it's okay. We have no authority to do things here without full involvement and concurrence of people at headquarters.... that's dumb. I mean, why am I here? I'm an executive, okay? You taxpayers pay me over a hundred grand a year to do this. And you don't allow me to make decisions? Come on. I mean it's ridiculous. It's a waste.*
>
> *DOE FO*

Frustration also manifests itself in more difficulty in retaining personnel.

> *When we were [at one site] we had a young guy taking us around who worked over the environmental restoration office there. He had just come from EPA...he had just gotten out of college and went to work for EPA, I think. And he was making all kinds of decisions right [at the regional office] for EPA. You know, signing off on things, denying permits, everything. He got to DOE, he'd been there for a year, and he hadn't made one decision about anything. Nothing he had done had ever come back from headquarters. He finally left.*
>
> *Federal Agency*

The change also disturbs some of the state regulators who see HQ intervention as something that interferes with effective and prompt interaction with field office and contractor people at the sites. DOE people at HQ have mixed feelings about the change to HQ control; the balance of sympathy among the most knowledgeable people is tilted toward believing the change has gone too far.

3.3.2 Formalization

The primary mechanism used by DOE for bringing about the change to headquarters control is the pervasive change to formalization as a way of managing the sites. By "formalization" we mean the development and promulgation of new detailed written rules, regulations, orders, procedures, report requirements, plans, budgets, and other documents to cover all activities of the site over which headquarters wishes to exercise control--by making or reviewing site decisions, or by dictating the exact ways in which the sites should operate. An additional aspect of formalization is the change to a much increased level of oversight (in addition to the increased oversight by line management) by groups other than line management carrying out formal audits, reviews, assessments, and other evaluations; such groups include both DOE groups and DOE-requested outside groups. (Those groups are add-ons to the assessors imposed on DOE by others. Examples include GAO and DNFSB.)

About half the people we interviewed volunteered comments about formalization as manifested by orders and other instructions originating in DOE HQ. The comments were rarely complimentary; the most frequent complaints about this change to increased formalization had to do with:

- the sheer volume of orders (broadly defined to include other instruments of formalization)—the number, bulk, and rate of new or amended orders, and the consequent burden of complying;

- their origin in different groups at HQ, perhaps without serious consultation between groups, thus causing redundancy of or conflict between multiple orders;

- the utility and clarity of orders, their usefulness in running the business in the sense of balancing detail and policy, or command and discretion, intelligently;

- the relevance of individual orders to the circumstances of the site, i.e. with the local cost-benefit of the value added.

Dissatisfaction cuts across stakeholder categories and has also been expressed by outside observers. Here are some sample quotations:

> *The orders system is broken. We get many new ones, hardly ever see one canceled. HQ should provide guidance on site-specific applicability issues, but isn't organized enough to do that.*
>
> *DOE FO*

> *We'll have to change some of the orders because certainly today one of the deficiencies in the order system is there is no way to get any kind of relief. It does not exist in DOE whether it's Duffy or anybody else, that allows us to say, "Hey, this doesn't make sense."*
>
> *Contractor*

> *One of the things that has happened in the last few years has been a tremendous proliferation of DOE orders and directives. And some appear to be redundant with existing regulations, many have requirements that are not applicable to [this site].*
>
> *State Official*

> As discussed above, the vehicle by which DOE headquarters provides formally binding instructions on health, safety, and environmental performance to field offices and contractors is the series of DOE orders. We perceive problems in both the orders and the means by which they are developed. DOE facilities, both within the weapons complex and elsewhere, differ significantly from each other. This diversity creates difficulties in the application of the orders. An order that provides concrete directions at one type of facility will not necessarily be appropriate at another.
>
> National Research Council (1989)

Many people at the sites stated that orders and other formal documents were developed and promulgated without a serious effort to get comment from them, the people responsible for implementation, before promulgation. Thus the change to formalization is seen by the sites not only as a change in burden and management systems but as a change in empowerment.

Two characteristics that tend to be inherent in a formalized system have also impacted on the sites. One is delay. Requiring the submission of documents to HQ for review, perhaps at multiple levels, simply requires more elapsed time before a decision can be made even if no new issues are raised and no iteration to the sites is needed. Delay can have its merits (see Section 4.6, for example), but it is ordinarily regarded as having demerits. Delay can cause extra costs, inefficiencies, and losses of credibility by the site in its local relationships.

The other characteristic is uniformity. Formal procedures, especially procedures laid out in great detail, tend to give less room for flexibility. The sites strongly believe they need the flexibility to deal with local circumstances of size, diversity, technical problems, and political and regulatory affairs. They often feel restricted or unreasonably burdened by one-size-fits-all procedures. State officials tend to echo that feeling.

Another aspect of formalization provides more evidence that HQ is skeptical about the ability of the sites to manage their own affairs. That aspect is the greatly increased level of audits, reviews, assessments, task forces, boards, and other evaluations imposed on the sites. The sites accept the principle that assessment of site activities by knowledgeable non-site assessors is both necessary and desirable--necessary for credibility (or legal obligation), and desirable for expert advice and constructive criticism. However, they also believe that the change in level of assessment is so great that assessments are now a serious drain on resources and a depressor of morale.

Assessment groups descending upon the sites include groups with relatively broad charters from DOE or outside such as Tiger Teams, DNFSB (Conway board), ACNFS (Ahearne committee), GAO, National Research Counsel, OTA, and OMB. They also include other groups of DOE and/or non-DOE experts, such as the Hanford Waste Tanks Red Team, chartered to look into particular procedures or problems.

The basic criticism of assessment groups is about their number, frequency, and overlapping missions--at a total cost not perceived to be justified by the total benefit. There are additional criticisms of the competence or objectivity of particular groups or members of groups. Some sense of the emotions inspired by assessment groups is conveyed by these quotations:

Audits are killing us. — *DOE FO*

Now we have the proliferation of audits to make sure you're meeting all the orders. And the audits come from everywhere.

State Official

If you get to the department level and down, they feel that, just besieged by oversight.

Contractor

The view from Washington, in HQ and elsewhere, is supportive of oversight groups in general. (There is little expressed awareness of how the sites react.) The basic rationale is that the track record of the sites does not justify their proceeding on their own. Non-site scrutiny is needed.

3.3.3 Staff Growth

Growth of EM staff is a rapid change that has been essential to implement the strategy of increased headquarters control and to develop and operate the new formalized management systems. Growth has occurred in two ways. There have been rapid increases in EM's own personnel at both headquarters and field offices. And there have been increases in personnel supplied by contractors to provide support and other services to EM. The limits placed by OMB on total DOE personnel oblige DOE to "rent" others to get its job done.[2]

The problems posed by change due to growth include problems in absorbing large numbers of new people, problems in acquiring (or developing) the skills and experience required, and problems of management that results from a larger organization. This latter problem was vividly expressed as follows:

> *I don't know whether the management [of EM] recognize how destructive that force of growth is. The old way of doing things, the collegial way of doing thing, all 55 people could know what was going on and why. All 350 people can't know currently what's going on and why. Therefore we run the risk of separation between the management and the staff, the feeling that they're mushrooms, stuck in the dark and fed you-know-what. Which therefore requires a risk by management if they want to keep them involved, that is the risk of real delegation. Not only responsibility, but authority downward.*
>
> *DOE HQ*

[2]GAO (1991y) claims that it is "substantially" more costly to have contractors rather than DOE employees provide some support services. GAO implicitly criticizes OMB for not considering the comparative cost consequences of its personnel policies.

Another observer at DOE HQ stated that the greatest need at present was more managers, and stronger managers, to direct the larger organization and to satisfy all the demands placed on EM by the top management of the department.

That inside view was echoed by an outsider:

> *Nobody realizes the phenomenal rate of growth... I don't think Leo has an adequate management team and staff to deal with the rate of growth.*
>
> *Congressional Staff*

Changes due to staff growth are likely to continue because DOE field interviewees who commented stated unanimously that they had too few people. They could not: protect government interests in overseeing the contractors, establish expertise in all the areas requiring expertise, live up to the agreements made with regulators, or satisfy the demands on them made by various groups at headquarters.

One consequence of DOE understaffing, the consequence that contractors are doing many of the jobs DOE should be doing, has caused frictions in the execution of audits, reviews, and other assessments. We heard frequent objections to having contractors come in to review other contractors. And we heard allegations of contractor reviewers displaying incompetence, inexperience, conflict-of-interest, and bias.

The pressure to grow--to recruit and train *and retain* staff--is exacerbated by concern about the competence and expertise of the current staff. This is a widespread concern expressed in all major stakeholder groups (although there are scattered compliments). Energy expended on growth and new people is not available to upgrade existing people. The concerns about competence and expertise make it more difficult to build credibility and trust with stakeholders both inside and outside the DOE family.

The adequacy of staff in both size and quality is not a newly-discovered issue. It has been noted in the outside studies by DNFSB (1992), ACNFS (1991), National Research Council (1989), and OTA (1991). Nor is it unknown to the department. Secretary Watkins (1991) noted that, "Many of the Department's programs are being severely impacted by staffing inadequacies. This is particularly true in critical areas such as environment, safety, project management..."

The issue we want to emphasize here is that rapid growth is a change in itself, and adjusting to that change puts one more stress on the organization and its people.

3.4 Change and the Issues of Organization and Management

Our characterization of EM's arena as an arena of change is important because the issues of organization and management (O&M) we observe result wholly or partly from change or efforts to cope with change. In the discussion below we note the O&M issues covered in Section 4, following, and how they relate to the elements of change described previously.

Organizational Design and Fit (Section 4.1) is a wide-ranging discussion that examines the perceptions of misfit expressed by stakeholders. How effective is the match between individual and organizational goals, between task demands and organizational skills, between task uncertainties and organizational structure, and so forth?

Some of the more serious expressions of misfit are the consequences of change. Examples include frustration about personal goals and tasks (culture change); shortage of expertise (staff growth change and mission change);

centralization needs in conflict with site-specific needs (headquarters control change); and inappropriate project management systems (task uncertainty change).

Credibility and Trust (Section 4.2) looks at credibility problems both within the DOE family and between the family and outside stakeholders.

Within the family, the shift to headquarters control and the growth of staff are the two key aspects of change that contribute most to existing frictions at HQ and between HQ and the sites.

Headquarters control also contributes to friction at the sites with outside stakeholders (through delays, reviews, vetoes) but two other changes probably are more important. The change to public oversight and accountability, exposing past neglect or errors or untruthfulness, leaves a bitter legacy. The change to task uncertainty makes it difficult to specify and fulfill clear commitments to the regulators and the public about cleanup.

Impediments (Section 4.3) examines three of the main factors that have slowed progress in cleaning up. Those three are a lack of appropriate priorities for the work to be done, a lack of standards for the work, and a lack of adequate technologies to conduct some of the work.

All three factors arise directly from the changes inherent in accepting the new cleanup mission. The lack of priorities and standards reflect the change to what is now a set of tasks that are neither clear nor certain. The lack of technology reflects the fact that EM is now asked to do a technical job that has never been needed or done before; there has been no reason to have technology available previously.

Project Management (Section 4.4) considers the systems that DOE uses to develop, cost, execute, and monitor large projects. The systems are traditional and were developed for projects that yielded well-defined products--a particular piece of construction or hardware, for example. However, the traditional project management system does not always cope well with EM projects which tend to be processes that are not easy to define completely in advance.

Once again, the difficulty here arises out of the fact that the cleanup mission charges EM with tasks that have high levels of uncertainty and lack of information. A project management system that recognized that inherent change should better fit EM's needs.

DOE-Contractor Relationships (Section 4.5) summarizes several of the aspects of the relationships including liability, ERMAC and support service arrangements, oversight style, and the general linkages.

Liability issues grow directly out of the change to public and legal scrutiny and accountability. Support service contractors exist because of the change to growth and the need to provide more services than can DOE provide with its own people. And issues of oversight and general linkages arise out of the changes to headquarters control and formalization; those changes manifest themselves in more oversight and review of the contractors and the development of a more adversarial relationship (which also exacerbates liability issues).

Delays (Section 4.6) focuses on the fact that the change to headquarters control carries with it the need for HQ reviews and approvals. Those HQ actions cause delays in making decisions and in getting work done at the sites.

From the sites' perspective, delays are harmful in causing work inefficiencies and credibility losses with outsiders at the sites, aside from giving more evidence of the loss of autonomy at the sites. There is little recognition in the field that delays can have a positive value in allowing time for decisions to be considered in a national context and in getting a broader range of stakeholders on board.

Compliance Agreements (Section 4.7) covers legally binding agreements between DOE and the regulators at individual sites. The very existence of these agreements is a result of the change in mission with its change to public and legal scrutiny and accountability.

The concerns expressed by stakeholders about compliance agreement suggest four needs for EM: the need to press key stakeholders for a workable national process to set cleanup priorities and standards, the need to negotiate achievable and nationally equitable agreements with both site and HQ participation, the need to manage the resources required for compliance with broader acceptance of the uncertainty inherent in cleanup, and the need to develop a constructive relationship with overseers—a corollary of the need for greater trust and credibility.

3.5 The Management of Change

Stakeholders are hardly unaware that EM has been subjected to major changes and that more changes are likely. They are realistic about the difficulty of bringing about change, but they are hardly admiring of the way "management" has understood the difficulty of and managed the change.

Stakeholders recognize that there is a common human resistance to change, as illustrated by the following quotations:

> *Folks that came here in the Manhattan Project in 1943 when they were 21 years old, and they are now in their mid-60s or older, and they did everything that they were asked and believed that everything they did was for the benefit of the country... And to ask them to make some changes now, that is real hard for those folks and many of them have refused to.*
>
> *Local Business*

> *... with changes comes turmoil--transition or change is not easily accommodated by the human being. I mean there are enough studies on that...*
>
> *DOE FO*

> *... you start dealing in this culture and there's a lot of sensitivity. "That's my world and don't come in and challenge it. Its not going to go away, because it's important, because I'm doing it." You get a lot of those little turfdoms all over the place.*
>
> *Contractor*

They also recognize the difficulty of changing an organization when the organization adopts a new mission or methods:

> *Basically there tends to be a conflict between the needed time for responsiveness and the organizational capability. In other words, things need to be done on a step change basis, and the organization's capability is usually a ramp change basis. So you have an expectation gap.*
>
> *Contractor*

> *They suddenly expect instant success and that's not the real world.*
>
> *DOE FO*

> *Contractors for years have been running DOE, and DOE's been watching from the sidelines. Now we're trying to repair that and run the show and call the shots. It's hard to change, but needs to be changed. But we've got to have enough people to oversee; they've got to be trained, have expertise.*
>
> *DOE HQ*

> *It takes ten years, maybe fifteen to get an organization turned around.*
>
> *Contractor*

[When the new contractor came on, the site] had one culture, one project. Now that totally changed in midstream. So they've had to undergo a change of ways, a difference of attitude. So a lot of people, a lot of organizations representing a lot of people, have had to be confronted with a drastic change. Not easy to coordinate all those ideas.

Labor

Criticism of how change has been managed came most frequently but not exclusively from contractors. For example, there is this matched set:

The shock treatment was necessary to bring real cultural change. The Admiral really did have to shake things. But there's a time to stop shaking and replant the trees.

Contractor

We needed an Admiral Watkins to come in and shake this place up silly. And he's done that. But we now need to move on in a more measured, more managed, more focused approach. It's time for the beatings and tortures to end, and it's time to move forward as an organization, recognizing that.

DOE HQ

Watkins has gone through a process totally demoralizing to the staff that he had. The staff with a lot of competent people was just gutted. He's taken authority away, been arbitrary with them, left them not knowing what they were doing and where they were going .

Congressional Staff

More typical are the two following comments by contractors at the site and at corporate headquarters, respectively:

Anybody who took any basic courses in how to manage changing organizations, we have violated just about every basic principle of it. Poor communication, poor direction as far as why we're making the change and what the value we're going to get for making the change, not allowed to buy in or even up front communication.

The organizational structure and how they want to manage this program is still evolving and changing. So there's not a well-defined framework in which we can do business. And that creates a lot of opportunity for change. Creates opportunities for unclear direction in some cases. And maybe even specifically unclear as to who's really in charge.

Another issue of change at the sites--short-term change or volatility--has been brought up by both contractor and DOE field people:

> *Even during budgeting, day-to-day technical operations change.*
> *Contractor*

> *There has not been good effort by DOE to establish clear priorities. Everything is a priority. Priorities are not clearly established and not formally documented. And they change weekly.*
> *DOE FO*

> *DOE expectations are unclear or constantly changing, given multiple layers of DOE on site reporting to multiple layers at HQ.*
> *Contractor*

These stakeholder views show that change is a continuing way of life in EM even if the changes now are less dramatic than the changes that accompanied the new mission and the new organization and management systems established for that mission.

The difficulty of accomplishing change seems to have been seriously underestimated by DOE management and by observers inside and outside EM. One result has been public overoptimism by DOE, in the early EM years at least, about what could be accomplished and when. Failure to perform has further impaired DOE's credibility. Changes less profound than EM has experienced take "at least 5 to 10 years to complete" according to GAO's recent survey of nine long-established companies in the more change-tolerant private sector: GAO (1992b). EM was a new-born only about three years ago.

Our interpretation of DOE's behavior echoes that of a DOE consultant reporting on a survey of federal employees at the Richland field office:

> It is our opinion that the Department of Energy, while legitimately needing to set a new agenda to reflect current realities, has consistently underestimated the impact of that agenda on the people of the department. While all change is resisted and is uncomfortable, managing the transition in terms of mitigating the negative impacts of the change on people ultimately serves the organization's purposes in terms of commitment and ease of implementation.
>
> Griffiths (1992)

Expecting EM to function efficiently and effectively, even if it were impeccably organized and managed--and no interviewee or published evaluation has made that charge--seems quite unrealistic in the short life of EM to date. Expressions of disappointment about EM's performance often arise out of EM's failure to meet expectations and commitments that were unrealistic from the beginning.

In seeking to organize and manage itself more effectively, EM (as other agencies have done) looks to the academics and to the private sector as sources of help in understanding and managing change. Here too it is wise for EM to have realistic expectations.

The help that EM management can get in dealing with change is limited by two considerations. First:

> ... organizational theorists have produced much more work, and work of greater depth and intellectual sophistication, on the recalcitrance of organizations and their people--how and why they resist change--than on the change process.
>
> Kanter (1983)

And second, most of that work has dealt with business organizations rather than with the public sector. As Alan Campbell points out, in quoting Wallace Sayre approvingly:

> There are many, many similarities between public administration and business management, and all of them are trivial.
>
> Campbell (1992)

Despite those two caveats, there are approaches for EM to use in introducing changes more effectively. The most obvious approach is to devote more effort to the human and organizational consequences of change. That effort would try to anticipate the threats, risks, and rewards of change as perceived by the individuals affected. It would establish a teaching/learning program designed to help alter organizational habits (no easy task) consistent with the change sought. It would make clear the connection between the changes and the goals of the organization, both long-and short-term. And it would involve other stakeholders to the extent that their expectations of EM might be affected by change.

Another approach is research. For example, how might existing change management models be modified (or new models developed) to fit EM circumstances? Or, what is the EM organization's capacity for learning (and thus adapting to change) and what might be done to increase that capacity?

4.1 Organizational Design and Fit

John S. Carroll

Abstract

The DOE family of headquarters, field offices, and contractors is an interdependent set of systems and subsystems that must carry out a complex set of tasks. Organization analysts direct attention to the congruence or fit among tasks, people, formal organization, and informal organization. This paper examines the perceptions of misfit that emerge from the interviews, including the match between individual and organizational goals, task demands and organization member skills, task uncertainties and organization structure, and so forth.

Several of the more serious expressions of misfits are: widespread uncertainty and disagreement about how DOE functions and where it is going; considerable frustration about personal goals and task accomplishment; shortage of expertise in many places; a culture of blame and blame avoidance that inhibits communication and risk-taking; political battles among headquarters groups and between line and staff; project management systems not adapted to uncertain tasks; centralization in conflict with exception-handling and differences among sites; and bypassing of formal channels.

These perceptions of misfit must be understood in the context of the larger structure of the components of DOE and the interrelationships among these components. Vast changes at DOE in response to a changing environment of stakeholders and institutions have made these interrelationships more difficult to manage. Headquarters' efforts to solve problems in the field may have contributed to other problems or exacerbated the original problems.

Any organization, machine, person, or society has parts that work together--systems and subsystems organized to carry out activities. How well DOE performs its production and clean-up tasks and satisfies its stakeholders over time depends on the effectiveness of the systems and subsystems and also

on the coordination or fit among the parts-to-whole and the interdependent systems. In this paper, we describe some features of the DOE system and the way they fit together, from the viewpoint of stakeholders within and outside the system. The primary focus will be on EM activities, although it will frequently be necessary to talk about DOE as a whole. Further, since the real "work" of EM is carried out by contractors, we consider the organization to include DOE HQ, field and site offices, and contractors.

4.1.1 Conceptual Framework for Analysis

4.1.1.1 A Caveat

The concept of fit is naturally prescriptive and normative: it is better for parts to fit together well than poorly. However, fitness concepts should be used cautiously as investigative tools rather than requirements for good organization. This is true for several reasons: (1) perceptions of misfit may not be realistic; (2) complaints about the organization may be symptoms of a different type of misfit (unhappy workers) or indications of temporary dislocations due to ongoing change; (3) some misfit is inevitable in any organization, and efforts to "fix" one problem may cause other problems that the "misfit" was handling, e.g., delays can have positive effects (see Section 4.6, Delays); (4) a certain amount of short-run misfit may be functional in the long-run by maintaining incentives for improvement and indicating ongoing learning and experimentation, which produces failures as well as successes. Nevertheless, the analysis of fit or alignment usefully directs attention at issues that are causing anxiety, are perceived as troublesome, or demand extra work and improvisation from organization members.

4.1.1.2 Macro and Micro Fit

Questions of fit can usefully be divided into two domains: the macro fit between the organization, its environment, and the strategy it develops to succeed, and the micro fit among the components of the organization that are assembled to carry out the strategy (and which influence the development of strategy). DOE, which historically had very good macro fit to the clear demands of defense production, became seriously misaligned to the new environment of multiple stakeholders whose demands had to be met (see Section 3, EM's Arena).

The new goals, strategy, and tasks could not be accomplished with an unchanged organization. Indeed, severe organizational (micro) fit issues emerged because the nature of the new organization was not (and is not) well understood and the transition is extremely difficult.

Because macro fit issues directly involve the relationships to external stakeholders (for example, the alignment between DOE goals and Congressional demands) that have been summarized elsewhere (see Section 3 , EM's Arena), this paper is limited to the micro fit issues.

4.1.1.3 Micro Fit Issues

The components of micro fit are generally considered to be the Tasks that organization members must carry out, the People in the organization, the Formal Organization of goals, rewards, and structured roles, and the Informal Organization of personal relationships, informal communication, social activities, and culture: Chatman (1989); Nadler & Tushman (1991). Organizational analysis generally proceeds by examining the alignment between each pair of these four

components (little is added by multi-way alignment and organizations generally know how to address single-component issues):

People -- Formal Organization (congruence of individual and organizational goals, clarity of perception of organization structures)

People -- Tasks (congruence of task demands with individual skills and needs)

People -- Informal Organization (congruence of individual needs with informal goals, norms, and rewards)

Tasks -- Formal Organization (congruence of goals, rewards, and roles with task demands)

Tasks -- Informal Organization (how the informal organization helps or hinders task performance)

Formal -- Informal Organization (whether goals, rewards, and structures of the informal organization are consistent with formal goals, rewards, and structures)

4.1.2 Observations About DOE Alignments

4.1.2.1 People - Formal Organization Fit

Partly due to rapid change, and partly due to the increased complexity of the DOE mission, organization members are uncertain about how to do their job. There are many different opinions about the organization, different understanding of its structure and varied expectations about its future. Further, individuals find that their personal and career goals may conflict with the

organizational goals; it is hard for DOE to satisfy the needs of different individuals while achieving its mission.

- There is considerable disagreement and uncertainty about the organization and how it works. Aspects of the organization do not make sense to observers and members experience conflicting demands.

> *[DOE] doesn't exist as an agency. There are a bunch of agencies that have been glommed together.*
>
> *National Activist*

> *Training either starts, stops, or is changed or redirected in midstream... then people become real anxious when they simply don't have a strong sense of what is happening to them..*
>
> *Labor*

> *SEN 6 and some of the letters tell me that the line is now having responsibility for environmental safety and health and I am a support organization to those folks, yet we've got a Tiger Team who is now quoting 5482.1b which says that the manager is responsible.*
>
> *DOE FO*

The GAO report on DOE includes statements by Joseph Hezir of OMB that "when you look within the Department, you often find that the various management roles and responsibilities are unclear, to put it mildly", GAO (1991c). The Ahearne Committee adds, "Confusion and frustration at the local level have resulted from the current approach", ACNFS (1991).

- There are different views of centralization. Some see it as a temporary phase, others as a permanent overcorrection. Most suggest that centralization went too far.

> *That's why the Admiral put out the SEN-15...Field offices were not doing the job they should've been doing, but they have overreacted.*
>
> *Contractor*

Decentralization would take place once the confidence level is high enough at headquarters to give some of it back to the field offices.
State Official

- There is uncertainty about whether the organization will continue in its present form after Watkins and Duffy.

[Watkins and Duffy need to consider who they are] putting in positions of responsibility and authority after they be gone.
Contractor

The next secretary ...will probably decide we need to decentralize.
DOE FO

- There is some incongruence between individual and organizational goals. It is difficult to change the mission and rely on the same people to carry it out.

There are a lot of people now... who are former defense program people. Retreads we call them.
National Activist

They see their principal mission still to be nuclear weapons and nuclear weapons production.
Local Activist

[Change is] extremely threatening to the middle management people.
Labor

The National Research Council (1989) also states that contractor staff are "accustomed to the old attitude that production automatically takes precedence over health, safety, and environmental goals".

- Many people want more autonomy, participation, and trust; the organization appears to be increasingly centralized and mistrustful. This has frustrated and demoralized some organization members. This is related to aspects of Credibility and Trust in Section 4.2.

[Watkins] has gone through a process totally demoralizing to the staff... it was just gutted, a lot of very competent people... but he's taken authority away from them.

Congressional Staff

They don't understand why every week there's someone looking over their shoulder with the clipboard... they got a group of people who think that they [the oversight groups] are only coming because they [the workers] have been unsuccessful.

Contractor

You've got ten people looking at something and signing it.. you have taken away the ownership and responsibility of the people preparing the work.

Contractor

The Ahearne Committee (1991) writes:

> ... to make the best of the experience gained in restructuring the Department's safety posture, to acknowledge failures when they occur, and to derive the benefits of the accumulated experience of the work force... management [must be] receptive to information from below, both good and bad... The pattern is set at the highest levels.

- The interests of beltway contractors are best served by identifying many problems, especially those for which they can recommend solutions, thereby providing themselves with work.

We had gotten dinged at the last environmental audit... by a consultant... And the EPA [regional] inspector... had never raised an issue... [There are many examples of] individual interpretations of regulations... one guy with a prejudice, with an axe to grind.

Contractor

- Employees are afraid that new contracting arrangements will put them out of work.

They think by dispersing the current work force that will relieve them of long-term liabilities, because they then can hire mom and pop outfits under the minority awards procedure.

Labor

4.1.2.2 People - Tasks Fit

EM poses new and complex tasks for DOE. Construction projects and defense programs, although also large and expensive, are more routine and have relatively-straightforward steps in their execution (see Section 4.4, Project Management). EM activities involve considerable uncertainties on both technical and political (stakeholder) grounds regarding the extent of clean-up, the ultimate uses of the area, the technical capabilities for measuring and ameliorating, etc. (see Section 4.3, Impediments). Thus, major concerns exist regarding the new expertise needed, and where it should be placed, at DOE HQ, field, and contractors.

- DOE is shorthanded and short of expertise, due to the Federal wage structure, clearance requirements, and the nature of the industries that compete for employees.

> *It [DOE] may be a little better now, because they've gotten some special dispensations from Congress to go out and hire senior management. But it lacks a lot of the technical expertise given the areas that it's into. And that can't help but be a poorly managed department, given the quality of the personnel they have now.*
>
> *National Activist*

> *[Field offices have been] emasculated, really, as a result of the last couple of years of transition.*
>
> *DOE FO*

> *I don't have strong enough managers as heads of some of the offices.*
>
> *DOE HQ*

The Ahearne Committee (1991) agrees that DOE "in some respects is demoralized and weakened in talent." The GAO report offers statements from Senate staff that "DOE has lost much internal expertise and talent in the past decade", GAO (1991c). The National Research Council (1989) adds that "when their on-the-job training begins to make new DOE technical employees

effective, they become prime recruiting targets for the contractors and other segments of private industry".

- Key DOE positions are filled with contractors and political appointments who lack the expertise and experience to carry out their assignments.

> *[Watkins] is closing down channels of communication.. with the Hill and with the public... in the name of efficiency, but he doesn't have the chain of command that the Navy has because four out of five employees are contract employees.*
>
> *Congressional Staff*

> *The people that came out from headquarters weren't really headquarters people ...[mostly] the Beltway people... They don't have the knowledge of the facility.*
>
> *Contractor*

> *[Program secretarial officers] have the responsibility but yet don't discharge their accountability. And in effect you have a political appointee who is responsible for the operation of a DOE site. And a lot of them are not trained in Management 101.*
>
> *DOE FO*

In the 1991c GAO report, Senate staff quotes from a prior Senate report that:

> In law and in theory, the use of contractors to assist in the central planning and management tasks of government is to be limited to a temporary or intermittent basis... In fact, contractors have come to serve as a permanent work force for Federal energy programs.

It is unclear whether the contractors have the expertise for the new tasks. The variation in perception may relate to variations among sites or particular occupational categories.

> *The expertise is with the contractor.* *State Official*

> *I don't think they [the contractors] have near the talent pool that was here ten years ago... try to find a lot of chemical processing type engineers ...[who] combine nuclear with chemical processing.*
>
> *DOE FO*

The contractor people... have problems with technical depth of the staff... If a guy takes off to get another job, you don't find another one... so readily.
DOE FO

- Further, there are concerns whether ERMCs will hire small companies with even less expertise or commitment. Again, this is related to Section 4.2, Credibility and Trust.

Privatization to us means subcontractors... that don't give a shit about training, health and safety.
Labor

4.1.2.3 People - Informal Organization Fit

Within the interviews are expressions of needs and wishes from DOE and contractor personnel. These needs include long-term security, challenging work, recognition and status. The mistrustful and blaming atmosphere at DOE seem to conflict with these needs.

- There is a culture of blame that prevents seeking challenges, cooperation, undermines security and fails to give recognition (see Section 4.2, Credibility and Trust).

DOE has a history of pointing the finger at the prime contractor and sacrificing them like a sacrificial lamb.
Labor

We are trying to establish a lot of teaming between ourselves and the contractors. We are trying to put in a total quality management environment... It gives people operating envelopes to work in. That doesn't exist today... You want to ensure that you don't screw up. Because the accountability is high, and it's a search for the guilty one.
DOE FO

The idea of bringing the team together to work on a problem? Has not occurred here. You know, it's not Leo's style.
DOE HQ

In the past there was a very deliberate effort on the part of the contractors not to keep DOE informed of the problems at the site... It has been an evolving relationship where the contractor sees it's in the best interest to notify DOE of potential problems.

DOE FO

The Ahearne Committee (1991) also finds that:

> There appears to be a growing reluctance within DOE and contractor organizations to identify problems or to admit lack of progress to higher management, because this would appear nonsupportive of management's plan... we have heard many accounts suggesting upper management unwillingness to receive bad news.

- HQ disparages the FOs.

How could the field possibly know anything? That's the attitude back there. And I'll tell you it comes out loud an clear in Watkins' staff meetings. It's them versus us, okay?

DOE FO

The Admiral had told the world that the [DOE] people were a bunch of turkeys from top to bottom... The Admiral has settled down it seems like.

Contractor

- Office politics create uncertainty and anxiety.

[Leo Duffy is] Empire building.

Federal Agency

[The headquarters groups] want to have their own turf, and it doesn't seem to be a common goal... Each one has got their own agenda.

Contractor

- Newcomers don't understand how the work is done, both the formal and informal systems.

They need to sit you down when you first come here and run you through a course... here is who you correspond with... just knowing who's who, who do you deal with.

DOE FO

[We need] seasoned managers ...[for] cutting through the bureaucracy, maybe shaving corners a little..., interpreting, working with the regulators... We just don't have that.

DOE FO

4.1.2.4 Tasks - Formal Organization Fit

EM faces a wide variety of uncertain tasks. These tasks vary substantially by site in terms of the nature of clean-up, the ongoing activities producing waste, the EPA and state demands and local stakeholders, the particular M&O contractor or contractors, and so forth. There are indications that the formal organization, including typical management procedures, articulated goals, and lines of authority, are not aligned with the demands of these tasks (although better aligned with defense production).

- Project management and budgeting procedures, developed for structured projects such as construction, are not well-adapted for uncertain tasks (see Section 4.4, Project Management).

The whole order was built around building a project, like a nuclear power plant. And extrapolating that and trying to adapt it to cleaning up dirt, where you don't know what the components of what you have to clean up, is difficult and has been a challenge... we're getting our plans in shape.

Contractor

Nobody ever goes back to the project manager and says you built a piece of crap, technically it won't run... They are accountable for costs and scheduling. They can go back and say that the technology came from these guys.

Contractor

The agreed-to time-frames are now driving the system.

DOE FO

Unplanned work requests.. The smallest number we had... was 25%. And in some programs it was as much as 70 or 80% of their budgets.

Contractor

The budget process, in the Congress here, is a two year budget process... You either do a phased basis, with a finite scope. And that may not satisfy the legal requirement. Or you estimate on the basis of satisfying the legal requirement, with an unknown quantity...the confidence level is low in your estimate.

DOE HQ

A budget cannot be released until the President submits the budget to Congress in January... and no draft material in the budget can be released because that thing has to be a plan.

DOE HQ

In the GAO report (1991c), Joseph Hezir from OMB argues that DOE:

> ...must complete for limited budgetary resources...in an annual cycle. So it becomes very difficult to plan and to execute expensive, multi-year projects in that kind of environment.

OTA report (1991) adds that:

> DOE agreements with EPA and States contain various environmental restoration plans and milestones... However, the budgetary process does not ensure that this funding will be available.

- Technical requirements are not specifiable (see Section 4.3, Impediments) yet sites are held accountable for meeting them.

DOE wants the M&O contractors to sign a certification that they've not added any additional radioactivity above background... without the technical input that says our instrumentation's only so good... I mean you're really talking some heavy duty liability.

Contractor

The technical uncertainties are on the inputs, both the type and volume, and on the output, mostly what the requirements are going to be. But the time scale... is such that we really have to go ahead before we know those answers.

Contractor

They are not too accepting when research comes and says now wait a minute and we'll have a solution for you in a year or two... one message being given to the troops says hurry up and get it done.

DOE FO

The Ahearne Committee (1991) adds, "the goal has not been defined in terms that will enable determining when the goal has been achieved".

- Decentralization of EPA does not match centralization of DOE. Some people suggest that EPA should become more centralized, while most think DOE should become more decentralized (see Section 4.7, Compliance Agreements).

> *EPA would like to have the flexibility to develop clauses as they see fit at every site... there is no mechanism [at DOE] for negotiating on a site-by-site basis [about mixed waste].*
>
> *Congressional Staff*

> *You've got to negotiate on a region by region basis... That starts with a little bit of the decentralization ... he's [Watkins] not ready to let go yet.*
>
> *Contractor*

> *DOE headquarters "can see how the decentralization approach that EPA has for regulation is providing different guidance to different areas of the country" and should get EPA to provide "uniform guidance out to [its] various regions.*
>
> *DOE FO*

Centralized orders do not acknowledge differences among sites.

> *Some DOE orders "appear to be redundant with existing regulations, many have requirements that are not applicable to [this site], because they're really geared for some of these great big sites.*
>
> *State Official*

> *There are some orders written with the big INEL type facility in mind and are not applicable to me, but literally, I am obliged to implement them.*
>
> *DOE FO*

The National Research Council (1989) report argues that:

> DOE facilities... differ significantly from each other... An order that provides concrete directions at one type of facility will not necessarily be appropriate at another.

The Ahearne Committee (1991) adds that:

> *An environmental impact statement on the total cleanup program is inconsistent with the localized nature of cleanup decision making.*

- Each site is responsible for a wide range of tasks that are authorized and controlled by different parts of EM or DOE. Thus, each site receives overlapping and potentially-conflicting demands without the authority to reconcile these demands at a local level (see Section 4.6, DOE-Contractor Relationship).

> *[Leo must] help prioritize both for his staff and for the field... at the field... we're getting inundated with demands... You need to have a line organization [with] someone at headquarters in my program.*
>
> *DOE FO*

> *I haven't been able to get an agreement. Between EM, EH, NS and all the other groups.*
>
> *DOE FO*

> *All these vice presidents men, and each one of them has got a little piece of the pie... they got award fee items that their counterpart in the Department of Energy says this is... for you. Sometimes they're conflicting requirements. They're fighting real hard to get theirs done.*
>
> *Contractor*

> *[The Contractor], as a customer, ought to respond to one boss... the [field] office... I saw conflicts in orders, compliance agreements, regulations or whatever... Or, really it may come through the [field] office, but there's inadequate time for them to reevaluate.*
>
> *Contractor*

> *The DOE came after them in waves from Headquarters... Then along came a Headquarters group, let's say it's EM, and they evaluated what the local DOE did. And then EH... And then along came NS... evaluated what EH, and EM, and the local DOE did.*
>
> *Contractor*

The National Research Council (1989) writes

> A process must still exist by which unavoidable conflicts can be confronted between production targets and health, safety, and environmental obligations in the face of limited resources of budgets, facilities, and personnel... the Secretary's reorganization plan does not yet adequately address how these conflicting needs are to be reconciled.

- There are many exceptions, and each exception or problem is raised to a very high level to be resolved, which greatly retards task accomplishment. This is directly related to Section 4.7, Delays.

> *The front office at DOE doesn't delegate.*
>
> *Congressional Staff*

> *Nobody in the system wants to take responsibility for anything [so it goes up to Watkins]*
>
> *DOE FO*

> *To get relief from a procedure [exceptions]... there is no place to find responsibility.*
>
> *DOE FO*

> *It takes time to get through the DOE chain of command to Admiral Watkins to determine whether, quote, DOE headquarters wants to pay for it [DOE requirements beyond OSHA requirements] or not."*
>
> *Contractor*

> *[Public affairs can't] respond to inquiries or be proactive ...when you have to go pass through Washington [for approval].*
>
> *DOE FO*

The National Research Council (1989) writes:

> We were informed that all budget issues relating to environmental and safety issues are routinely referred to the ASDP, and often to the Undersecretary, for resolution... not all issues can or should be addressed at the highest levels in the Department.

The OTA (1991) report adds that:

> ...a noticeably longer time was required to obtain even routine environmental reports... apparently because DOE HQ wants to review information put out by FOs before making it available to the public

- Reorganizations occur to answer specific problems without considering the overall tasks. Thus, implementation of change is not planned and managed appropriately.

> *[If there is a problem], our response is to ... try to reorganize... [but reorganization] is not being done to support some initial or some clearly thought out goal or objective.*
>
> *Contractor*

> *Leo doesn't get the document he wants, so instead of calling up [the site head] and telling him..., he puts in another guy to review things. That's not making the guy that produced it accountable. That's making somebody else accountable for my action.*
>
> *DOE FO*

- Priorities are not clear (see Section 4.3, Impediments).

> *We are under DOD... We should be excluded... as an environmental thing.*
>
> *DOE HQ*

> *DOE is conflicted about resuming ops or complying with RCRA and cleanup... There is a lack of communication between local management and HQ people. The messages are usually mixed. It depends on who you talk to.*
>
> *State Official*

> *The job of environmental clean-up is somewhat nebulous in nature to begin with...[We don't have] a clear vision, a clear mission... If people are going to sit down and do a reorganization, at least let people know why you're doing this, and what exactly you intend to achieve by it. Communication of organizational goals... allowing... the opportunity to take ownership for a local organizational goal.*
>
> *Contractor*

- Contracting and liability arrangements are producing anxiety (see Section 4.5, DOE-Contractor Relationships and Section 4.7, Compliance Agreements).

> *And I hate to see us get to that where rules and their impacts and/or implementing the work gets so hide-bound in each trying to protect their position that everything is very explicit correspondence... Certainly [our company] will not want to be exposed.*
>
> *Contractor*

> *One of the most destructive things we do around here is the cost plus award fee... instead of "Is this the right thing to do?"*
>
> *Contractor*

The National Research Council (1989) notes that, "unlike most government organizations... DOE orders may become effective during the term of a contract and prescribe new requirements". The NRC (1989) also observed that as DOE "narrows the indemnification it offers its contractors, it creates the prospect that a contractor might incur substantial loss for noncompliance".

4.1.2.5 Tasks - Informal Organization Fit

Organization charts and procedure manuals do not fully describe how tasks are accomplished. The informal organization includes all the communication channels and working relationships that are not on the charts. For example, unions are well aware that they can disrupt production simply by "working to rule," which means doing *only* what the formal roles and rules specify. The complex tasks newly assigned to DOE require good working relationships among many parts of the DOE family. However, relationships to HQ seem particularly difficult, and may interfere with task accomplishment.

- Good working relationships seem to develop at the local level more readily than between HQ and sites (see Section 4.5, DOE-Contractor Relationships and Section 4.7, Compliance Agreements).

Once you get a good site team together and I think that we're getting that here at Fernald... DOE internal reviews now are just eating up time and resources.

State Official

Whenever we've had direct interface with the regulators, the meetings have been fairly good... problems usually only arise, the higher the...issue is raised in the government bureaucracies of the state or DOE or whatever, the more, as I say, issues of manhood arise.

Contractor

- However, HQ needs to monitor and control these local relationships without undermining the local organization or implying mistrust.

The contractor understands the DOE field people, and I think that gets to be a problem when it looks to making some crucial decisions about, particularly where the EM programs are going to go.

Contractor

- The politicking and power struggles at HQ and in the field sites may interfere with task accomplishment.

Different camps at headquarters trying to establish who has the power base... These people create lots of new management tools... So these multitudes of things... we are struggling to try to satisfy them all.

DOE FO

You have seen a certain level of turf battles... there is uncertainty as to who is responsible for certain activities within the field office, whether it's the site office, whether it's the field office, whether its management... if there are turf battles at the field office level, then there are turf battles at the headquarters level.

State Official

4.1.2.6 Formal-Informal Organization Fit

The informal organization may support the formal organization by filling the gaps, but the informal organization may conflict with the formal organization if they call for divergent activities. DOE seems to have developed ad hoc ways of doing things that bypass the formal organizational channels and create

conflicting lines of authority between HQ staff and line. Although the formal organization is possible to change by fiat, the informal organization is more difficult to change without cooperation from those whose roles and status are changing.

- There is extensive bypassing of formal channels of communication and authority, which leads to confusion and annoyance.

> *If you got a management structure, let's use it. Or let's fix it. Let's not bypass it... Got all these people in this organization and nobody trusts anybody.*
>
> *DOE FO*

> *A lot of stuff was sent to [HQ staff] directly like that without going through the [field office]... I had told my people don't call him, if he calls you tell him to call the [field office].*
>
> *Contractor*

> *SEN6-91 set that up... We no longer have the managers reporting to the front office... Leo's special assistants feel they have a mandate to deal directly with our contractors.*
>
> *DOE FO*

> *If Leo is going to persist on picking up the phone and talking to [his contacts, then the recent reorganization]... won't work.*
>
> *DOE FO*

> *So if the field office is sending something directly to Leo's staff, they're not even giving us a copy of it.*
>
> *DOE HQ*

> *There was not communication between DOE [field office] and DOE [site office], but there was between DOE [field office] and [the contractor].*
>
> *DOE FO*

- The line and staff seem to be in conflict, and this contributes to delays (see Section 4.6, Delays).

> *[DOE headquarters has] a palace guard. It is very hard to talk to Admiral Watkins... and the only ones that can really work through those barriers are [a very few people like Leo].*
>
> *Contractor*

Leo should be looking to [his DAS's] but [his staff] are trying to do the management function that really should be delegated to the associate directors.

DOE FO

[Our upper managers] go straight to staff to get something done because they need it done now, and middle level management doesn't know anything about it.

DOE FO

- Contract requirements are used as a game to avoid responsibility (see Section 4.5, DOE-Contractor Relationships and Section 4.7, Compliance Agreements).

Contractors "learned to protect themselves... by sending to us their requirements, and in some cases they are quite large.

DOE FO

The contractor co-operated is this ploy by the contractors to get out of being under Resource Conservation and Recovery Act (RCRA).

Local Activist

DOE's clearly searching for ways to make contractors more responsible or accountable to their will.... And it all stems from, I think, the basic contractual relationship they have, where the contractors have the upper hand by definition.

Congressional Staff

- Informal goals of avoiding blame are best served by preventing information flow, whereas the formal goals are best served by enhanced information flow. Information flow is also a key aspect of trust (see Section 4.2, Credibility and Trust).

[DOE is] supposed to give out this information... but on the waste management part of EM... they're worried about the legal implications.

Local Activist

We reproduced a report... in our attempt to be open to talk... and it has basically been held up in Headquarters because they are afraid it is going to get bad press.

Contractor

The tiger team told us up front, anything that they find, they're going to turn over to the Justice Department... and then immediately the legal folks shut down communications. And then the tiger team says, "Well, we're going to beat you up for that."

Contractor

- It is difficult to change old ways of doing things (see Section 3, EM's Arena).

[It took 10 years for the Navy nuclear and civilian nuclear programs to change conduct of operations], we're trying to do that in a year here.

Contractor

[You're changing] the system and... people's way of doing things they've been doing for forty years.

Contractor

4.1.3 Implications

Admittedly, it is difficult to make unambiguous interpretations of the above issues. Each example of a misfit may be an incorrect personal impression, a symptom of something else, a temporary situation brought about by rapid change, or an equilibrium that is avoiding even worse problems. Further, micro-fit problems may not be solvable through micro-adjustments such as new hiring, training, reorganization, or new procedures. Instead, the real problems may be at the macro-level, where inconsistencies among local demands and Congressional mandates may simply be reflected within the DOE family. However, the analysis of stakeholder perceptions in this framework has allowed us to raise important issues for discussion and further research.

4.1.3.1 Key Role of Informal Organization

Typically, the informal organization is the most flexible and adaptable part of the systems and subsystems that do the work. Tasks and people remain fixed in place for years; changes in the formal organization are often attempted

from the top down, and often disappoint their designers. Sometimes, the informal organization acts to preserve work patterns when formal changes are made (paperwork changes but real work does not). Whether the informal organization helps or hinders task performance depends on whether the competencies and needs of organization members are aligned with organization goals.

For example, would decentralizing authority to field sites make the system work better? This would seem to satisfy the site personnel who want more authority and resources and less interference from HQ. They then have flexibility to deal with the specifics of the local site. However, there is the danger that the contractors or other local actors (EPA, states, localities) would act in their own interests without sufficient guidance from the national perspective of DOE, and push for infeasible goals or resist the national agenda for change.

4.1.3.2 Headquarters' Responses to Field Problems

DOE HQ has made numerous efforts in the past years to identify the sources of perceived problems and to reorganize, staff, train, and define new procedures and orders to improve functioning. In short, HQ has made their own diagnoses of fit and misfit and reacted on the basis of their own insights and theories of the organization. Generally these interventions have been prompted by the insights and beliefs of a few top administrators (e.g., Watkins and Duffy).

However, HQ actions are reported to have created their own problems and side-effects or to have exacerbated the existing problems. It is difficult to control a large, complex system. Many actions have no apparent effect because the system readjusts to retain its accustomed habits. Other actions have some impact, but may have unintended, unpredicted impacts. In essence, organization

change is like empirical medicine--you try a remedy and wait to see what happens. For example, HQ may add a staff person, reorganize, or issue an order, but the consequences of these remedies are uncertain.

In the following subsections, we suggest several instances in which HQ actions produced new problems or worsened the original problem.

4.1.3.3 Trust and Centralization

The contractors had reasonable autonomy to carry out their weapons production mission, protected behind a wall of national security. FOs were small and protective of the contractors. However, the shift in mission and constituencies meant that DOE would have to change dramatically in the way it did business and the degree of control exercised over contractors (see Section 3, EM's Arena).

Because HQ, for whatever reasons, was no longer willing to trust the FOs to supervise the contractors, they centralized authority at HQ (see Section 4.2, Credibility and Trust). s were told that they were not up to the new task, and that even minor decisions would have to be cleared with HQ.

The result of this organizational intervention was to further reduce the capabilities of the FOs and demoralize their personnel. Good people were frustrated and left; hiring and training of new people was difficult and absorbed further resources. Personnel knew they would be monitored closely and punished for mistakes so they took no chances and passed everything through to HQ.

This is a kind of "death spiral" for the FOs--as they do less they become less capable, more frustrated, less successful, more criticized by HQ, and have

more tasks and authority removed. This stops at some equilibrium level where the FOs are doing minimal "pass-through paper-pushing" with less-qualified personnel, or if personnel with loftier goals are successful at reversing the trend through politicking or making a fuss, or if HQ decides that FOs have to be stronger and more autonomous.

4.1.3.4 Compliance and Audits

Similarly, because HQ wanted to assure compliance and standardization (see Section 4.3, Impediments and Section 4.7, Compliance Agreements), they instituted an extensive system of audits and directives to create oversight of FO and contractor activities (see Section 4.5, DOE-Contractor Relationships). Thus, wave after wave of assessments rain down upon the FOs and contractors, and FOs are also involved in staffing these assessments for sister offices.

However, this has the result of making the system more complex, with more requirements and more paperwork. It is therefore harder to manage and more difficult to accomplish the EM tasks. In short, resources are diverted from compliance activities to the oversight process itself (preparing for oversight, participating in it at own and other sites, etc.).

Further, the personnel being audited find that the audit process is punitive and idiosyncratic. They believe that the repeated audits reflects headquarter's belief that they are failures. With lowered morale, they are less effective workers and the good people tend to leave. The net result is that compliance activities are less effective.

4.1.3.5 Rapid Action and Bypassing the Line

Because HQ wants to get things done quickly, and doesn't trust the line to get things done, they bypass the line organization (see Section 4.2, Credibility and Trust, and Section 4.6, Delays). HQ staff are given formal or informal responsibility over line tasks, direct communication links are set up between staff and contractors, and so forth (see Section 4.5, DOE-Contractor Relationships). When the field does not respond to HQ satisfaction, HQ appoints another person to do that task or oversee someone else doing it, thus accelerating *that particular task.*

The impact on the line organization is again to undermine and demoralize them. The real lines of authority become unclear, so that personnel no longer know how to get authorization or how to resolve conflicting orders. As the system becomes more complex, due to appointments and adjustments made to solve specific problems without attention to the larger administrative picture, it therefore becomes more difficult to accomplish work in the long run. More and more problems emerge, requiring more and more bypassing and tinkering with staff assignments.

4.1.3.6 Conclusion

Lacking detailed information about work activities, we cannot make confident judgments about the importance and sources of these misfits. Nor can we confidently generate alternative structures and processes that would be better aligned within the organization and to its external environment. Typically, it is hardest to learn about the people and the informal organization.

Research can shrink some of these areas of ignorance. Comparative case studies within DOE, or between DOE and other organizations, can be helpful in understanding how one group has reduced its misfits to perform more effectively than another. The comparisons can be of the misfits in internal operations, or in relations with external groups. Several of the ideas described in Section 6, Phase II Research Topics, incorporate this approach.

4.2 Credibility and Trust

Heidi A. Hahn

Abstract

Issues of DOE's credibility and trust arise both within the DOE family of stakeholders and with stakeholders external to DOE. Inside the complex, credibility issues arise at HQ, between HQ and the field, and between both HQ/field and the contractors. HQ issues are related to the split between DP and EM activities as well as to rapid expansion and elitism. Field office vs HQ issues are related mainly to the impacts/perceptions that arise from centralization. DOE vs contractor issues are mainly related to liability. For external stakeholders, DOE's credibility hinges primarily on mission-related issues (DP vs EM mission, secrecy, and personnel), programmatic issues (commitments to cleanup), issues related to oversight, and public relations issues (including the need and mechanism for public exchange). It is often the case that DOE must optimize its strategy of dealing with competing requirements from stakeholders. Quite clearly, the issues impacting DOE's credibility are complex ones and ones in which there is a great potential for backlash from one or more stakeholder groups.

The issues of credibility and trust mainly have to do with whether stakeholders believe that DOE is honest in its representation of itself and its activities and whether stakeholders are willing to commit responsibility for environmental management and restoration activities to DOE without misgivings. The honesty of DOE is maligned by stakeholders on three fronts: (1) that DOE has lied about safety and environmental matters; (2) that DOE has remained silent on environmental and public health matters, fearing negative publicity, when they should have been forthcoming; and (3) that DOE has selectively released ES&H information so as to mislead the public.

For 40 years they kept us blind and ignorant...We were lied to and done wrong.

Labor

Additionally, though, there is the issue of credibility within the DOE family, specifically in terms of how various organizational entities (headquarters and field offices) view one another and how DOE (at any organizational level) views and is viewed by its contractors. Conflicts of credibility in this domain serve to exacerbate lack of confidence on the part of external stakeholders, as described below.

4.2.1 Stakeholder Observations on Credibility Issues Within DOE

Internal credibility problems exist largely in three domains: within headquarters, field office vs headquarters, and contractors vs DOE. Interestingly, speakers on this topic were not limited to FO, HQ, and contractor interviewees. Rather, as can be seen from the comments in the following sections, other stakeholders often "took the view of" one of the entities involved in the controversy.

4.2.1.1 Within Headquarters

Stakeholders discuss three major problems impacting DOE's credibility that arise within HQ. One is the split between DP and EM activities; another is the rapid expansion of HQ activities and staff; and the third is elitism.

Stakeholders note that there are "too many masters" within DOE HQ. With DP and EM struggling to define their roles and responsibilities, there often seem to be power grabs in terms of budget, status, etc. Fear seems to be the main driver here. It is widely recognized that, with the changing political -

climate, DP is in decline--DP people recognize this and are trying to maintain their turf.

EM, while on the rise, is still widely viewed as a stepchild, lacking the prestige associated with the production side of the house. Several pieces of evidence point to the lack of status of EM. First, in spite of the fact that EM has the second largest budget in DOE, it has only been recently that Leo Duffy was named an Assistant Secretary; and, that recognition was two years in the making. Also, the Secretary is viewed as caring only about DP and "big science." Finally, it appears that EM does not get its fair share (i.e., proportional to its budget) of the FTEs allocated to DOE by OMB.

> *I think from the Secretary's standpoint, his interests lie in two basic areas. Weapons and basic science. And so you see emphasis on weapons and basic science, since there is an interrelationship between the old weapons program and basic science. Whereas, environmental restoration and waste management, in the old environment did not have the same "stature." And now it's demanding a major portion of the Department's budget.*
>
> *DOE HQ*

There is the perception that the two sides of the house do not talk to one another because they are trying to protect their own interests. The net effect of this, though, is that conflicting requirements (orders and standards) and management systems are sent down to the field and contractors, making DOE HQ appear unorganized and inefficient, thus, eroding its credibility at lower levels.

> *DOE orders come from different groups, each with its own requirements, that don't talk to each other.*
>
> *DOE FO*

Centralization has resulted in increased responsibilities for HQ personnel. It is widely recognized that there are too few technically qualified

people available to fill the need. Hence, many former weaponeers are being "retrained" for EM activities, not only at HQ, but in the field, and contractor organizations as well. This is viewed with suspicion by external stakeholders, as described below. Within HQ, though, there also appears to be a movement to hire new employees away from regulatory agencies. This has not been well-received internally; at least one interviewee referred to a policy of hiring "regulator rejects." A DOE employee who was formerly a regulator said:

> *Coming [to DOE HQ from a regulatory agency] I was viewed as some pinko weirdo, a guy that was going to get in the way of national security. Things have changed dramatically since then, but there's still a view that some of these requirements are an add-on pain in the butt and have no possibility of being beneficial or useful.*

Further, although it is not clear whether the reasons for this are lack of trust or unavailability of time or interest to invest in communication, some HQ interviewees reported feeling like "mushrooms."

> *The old way of doing things, the collegial way of doing things, all 55 [HQ] people could know what was going on and why. All 350 people can't know currently what's going on and why. Therefore, we run the risk of separation between the management and the staff, the feeling that they're mushrooms, stuck in the dark and fed you know what.*
>
> *DOE HQ*

Finally, charges of elitism emerge in the criticism that only the Secretary's hand-picked staff are allowed to interact with Congress and with the media, presumably because no one else is trusted.

> *That also gets back to the Secretary control problem, I mean, people are not allowed to talk to us unless they go through [the Congressional] liaison group in DOE.*
>
> *Congressional Staff*

> *The problem is that they believe on the seventh floor that only they can handle Congressional relations.*
>
> *Congressional Staff*

4.2.1.2 Field Office vs Headquarters

The most prevalent view here is that there has been pressure within DOE to centralize functions at HQ because HQ personnel (particularly those at the top of the organizational hierarchy) do not trust the FOs to perform effectively. DOE HQ staff justify centralization, citing examples of past laxness on the part of some FOs.

At the local level, though, there is a perception that the ulterior motive for centralizing functions at HQ is not that HQ is better able to handle the work from either a technical or administrative standpoint (in fact, many people believe just the opposite to be the case) but rather that key people within HQ are "empire building" and wish to "do away with" FOs entirely so as to better control their own power base. FO personnel feel that they are not well supported by their parent organization and find themselves in the position of being blamed when things go wrong but not rewarded when things go right.

> *I suspect that there's some mistrust of the field, with what happened at Rocky Flats and Savannah River. People say the field can't manage, therefore we need more people in headquarters.*
>
> *DOE FO*

> *I think headquarters wants to get, do away with the field offices.*
>
> *DOE FO*

> *How could the field possibly know anything? That's the attitude back there. And I'll tell you it comes out loud and clear in Watkins' staff meetings. It's them versus us, okay?*
>
> *DOE FO*

> *The empires are growing...I think fiefdoms are building up.*
>
> *DOE HQ*

One effect of centralization is that it impacts the credibility of DOE with its external stakeholders. A common complaint about centralization is that, because the FOs have little authority and must refer decisions to HQ, where delays are the norm, requests for information coming from the general public, media, regulators, etc., are not dealt with in a timely fashion. This contributes to the view by external stakeholders that DOE is being less than forthcoming in providing truthful information. Further, HQ review sometimes leads to a change from the position on a particular issue taken by the field or a contractor--lack of consistency of information also undermines public confidence. Many external stakeholders expressed the view (described in further detail subsequently) that they would like a local (FO or contractor) contact from whom they could obtain information.

> *Many times documents finally exist and positions are taken that bear little relationship to what was sent out of the technical organization, and that plays heavily into the hands of the oversight groups such as the EEG because consistency gets to be a problem.*
>
> *Contractor*

> *Environmental monitoring reports are always anywhere from a year to a year and a half behind because they sat on somebody's desk...I don't care if they send them up to Washington. But that seems to be the hang-up. The site does their part. It's been pretty much cleared and okayed down here. Send it up to DC. [But] by God in thirty days, get it back here so it can be gotten out to the people.*
>
> *Local Activist*

Finally, our interviews with FO staff gave a clear message of a demoralized workforce. Many people characterized the Secretary and, to a lesser extent, Leo Duffy as critical and unsupportive of their own people:

> *The Admiral had told the world that the people were a bunch of turkeys from top to bottom.*
>
> *Contractor*

Watkins has gone through a process totally demoralizing to the staff that he had. The staff with a lot of competent people was just gutted. He's taken authority away, been arbitrary with them, left them not knowing what they were doing and where they were going.

Congressional Staff

4.2.1.3 Contractors vs DOE

Both contractor personnel and other stakeholders expressed the view that DOE has tried to disassociate itself from its contractors and, indeed, has overtly discredited them. DOE's moves to increase the liability of the contractors is seen as symptomatic of this position. (See the paper on DOE-Contractor Relationships in Section 4.5 for more information on this topic.)

Two views of this phenomenon are fairly common. First, people express the idea that DOE, especially DOE HQ, does not trust the contractors to perform responsibly, and that, in some cases at least, such concern is appropriate. For example, there is concern that the contractors do not keep DOE fully informed.

The contractors have been hit with sledge hammers. Sometimes with good reason, sometimes not.

DOE FO

In the past there was a very deliberate effort on the part of contractors not to keep DOE informed of problems at the site. Basically no bad news was good news...I think it has been an evolving relationship where the contractor sees it's in his best interest...not only just because it's the change in culture, but also because there are rules coming down the pike that make it imperative that the contractor not sit on problems.

DOE FO

Second, the notion that increasing the accountability of the contractors, thereby keeping DOE "out of bed with" it's contractors is a positive step in making the complex safer is widely held. But, increasing contractor liability is seen as counter-productive in terms of the relationship between DOE and the

contractors and between the DOE family and external stakeholders. Similar to the case of the FOs vs HQ, the contractors do not trust DOE to deal with them fairly, but rather, see DOE as wanting to assign blame to contractors and take credit for themselves.

Both the contractors and the external stakeholders view DOE as being inconsistent--saying one thing (that DOE is willing to be accountable and that they are the owners of the complex) and doing another (blaming the contractors for anything that goes wrong, and washing their hands of responsibility or liability).

> *What DOE doesn't understand is every time they discredit a contractor, they discredit themselves and they [have] just about run out of contractors to discredit without having said that their whole program was no good.*
>
> *Contractor*

> *DOE has a history of pointing the finger at the prime contractor and sacrificing them like a sacrificial lamb. They've done that at several sites across the country, and are in the process of doing it at a couple more, all right? [The contractor] is a big company, with a fine, respectable reputation. For them to have to sit handcuffed and allow DOE, through the media, through agencies, even to the public, public forum, point a finger at them and not be able to respond is wrong.*
>
> *Labor*

> *All this focus on individual ownership, punishment, and discipline--what it does is bring you back to saying "We got no teams, we got no integrated workforces. It's every man for himself."*
>
> *Contractor*

In addition to undermining public confidence, DOE's actions are viewed with concern because there is a fear that the risk/reward imbalance will become so great that experienced contractors will no longer see any incentive for continuing operations in the DOE complex, leaving a technical

and managerial void. This fear seems well-founded, in light of the comments given by an interviewee at a corporate headquarters shown below:

> *It is unreasonable to expect people to take risks that are either ambiguous or uncapped...Corporations won't do that...I think we are willing to take risks and I think we are willing to take the responsibility assuming the rewards go with it. The rewards are a very, very important piece of that ingredient. But you can't just expect to take a nuclear facility that's been going for umpty-ump years and say, "Okay, Mr. Contractor, it's yours. All the past is yours, all the future is yours. It's your kettle of fish. But, by the way, you don't have any control over how much money you spend on it."*

Other stakeholders though, especially Congressional staff, do not believe that argument:

> *The threat by contractors that they will withdraw from, or not compete for, business with DOE if they are exposed to greater liability is hooey, there are too many dollars to be made.*

Contractors also complain that they do not have open communication channels with DOE HQ. Numerous interviewees discussed having been asked to provide review and comment on orders and standards, only to see that there was no result from their input. People are developing a cynical attitude of "Why bother? No one's listening." This is also a complaint voiced by external stakeholders.

> A case in point is a recently issued DOE order (5480.11) addressing radiation protection for occupational workers. The consensus of a contractor conference (Albuquerque, January 31-February 3, 1989) was that this order will not significantly reduce risk, that it will be expensive to implement, and that it is overly broad in its reach. Yet, as far as we have been able to determine, the results of the conference have had little if any effect on the order.
>
> National Research Council (1989)

4.2.2 Stakeholder Observations on External Credibility Issues

The general view across stakeholder groups is that the DOE family has low credibility with the external world and that many of its actions serve to further reduce public trust. Factors affecting external credibility fall into five general categories: mission-related issues, programmatic issues, issues related to oversight, management issues, and public relations issues. Stakeholder views on each of these areas are detailed below.

4.2.2.1 Mission-Related Issues

One of the largest challenges facing DOE in terms of establishing credibility for environmental management is overcoming its past, namely, the perceived emphasis on weapons production over safety and the environment. Stakeholders are still not confident that DOE is giving appropriate programmatic priority to EM activities over DP work. In spite of the Admiral's statements that safety comes first in the DP side of the house, stories are still told about EM functions taking a lower priority than DP functions. Budget squabbles and the lack of clear-cut guidance about where DP responsibility ends and EM/ER responsibility begins only exacerbate the lack of confidence that EM activities are being viewed as a serious mission of DOE. Further, the continuation of DOE DP activities allows for muddling of the issues raised by public interest groups--waste management, compliance, and litigation issues are being used as an easy avenue of attack for people whose "real" agenda is suspending work on nuclear weapons. (On the opposite side of the coin, though, is the position that the pushing of a non-nuclear agenda through attacks on waste issues undermines the credibility of some activist groups.)

Duffy is responsible for WM facilities at [site]...He wants to run his facilities in a compliance mode, which he has always charged us to do. If we're in danger of missing a production milestone, he'll say go ahead and miss that production milestone at [site]. The programmatic side will say absolutely not--that weapon part that we have there is necessary, and has higher priority than taking care of the waste.

Contractor

One of the problems here they are trying to deal with is this dual mission of building weapons and cleaning up the environment. And they don't go together very well in most cases...Each step they take towards developing a new plan for building weapons somehow usually detracts from any steps they take towards environmental restoration.

Federal Agency

People aren't convinced that production isn't going to return as a priority.

State Official

Additionally, stakeholders feel that DOE is carrying the culture of secrecy that surrounded weapons production over into its environmental management activities. Here, the view is that DOE is hiding behind the veil of secrecy, not because national security would be compromised if information was made available, but simply because it does not want information that might be damning to itself available for public scrutiny, so as to avoid liability. Critics argue that all information pertaining to environmental management, including things such as environmental monitoring reports, public health assessments, and the like, should be readily available.

From the standpoint of EM, there's nothing that should be secret...We're talking about waste streams, environmental restoration primarily of things that happened years and years ago. The secrecy stamp just really shouldn't be involved, period...I think there's very little justification for claiming national security on waste management, but that doesn't stop them from doing that. It also, I think, creates some skepticism from a certain level of people.

Local Activist

Finally, the personnel practices of DOE and its contractors have been criticized as not adequately supporting EM activities. There is great concern over personnel actions in which former DP employees are placed in EM roles. First, stakeholders view this with somewhat of a "fox guarding the hen house" mentality, arguing that these employees are biased away from being able to perform adequately in the sense that they come from a culture in which production goals are (or have been) viewed as more important than ES&H issues. Further, stakeholders voice the opinion that people who have the skills necessary for designing nuclear weapons (physicists and nuclear engineers, primarily) do not have the requisite skills for environmental remediation activities (such as training in environmental science, biotechnology, etc.). Stakeholders view environmental management as a distinct discipline, and feel that, if DOE is to demonstrate true commitment to EM, it must hire practitioners of the discipline. HQ staff, in particular, is viewed as lacking in expertise, not only because of the large numbers of "retreads," but also because of the prevalence of political appointees in the highest positions.

> *Don't take weaponeers, don't take plutonium reprocessors and put new hats on them and expect people to believe that within a month they know anything about cleanup, environmental restoration, or waste management.*
>
> *Local Activist*

> ***When** the AEC ceased to be in '76, and all the good people started leaving, and political candidates came in with no technical background, but simply a paycheck for their political contribution, the agency went into disrepair...[The Agency] did not keep up with the NRC and technical expertise or in guidelines to its field offices and contractors.*
>
> *Contractor*

4.2.2.2 Programmatic Issues

Concern over programmatic issues is mainly focused on the cleanup commitments that DOE has entered into at its various sites. (See also the paper on Compliance Agreements in Section 4.7 of this report.) Stakeholders express the view that the commitments must be realistic and that failure to meet commitments that have been made will further damage DOE's already low credibility. Of special concern are delays in areas where technology currently exists to solve problems. Critics seem to have the view that inadequate budget or finding that problems are more technically challenging than was originally thought are not acceptable reasons for not meeting commitments. In fact, there seem to be no circumstances under which slipped milestones will be publicly acceptable. However, there is the recognition that, when timelines do slip, DOE must be honest about the reasons for adjustments. DOE personnel, though, seem to resent this rigid position and note that states, if they are acting realistically, must be willing to use compliance agreements as a mechanism for ongoing dialog.

The worst thing you can do under agreement is not to do what you said you were going to do.

DOE FO

A little compliance can buy you a whole lot sometimes.

DOE FO

If the Congress decides not to appropriate the money, then we need to go back to the parties and make sure they understand this is why the program isn't going to be done. That's a different question than leading the states to believe that a certain project has a certain priority then the department unilaterally reprioritizes the program without going back to that state and saying, "Your project was reprioritized."

DOE FO

A particularly sensitive issue is that of complex-wide prioritization. Local stakeholders, including state regulators, take a very dim view of activities at their site being deferred because work at another site is deemed to have higher priority. The position seems to be that DOE has committed to complex-wide cleanup in a thirty-year period, and "the public" fully expects that promise to be kept. Missing milestones leading to that goal at any site will inevitably lead to public backlash.

> *The states don't want a priority system...They will tell you that they think a priority system is fine, a good idea, so long as they don't end up number 30.*
>
> *Congressional Staff*

> *It's going to create a tremendous amount of anger and hostility on the state level if a number of states find that their compliance agreements are going to be broken and disregarded, and instead have a national priority system.*
>
> *National Activist*

> *Watkins is sitting back there saying, "Well, I've got my 5-year plan here. I've got my priority system on how we're going to go at this." And the governor of New York is over here saying, "Wait a minute," you know, "how can you put mine down here at the bottom of the list?"*
>
> *Contractor*

Related to this issue is the attitude of many stakeholders that they want to "see progress." Rather than studying the problem, there is pressure on DOE to "turn dirt." On the one hand, succumbing to this pressure may help alleviate the short-term public relations problems of DOE. Caution must be exercised, however, that short-term efforts do not have the effect of delaying long-term milestones.

We are giving you people all this money to spend, but we don't see anything happen. There is nothing happening. There is virtually, at least, again, to an outsider, very little in the way of productivity, actually moving to turn dirt to solve problems. There is a remarkable amount of characterization and paperwork, but there are real internal conflicts over things such as training of employees... There is real concern that ultimately what has been accumulated here may well go bust again because the job that was supposed to be done is not being done and the resources will be pulled out in frustration or the political whims will change again.

Local Business

Controversy exists over the best ways for progress to be made. DOE advocates a risk-based approach to cleanup as being the only rational way to contain costs. A risk-based approach is criticized by stakeholders, though, as not being responsive to public concerns or to Congressional pressures. Advocacy groups and state legislators, on the other hand, use the concept of total cleanup as a political lever, insisting that sites be returned to "pristine" condition. This position, too, is criticized--DOE and contractor interviewees expressed the view that insistence on this hard-line position undermines the credibility of the public advocates, making them appear irrational. (The risk-based approach to prioritization is also discussed in the paper on Impediments found in Section 4.3.)

If we don't get more cooperative about a risk-based budgeting process where the highest environmental priority gets the dollars first, there's going to be real chaos.

Contractor

The actual risks associated with the transportation and placement of the waste--which done properly are very, very low--those tend not to get discussed.

Congressional Staff

You have the public who doesn't talk about cleaning up, for example, a hazardous waste site to some reasonable level. They want it all cleaned up. They want it to go away.

Contractor

4.2.2.3 Issues Related to Oversight

Most stakeholders agree that there is a need for external oversight of DOE, if for no other reason than to enhance credibility. Indeed, the fact that there is a perceived need for oversight is indicative of a lack of trust of DOE.

Many interviewees noted that past problems in DOE would never have come to light without outside pressures. However, there are many criticisms of the oversight process, ranging from operational impacts of multiple reviews to the credibility of the oversight groups themselves.

> *The DOE's record to date is such that I think oversight is required. They really haven't proven that they can change their stripes and consistently carry out a cleanup mission effectively. So from that point of view I'd say the critics are right and oversight is required.*
>
> *DOE HQ*

> Technical advice from outside the complex can be a source of insight from people with broader experience and a fresh perspective, and by demonstrating openness, can help to restore public confidence in DOE decisions.
>
> National Research Council (1989)

Insiders in the DOE complex, including contractors, complain that there are too many audits, impairing their ability to get work done. They also wonder about the credibility of audit results, citing cases where different reviewers, looking at the same problem, reached very different conclusions. Finally, there is a question about the motivation for and the utility of the audits (again, taken as indicative of avoidance of risk by DOE) and the concern that audits have caused an unnecessarily adversarial relationship between the contractors and DOE.

They're [the auditors] not shareholders, they're not stakeholders in the outcome per se. They kind of at times are in a position where they come up with their findings and they're off. There's no ownership of what they've come up with. There's no need for them to balance it against other priorities. There's no need for them to assess the dollar impact. They just have as their output a bunch of findings. Plop. Off to the next game.

Contractor

Two different teams in two weeks had opposite opinions [on a management system].

DOE FO

Reviews are used to avoid risk-taking.

Contractor

The concept of Tiger Teams was widely viewed as positive both for cleaning up the complex and for enhancing public confidence. However, there was a concern that results were sensationalized, misleading the public about the seriousness of problems, and that Tiger Team findings were treated with a "drop everything and fix it" mentality that causes delays in getting " real work" done. Further, there was criticism about HQ sincerity--stakeholders noted that HQ has yet to have a Tiger Team investigation itself. Finally, the credibility of some of the Tiger Teams was questioned, with criticisms that Tiger Teams were often composed largely of contractor (rather than DOE) employees, that the same people who sites hired to help them prepare for Tiger Teams then served as the auditors, and that some Tiger Team members behaved in a less than ethical fashion (i.e., offering paid consulting services to fix problems that they had identified during their visits).

Now instead of writing a document to fix the problem, we're going to be writing an action plan telling the Tiger Team how we're going to write the document to fix the problem. So the Tiger Team placed another layer in the process of doing the job, delayed things from getting fixed...I know some audits are necessary, but every time you have an audit, you have to take somebody off of doing productive work while the audit is going on.

Contractor

Everybody would love to have the Tiger Team at headquarters.
DOE HQ

I think where it gets to be frustrating is they [oversight groups] often times are populated by people who know little about the business. They're subcontracted out.
Contractor

One of the things we thought was pretty unethical about one of the Tiger Team members was he wrote three or four findings on one of the information systems data bases that we have and then called back after the Tiger Team was over and asked if the system people could consult with his company in developing a system for them.
DOE FO

Other oversight groups were similarly criticized. The Defense Nuclear Facilities Safety Board (DNFSB), in particular, has taken hits. It is widely faulted by external stakeholders as being worthless from a public standpoint; it collects a wealth of information, but that information is inaccessible to the public. Further, the chairman of the Board is himself a weapons retread, therefore, suspect in the public eye.

I think the Conway Board gets an extraordinary amount of information. I think the Conway Board is loathe to disclose anything to the public...Those guys are used to operating for the most part as insiders and in an inside game and very little gets out to the public...So from a public standpoint, the Conway Board is close to useless.
Local Activist

The GAO (1991d) has commented on the functioning of the DNFSB as follows:

> Safety Board actions that could erode the public's perception of the Board's independence include (1) communications with DOE or its operating contractors that could appear to be informal recommendations or suggestions to DOE and (2) the use of DOE contractor employees to conduct safety Board studies. The Safety Board has no written criteria or procedures to govern its actions in these situations.

At DOE's Savannah River facility, DOE changed its seismic program in response to discussions with Board members about the Board's safety and health concerns. Although the Board issued no formal recommendations to the Secretary of Energy, DOE took corrective action. While discussions between Board members and DOE may improve safety at the facilities, the informal nature of these actions limits public awareness of the safety and health problems, the Board member's concerns, and DOE's actions, as well as eliminates the opportunity for public comments. In addition, formal recommendations require a DOE response and implementation plan that the Board can use to determine the adequacy of DOE's corrective action.

4.2.2.4 Public Relations Issues

Within the area of public relations, stakeholders unanimously cite the need for more effective interactions between DOE and the public. Many prescriptions were given for improvements in this area. One of the most commonly voiced was that DOE needs to be the one to tell any bad news first, and in as much detail as possible. Otherwise, "they will always look like they have something that they are trying to hide."

External stakeholders complain that there are inadequate mechanisms for providing input on orders, standards, policy, and requirements, and that their input is not taken seriously.

I thought that we were really going to have a chance to discuss the DOE priority system, and it became apparent that the process was too far along, and they've spent too much money, and it really isn't open to much public input.

National Activist

Most people agree that public meetings, led by public relations specialists, are probably necessary, but are not a particularly good way to exchange information with the public. Additionally, stakeholders suggest that DOE allow the "public" access to technical people within DOE. The rationale is that the ability to engage in technical dialogue would enhance

trust, because it would foster the idea of dealing with "a real person" and also because the technical experts have available both the facts and uncertainties needed to set realistic expectations. It is a widely held view that delegation to the field would improve local credibility, as the FOs are seen as being more willing to work with the public and more technically credible than HQ.

> *I don't trust [site representative] any more than I trust Leo Duffy. But I think at least that there were some conversations that we had over the course of the last six months where I think he has revealed things about the process of [site] in terms of cleanup and how they're doing the ranking and how they're doing their budgeting, which have been a lot more realistic than what headquarters describes that process to be, which is sort of like a fantasy about what's going on in the Ops offices.*
>
> *Local Activist*

> *My experience has been that the public wants to deal with the folks who are doing the work. They don't want to deal with a bunch of go-betweens.*
>
> *Contractor*

OTA (1991) notes that "Serious and sustained efforts will be required to educate community members about technical aspects of the contamination, proposed remediation plans, and associated problems or scientific uncertainties. Similarly, DOE managers and technical experts must solicit, acknowledge, and respond to the health concerns of local communities." Like the stakeholders we interviewed, then, OTA seems to favor increased technical dialogue with the public by technical experts.

> *Share what we know when we know it. Tell people what the problems are and the uncertainties. We need to be the first people out the door with the bad news. We are always the first people out the door with the good news. We don't gain any credibility when we go out and tell good news. We gain our credibility when we go out and tell bad news.*
>
> *Contractor*

> *When you tell just part of the story, you give the public the impression that you're trying to hide something.*
>
> *Contractor*

We have to get to the point where they [the public] accept them [the things going on at the sites]. The way we do that is not with a bunch of PR folks going out and trying to do a snow job and convince folks and sell the site. And not with a bunch of slick brochures and fact sheets and those kind of things. The way we do that is that we make ultimately the technical project and program managers accountable for public interactions.

Contractor

Finally, many people suggested opening the sites for public inspection via tours and other outreach activities. Again, the rationale is that exposing "the public" to real people employed at the sites will enhance confidence to some degree, and that removing the secrecy that has traditionally surrounded the sites will also remove some of the fear (i.e., fear of the unknown).

They [the public] appreciated it that we went around and shook hands and said "hi." A lot of people like having some contact and when they meet someone who works at [the site] they like to shake their hand and raise the confidence level. The highest level of confidence came from knowing someone who worked at [the site]. They have a high level of confidence by seeing [the site], so we do tours of the place...Familiarity is very important to making people feel confident.

DOE FO

4.2.3 Implications for EM

The credibility of the EM organization has been criticized by the public, by government officials, and, at times, by DOE management itself. As past errors and omissions are disclosed, DOE people are accused of having been incompetent, of having concealed the truth, or even of having lied, and of leaving a huge legacy of contamination for others to deal with. Those views result in another legacy, namely a mistrust of DOE's competence and truthfulness, that seriously affects EM's ability to do its job well.

Many of the manifestations of lack of trust within the DOE family, such as the centralization of functions at HQ, formalization, and the increase in

audits and inspections, have the effect of increasing the administrative workload to the detriment of technical work accomplishment. For example, requiring additional approvals at the HQ level means that more people/time are needed at HQ to review documentation. Increasing the number of orders means that more people must spend time in verifying and documenting compliance. Time spent preparing for audits and hosting auditors means time away from "real work."

The increase in the administrative workload brought about by lack of trust also has an effect on external credibility, namely, that information requests at all levels are delayed, giving the perception that DOE is being less than forthcoming. In addition, the fact that technical work is being impacted gives the impression that little progress is being made on cleanup.

On the positive side, though, there is general agreement that DOE is working hard to improve its credibility. Stakeholder representatives indicate that *individuals* within DOE are making an attempt to communicate more openly. But, there is no consensus on how well DOE's efforts are working, just a general feeling that more needs to be done. There is the feeling that a "cultural revolution" in which DOE as an entity fosters open communication has not yet happened, but is needed.

Quite clearly the issues impacting DOE's credibility are complex ones, and ones in which there is a great potential for backlash from one or more stakeholder groups. Indeed, it may be that dealing with the lack of public trust is on the critical path for DOE's accomplishment of its technical mission. Not only does EM need to arrive at technical solutions to waste problems, it

needs to convince the public that those solutions are *credible*. The ability to be seen as credible is inherently linked to trust.

Numerous suggestions appear in our interview data for how DOE might better respond to public concerns--through greater openness, more public interaction, increased external oversight, etc.--thereby building public trust. But, some of these suggestions would no doubt have the effect of further alienating internal stakeholders, especially at the field and contractor level. Increased oversight, for example, would likely be viewed negatively at the sites, not because of any inherent belief that oversight is a bad thing, but because of the disruption of work and message of lack of trust that such action would convey.

Thus, it is very often the case that DOE is in the position of needing to optimize its strategy to satisfy competing requirements. This is an area where DOE needs both a clear view of stakeholder goals and objectives and a mechanism for assessing the impact of its proposed actions on various stakeholder groups and planning mitigation activities if needed. Our Phase II research should give further insight into cause-effect relationships impacting credibility and trust.

4.3 Impediments

Kent F. Hansen

Abstract

Progress in carrying out the cleanup mission has been very slow, to the extent that concern with progress emerged as a frequent issue among various stakeholders. Numerous sources of delay, or impediments to progress, have been suggested. The most frequently cited impediments were: unclear work priorities; unclear cleanup and/or management standards; a lack of appropriate technologies for some work to be done. Those factors impact the EM management task directly in terms of carrying out cleanup work, and indirectly in terms of morale of personnel, public perceptions of DOE, and the potential of failure to meet compliance agreements.

There is a widely held perception that DOE has made very little progress toward the physical cleanup of weapons complex sites. The lack of progress is particularly bothersome in view of the very large expenditures on environmental restoration and waste management the last three years. Total EM expenditures for FY90 through FY92 are about ten billion dollars. In spite of these expenditures, observers within and without the complex itself agree that almost no cleanup has occurred. The objective of this paper is to identify how stakeholders view the situation and to identify the causes which they believe have impeded progress.

In the next section we summarize the observations obtained from the stakeholders interviewed and present a distillation of impediments revealed by the interviews. There were many reasons cited for lack of progress, such as inadequate funds, inadequate manpower, political interferences, etc. We have

focused on only three impediments because they were the most frequently mentioned and had the greatest impact on progress. The other impediments are in various issue papers. In Section 3, EM's Arena, we present some analysis of how different types of EM activities are affected by the impediments.

4.3.1 Stakeholder Observations

Stakeholders had varying explanations for the slow rate of progress in effecting the cleanup. Most of the opinions could be characterized as one of three major factors that impede the cleanup work. These three are:

- a lack of appropriate priorities for the work to be done;
- a lack of standards regarding how the work should be done;
- a lack of adequate technologies to conduct some of the work.

4.3.1.1 Work Priorities

The issue of work priorities was seen as a continuing, important factor by almost all stakeholders. Each stakeholder (or stakeholder group) has its own priorities which it attempts to impose upon DOE. Usually these different priorities are in conflict. The Department faces the difficult task of maintaining a balance betrween the many conflicting views, as well as the political pressures that accompany some stakeholder groups.

There is the perception amongst contractors and DOE FO personnel that HQ is guilty of inadequate or even conflicting signals about priorities. The consequences are manyfold, including:

- An inability to do integrated planning on a site-wide basis.

  There is a lack of priorities from the DOE on work to be done. Further, there is a lack of commitment by DOE to those priorities that already exist for work being done. [Site] cannot do integrated planning without an agreement from DOE on priorities.

  Contractor

- A sense that money is being wasted on unimportant problems.

  We don't have enough money to do everything simultaneously. So we ought to be going after the problems that present the biggest hazard to the public and the environment. We can't even do that.

  DOE HQ

- The view that rapid changes in priorities create delay and disruption in work as funds get reallocated.

  So we're always changing. We're always either revising projects in midstream or something, because funding gets cut at the last minute. There seems to be an inordinate amount of time spent on funding, and very little, less time on execution of the projects.

  DOE FO

- Too much activity takes place in a "fire-fighting" mode which is inefficient and disruptive.

  The 'fire-fighting' mode of current operations is counterproductive. Everything is given immediate priority with a consequent paralysis of action.

  Contractor

- The lack of priorities leads to a diffuse, mediocre effort on too many projects rather than a focused effort on appropriate projects.

  The lack of prioritization finds us often going off in one direction, getting redirected by DOE, then going off into another direction and being redirected. So it results, not only are we short on resources, but lack of prioritization often results in inefficient use of the resources we have. And I think that might be complex-wide.

  Contractor

- Morale of FO and contractor personnel is adversely affected by ever-changing priorities, and a lack of a sense of direction.

> *Priorities are not clearly established and not formally documented. And they change weekly. And that's a morale buster, because you don't know where we're headed.*
>
> *DOE FO*

Stakeholders put forward several reasons for the difficulty in setting clear priorities. The contractor and DOE personnel frequently mentioned the conflict in objectives between Defense Programs and Environmental Restoration and Waste Management (EM), or between EM and Environment, Safety, and Health (EH).

> *There apparently continues to be just basic, fundamental differences and rivalries, intramural warfare, going on between the different departments that I don't think helps the complex a bit.*
>
> *Contractor*

> *So, almost all implementation of orders, budgeting, prioritization, everything we do there, we get two sets of instructions, one from Defense Programs and one from Duffy's outfit, and they're never consistent.*
>
> *DOE FO*

There was widespread appreciation of the fact that setting priorities is a political process, as well as a technological process, and a lack of consensus amongst influential actors is a major impediment. Most contractors and DOE staff felt it would be useful to have a risk-based priority system. However, they were appreciative of the difficulty in DOE adopting such a priority system.

> *If we think that a technically-based priority system is going to answer all those questions, we are kidding ourselves. The point there is, we should have some good reasons for setting priorities. But we also need to understand that there is going to be influenced heavily by politics, particularly by Congress.*
>
> *Contractor*

... although on a legislative basis, I mean, we still fight that issue tooth and nail...just anathema to discuss the concept of priorities in any legislative sense.

Congressional Staff

A final difficulty cited by DOE staff was the impact of compliance agreements on the ability of EM to set its own priorities. The existing agreements represent legal commitments by the Department that take precedence over the order in which work is done.

The bottom line in terms of cleanup is, how fast is fast enough. And the budget issue is directly linked to the prioritization. All of these things are kind of hooked together, non-compliance is an issue on the part of the states.

DOE HQ

The only way to accomplish this in the given legal and regulatory environment is to play hardball in these compliance agreements. And when we feel like we need to change priorities or alter the agreement based on new information on what the hazard is, I think we just have to fight for what we think is right.

DOE HQ

The problem we've got now, though, is I think we are entering into so many compliance agreements with the states that we are not going to have the money to fund all of those, and where are you going to go then?

DOE FO

4.3.1.2 Standards

There were many references in the interviews to standards, or the lack thereof. Two distinct types of standards were alluded to. The first reference is to technical standards for safety, health protection, and/or cleanup. These are basically physical standards. The second major use of the word related to managerial standards for measuring operations performance. We discuss observations on both definitions below.

There was widespread agreement amongst contractors and DOE staff that a serious impediment to progress was the lack of clear cleanup standards for contaminated sites. The ability to properly characterize a site and then plan and conduct cleanup requires a definition of the levels of cleanup required. Many interviewees expressed concern that there was no consensus, or guidelines, on how clean is clean.

> *There's no top level headquarters standard for what some of those regulations are. From an ER standpoint, how clean is clean? What is the criteria as you go and approach one of the cleanup sites? We think that's a fundamental issue; it just has to be worked.*
>
> *Contractor*

> *... the cost estimates just keep escalating and people want to know why they've gone up. Why didn't you do it right the first time? Geez, when you don't know what the standards are, and that sort of thing, or where you are getting fake assumptions, what the heck can you do?*
>
> *DOE FO*

> *To a pre-existing, pristine environment--not doable. I don't know of any technology.*
>
> *Federal Agency*

The same stakeholders expressed a need to establish a *de minimis* risk level, or levels of contamination below regulatory concern so that cleanup and restoration could proceed in an efficient manner.

> *There's no de minimis standard. Headquarters has said that the minimis number is zero. That's a pretty absolute number.*
>
> *Contractor*

> *So finally we say we'll ship it to Europe, they've had enough guts to come up with a de minimis standard.*
>
> *DOE FO*

There was some view that DOE would make progress, and increase its own credibility, if it would adopt standards set by the Nuclear Regulatory Commission or the EPA and stop trying to create its own standards.

The way around that lack of credibility is DOE should not have their own regulations. They should comply with EPA and with the NRC. If they don't have something in the way of regulation that DOE needs, DOE should ask one of these other regulatory agencies to provide the regulation.

Contractor

There was some dissent from the general view that radiological standards are too conservative.

Even though some say there's more openness on DOE's part, it is still resisting state standards that are more rigorous than federal--the resistance is at all levels: HQ, plant, and contractor.

State Official

... I would say they aren't stringent enough. So there's that side, but how practical is it to meet those standards? I'm not sure and I guess I'm less sensitive to that issue than, hey, this is the goal, let's try to meet it and let's just not try to skirt the issue of health and safety.

Local Activist

There was a second context in which standards were identified as impediments to progress, namely the management standards that influenced how work is carried out. This interpretation was very frequently cited by contractors. The general feeling was that DOE HQ imposed standards for policies, procedures, and reporting that were excessive and led to inefficiency, confusion, and wasted time and effort.

I still understand the basic, fundamental idea, I believe, behind all this thing, that it's trying to get this standardization within this agency so that we know that we're doing the same things across the system in the same ways. And that's, you know, I think that's critical to the success, the eventual success, of DOE in its efforts to clean up all of these facilities and these sites. [Q: Can you have standardization and still allow enough room to accommodate the obviously different situations at the sites?] My personal opinion is they're mutually exclusive.

Contractor

... what fills the domain is orders, directives, other requirements. And they're imposed on DOE sites which are GOCO's, Government-Owned Contractor-Operated, through a contract, okay? That is the predominant forcing mechanism. If you may, if you'll forgive me, to approach the stuff on this side of the [environment] through the order standards mechanism is wrong-headed, because you've got seventeen laws that are stacked up before you ever get to an order, or you ever get to work.

Federal Agency

Many contractors expressed explicit objections to the imposition of Institute of Nuclear Operations (INPO) standards upon conduct of operations. There is a clear consensus among contractors that INPO standards were developed for the civilian nuclear power industry and are inappropriate in many contexts for EM work.

Another big issue is when you're getting ready to do some big project, you've got all these people and requirements--NRC, INPO, industry standards, DOE orders, and then things that just make sense, you've got to do those too. We're spending more and more resources on keeping track of those things and tracking where the money goes.

Contractor

Things like INPO good practices. When I came here I thought we'd pick out the good parts of INPO requirements, but now they say we're going to do everything. In some cases they don't fit.

Contractor

There was some sympathy for the contractors' position as expressed by a local DOE official:

I probably am more of a zealot for technical excellence than people would normally perceive because I oppose most of the ideas that centralization and standardization and all that sort of thing because it's been my experience that technical excellence does not come out of a policy book, does not come out of standard rules and regulations. It comes out of individual application of skills, creative knowledge, creative techniques, developing the precise answer to what your circumstances are that you're confronted with.

4.3.1.3 Technology Development

There was a reasonable consensus amongst all stakeholders that some of the cleanup tasks would be extremely difficult without new technologies. The contractor and DOE personnel have the hope and expectation that new technologies can reduce the volumes of waste as well as the costs of processing.

> *So I have a concern in the longer term with waste minimization, and in particular the technology for solving problems in situ without creating large quantities of waste. This must be a major factor in this overall program. We just cannot continue to implement action that creates the quantities of waste that we're creating, because the legacy associated with those waste costs are beginning to grow as a larger and larger percentage of the budget. So that has to be brought under control.*
>
> *Contractor*

The general perception is that new technology is necessary.

> *... we just cannot afford to do everything as an archaeological dig, the way the laws are set up right now. And we need new technologies to make that happen.*
>
> *Contractor*

The public interest groups also advocate investments in technology development albeit for reasons somewhat different from the DOE and contractors. The public interest groups want the cleanup to be extensive and believe new technology will contribute to a higher level of cleanup.

> *... but there's going to be a great need for research and techniques developed to clean it up to the levels we all want, and that technology isn't around today, and there's just going to be a whole lot of brain power needed to make it happen safely, which is our concern.*
>
> *Local Activist*

> *... it'd just be much better to deal with it once, somehow destroy it, or there's transmutation. Have you heard of transmutation? It sounds like turning lead to gold but evidently it's a new technology of these longer-lived radioactive wastes into shorter-lived waste.*
>
> *Local Activist*

In spite of the universal appeal of new technology, there were some criticisms that the actual program is somewhat misaligned with existing needs for new technologies. In some cases the concern was that some R&D projects were inappropriate, whereas other projects might be relevant but would not be available in a timely fashion.

> *On the other hand, from the research perspective, if research isn't directed at a specific need, then it doesn't do you any good. And very frequently, and in looking at a lot of the proposals that have been submitted ... it's almost research for research's sake.*
>
> *Contractor*

> *The typical bureaucratic response to solving a perceived technical/management problem is not going to work in today's environment where we are so subject to outside regulation. ER owns the impact of the problem , but the resolution of the problem gets handed to technology development, a whole other organization that isn't affected by the milestones and the criticality of it, that then develops its own little empire and problem-solving thing whose schedule has no relationship to ER's needs.*
>
> *DOE FO*

4.3.2 Consequences of the Impediments

The major activities at any site can be divided into physical activities or managerial activities. Physical activities include the characterization of the site in terms of waste types, quantities, and distribution. The second major physical activity is the actual cleanup effort which would include recovery, transport, and transformation of materials. The managerial activities include program or project planning and conduct of operations resulting from such planning.

All of these activities are affected by the impediments of priorities, standards, and technology development. For instance, the characterization of a site such as the Hanford tanks requires development of technology for sampling and analyzing tank contents. At the Idaho National Engineering Laboratory

(INEL), the characterization of buried wastes may need to be done remotely using robotic technology not yet available. Even at sites where the characterization is available, it is difficult to plan the cleanup due to uncertainties in policies and procedures as well as how to conduct operations. Limited experience, such as obtained at Rocky Flats, has indicated that the tasks are very complex, time consuming, and expensive.

As a consequence of the impediments to progress, the EM program is in the position of having spent large quantities of money but still facing major uncertainties about many aspects of the problem. Thus, the lack of standards and a definition of how clean is clean leaves the characterization process incomplete at many sites. For the same reason, there remains much uncertainty about the level of cleaning that will be required, the technologies required to accomplish cleanup, as well as uncertainties about what the costs of cleanup will be.

The contractors feel overwhelmed by the managerial and documentation requirements imposed upon them. This is compounded by a sense of uncertainty regarding liabilities and legal processes which, in turn, affects the productivity of the work. Finally, there is great uncertainty about the work priorities for different tasks at the same site, as well as uncertainty about priorities between sites. Compounding the uncertainties is the pressure upon the sites to enter into and then conform to compliance agreements.

The effects of the lack of progress to date are clear. Almost all stakeholder groups are frustrated by the situation and becoming increasingly antagonistic. The loss of credibility of the Department is frequently cited by stakeholders within the complex as well as outsiders. The morale of personnel in the FOs and

the contractor organizations has been adversely affected. There are suggestions that the falling morale has lowered productivity of contractor staffs, and possibly the quality of the work. In the case of facilities that are extremely hazardous, such as the Hanford tanks, there is a concern that a demoralized staff may add to the risks of operations.

It seems clear that DOE will face a more difficult future unless steps are taken soon to resolve the uncertainties and begin making real progress in the cleanup. In Section 6, Phase II Research Topics, we suggest a few topics for research that might assist in overcoming the existing impediments.

4.4 Project Management

Constance Perin

Abstract

All EM projects are subject to the reporting requirements of DOE Order 4700.1, and those estimated to cost $100 million or more are subject to further requirements as Major Systems Acquisitions (MSAs). Currently, about half of the Department's MSAs are in EM. Both DOE field staff and site contractors question the applicability of these requirements to EM's mission, largely because the uncertainties surrounding waste management and environmental restoration activities require more flexibility than the types of projects associated with conventional project management. Meeting reporting and tracking requirements, they also feel, diverts operational resources from remedial activities. They also observe that the budget cycle is out of phase with project schedules and, as a consequence, EM projects have a history of being poorly defined.

Because conventional project management models are oriented to outcomes and products, they tend to neglect the organizational and managerial processes needed for mobilizing the technical, human, and financial resources to achieve cleanup, restoration, and decommissioning. The formalisms of conventional models further overlook the institutional, organizational, and technological contexts of change, uncertainty, and lack of information inherent in EM's mission. The scale, scope, and costs of EM programs suggest that they might better be regarded as mega projects.

Achieving EM's mission depends on such fundamental organizational and managerial processes as information development, information interpretation, strategy formulation, negotiation, learning, and consensus building within and outside of DOE. An organizational strategy that acknowledges the significance of these processes would evaluate alternative project management systems in terms of each system's capacity to develop and facilitate them.

4.4.1 Introduction

EM programs and projects are obligated to meet the requirements of DOE Order 4700.1, the Department-wide project management system. All management policies, requirements, and procedures are also required to conform to this order as well as to SEN-27-90, "Strengthening the Department of Energy Project Management System." These orders and policies define steps for developing program requirements, project development, cost-estimation, and project tracking systems designed to produce monthly and quarterly information about EM programs' progress and expenditures. These data are used in determining whether projects meet various statutory, financial, and contractual obligations. The system structures project objectives into tiered milestones--e.g., projects can slip lower-level milestones if they meet those at higher-levels.

Major Systems Acquisitions (MSAs), which are projects estimated at $100 million or more, are subject to further DOE procurement requirements; currently, DOE has 53 MSAs of which about half are in EM. EM has developed its own system of Activity Data Sheets for each piece of work at a site. Both GAO and the DOE Procurement Office are concerned that EM's reporting systems be consistent with both OMB and DOE requirements. Even though EM's activities and tasks have proved to be difficult to "put fences around," according to DOE's Office of Procurement, they have to comply with DOE Order 4700.1. Stakeholders observe as one consequence that EM projects have a history of being poorly defined, in that dollar requests are not well supported and legal milestones may be defined without having considered the activities required to meet them.

Stakeholders suggest that EM activities and governmental control structures are misaligned in other ways, as reported in the next section. But there do not seem to be inherent obstacles to considering alternative project management approaches, in that the "management concepts" mandated by DOE Order 4700.1 and SEN-27-90 appear to be open to interpretation:

- Identification of basic program and MSA project requirements;
- Description of a systematic process for MSA project development;
- Establishment of cost, schedule, and technical program and MSA project baselines;
- Specification of performance variances from program and MSA project baselines;
- Regular reporting and assessment of MSA project status, DOE (1991b).

For example, EM has looked to EPA for models of project management that might relate to its environmental concerns and the types of uncertainties it faces. EPA has explored those of the Bureau of Reclamation and the Corps of Engineers. The extent to which other models have been shown to be relevant to EM's unprecedented concerns with radiation, potential criticality, and chemical contaminants, for example, is unclear from our research thus far.

Cleaning up land areas contaminated with nuclear and chemical wastes and decommissioning and decontaminating reactor installations have few precedents. The kinds of wastes as well as the criticality and safety issues involved are unprecedented. The sites are vast in scale and scope, and the cost involved are enormous. But current EM project management models

appear to be misaligned with the degree of complexity, change, ambiguity, uncertainty, lack of information, expenditure, and risk that are involved. They emphasize managing to schedules, baselines, and budgets and tend to neglect the activities needed for developing and managing the fundamental organizational processes through which project results are achieved, such as developing and interpreting information, reaching consensus, reducing uncertainties, and learning.

4.4.2 Stakeholder Views

Stakeholders express a range of concerns about the current project management system's affect on work quality and performance capabilities. Because the system requires definite budgetary and schedule commitments to be made on the basis of indefinite and unavailable information, this misalignment appears to exacerbate DOE's general reputation for unsuccessful management of large-scale projects. Not only are stakeholders concerned with how the system affects EM's reputation and credibility with the public and Congress, there are also concerns about its effect on internal relations between HQ and field staff (see Section 4.2, Credibility and Trust). Field officials, site contractors, and corporate-level contractors implicitly express the need for alternative models in their criticisms, without, however, suggesting others that might be more appropriate.

- Off-the-Shelf Project Management Models

  [To have established a different system] would have taken some coordination up front to pull together some key people and to make some conscious decisions on what type of project management system do we really need for doing this type of work. The easy decision was to take DOE order 4700.1, which was required for major system acquisitions, for big buck ticket items, and just say "That's it."

  Contractor

DOE Order 4700.1 imposes a fairly heavy burden [due to] the nature of the number of plans, project management plans, quality assurance plans, data management plans, systems engineering plans. The whole order was built around building a project like a nuclear power plant. And extrapolating that and trying to adapt it to cleaning up dirt, where you don't know what the components are of what you have to clean up, is difficult and has been a challenge and has taken a lot of time....A system engineering management plan is required...these came out of the Department of Defense. And we're really geared around how do you do system design for an R&D project and then transition that R&D project into a prototype and then into a production item. So there's a lot of studies and trial and error. The whole system engineering policy was developed around that. It actually sprung out of NASA and the DOD for putting together complex weapon systems. Well, the DOE order 4700 requires a systems engineering management plan. Now trying to figure out what that is in the context of remedial action is difficult. I just blew it off and said it wasn't necessary, and said that the CERCLA process, the superfund process in itself, was a system engineering process.

Contractor

- The politics of funding drive project implementation.

Apparently there is enough difficulty in getting support for what needs to be funded and enough politics in that so that funding becomes a major issue. Once there is funding, they take off and run with it. For some reason there is a big hole there, where it says you really ought to do your homework and you really ought to make sure that you answered all the technical issues before you start into this design and fasttracking it with all these budgets and schedules and pressures. And more time ought to be taken from the front end during conceptual phases, the initial phases of the project. Or more money put into the R&D aspects. You can run a lot of that in parallel without having to add a lot of time to it.

Contractor

Schedules and audits are based on requirements level but we don't get funded to that level.

Contractor

- DOE Order 4700.1 is difficult to implement in a changing environment.

> *This system was designed to function in the environment of a line item project, where you can spend some time defining the up-front requirements, develop a baseline understanding of the facility and the process that will meet the objectives and can spend the time necessary to go through and implement that. What we're finding is that the situation is so changeable it makes that process very difficult to implement.*
>
> *Contractor*

> *The preferred way to work would be for top level goals, strategies, and objectives to be agreed upon between the project office and upper DOE management, whether that goes to Albuquerque or Leo Duffy or to the Secretary of Energy. Once there are upper level goals and objectives are identified and the schedules and budgets baselined, then the project office should be able to go out and execute to implement that and deliver the product without thousands of changes through the year. Over the last two years we've had thousands of changes each year. And we have not been able to maintain the baseline because once we get schedules and people committed and planned and everybody starting to work towards our objectives then we get all these other calls that say, "Oh, no I need this, change this, don't do that, go left...."*
>
> *Contractor*

> *The rigor of the traditional process is too rigorous for direct application to this work.*
>
> *Contractor*

- The system prevents a flexible, experimental approach to technical improvements.

> *Throwing money at technology that may fail is DOE's role. There's more and more pressure to act. The balance between acting and having technology is causing conflict. For example, closure activities involved in decommissioning. The pressure to be perfect the first time is directly in competition with making the situation better. Improvements based on engineering judgments should be made and then continue to enhance and evaluate them. There hasn't been enough thought about how to live with mistakes and at least be making improvements. There are no indications that regulations allow us to do that.*
>
> *DOE FO*

In the [reactor design] work that I've done in the past, we would have goals....and we'd have our constraints, but there was a lot of freedom in developing the end product. The schedules were firm, but the things that took place along the way were very, very loose. We could do a lot of things, and it created a better atmosphere for creativity than what I've seen here so far. The way we looked at many of our situations were, okay here's a problem or here's a barrier or here's a certain situation, we need to solve this. Then everyone would go off and we'd start putting on our thinking caps and start working on solving the problem. The process may be a little more formal in this atmosphere because of DOE Order 4700.1, which lays out in very specific terms how you go about getting to one point to the next. In my opinion, it doesn't leave a lot of flexibility for solving problems.

DOE FO

- Documentation takes time and resources away from operational activities.

Even though faster, better, cheaper is a clear goal and everyone wants to do that, the basic management structure of DOE does not provide any incentive for that to happen. Project management requirements are extensive and burdensome because they require documentation in great detail of cost and schedule. Developing clear cost and schedules on EM projects is extremely difficult and time consuming.

Contractor

My activity data sheet is a basic component of the five-year plan. So we're getting that kind of direction. We're also getting direction on the SEN-25 side of the house that says, "We need all of this project management system documentation, which relates back to the DOE Order 4700 that says you'll do things like you'll do technical logic. And you'll do work breakdown structures and you'll do monthly reports and schedules and all of this kind of stuff"....So immediately we are thrust into two separate reporting requirements. That gets even further complicated by different kinds of reporting requirements that we see coming out of the controller's organization....Pure financial stuff. "We want things reported this way," which happens to be different from any of the other two....We end up putting a lot of resources into administrative work, rather than taking the money and the staff and putting them into actual cleanup.

Contractor

You go through a process that's called "remedial investigation," a feasibility study that says, "based on this characterization, here are the various techniques we would use." That process, from the time we start the work plan to the time we get the record of decision takes anywhere from four to seven years, per operable unit. Just paperwork. Before you turn a shovel out there to do any cleanup takes four to seven years. And then you wonder why the money is going down the tubes.

Contractor

- Field input is missing.

But [HQ] also don't seem to understand that in the field we do think and we do develop systems. For example, project management and environmental restoration. We started quite some time ago implementing project management systems in that program. Had an implementation plan for 4700.1. Headquarters decides they need to develop a system but they don't request any input from the field. So they're developing something out there in their own little black hole not caring that we're spending time, money, and resources development a program, as was Hanford, as was Albuquerque, at the same time. What they're coming up with and what the three of us are coming up with aren't going to be the same.

DOE FO

- Unmet program goals widen EM's credibility gap.

If you look at the history of DOE's management of big projects you would have to say they have almost a 100 percent chance of failing in the clean up. Because they failed in virtually every other large project they've managed in the last fifteen years. Anywhere from 50 to 100%, 200% cost overruns, years behind schedule. The record shows the complete lack of management capability in DOE. And part of it has been on and off again funding in Congress. But for the most part it's been overselling, understudying problems, promising too much too soon, and launching off on things that they just aren't prepared to do and have no capability for managing.

National Activist

- HQ and site personnel report differently to the public.

> *The assistant plant manager has revealed things about this site in terms of cleanup and how they're doing the ranking and how they're doing their budgeting, which have been a lot more realistic than what headquarters describes the process to be, which is sort of like a fantasy about what's going on in the Ops offices.*
>
> *Local Activist*

- Once project schedules are set, HQ staff may be unresponsive to technical issues at sites.

> *DOE does not do their technical homework before they get into a major project and DOE project management division does not want to deal with technical issues once [projects start] because those people get their gold stars by staying on schedule and within budget. So if the project is started and you haven't done your homework, nobody really wants to hear about the issues, because they will either cost money or run into a schedule slip.*
>
> *Contractor*

4.4.3 Implications for EM and DOE

EM programs are characterized by their complex inter- and intragovernmental contexts, their high degrees of scientific and technical uncertainties, and their enormous scale, scope, and cost. To what extent does the primary management control system align with these characteristics?

4.4.3.1 Project Management Systems Appropriate to the Characteristics of EM Programs

EM programs have two main characteristics. First, they are defined and implemented in institutional, organizational, and technological contexts that require managerial and organizational plans and actions no less significant than technical performance. Second, the scope and timetable of EM's mission

are at a scale comparable to if not exceeding the great public works of recent history. EM programs readily classify as "mega projects," defined as "any collaborative project which requires knowledge, skills or resources that exceed what is readily or conventionally available to key participants", Morris (1988). Because of the length of time mega projects require, they are subject to unanticipated changes of all kinds--in the availability of funding, political commitment, and material and human resources, for example.

EM's programs also reflect the characteristics of DOE programs as a whole. These are, according to Joseph S. Hezir of the US Office of Management and Budget:

> Very expensive and multi-year....
> Many scientific and technical uncertainties....
> Very complex and on the cutting edge of US science and technology...
> Very extensive, complex, and often contentious interactions with outside groups....
> One-of-a-kind projects....
> Involve interactions with other federal agencies....
> Rely on contractors....
>
> GAO (1991c)

These characteristics suggest that EM activities depend so greatly on external resources that EM's organizational and managerial processes are as much geared to these contexts as to its own program activities.

4.4.3.2 Institutional, Organizational, and Technological Contexts of EM Programs

Appropriate project management systems would also take account of the characteristics of the contexts in which EM's work occurs. Conventional project management logics are arranged to meet legal and administrative requirements--e.g., assessing contract fulfillment, tracking EM expenditures,

and reporting program progress to OMB and Congress. But these administrative logics generally fail to take account of the institutional, organizational, and technological contexts of EM's programs. These can be prime, structural sources of "delays" and "schedule failures."

- *Institutional contexts* consist of the inter- and intragovernmental activities EM engages in to comply with DOE Orders and other internal regulations, to meet regulatory requirements by defining and implementing tri-party compliance agreements with public participation, and to get budgets approved to meet these obligations;

- *Organizational contexts* are central to such EM activities as planning, designing, and staffing EM program implementation;

- *Technological contexts* form the background to choosing technical objectives, assessing their feasibilities, and estimating the availability of appropriate tools and techniques.

The public's and Congress' expectations of EM program accomplishments have been set by schedules and milestones likely to have been defined without taking into account the managerial and organizational processes that these contexts require. The institutional, organizational, and technological contexts of EM's programs tend instead to be regarded as sources of delay and failure rather than recognized as part and parcel of program implementation. By the same token, as a consequence of being neglected, few if any performance criteria exist with which to set expectations for program implementation within these contexts.

As it stands, project management concepts are generally the same across construction engineering, industrial production processes, procurement functions, and cost-accounting. By setting budget and time horizons, they clarify and guide activity sequences and commitments. Yet these concepts also set up both external and internal expectations of schedule adherence, measurable outcomes, and tangible products. These particular expectations may be more appropriate in conventional projects than in projects with the higher degrees of complexity, ambiguity, uncertainty, expenditure, and risk that constitute EM's mission. Other kinds of expectations for productivity and effectiveness commensurate with the activities involved also need to be set.

The fact that conventional project management logics and decision-making can adapt to contingencies and changes does not adequately deal with deeper differences between EM's mission and more predictable activities, such as building construction and routinized production processes. EM's performance is evaluated in a rigid system that penalizes for "delay" and "failure to meet milestones," for example, instead of providing positively for the flexibility needed to surmount problems (see Section 4.6, Delays). When "delay" is the term used to describe the time used to negotiate differences, achieve commitment, and solve problems, for example, it is mistakenly pejorative. But if these activities are not anticipated in the schedule, yet inevitably (and constructively) occur, not only have they been neglected but they are disparaged as well.

When expectations for performance are not met and cannot be met due to operational uncertainties and lack of technical information inherent in

much of EM's work, those responsible--both contractors and DOE staff--become dissatisfied with their own performance yet feel helpless to do better. Internally, staff morale suffers, and externally, credibility with Congress and the public suffers.

It is already far from simple to define the administrative logics of EM project management, and it is even more complicated for project management paradigms to take institutional, organizational, and technological contexts into account. For example, in the current institutional context, Congressional budget approvals may drive implementation activities and distort program objectives. One result is that the conceptual work (simulations, experiments, prototypes) needed up front may be neglected, thereby leaving a "big hole" in project logics, as a site contractor suggested. If this result occurs regularly, then a project management system is needed that can acknowledge that this hole needs to be filled.

Similarly, when project schedules and budgets are predictably liable to be renegotiated and adapted to unfolding technical and political circumstances, it clearly signals that the formal logics may not mesh with the substantive concerns of waste management and environmental remediation. The conventional models create expectations appropriate to conventional products, but there are few conventional objectives in EM's mission. Stretching the activities of remediation and restoration work to fit the Procrustean bed of cost accounting management appears in many (not all) respects to be counterproductive. Inattention to the management processes necessitated by EM's contexts may contribute to widespread complaints that EM's mission is unclear, that accountabilities are ambiguous, that communication is poor, and that priorities are missing.

4.4.3.3 Scale, Scope, and Cost of EM Programs: Mega Projects

To frame EM programs as presenting a conventional engineering challenge not only does them a disservice, but misleads. They are mega projects with unique characteristics that make them more dependent on their institutional, organizational, and technological contexts than conventional projects. But mega projects generally are often not understood that way: "Faced with the difficulties of a mega project, conventional managements take refuge in studying what they know best; hence, the huge engineering studies often undertaken on projects that will later fail for nonengineering reasons," Sykes (1990).

In addition to neglecting nonengineering factors, mega projects have the following characteristics that often explain their rates of failure, according to analyses of a number of studies that evaluate the sources of project overruns and of project success and failure, Morris (1990, 1988):

- Large numbers of stakeholders with whom relationships have to be managed;
- Difficulties in estimating costs;
- Difficulty recruiting senior managers because results take a long time and can damage their career;
- Scarcities of competent people and/or high turnover.

after Sykes (1990), Morris (1990)

In addition, given the length of time mega projects take, regulatory standards and engineering practices and standards can change and changing interest rates can force projects to stop and restart, for example.

Considering the extent to which EM's mission should be defined among the mega projects of our time is one way to clarify the policies behind its strategic choices. Equally important, this could help to orient the expectations of staff and constituents. Through this exercise EM might better identify its sources of uncertainties and design strategies required to reduce them. Other questions need to be considered, such as: Is EM engaged in a temporary or a continuous enterprise? How do its programs divide between purely engineering tasks and organizational-institutional-technological tasks? How are its programs phased, vis-a-vis manpower resources and technological developments, and how do these mesh with budget cycles?

Program by program, such characteristics should govern choices not only of appropriate project management systems but of organizational designs as well. These structures should outlive the personal capabilities of "leaders" or "champions," no matter how gifted they may be in managing bureaucratic and political environments.

4.4.3.4 Alternative Project Management Systems

Missing from stakeholder discussions and from discussions with DOE HQ staff are alternative concepts for project management that are more consonant with EM's objectives, financial and human resources, and the scientific, technological, and political constraints it faces.

When asked whether other types of project management models were being considered for EM activities because its mission is a major departure from previous Departmental concerns, a staff member in the DOE Procurements Office replied that clearly experimental work would not be

closely tracked, but because EM's work is strictly operational the project management system is appropriate. EM and DOE need to consider the circumstances under which that perspective can be supported. Can fulfilling EM's objectives be categorized across the board as singularly operational? Can "close tracking" accommodate every kind of trial-and-error, simulating, and prototyping activity that may be appropriate to reducing the uncertainties inherent in EM's programs?

To carry out operational procedures, project management systems rely on developed scientific principles, standards, or consensus. In EM's case, one goal is to apply these in the form of risk-benefit ratios rather than as statutory or regulatory standards. But neither the information nor the consensus are at adequate levels for immediate application. So few principles and standards readily translate to waste management and environmental restoration activities and so little consensus exists around interpretations of risk data that to accomplish its mission, EM by default is oriented more toward experimental or incremental work than toward operational performance. (See Section 4.3, Impediments.)

The high levels of information deficit almost guarantee that operational staff will make mistakes or try out new approaches as they develop new information to lower the deficit. But project management concepts foster expectations of being "perfect the first time," which prevents learning "how to live with mistakes." When new information is absorbed to influence procedures, policies, and routines, organizational learning is occurring, as changes are made in a spirit of experimentation and continual improvement. But when only ultimate results are rewarded, these organizational processes are jeopardized. Although EM programs appear to

require only straightforward technical implementation, their inherent uncertainties align better with an attitude of experiment and discovery, Cook, Emel, Kasperson (1990).

EM activities that consist mainly in defining and solving problems instead of applying known techniques to well-defined problems require project management principles tailored to exigencies and organizational learning.

4.4.4 Conclusion: Management Systems And Organizational Designs That Align with Program Characteristics

Under the conditions of technological, political, and social change and uncertainty that will accompany EM's mission into the next century, organizational strategies that value learning and continuous improvement are needed. A project management philosophy designed around such goals can be a powerful tool in coping effectively with uncertainty. A first step in developing that philosophy or theory of project management is to assess each program's needs for information. The second step is to redefine information development and interpretation processes as themselves "projects" with as high a priority as program implementation.

These shifts in emphasis also imply shifts in managerial competencies. In situations where projects face few uncertainties, project management can proceed "by the book" and concern themselves most with control and content and least with process issues. Technical competence is primary. But in contexts where projects are more vulnerable to failure, managers need to be able to give top priority to process issues and secondary attention to control and content issues, Buchanan (1991).

4.4.4.1 Reducing Uncertainties and Developing and Interpreting Information: The Tasks of Management and Organizational Design

Organizational and managerial systems differ and should differ according to the ways they approach the necessity of identifying, collecting, and processing information to reduce uncertainty, Stinchcombe (1990). This hypothesis suggests that organizations do not operate and cannot be designed "as a whole." How their constituent units each identify, collect, and process particular kinds of information needed in its particular environment shapes both organizational design and managerial practices. Each EM program differs to some extent by the kinds of information it needs and can get, and within each program, specific projects further differ. Doubtless there are also commonalities across programs.

The information developed in conventional project management models often does not help in the management task, according to GAO staff we interviewed, for two reasons: Those using the information to manage with may not have been consulted in setting up reporting categories and the available information therefore is not relevant, and/or the available information is out of date. In EM's case, the problem is again deeper: Conventional information categories are unlikely to tell the stories of many projects, and more often than not, the information that program managers need is in any case unavailable.

Management science and organizational design are centrally concerned with uncertainty-reducing processes--information development, information interpretation, strategy formulation, consensus building, and reaching commitment. These constitute most of the work that field and HQ staff do to

meet their fiduciary obligations. Not by design necessarily but certainly by default, conventional project management models obscure their importance. When expectations are oriented to milestones and products, these critical processes can be seen as "just paperwork" or painful and disparaged up and down the chain of command.

In considering alternative project management systems, the first question is, to what extent do which they align with the particular characteristics of each EM program, and above all, with the uncertainties and information deficits that affect them? How do current project management paradigms and alternatives align with:

- The state of scientific and technical knowledge about waste management and environmental restoration?
- The processes involved in defining and implementing compliance agreements?
- The federal appropriations cycle?
- The iterative work processes involved in cleanup, restoration, and waste minimization?
- The social, political, and organizational processes in technical-political decision-making?
- The organizational feedback and incremental learning processes necessary for efficient and effective implementation?
- Situations involving short-term certainties and long-term uncertainties?

Other questions are: What do the answers imply for the internal organization of EM? Are programmatic or functional divisions the most effective grounds for managing complex projects where "cross-cutting issues...come together"? Can conventional project management models consolidate activities across programs and acknowledge that they need to be managed as mega projects?

> *EM 40 has their fence around their money, EM 30, EM 50 has the fence around their money. But what I'm talking about is where you get these cross-cutting issues that come together. You've got interrelationships like the contents of the single shell tanks....Putting together an integrated program covers not only the people that are treated in 30, but who have to deal with the tank in 40 to get rid of it. How are those integrated schedules forced upon, requested from the contractor, to get those put together, and how are they brought into one single unified package?....You've got to make sure that the intertwining logic between those milestones is fully laid out.*
>
> *Contractor*

As Section 4.1 Organizational Design and Fit suggests, shaping the organization as a tool for carrying out its mission--and changing its shape as program phases and circumstances warrant--is a primary strategy for successful project management.

4.4.4.2 Viewing Managerial and Organizational Processes as Products

Drawing on conventional project management models implies parallels between EM's mission and large-scale construction projects with engineering challenges--e.g., dams, the supercollider, nuclear power plants. Although some EM projects may be wholly construction projects or include construction phases (e.g., rehabilitation or replacement of tanks), most are different in kind. Given the many unknowns, EM activities are in practice

dependent for their success in carrying out organizational and managerial processes that allow them to achieve products.

Spelling out the activities and processes needed for developing and interpreting information, reaching consensus, and making commitments in project management documents and reporting requirements would make the performance of these as important as any other kinds of outcomes. A study of DOE's policymaking process suggests that as important as it is, nevertheless the process of interpreting information, for example, is little valued organizationally, Feldman (1989). Situating the development and maintenance of these processes themselves as "subprojects" within every project could help to change that. Given the magnitude of external and internal changes that have occurred and that will continue to occur throughout the years of EM's mission, the importance of these processes looms large. But they also should be seen as experimental and flexible, to be reviewed and improved as lessons are learned and conditions change.

4.5 DOE - Contractor Relationships

Jerome A. Morzinski

Abstract

Relationships between DOE and its contractors reflect fundamental changes that are taking place throughout the complex. The sites are subject to more rigorous accountability measures and increased headquarters control, and those changes have several consequences.

Efforts to make contractors more accountable for their work are matched by contractor actions aimed at ensuring that they don't bear more than their fair share of risk. Contractors and field office employees are concerned about liability. The response, in some cases, is to do more than necessary, which will add to the cost of cleanup.

Site stakeholders feel overwhelmed by what they see as multiple and redundant audits and reviews. They feel they are visited so often that they can't get their job done and would like to see headquarters coordinate those visits.

DOE doesn't have the resources to do all its work with federal employees, and so makes substantial use of support service contractors. The potential problems of loss of control, increased cost, and conflict of interest may make the cure worse than the disease.

Plans to create Environmental Restoration Management Contractors are little understood or accepted outside of headquarters. The ERMC will have to play by the same rules as the M&O contractor, but will be handicapped by startup and integration problems.

In general, contractors and DOE field office employees think they should be working together more closely, but see several things that push them into more of an adversarial relationship. Other stakeholders think the relationship has been too cozy all along, and that it's about time DOE started to exert proper management and oversight of its contractors.

Relationships between DOE and its contractors are undergoing a transformation, brought on by fundamental changes that are taking place throughout the complex. Among those changes are increased scrutiny of

DOE by Congress and the public, and increased scrutiny of the sites by DOE headquarters. The entire DOE family is being held to different standards of accountability than has been the case throughout the history of the complex. The new accountability rule, which is intended to hold the contractor responsible for costs that could have been avoided by proper performance, is one example of such change. DOE and its contractors are responding to those changes in ways that affect their relationship.

Much of what follows is colored with a site perspective, quite naturally. Most of our interviews were with site stakeholders; other stakeholders were not as likely to be concerned with the DOE-Contractor relationship as those people who have to live with it every day.

4.5.1 Stakeholder Views

One result of increased public scrutiny is that contractors (and DOE employees at the sites) are subject to higher standards of accountability than they were in the past.[1] Measures (such as the new accountability rule) that are designed to ensure compliance with those higher standards produce other effects as well. Contractors and field office personnel are concerned about liability, and those concerns affect their actions. The sites are subject to increasing amounts of oversight--far too much oversight, in the view of site stakeholders. As DOE changes the way it manages its contracts, the general nature of the relationship is changing so that DOE and its contractors are becoming less like partners and more like adversaries.

[1] It's not just the sites--DOE in general is subject to increased accountability measures, but the main effect is on the sites.

In addition, two other topics arose that bear on the relationship between DOE and contractors: there are concerns about DOE's use of support services contractors and about plans for creating Environmental Restoration Management Contractors (ERMC).

Comments about the nature of the DOE-contractor relationship are summarized in these five categories:

- Liability
- Oversight
- Support Service Contractors
- ERMC
- General Concerns

4.5.1.1 Liability

There is general agreement across all stakeholder categories that the specter of liability affects how people are acting. It includes things such as doing more to minimize liability, to being less open on a personal level, to broader system-wide behavioral changes. Managers will order more characterization studies before acting, or take action based on legal opinion.

> *We check with our lawyers before doing something, which might sometimes overrule how we feel we should proceed on a strictly technical basis.*
>
> *DOE FO*

> *Correspondence has to be signed off by ten or 15 other people, because people are afraid of the personal liabilities.*
>
> *Contractor*

> *With the concerns about going to jail, we're going to take the conservative approach and go beyond meeting all the regulations.*
>
> *DOE FO*

On a larger, system-wide scale, there are fundamental changes in the way contractors and DOE are doing business, ranging from the way contracts are being written to the process of writing proposals and asking for funding. Contractors are changing the way they operate to lessen their liability risk. In response to the new accountability rules, contractors request enough money so that they can be totally in compliance, even though they may not know what "total compliance" entails. They attempt to share liability with DOE by getting DOE buy-in before proceeding on a course of action. At least some field offices feel they need to pass contractors' proposals on to headquarters "as is," including requests for funding, in order to avoid liability.

> *If there is a problem on site, and the contractor says we asked for a certain amount of money and you, DOE, chose not to fund that, they, the contractor, are off the hook. The burden of proof is now on us to show that the problem would have happened regardless of whether he got the full amount or not. So we're in a position where we're forced to pass the contractor's estimate on to headquarters. It's very chancy, with the criminal liability aspects, to attempt to cut the contractor down further than what he's willing to go.*
>
> *DOE FO*

> *We feel we share liability with DOE by telling them what we need, making recommendations, and getting their concurrence. We take a little liability back when we recommend something, but I feel we should be doing that.*
>
> *Contractor*

Contractors generally understand and accept that the new accountability rules mean that they will be more at risk; naturally, they feel they should stand to gain more, too.

> *We won't take on unbounded risk. There must be a reasonable risk-reward relationship.*
>
> *Contractor*

4.5.1.2 Oversight

The sites have to submit to many audits and reviews--entirely too many, in the view of contractors and field office staff. People understand that audits are necessary, but object to being hit so often and so redundantly--they feel the same material is covered by different groups. There is no sense that anyone at headquarters understands what the cumulative impact of the various reviews is. Contractors bear the brunt of those reviews, but DOE employees are affected as well.

> *It wasn't only one headquarters group, we had several. We thought they would send out one unified group with the same goals and intents, but that was not the case. They came with separate goals, with different schedules. And they weren't even headquarters people. Maybe a couple of headquarters people on a team of ten, the rest beltway contractors who DOE hired.*
>
> *Contractor*

> *Operational readiness reviews have been a problem. The contractor did theirs, then DOE did one. We worked with headquarters to resolve their findings, and thought we were pretty well along on that. Then months later some other headquarters groups jump in and review the adequacy of the ORR and have their own findings. So it's a very strung out process.*
>
> *DOE FO*

> *The amount of oversight is excessive, to say the least. This summer past was just one series of audits after another. And it's gotten to where nobody's told us anything new in a year. They're all on our list to do. If they would just get off our backs and let us go fix the things that we have commitments to fix, we'd be much better off.*
>
> *Contractor*

We get a lot of external reviews. And since June, we have a cost quality management team, we've had the independent cost estimate team in, we are getting ready for the OMB audit week after next at the field office, and those three audits collectively have taken about two and a half months of my life, in about a four-month period. That gives me about a month and a half to do four-months worth of work, and I am only one-third time on this program. And so inconsistent, late, contradictory guidance, and just woeful amounts of oversight. All three of those audit teams I just mentioned are all looking at exactly the same thing.

DOE FO

The problem people have with being audited often is that they feel like there isn't enough time to devote to getting their real jobs done.

They want to know what's going on in the field--want to see some progress--and by the way, tomorrow give us all this information. And so we are required to instantly jerk eight people off a job to develop information on estimating the volumes of all our mixed and hazardous waste by type, that's a characteristic example.

Contractor

I have never seen more audits and assessments and tiger teams and special studies in my life go on in an area. The EH part of folks we work with--and the M&O's time is consumed with responding to those as opposed to managing the actual restoration project.

Contractor

We've had three or four budget reviews in the past two months. Duffy's ICE team, the Corps of Engineers, OMB, and there's a fourth one, I can't recall who. Each one of these required significant advance preparation and a lot of time.

Contractor

I don't know whether you've heard about all the ICE teams and OMB reviews, but of the last six weeks, four of those weeks have been dedicated solely to independent audits and reviews of the organization.

Contractor

There is some sympathy for the plight of contractors among other stakeholders, too.

> *In terms of oversight, audits, reviews, what the field regards as redundant, in a lot of cases I think they're right. In a lot of cases we're failing to communicate what we're doing.*
>
> *DOE HQ*

4.5.1.3 Support Service Contractors

There were comments about the tendency of DOE to hire contractors to do work that, in the view of many people, should properly be done by DOE employees. It is felt that DOE loses control by having support service contractors do too much work. Another reason, of course, is cost. GAO criticizes DOE for not using cost estimates when determining whether or not to contract out certain work, but acknowledges that many contracts are awarded simply because DOE does not have the resources to perform the work (GAO, 1991b). It is recognized that OMB puts limits on the number of FTEs that DOE is allowed, and that a large part of the problem stems from that. Nevertheless, the widespread use of support service contractors is seen as detrimental and symptomatic of DOE's personnel problems.

> *The problem now is that we have support services contractors reviewing the results of support services contractors. The DOE is a big player in it. The truth of the matter is, DOE is not in control of that process. Take any evaluation anymore. It isn't reviewed by the feds. It is prepared in most cases by support services contractors and it goes through the review system by support services contractors.*
>
> *DOE FO*

> *There are too many beltway bandits controlling the activities of DOE in Washington, DC. There are not enough DOE people.*
>
> *DOE FO*

Given the quality of personnel DOE (headquarters) has, they're just not up to managing the programs they have. So they tend to hire a contractor, even on simple things like giving testimony to Congress.

Public Activist

Most of the comments regarding the use of support service contractors were directed at headquarters, but field offices make use of them, too, and received some similar criticisms.

We're overwhelmed by outside help, meaning the contractor staff the department gets to supplement its own staff. We have contractors here that supplement the field office, and there are contractors supplementing the staff at headquarters. For each one of those people, we need more contractor staff to respond to their questions.

Contractor

4.5.1.4 ERMC

There is much uncertainty about the creation of ERMCs. People outside of headquarters don't understand the motivation behind the idea, or see why they would be any better than M&O contractors in getting on with the cleanup.

Duffy decided that he would enter into a series of ERMCs. I don't recall, the stated reason, I guess, was that they didn't want M&O contractors cleaning up and profiting at the sites that they had polluted. The persuasiveness of that was, it wasn't very persuasive to me.

Congressional Staff

Nobody out here seems to know really what ERMC is going to involve and that in itself may make the case where the point that the programs or policies are not well enunciated. The contractors we have talked with don't have a good grasp on what the ERMC really is, except that nobody is real happy with the concept.

Local Business

There's a lot of uncertainty with the ERMC. Labor on site is well trained, and don't want to lose job security.

Labor

There is some feeling the idea can be made to work at sites where remediation is the only mission, but people don't see anything to be gained. The ERMC will have the same set of problems as an M&O contractor has, but will be starting over in a sense and won't have the benefits of the existing contractor's corporate knowledge.

At this site, I think that the ERMC does have a chance to work. I think the ERMC, though, is going to be plagued with some of the same problems that DOE has been plagued with and not yet resolved.

Contractor

To give all this stuff to the ERMC and get it out of the DOE system--that's just not the way to get this job done. Because the ERMC comes in and has the same problem. We've got the same rules.

Contractor

There are other drawbacks, too. Establishing an ERMC will interrupt cleanup activities in progress, and there will likely be problems trying to integrate activities of the ERMC with those of the M&O contractor.

M&O contractors have established solid cleanup programs. Their progress should not be interrupted by reassigning responsibilities to new, independent contractors. Integration of waste management activities and environmental activities would be severely hampered.

ACNFS (1991)

One comment on the ERMC concept that is difficult is for an operating facility like this one, we find it difficult to imagine how an ERMC concept could work, just because it is an operating facility and the amount of interface that's required.

Contractor

4.5.1.5 General Concerns

Stakeholders within the DOE family think of the relationship between DOE and its contractors as being somewhere between partners and adversaries. Generally speaking, people on both sides see the need to work with the other side as partners, but think that the current climate (the new accountability rule, e.g.) has pushed the relationship more toward an adversarial one.

> *If he (Duffy) can establish a partnership with those on the site, then we can get a lot accomplished. But if he starts out that we're the enemy or the field office is the enemy, then everybody's going to go into a foxhole.*
>
> *Contractor*

> *As far as the relationship with the contractor, right now it borders on the edge of adversarial, confrontational, and it needs to move away from there into more of a cooperative team effort. With the new accountability rule, everybody is going, well gee, I don't trust him now.*
>
> *DOE FO*

Again from stakeholders in the DOE family, there are some feelings that DOE is being too hard on its contractors, not "working with them" in a cooperative atmosphere.

> *The mode, it is more of a, "Let's see how we can go out and get the contractor. Let's go out and see what we can find. And where we can hammer them over the head or where they are messing up." That seems to be more of a common flavor than the, "Let's work together as a team."*
>
> *Contractor*

> *I still have managers that like to point fingers as to who is to blame and they want to write this letter expressing their unhappiness. Like, look at what you have done. I don't think that's the way to do it. We need to work together and I strongly believe that they are very willing to work with us.*
>
> *DOE FO*

In stark contrast to those comments are the views of some stakeholders outside the DOE family. To them, DOE has been too much of a partner with its contractors for too long, and has not adequately exercised its proper role of oversight.

> *DOE as a government oversight body has not provided adequate direction and oversight of the contractors. That is one of the deficiencies the critics identify. In many of these sites the local DOE guys were basically along for the ride, kind of go with the flow within fairly broad parameters.*
>
> *Congressional Staff*

The GAO agrees with this view. While it recognizes DOE has made significant changes in the way it manages its contractors, GAO nevertheless feels DOE's management of contractors is a high-risk area. A recent report GAO issued on DOE's oversight and management of contractors, concluded that

> DOE's contracting is vulnerable to waste, fraud, abuse, and mismanagement because of its long-standing approach of (1) indemnifying nearly all contractor costs and (2) not exercising adequate oversight over contractor operations and activities.
>
> *GAO (1992c)*

And finally, several field office people think that DOE relies too heavily on certain contractors--specifically, that one contractor should not be the prime M&O contractor at multiple sites. The fear here is that one company is not likely to have a large enough talent pool to provide top-notch managers for many sites.

> *Is it a mistake for DOE to allow one contractor to be the prime at multiple sites? You bet it is. The depth of talent is not there.*
>
> *DOE FO*

4.5.2 Implications for DOE/EM

The issues mentioned in this section are not all independent--they are inter-related. Two overarching themes tie them together--accountability and control. Changed standards of accountability, and the responses to that change, have resulted in behavior that is influenced by concerns about liability. Increased headquarters control, together with the new accountability rule, has brought about an increased level of oversight. The trend toward increased headquarters control is not compatible with current levels of staffing, and so support services contractors get called on to do work that should, in the view of many stakeholders, be done by DOE employees. Plans to create ERMCs can also be seen as an attempt by headquarters to maintain control, because cleanup activities of a contractor strictly devoted to cleanup may be easier to control than similar activities of a contractor engaged in both production and cleanup. In what follows, we discuss implications and consequences in the context of those two themes (accountability and control).

4.5.2.1 Liability

DOE's new accountability rule is intended to make contractors more responsible for their actions. Contractors respond in two ways: they (1) ask for more money, out of a genuine desire to "do things right," and (2) try to get DOE approval for everything they do, which, they figure, puts a good deal of the liability back on DOE. Headquarters wants the field offices to filter those proposals, to make them more reasonable (ask for less money). Some field offices are unwilling/unable to do that, because they're concerned about personal liability, too. So contractor's requests tend to get passed on "as is." On top of that, because of liability fears, more testing and characterization will

be done before actually breaking ground. The combined effect is rising cleanup costs.

Fear of personal liability is likely to have another effect. Companies or individuals won't be as willing to admit making mistakes if they know they might have to pay for it, resulting in loss of "lessons learned" information.

One of the reasons for imposing higher standards of accountability is the hope that costs can be kept under control. A major concern of EM must be to see that the actions that people take to neutralize the threat of increased liability don't overshadow the gains hoped for by insisting on higher standards of accountability.

4.5.2.2 Oversight

DOE needs to maintain an appropriate amount of oversight of its activities and can't afford to even give the impression that it's not conducting oversight of its contractors. On the other hand, if what the sites say is true--if significant resources are being wasted on redundant inspections--then the cleanup effort is suffering. It's not clear what a reasonable audit/inspection cycle should be, but if many audits do indeed cover essentially the same material, this might be an area where HQ coordination (of audit teams) could provide some relief.

4.5.2.3 Support Service Contractors

DOE's wish to control more of what goes on in the complex means it must use support services contractors, because it doesn't have enough people to do everything it wants to do in-house. Some stakeholders feel DOE risks losing control by using support service contractors too much. Specifically,

DOE field offices and contractors feel it's not right for (other) contractors to be reviewing their work.

Then, there's the matter of cost accountability. We recognize that DOE doesn't have sufficient staff to do all of its work, and must use support service contractors, but that can mean increased costs. GAO has reported that using support service contractors can cost significantly more than using federal employees would (GAO, 1991). Continued dialogue with OMB to effect higher personnel ceilings is clearly appropriate.

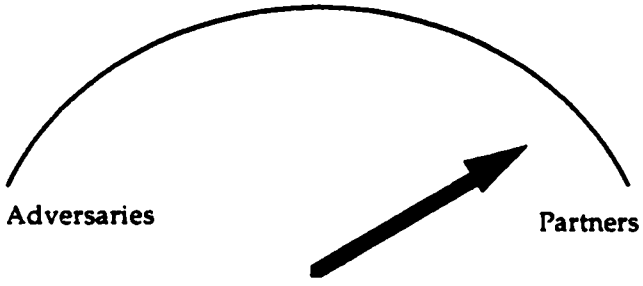
Finally, conflict of interest problems can arise. One example is illustrative. According to the field office at one site, a (contractor) member of the Tiger Team wrote several findings in a particular area, and then inquired later whether his company could help fix those deficiencies. Such incidents don't appear to be widespread, but are still cause for concern.

4.5.2.4 ERMC

Prime M&O's can't help but see imposition of an ERMC for remediation work as a slap in the face, a demotion of sorts. Labor is worried, too, because it looks like another excuse to dump existing workers and hire "experienced cleanup personnel." There will undoubtedly be disruptions in cleanup work while responsibilities are transferred to the new ERMCs, and integration of the ERMC's activities with those of existing M&O contractors would be a problem. Lacking clear, compelling reasons to establish ERMCs, it would seem that there is more to be lost than gained by doing so. If there are good reasons for creating ERMCs, those reasons need to be made clear to all stakeholders.

4.5.2.5 The General Nature of the Relationship

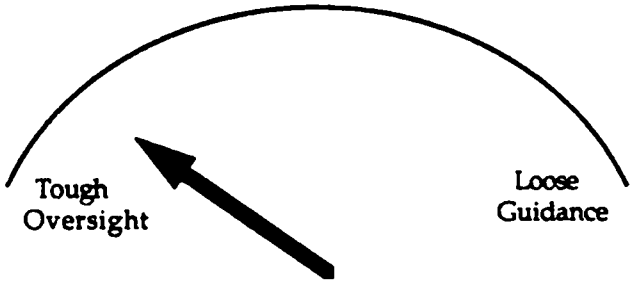
DOE field offices and contractors (site stakeholders) see the relationship between DOE and its contractors as lying somewhere on a scale between *adversaries* and *partners* (Fig. 4.5-1). They see partnership as good and would like to see the "relationship pointer" over on that end of the scale.



Relationship Gauge, Site Stakeholders

Figure 4.5-1

In contrast to that, many other stakeholders would use a scale with the ends labeled *tough oversight* and *loose guidance.* Those stakeholders feel DOE has traditionally provided loose guidance, while what is needed is tough oversight of its contractors (Fig. 4.5-2).

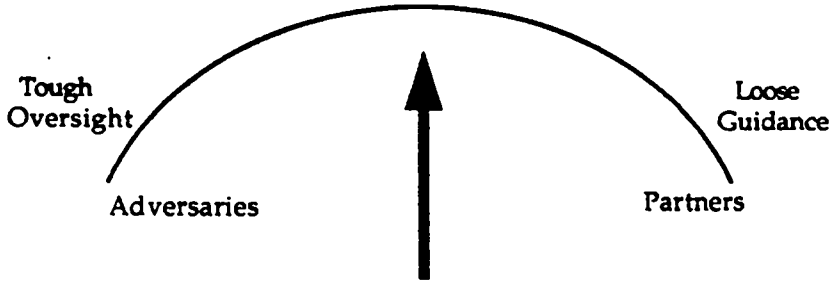


Relationship Gauge, Non-Site Stakeholders

Figure 4.5-2

Those two views are in complete opposition to each other. Field offices and contractors work closely together and share similar goals and experiences. It's only natural that they develop a close relationship and feel the need to be partners with each other. Many other stakeholders equate partnership with loose guidance, which they think is bad because it contributed to the problems that exist today. In that view, the relationship has been much too cozy for too long, and it has been just that cozy partnership which has precluded DOE from providing the effective, tough oversight it should have been doing all along.

If we combine the views of site stakeholders and non-site stakeholders, we get a scale (Fig. 4.5-3) which shows those views in opposition. Headquarters job is to balance those opposing views, to define a relationship that is a compromise between the partnership needed for smooth running of the complex and the tough oversight needed to ensure that contractors are held accountable for their actions. Such a compromise is required to overcome the contradictions inherent in DOE's dual-natured role--that of providing both guidance and oversight.



Relationship Gauge, Combined

Figure 4.5-3

4.6 Delays

Jerome A. Morzinski

Abstract

Interviewees from virtually all stakeholder categories feel that DOE headquarters takes far too long to grant approvals and make decisions. These delays have obvious and immediate consequences--work gets postponed or canceled, schedules slip--as well as consequences that are harder to pin down or measure--lost credibility and frustrated employees. Delays are explicitly linked to the issue of headquarters vs field office authority. Stakeholders from all categories feel that the field offices should have more authority to make decisions than they now have, especially in light of the perceived inability of headquarters to make timely decisions. Previously published reports have also said DOE headquarters needs to delegate more authority.

Despite the nearly unanimous chorus of complaints about headquarters delays, there are unresolved issues. We have no yardstick with which to measure delays and their effects, and what is "bad delay" to one party might be "necessary and good interval of time" to another. Delays have turned out to have good effects in some cases. Perhaps people who complain about delays don't see the big picture. It may be that what they see as headquarters delays are in fact part of a deliberate strategy to gain positive results, although it's not clear that such a strategy exists, or if it does exist, that it produces benefits. Whether delays are deliberate or not, they have real, negative consequences which must be weighed against any possible benefits.

When making important decisions, any organization needs to gather information, examine alternatives, and assess the soundness of different opinions and arguments before agreeing on the most appropriate way to proceed. That process takes time, and the length of time depends on many factors, such as the degree of delegation of decision-making authority, the amount of information deemed necessary before making a decision, the

mechanism by which alternatives get proposed and tested, extent of approval chains, etc. Most of those factors depend on and are, in theory, controlled by choices made by leaders of the organization.[1]

From the perspective of many stakeholders around the DOE complex, DOE headquarters has chosen to operate in a manner that results in unacceptably long delays in the process of making decisions and granting approvals. The issue of delays, then, is primarily one of delayed decision-making. There are, of course, other kinds of delays, namely, delays in getting work done. That, however, is just one consequence of delayed decision-making. Some other consequences are increased costs, wasted resources, and strained relationships with other stakeholders, including employees of the DOE family.

4.6.1 Stakeholder Views

The issue of delays is important because delay in making decisions and granting approvals frequently has negative consequences. Most of our interviewees, however, did not focus on specific instances or examples of those consequences, but rather spoke to what they felt were the underlying causes or reasons for the occurrence of delays in the first place. Those reasons tended to fall into one of two broad categories:

- Headquarters vs Field Office Authority
- Headquarters Inefficiency

[1]There are exceptions, of course, and for DOE/EM, one that stands out is staffing. If headquarters cannot attract and hire sufficient numbers of qualified people, the decision-making process will suffer no matter what organizational choices are made.

Delays, of course, have other sources, such as task uncertainty, but our focus will be on the two categories of headquarters delays listed above.

4.6.1.1 Headquarters vs Field Office Authority

There is a great deal of frustration in the field over the issue of authority to make decisions. Authority to make decisions and grant approvals has been centralized at headquarters, which, even in the best circumstances, causes inherent delays. It simply takes longer to do things long distance. The field offices can't make what many people see as routine decisions, and this fact is explicitly linked to delays in getting work done. Two interview segments that are typical of comments in this area follow.

> *The system isn't working, things aren't getting done, because Leo Duffy has to personally approve everything. Until just recently, we needed his personal approval to paint walls.*
>
> *DOE FO*

> *NEPA*[1] *... it's got to go back to headquarters for their review, and get signed by Leo. Absolutely ludicrous, it's costing us millions.*
>
> *Contractor*

People recognize that the Watkins/Duffy team needed to take control, to show that things were not going to be "business as usual" anymore. We heard over and over again, though, from stakeholders in all categories, that it went too far, has gone on too long, and that the system is suffering.

> ***The other thing that's sad, a lot of decision-making has been centralized.*** *I think there was a need for some coordination and to that extent, centralization. But the result has been people feeling left out, and a lot of institutional paralysis because everything had to get approved from the seventh floor.*
>
> *National Activist*

[1]Much NEPA authority has recently been delegated to the field, but this was a hot topic when we conducted interviews, and is indicative of the general nature of the problem.

The field has little or no ability to make decisions here at the site so we can do things more efficiently.

DOE FO

Leo talks about doing things smarter, cheaper, faster, but roadblocks are killing us, because of this type of activity where everything has to be approved at headquarters.

Contractor

DOE's field offices have no authority now. The Congressional Liaison people are no help except on routine issues, because they never know what's going on and they need front office approval to say anything and that causes more delays.

Congressional Staff

This same view--that headquarters doesn't delegate enough authority--also comes from other studies of the DOE complex. For example, the final report of the Advisory Committee on Nuclear Facility Safety (1991) concluded:

> Headquarters appears to control decision-making at a level that is inconsistent with the inherently decentralized regulatory process and the diversity of cleanup problems in the field.

And from the National Research Council (1989), in their report The Nuclear Weapons Complex:

> Many decisions are now unnecessarily deferred by staff to higher management levels, sometimes creating delay and paralysis in decision-making.

People in the field (DOE and contractor employees) feel they can't get their job done because of the delays encountered in getting headquarters approval, oftentimes for what they view as minor things. The prevailing attitude is yes, some things need to go to headquarters for approval, but let's be reasonable and delegate more decision-making authority (along with policy guidance) to the field.

There seems to be precious little policy and a lot of specific 10-point directives and layers of approvals coming out of headquarters. Rather than saying this is our policy, and as long as you're going to work within policy, you have approval to do as you see fit.

DOE FO

The obvious question is, are all these headquarters approvals necessary? What do they pay me the big bucks for if they're going to manage it from Washington?

DOE FO

There's approval cycles for all these things, which takes a long time. Besides lack of delegation, the problem is really micro-management. If I want to make a change, it's not enough that I get approval from the level above me, I have to get approval from all levels above me.

DOE FO

Frankly I think it doesn't make sense for us to try to operate in as detailed, on as detailed a level as we are from the headquarters. I understand the value of it, but unless the system is willing to put a great deal more resources into the headquarters, it's putting a stress on the staff that is not going to be able to continue.

DOE HQ

4.6.1.2 Headquarters Inefficiency.

Admitting that some things do need headquarters approval, there is still widespread feeling that headquarters is a black hole--things go there but never come out. People understand that some decisions must be made at headquarters, but feel that it takes far too long for that to happen.

The issue here is not only one of headquarters vs field office authority. If headquarters was a smoothly running outfit, we might be able to operate by having all decisions made at headquarters. The fact is, headquarters doesn't work very well, so we have the worst of all possible worlds--we are not allowed to make decisions, and headquarters doesn't seem capable of doing so in a timely manner.

DOE FO

Everything has to go to headquarters to be approved, and nothing ever gets done there. Or if it does, it comes back ambiguous, conflicting.

Contractor

The regulatory process is slow in terms of authorization, but when you find that it outruns the DOE's capabilities of making a decision, and you are waiting for a response when you have all the regulatory approvals, there's something wrong.

State Official

One contributing cause to delays at headquarters is inadequate staffing, and it is a problem recognized by virtually everyone, including DOE headquarters. Its ultimate solution lies with getting authorization to increase the size of the EM staff and then finding people with the right talents. The interim solution of using support service contractors raises another set of problems (see Section 4.5 on DOE - Contractor Relationships).

We had to build in our schedule time for headquarters to do document review. They pore over these documents and send them out to support contractors, come back and say we don't like your wording of that phrase on page 17, etc. That's a big barrier.

DOE FO

When you send something back to headquarters, it immediately goes out to another subcontractor for review. I don't see that that's going to improve things, and it does result in a big delay.

Contractor

Various reasons other than inadequate staffing are proffered. There is some feeling that DOE as a whole is still struggling with the issue of how EM fits in with other programs.

There apparently continue to be fundamental differences and rivalries, intramural warfare, going on between the different major departments that don't help the complex a bit. (One result is) a lot of wasted motion in terms of positioning and budgetary shenanigans that a stronger hand topside would probably save us guys in the trenches a lot of make-work.

Contractor

. . . not coordinated well enough between DP and EM, because DP runs the reactors, and also the separation facilities. And there's not communication up there, so consequently the direction coming down from up there, and sometimes implementing plans, there's differences. With no real basis.

DOE FO

Other comments indicate that clear lines of authority don't exist within headquarters. One illustration is the use of special assistants. Line management within headquarters feels that it sometimes gets bypassed as a result of the way special assistants are used.

Instead of our office handling it, (one of Leo's special assistants) is handling it. We didn't even know it was up there. So if the field is sending something directly to Leo's staff, they're not even giving us a copy of it. This gets pretty bad after a while. And we don't really know what's going on.

DOE HQ

We can't get memos out of Leo's shop because it's so fragmented with all the groups they've set up there.

DOE HQ

Finally, stakeholders from all categories speak to general organizational inefficiencies, such as too many approvals, unclear roles, and lack of delegation.

The problem with headquarters is primarily one of lack of resources to do a quick turnaround on these reviews, and also the lack of authority at lower levels at headquarters. There's a tremendous number of signatures required with concurrence on all actions at headquarters.

DOE FO

You shouldn't take months to review something and decide whether it's OK or not just because you do things in sequence instead of simultaneously.

Contractor

Another item about impediments to getting the job done, was the need to define better roles. Because we're trying to cover a lot of territory here. If we could concentrate on certain roles, on beefing up certain roles, and delegate some of the stuff to the field, it would allow us to operate more clearly and concentrate our energies.

DOE HQ

Whatever the reason, there is consensus across all stakeholder groups that when/if something has to go to headquarters for approval, the process is unreasonably delayed.

4.6.2 Implications

Is the picture we've painted here, of unreasonable delays caused by the way DOE headquarters operates, an accurate representation of the situation? Or, is this nothing more than the typical amount of discontent that could be expected from any organization? If there's more to this than "typical complaining," and we think there is, what are the implications for EM? Perhaps if we step back away from the field and take a more global view, it'll turn out that what the field sees as delay is an unavoidable, maybe even desirable, part of the process. How do we judge if delays are bad, how bad they are, and what the consequences are? There can be both negative and positive aspects to delays.

4.6.2.1 Negative Consequences of Delays

In one sense, it could be true that complaints about delays are exaggerated, or that people's vision is clouded, or that perceptions from the field (and even from some headquarters stakeholders) are too narrow. We don't have a good way to measure delays and their effects. On the other hand, though, several things argue for the general validity of what most of our

interviewees said. First, sheer numbers. While not making any claims about statistical validity, one can't help but note that so many people said basically the same thing: too much has to go to headquarters, and it takes too long to get anything out of headquarters. Second, those comments come from across the spectrum of stakeholders, as well as from other reports. And finally, if enough people think delays occur because of actions or inaction that headquarters should be able to control, that perception can have real effects which add to other negative consequences on the way the system works.

What are those consequences? First, problems of an operational nature. When work is delayed for any reason, there are problems with meeting milestones and staying on schedule. And that, of course, can affect compliance agreements and have other legal implications. There will also likely be increased costs and wasted resources. Although our interview data is sparse on specific examples of those kinds of effects (because we didn't ask for them), we did get many comments that clearly implied that those problems are occurring now. Second, delays affect people and agencies; we can say there are political consequences. When unwarranted delays occur, DOE loses credibility with Congress, regulators, and the public. Compounding the issue, those stakeholders are likely to push back in ways that make life harder for DOE--with bad publicity and lawsuits, e.g. The effect on DOE employees is no less severe. For many, problems with delays are directly tied to the centralization/authority issue, and maintaining centralization to the degree that exists now sends the message that they can't be trusted. Both in the field and at headquarters, many DOE employees feel frustrated and alienated, which can't help but have bad long-term effects.

Having said all that, we admit that there is uncertainty here--we haven't objectively measured delays and their consequences, and it may be that part of the problem is perceptual as opposed to real. Acknowledging that uncertainty, let's step back and look from a different perspective, and ask if some of what people see as delay doesn't in fact serve some good purpose.

4.6.2.2 Positive Consequences of Delays

Consider the idea that what one party sees as "bad delay" may simply be seen as a "necessary and good interval of time" by another party. There are several aspects to this line of thought, motivated by Stinchcombe's work on delays in government approvals in Norwegian offshore oil development (Stinchcombe, 1985).

Delay can be part of, in fact is a necessary component of, many processes. Public participation is an example. DOE is given credit for making a real effort to give the public a chance to participate in finding solutions to cleanup problems. That process requires that the public be given time to review plans and proposals and to respond to them. It may be that what many people see as "headquarters delay" is really part of such a process. It would be wrong to label delays of that nature as bad.

Then too, delay can simply be a time to figure out what really is in the best interests of DOE. People in the field, whether they be contractors, local/state government or DOE employees, have a relatively simple agenda when compared to DOE's national programs. It is relatively easy to determine what course of action is best for an individual site, but much harder to make that determination for all sites together. DOE headquarters has a complex agenda with many objectives, and part of the problem may be that those

objectives are not well-known in the field (maybe not at headquarters either, but that's another issue). In any event, DOE's needs may be better served if basic policy decisions are made with great deliberation, while the interests of the site would be better served by decisive businesslike behavior in which fewer values are taken into account. Given that dichotomy, it isn't surprising that the field sees delays as bad.

Finally, consider the matter of control. Headquarters does need to maintain control over operations in the field. From one perspective we could say that delays, whatever their cause, really help DOE headquarters to maintain control. Without the benefit of delay, headquarters might be forced to make decisions before they are ready to do so--decisions which may be good for one or a few individual sites, but which turn out to be bad in the overall scheme of things. In other words, rather than (or perhaps in addition to) being a result of an attempt at control, delay may be a factor in maintaining that control. (That can be carried to extremes, of course, if lengthy delays are encountered because too many approvals are required, or because complete information is sought before making a decision.) Our research has not produced data on this issue, but it would be interesting to know to what extent headquarters intentionally delays actions to maintain control, or to gain other positive results. If some delays are part of a deliberate strategy that is beneficial for DOE overall, and if that information were communicated to the entire DOE family, it's likely that people would be more inclined to put up with what they see as bad delays. But in any event, delays, whether deliberate or accidental, can be good from the standpoint of helping headquarters to maintain control.

4.6.2.3 Conclusion

Even with the uncertainty of whether or not there are good reasons for delays, or if the perception that most people have of delays is wrong by some absolute, "big picture" criterion, it still is apparent that there are real, undesirable consequences of delays. It might be the case that potential benefits (maintaining control, e.g.) outweigh the negative consequences. If so, that information needs to be clearly communicated to the field. If it turns out that the negative consequences are serious enough so that the problem of delays must be dealt with, one action stands out as having most promise: more delegation of authority to the field, accompanied by clear policy guidance. That idea is echoed in other studies.

> The Department should strengthen its management structure by delegating authority and responsibility for the initial resolution of issues to the lowest possible management levels, subject to clear guidance and support from upper management.
>
> *NRC (1989)*

> Headquarters should provide overall guidance to the FOs to help them select cleanup projects. But the field offices and M&O contractors should be given substantial latitude in developing the specifics required to implement the overall policy.
>
> *ACNFS (1991)*

It is clearly necessary for DOE/EM to maintain control over operations in the field, but it is also clear that most stakeholders feel that headquarters is trying to do more than it is currently capable of. Just about everyone outside headquarters feels that the balance of headquarters/field office authority is too heavy on the headquarters side, and that it's time to start delegating authority back to the field, as was recently done with NEPA. Continuing to return decision-making authority to the field, accompanied by guidance in the form of policy statements, has the potential to alleviate many of the problems people

see with delays. Keeping most decision-making authority centralized at headquarters, on the other hand, enables DOE/EM to maintain more control over operations, but reduces the likelihood that problems with delays will be solved anytime soon.

4.7 Compliance Agreements

Malcolm A. Weiss

Abstract

Binding compliance agreements between DOE and regulators are an increasingly important driving force in setting the direction and priorities for EM's cleanup effort. Stakeholders see those agreements as raising issues from conception to closure.

Both regulators and DOE are motivated to enter into agreements, the regulators to get legally binding commitments and DOE to demonstrate responsiveness, clarify tasks, and justify budget requests. However, there is widespread concern that the costs of strict compliance will exceed the funds Congress will make available long term. Negotiation of specific agreements is complicated by DOE's desire for national uniformity conflicting with EPA's regional autonomy. Pressures to reach agreement may result in unrealistic agreements and failures to meet milestones. Successful implementation of compliance work is influenced most by funding for the site--its overall adequacy or its diversion to other purposes.

Those stakeholder views imply three needs for EM. The first is to negotiate realistic and nationally equitable agreements involving participation by the field for realism and by HQ for equity. The second is to acquire, deploy, and manage the resources required for compliance with broader acceptance by all stakeholders that uncertainty is inherent in the cleanup business. And the third is to develop a constructive relationship with the overseers of compliance agreements; that depends most on increasing mutual trust and credibility.

Compliance agreements[1] have become an increasingly important driving force in setting the direction and priorities for EM's effort. The agreements are entered into in order to serve legal, management, and political purposes. But they have also caused legal, management, and political problems. This section summarizes the views about compliance agreements that have been expressed by

[1]"Compliance" by DOE or EM is mentioned frequently by stakeholders and is a broad area including many topics. "Compliance agreements" is one of those topics and it is the sole topic discussed in this section.

the stakeholders we interviewed. We also consider the implications of those views for EM.

> Compliance agreements are defined as follows:
>
> Legally binding agreements between regulators and regulated entities that set standards and schedules for compliance with environmental statutes. Includes Consent Order and Compliance Agreements, Federal Facilities Agreements, and Federal Facilities Compliance Agreements.
>
> DOE (1991a)
>
> A regulatory agreement defines the responsibilities of the parties involved, what activities are going to be accomplished under the agreement, and who will be financially responsible for those activities.
>
> DOE (1991c)

In general, the agreements apply to specific sites and the parties involved are DOE agreeing with the state or EPA or both (the latter constituting a tri-party agreement, TPA). A total of 64 agreements are listed in EM's last-published five-year plan, DOE (1991a). In addition, 10 agreements-in-principle with states have been finalized and others are under negotiation. Agreements are intended to ensure compliance of particular sites with site-relevant federal statutes including CERCLA, Resource Conservation and Recovery Act (RCRA), Clean Water Act (CWA), Clean Air Act (CAA), Toxic Substances Control Act (TSCA), National Environmental Policy Act (NEPA), and/or Safe Drinking Water Act (SDWA), and/or with site-relevant state statutes.

4.7.1 Stakeholder Views

The compliance agreement serves as the formal connection between the site, the cognizant regulators of the site, and other parties that are permitted to enter into the negotiating or oversight process. Although the formal agreements are with DOE, the contractors are seen as key participants since they possess

most of the expertise and they will have to implement the agreements. The views expressed by contractors and DOE field people about compliance agreements rarely seemed to differ systematically. For example:

> *If you go out the field and get a group of people at one of the facilities sitting right at the table, it is very difficult to tell who works with DOE and who works for a contractor. And very often people will not even offer to tell you where that dividing line is--...it's very hard for people to really even understand where their responsibility is. Especially mid-level managers.*
>
> *Federal Agency*

We have chosen to summarize stakeholder views in five categories:

- Motivations for entering into agreements
- National allocation of resources for implementation of agreements
- Negotiating agreements
- Implementation of agreements
- Compliance agreements as program drivers.

4.7.1.1 Motivation for Entering Into Agreements

The existence of compliance agreements, arrived at after negotiation by DOE with federal or state agencies or both, is generally regarded favorably by stakeholder groups--in principle, at least. However, the reasons for that favor vary.

The states and federal regulators usually see compliance agreements as a way to compel legally the fulfillment of specific commitments by DOE.

> *...the compliance agreement is a way of getting DOE's commitment that they're going to do something; and I think that people are rushing to get those DOE commitments met and then say, "DOE meet your commitments in this, either court ordered or your administrative order, that you've got." And they want penalties in there...*
>
> *State Official*

But not every state will participate. For example, Ohio is thought to believe it will lose authority by signing on to the agreement between DOE and EPA at Fernald. DOE sees a problem in the failure to have Ohio as part of a tri-party agreement at Fernald.

DOE HQ sees a negotiated agreement--and preferably a tri-party agreement--as evidence that can be presented to Congress or other political officials that DOE is responsive to legal, political, and public needs at the individual sites. The sites see the agreements as clarifying their mission by setting specific targets for action. In addition, the sites can use compliance agreements as a justification for budget requests to HQ, while HQ can similarly justify requests to OMB.

With one conspicuous exception, no stakeholder expressed an unfavorable view of compliance agreements in principle. That exception, a Congressional staffer, sees compliance agreements as a way for Congress to avoid dealing with the broader problem of cleanup on an equitable national basis.

> *Congress doesn't have the political will to mandate the development of a comprehensive long-range plan by DOE. Rather, they permit the bandaids of compliance agreements. Congress is also not in the habit of long-term thinking, and waste management is a long-term problem.*
>
> *Congressional Staff*

Another Washington, DC, stakeholder believes it may be too late to abandon local compliance agreements. Congress and the Administration don't want to try to override existing commitments to local interests.

> *I don't know enough by way of alternatives to the agreements that have already been negotiated to be able to say we would have a better system if there were a national priority system. I'm also inclined to believe that, at this point, that comes a little late, because it's going to create a tremendous amount of anger and hostility on the state level if a number of states find that their compliance agreements are going to be broken and disregarded, and instead have a national priority system.*
>
> *National Activist*

4.7.1.2 National Allocation of Resources for Implementation of Agreements

Although the principle of compliance agreements is widely favored, many stakeholders expressed concerns about the cumulative cost of living up to those agreements. Those concerns focus on the belief that there is not enough money appropriated by Congress now, and never will be enough, to meet every specific obligation of every agreement even if most future decontamination and decommissioning (D&D) activities--a potentially huge cost burden--will not be subject to compliance agreements. In other words, the agreements, however well-intentioned when entered into, are ultimately unrealistic.

> *We're told this is the age of compliance, we've got to meet all the regulations, we've got all the consent orders, everything else, everything's got to be met. And there's just not enough dollars and qualified staff in the world to do it all.*
>
> *Contractor*

> *... The cost of doing business is so great that we will not be able to comply with our compliance agreement. Not just here but across the country and there will be a court case. Congress then will wake up...*
>
> *DOE FO*

The enormous prospective cost of full compliance is well-known among stakeholders inside and outside the complex. Therefore, these stakeholder views

support the previous conclusion. That is, the willingness of Congress and the Administration to let local compliance agreements drive the EM program is a way to avoid facing up to a national policy and decision about the total resources the US should commit to cleanup and the priorities to be established. That type of issue is not unique to the cleanup of weapons plants. It is also faced by Superfund:

> Last, [among the main Superfund Issues] what are the risks of Superfund sites to human health and the environment? These risks have not been adequately defined. The Congress and the public need better information to help set expectations for the program in light of alternative possible uses for scarce environmental protection resources.
>
> GAO (1992a)

4.7.1.3 Negotiating Agreements

The process of reaching agreement, and the content of the agreement itself, inspired comments from many stakeholders. Those comments fell into three areas.

- Uniformity and consistency of agreements
- Involvement of HQ in the negotiating process
- Confidence in the details of the agreements.

Issues of *uniformity and consistency* arise most often because EPA grants a great deal of autonomy to its regions while DOE HQ is attempting to establish more uniformity for its sites. Therefore, site-to-site variations in agreements are the norm for EPA, but they cause DOE HQ discomfort.

There's been a lot of discussion between EPA, states, and DOE on these cleanup agreements... It's been a major issue of contention. So the way DOE is trying to deal with that is to develop these standard clauses. However, my impression is EPA is not supportive of that. EPA would like to have the flexibility to develop clauses as they see fit at every site.

Federal Agency

At the sites, DOE field office personnel are more likely to prefer uniformity than contractor personnel are.

There ought to be a central location in headquarters that is able to take all that information together and be able to say, "Wait a minute, EPA, you are doing this, this, and this to us across our sites. EPA headquarters, what can you do to get some uniform guidance out to your various regions so we are dealing with this problem in a uniform manner."

DOE FO

The basic principle of negotiating federal facilities compliance agreements and consent orders is good.... [But HQ needs to] understand that you've got different regions in there. All right? And you've got to negotiate on a region by region basis.

Contractor

The *involvement of HQ* in negotiating agreements is tied to the desire of HQ for uniformity, and it is one manifestation of the centralization of authority in HQ. That involvement irritates some non-DOE site people, especially when faced by the model of EPA.

You know, we're dealing with EPA right now in negotiation with a compliance agreement and a consent order. And whereas we need to go to Watkins to get our portion of the agreement signed, the regional administrator in [EPA regional HQ] is signing that here because it's been delegated.

Contractor

At the field office level we negotiated an agreement that was essentially based on a model agreement. We had the public hearing assuming that everyone had reviewed it and had signed off on it and that everyone who signed it that there were no public comments that necessitated the requirements to change it. It took nine months to get that agreement back from headquarters.

State Official

No site interviewee was explicit about seeing a need for HQ involvement in order to ensure reasonable equity among sites in the allocation of limited DOE resources, although there was a suggestion of that in the comments of two Washington, DC, stakeholders.

> *As compliance agreements are being signed at the offices, there needs to be some consistency in this. So they need to go through headquarters. But at the same time the field has the experience. It seems to me that the people in the field who have been producing nuclear materials or cleaning up waste have the best knowledge as to how to address it.... My personal sense is that they need [some headquarters] controls. The competence is not as high in the field offices as people may have assumed it to have been. Especially in the cleanup areas.*
>
> *Federal Agency*

> *I guess we're going to have to tick off even more people than we have already. Because I think we can't in good conscience go out and clean up something that isn't a problem while some other, while there's a life threatening situation in the next neighboring state.*
>
> *DOE HQ*

Confidence in the details of the agreements reached may be shaky. The pressures to reach agreement have resulted in making some specific commitments about cleanup without adequate characterization of what needs to be cleaned up, or of what the cleanup will cost, or of how long it will take, or even if adequate technologies will be available. And dominating those technical uncertainties is another--whether funds will be made available to do the job. Thus, the agreements negotiated are sometimes seen to be agreements which portend a failure to meet the commitments made. Several interviewees in the field were sure, and believed that others were sure, that some commitments could not be met. The impacts on the site for failing to fulfill commitments could mean losses of credibility, impairment of morale, needs to renegotiate, and possibly the imposition of legal penalties.

We know we have commitments that we can't make. That's going to create lots of problems for us.

Contractor

[The contractor] has prepared schedules they cannot meet using nonrealistic assumptions and milestones provided by DOE..... this false planning [is] one of the major reasons for worker frustration at the plant.

Independent Technical Review (1992)

Agreements that are, or come to be, inappropriate should not be accepted supinely by DOE, according to one interviewee. Provision for renegotiation should be up front, part of the system.

... if we [DOE] don't think they [compliance agreements] make sense, we say so. And when we feel like we need to change priorities or alter the agreement based on new information on what the hazard is, I think we just have to fight for what we think is right.

DOE HQ

4.7.1.4 Implementation of Agreements

Several types of issues arise once a compliance agreement is in place and the site begins work to carry out the terms of the agreement. The views expressed by stakeholders fell into three categories:

- Funding
- Missing milestones
- Conflicts of priorities.

Funding for DOE's implementation of compliance is a concern to both outside and inside stakeholders. Outside stakeholders want to be assured that DOE will request sufficient funds from the President (who requests them from

Congress) to meet the commitments made in the agreement. Pursuing that reasoning, they may see the compliance agreement as a budget agreement.

> *When the Hanford tri-party agreement was made, it wasn't a budget, it wasn't intended to be a budget document. It became one.*
>
> *DOE HQ*

But outsiders are legally prohibited from participating in the formal budget process. Being excluded from the process raises suspicions about whether the funds needed are in fact requested.

> *Our state, for instance, wants to be part of what we do, putting that budget together to see if we are budgeting sufficient funds to meet our compliance agreement. Well, we can let them look at what we do. Once it goes to headquarters, they don't see those dollars anymore. And there is a tug there. Because by law the state has the hammer on us to be in compliance. And one of the outs in compliance agreements is "Did Congress authorize funding?", did you ask it?*
>
> *DOE FO*

If funds are requested but not authorized, the responsibility for being out of compliance is frustratingly unclear. (See Section 4.5, DOE-Contractor Relationships, for further observations on liability.)

> *And so, if we don't get enough money to meet the compliance agreements, then who is out of compliance? And what is the Justice Department's assessment of that, on the basis of we have an agreement. It's a legal document. We don't have the money.*
>
> *DOE HQ*

Being out of compliance because of *missing milestones*, due to a lack of funding, or to an overoptimistic agreement as noted above, or to any other reason, is seen as damaging credibility of the site and of possibly invoking penalties, as well as the displeasure of other stakeholders.

I'm afraid reneging on those agreements is going to cost us credibility that we've been working pretty hard to gain with the regulators. One possible budget situation right now for next year will allow us to work on three operable units on this site whereas the agreement we have requires us to do seven. I mean, that's not completing any of them.

DOE FO

When milestones are missed, the sites try to avoid using insufficient funding from HQ as an excuse, even if they believe that to be the reason.

... we try to make up technical arguments for slipping a milestone when it is really a budget cut. A lot of those milestones were slipped because there wasn't enough money to do the job. Yet, DOE's official line was they were all technical driven. What they wanted to say is, well, they are technical driven because we had new technical problems that we didn't anticipate so we had to divert money over here.

Contractor

It's a budget issue [milestone delay] really, but [EM HQ] needs a technical reason for doing it because of the legal requirements of the tri-party agreement.

DOE FO

Conflicts of priorities can cause the sites to satisfy one milestone at the cost of missing another, or can cause diversion of funds and effort to other urgent problems at the site that may not be covered by compliance agreements.

I have a customer in DP, a customer in NE, two customers in EM. I have other people back there who I have to satisfy, including the Office of Nuclear Safety, the Conway Committee. EH gets into it one way or the other through NEPA. I have responsibility for [most of the compliance] agreement milestones. They all want things, and their sense of priorities are all different. Every group has its own idea of what the priorities ought to be. So there's absolutely no way to win in this situation.

DOE FO

There's also, though, I think, a lot of frustration on [HQ] part in seeing the way the estimates keep increasing... and it doesn't seem like there's anything being done. Milestones are still being missed and we're hearing a lot from [HQ] now as, for example, waste tank safety needs money. That's your highest priority, go get it from the rest of the waste management program. [But that is] not recognizing we have TPA milestones.

DOE FO

4.7.1.5 Compliance Agreements as Program Drivers

Compliance agreements sharpen up the tasks at the sites. In addition they carry with them the threats of civil or criminal penalties for failure to comply. Therefore, increasingly, these agreements take precedence when the site sets its priorities and allocates its resources.

... we have a whole range of agreements, some of them very formal, like compliance agreements. ... the challenge becomes to meet those agreements. So far we haven't had the luxury of looking at other requirements... the driving force of the program so far has been the real legal requirements.

DOE FO

... what I do on a daily level, quite frankly the things that impact me the most, are the regulations that come from EPA and the State, all right? So my order of priorities to my folks are, you take care of things that result in fines and penalties. Then come DOE orders.

Contractor

Although compliance gets highest priority, it does not always provide the highest satisfaction.

... we're spending the whole front end of the TPA mostly doing paper, paper, Part B permits and sampling and analysis plans and lots of negotiations. We have not cleaned up one tank yet. Well, we won't for several years.

DOE FO

Complaints about money being spent but dirt not being shoveled are widespread among outside stakeholders who are impatient with delays due to the

"paperwork", characterization, and planning undertaken before picking up those shovels.

4.7.2 Implications for EM

Compliance agreements are a driving force for EM activities broadly, not simply for setting priorities at the sites. Money to satisfy legal commitments justifies budget requests to OMB and to the President, and can inspire a more sympathetic hearing from Congress. On the other hand, failures to meet commitments provoke political and perhaps legal fallout hazardous to EM's health.

Compliance agreements are a relatively new experience for DOE and an unavoidable consequence of the change in mission from production to cleanup. The issues associated with compliance agreements are often consequences of other changes: the need for scrutiny by and accountability to the public, the uncertainty of the cleanup task and not simply the technical change from production, and the shifts of control from the sites to headquarters.

There is no prospect that compliance agreements will go away. On the contrary, more will be negotiated (for example, as required by the Federal Facility Compliance Act of 1992) and an increasing share of all EM activities is likely to be devoted, directly or indirectly (as in technology development), to satisfying commitments made in current or future compliance agreements. Therefore, the first issue for EM is to negotiate equitable and realistic agreements; the second is to acquire, deploy, and manage the resources necessary to satisfy those agreements; and the third is to maintain an association with the cognizant regulators (and other involved parties) that will result in a constructive

professional (even if formally adversarial) relationship for dealing with the inevitable changes and failures to meet milestones.

On the issue of negotiating, the dilemma for EM is to meet local demands to a tolerable level of regulatory dissatisfaction without giving away the store--without allocating resources to the site that seem inequitable when compared to the problems needing attention at other sites. (That assumes, of course, that EM is *not* given enough money by Congress to pursue all tasks simultaneously; "it is the responsibility of each executive branch agency to request sufficient funding for environmental compliance", EPA (1991).) The Environmental Restoration Priority System was designed to deal with the issue of national equity by establishing "a risk-based priority system to help formulate and allocate the budget for cleanup", DOE (1991b). However, its adoption is unlikely in the face of widespread stakeholder opposition. For example:

> This letter is to express my strong objection to the Environmental Restoration Prioritization System that US DOE is proposing.
>
> Oregon (1991)

Oregon's objections emphasized complexity, inappropriate use of the system to establish budgets, and disregard of legal requirements. The system may be useful within EM as a guide for allocating resources, but its persuasiveness to the states in negotiating or implementing agreements seems limited if the states won't sign on. Despite this resistance, DOE should continue to press key stakeholders for convergence on a workable national process to set cleanup priorities and standards; an agreed-upon process could give DOE the added moral and legal leverage it needs to reach some agreements.

Aside from national equity, an important aspect of negotiation is realism. Realism means that commitments should reflect the state of technical uncertainty

or lack of knowledge or lack of resources that exists when the commitments are made. As uncertainty is reduced, or as new knowledge is generated, bad news may cause milestones to slip even if there were full funding by Congress and flawless implementation by DOE. We do not underestimate the difficulty of getting regulators to accept the principle of writing that type of flexibility into compliance agreements.

The assurance of national equity in negotiation is primarily a HQ responsibility. The assurance of realism is primarily a site responsibility since the site carries the burden of implementation and has most of the technical expertise. Therefore, the negotiation process should engage both HQ and FO groups at DOE.

On the issue of resources, uncertainty and lack of knowledge again intrude on everyone's comfort level. Auditors, regulators, and Congress notwithstanding, firm cost estimates and schedules cannot be built on a muddy foundation and EM needs candor about the mud. One broad alternative for EM is to try to delay cost estimates and budget requests until the foundation is firmer. As GAO (1992b) states: "...projects need to be better defined and there needs to be a better understanding of the degree of technological complexity and the variety and type of contaminated media and contaminants present." All that takes money and time.

Another broad alternative is to market successfully the principle that early dollar estimates and requests are and should be subject to revision without stigma. Both alternatives face serious political obstacles but perhaps not insurmountable ones. The obstacles are high in part because of a broader problem--DOE's poor credibility with its critics.

Credibility and trust are the key to the third issue, developing a constructive relationship with the regulatory and public overseers of EM's performance on compliance agreements. Credibility and trust are discussed in detail in Section 4.2; therefore, they are not expanded upon here. However, there is one asset available for EM to build on. That is, state officials at several sites expressed to us their views (echoed by site DOE and contractor people) that they could work constructively with people at the site; issues could be resolved professionally (although the relationship cannot become too cozy for fear of the regulators losing *their* credibility with the public) even when there were disputes. The role of HQ was seen as most often delaying or disrupting that resolution. So, here again, there needs to be a sensitive balance between the roles of DOE-HQ and DOE-field in dealing with regulators on compliance agreements.

EM has now begun to accumulate a body of experience with compliance agreements across the complex. Some agreements are working better than others. One or more case studies may be helpful in understanding how to deal more effectively with the issues we have raised.

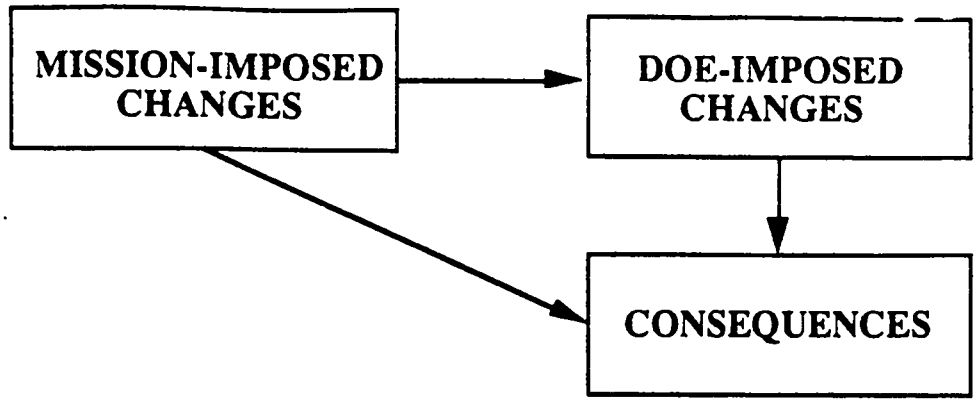
5. The Consequences of Change

In this section we present an overall summation of the information and opinions collected, analyzed, and reported in the previous sections. In particular, we summarize the important consequences for EM's effectiveness that are reported by stakeholders or that can be directly inferred from their comments or behavior. "Consequences" is the term we use to mean behaviors (or attitudes that affect behavior) of the EM workforce, or of external stakeholders, that affect the way in which the organization functions.

This section represents our interpretation of the significance of what we have found for the management of EM.

We believe that the driving forces behind these consequences usually stem from the changes described in Section 3. These include both the external changes imposed upon DOE by the cleanup mission and the changes that were self-imposed. "Changes" mean differences between the circumstances under which people now in the EM workforce now function and the circumstances under which they functioned while producing nuclear weapons before EM's birth in 1989. The concept of reacting to and coping with change provides us with a framework for helping to understand the origin of the consequences.

A simple diagram of our logic is:



The two groups of changes shown in the diagram were categorized in Section 3 as follows:

Mission-Imposed Changes	DOE-Imposed Changes
• Culture	• Headquarters Control
• Public Involvement	• Formalization
• Task Uncertainty	• Staff Growth

The "consequences" shown in the diagram may result directly from mission-imposed changes, or from DOE-imposed changes, or from both. For example, one mission-imposed change is exposure of site activities to public and legal scrutiny and accountability; that leads to the sense of a punitive environment due to the threat of civil or criminal liability. One DOE-imposed change (introduced in order to carry out its new cleanup mission) is a large increase in control by headquarters which has created a more anxious and mistake-intolerant atmosphere in the organization; that change also leads to the sense of a punitive environment due to the threat of administrative action for

failure or mistake. The sense of a punitive environment leads, in turn, to a risk-avoiding behavior, to reduced initiative, and to paper blizzards (and delays) while responsibility is kicked upstairs.

The specific important consequences for EM's organization and management have been selected from those covered implicitly or explicitly in the issue papers of Section 4 or from our other reviews of the interview data. We have categorized them into two groups, randomly ordered below in the two lists. One group includes attitudinal/behavioral consequences, and the other group includes structural/organizational consequences.

5.1 Attitudinal/Behavioral Consequences

The attitudinal/behavioral consequences are reviewed below and are listed in Table 5.1. The connections between the causal changes and resulting effect (consequence) are shown in Figure 5.1. Although we think that Figure 5.1 is a helpful model, we realize that it (and Figure 5.2) is an obvious simplification of reality; consequences interact, consequences can create changes as well as the converse, and change cannot explain all consequences.

- Morale Impairment at Sites

  Morale impairment at the sites was frequently encountered in the interviews. We use the term "morale" to indicate the degree of satisfaction people feel about the importance of their work and their sense of contribution to its completion. There was a great deal of dissatisfaction among DOE field office personnel and contractor personnel. One reason for the lower morale was the belief that transferring authority to headquarters had removed decision-making responsibility from the site, placing the site in an entirely reactionary

mode. Another reason was the lack of priorities, or the rapid change in priorities, for the work to be done. People frequently expressed frustration with the inability to complete tasks because of changing priorities. There is a further feeling of frustration that some matters given priority are inconsequential and a waste of time and resources. Finally, many people expressed frustration with the uncertainties that complicate and confound their work. The uncertainties related both to what should be done, as well as how it should be done.

- Low External Credibility of DOE

There exists a widespread perception by external stakeholders that past activities of the Department have done a great deal of damage to the environment, and the damage was avoidable had DOE managed its activities better. Further, efforts in recent years have not produced visible improvements in progress of the cleanup in spite of very large expenditures. Local stakeholder groups have the view that DOE HQ frequently intervenes in local negotiations without adequate understanding of local issues. Finally, numerous stakeholders believe that DOE HQ has been excessively optimistic in its own public pronouncements leading to the perception of continued loss of credibility.

- Consensus that Organization and Management of EM Are Not Good

The sense of inadequate organization and management of the cleanup is widely held by stakeholders throughout the complex. There are several reasons cited as the source or cause of inadequacy. The centralization of control within headquarters has numerous unfavorable impacts upon the quality and timeliness of decision-making. There is a common opinion that

too many low-level decisions are made at headquarters rather than in the field. There is also a belief that work priorities are frequently changed by headquarters. In addition, there is conflict and ambiguity about priorities between different parts of DOE that lead to confusion in the field. Finally, many observers were outspoken in their view that headquarters has imposed a large number of managerial controls that are inappropriate, unnecessary, and excessively burdensome in the conduct of local cleanup operations.

- Sense that the Internal DOE Environment is Punitive

  Many stakeholders within the complex expressed unhappiness with the climate within DOE. In particular, there is a belief that HQ authorities are very anxious to avoid any negative publicity and as a result will punish any mistakes, irrespective of merit. This atmosphere is compounded by the imposition of new external factors such as compliance agreements. The new external factors include legal liabilities that can be very severe. The consequence is a risk-averse environment where decisions are passed upward to avoid responsibility and potential punishment. The combination of public accountability and HQ control was introduced because of the belief that various sites were inadequately controlled in the past. The situation has reversed in the view of many interviewees to the point of near paralysis because of excessive control.

- A Belief that DOE EM Is Held to Unrealistic Expectations by External Stakeholders

  There is a widely held view by many stakeholders, within and external to DOE, that the public and other stakeholders such as Congress have unrealistic expectations about the level of cleanup that can be achieved at

reasonable costs. These expectations arise from the belief that DOE should return the sites to their original, uncontaminated status. At the same time, the technical uncertainties about the level of contamination and the level of required cleanup make it impossible for the Department to estimate costs accurately. The inability to carry out the restoration to the desired level leads to unwarranted criticism of DOE and a further lowering of public credibility and trust.

- A Sense of Legitimacy Regarding the EM Mission

  DOE leadership has been successful in bringing about a notable change in attitude with regard to the EM mission. The internal value system, at least at sites devoted to EM activities, has come to recognize and accept cleanup as an important objective. Almost all internal stakeholders expressed their endorsement and support for DOE undertaking the cleanup mission. The production mission has not been abandoned or displaced but, in the minds of many, cleanup is approaching equality with production.

5.2 Structural/Organizational Consequences of Change

The structural/organizational consequences of change are listed in Table 5.2 and shown graphically as they relate to changes in Figure 5.2. The relationships are discussed below.

- Lack of Physical Progress in Cleanup

  The EM expenditures since its inception in 1989 total over ten billion dollars. Yet the perception, and reality, is that little actual cleanup has occurred. The fundamental source of difficulty in making progress rests with the uncertainties that surround the cleanup task. The uncertainties extend from

the lack of detailed knowledge about the degree of contamination at each site, through to the appropriate technologies to use in effecting the cleanup. The combination of problems has frustrated progress but has not diminished expectations by the public.

- Public Outreach

  In the past the DOE weapons mission was carried out in a very private and secretive manner. The revelations about widespread contamination produced a demand for greater openness of the Department. Almost all stakeholders agree that DOE has made great strides in opening channels of communication. The external stakeholders are not always satisfied with the results of the dialogue, nor are they convinced that their views are given adequate attention. Nevertheless, there is a general consensus that the Department has worked hard to improve public outreach.

- Unclear and Changing Priorities

  Many persons within DOE and the contractor organizations expressed the view that work progress has been hampered by unclear and/or changing priorities. The general view is that DOE headquarters has reserved for itself the right to set priorities to very detailed levels. At the same time the headquarters staff is no less uncertain than others about the nature and extent of the task it faces. This uncertainty can lead to reprioritization with the shifting winds of public or Congressional attention. Complicating the matter is the high degree of formal control exercised by headquarters. The formal control is enacted by different offices of DOE with inconsistent and often conflicting priorities. Taken together, these changes have produced a strong

consensus across the complex that there are real problems resulting from a lack of clear, consistent priorities.

- Contractor Relations

Relations between the Department and contractors are perceived as strained, both by DOE personnel and contractor personnel. The conventional wisdom is that DOE local offices and site contractors had a very close relationship in the past which contributed to present environmental problems. By taking greater control in headquarters, the Department has tried to restore a degree of control over the contractors. However, the contractors and field offices disagree with the assessment of their past activities. Their view is that they carried out their mission in accord with DOE wishes and are now being held responsible for decisions over which they had little or no control. Exacerbating matters is the increased level of procedures, rules, and guidelines that dictate how work must be done. Further, the increased public accountability, with the related legal liabilities that accompany cleanup projects, has created added tension between DOE and contractors. The combination of changes has led many contractor personnel to question the value of work with DOE.

- Personnel Recruitment and Retention

The changes have made it very difficult for DOE to recruit and retain the technical personnel needed to operate and manage the EM tasks. The growth in the program has been very rapid, and in the best of circumstances it would be difficult to staff up. There are relatively few persons with a strong background in EM-type work, either within DOE or elsewhere. In addition, the high degree of formalization demanded by HQ requires that a great deal

of technical staff time be spent in bureaucratic activities, which has the effect of increasing even more the need for trained people. Compounding the issue is the public scrutiny of DOE and the perception amongst potential staff that they would be functioning in a goldfish bowl. Further, the EM task remains vague and uncertain in detail. Lacking a clear understanding of what cleanup means and entails, it is difficult to recruit first-class talent. Finally, within DOE there is a concern that staff at field offices are given large responsibilities but inadequate authority. Positions at the field offices are seen as high-risk, low-reward opportunities. This is in notable contrast to working for the contractors, where the pay scale exceeds that of the government and the risks are much lower.

- Poor Communication Between HQ and Sites

Concerns with communication were expressed by DOE employees at HQ and at the sites. The centralization of authority is seen as the major source of the problem. The centralization move has placed a heavy burden on the HQ staff making them unavailable to site personnel. It was suggested by several stakeholders that the rapid growth of HQ staff inhibited communications amongst themselves, as well as with the field. As a consequence the site people feel that headquarters is inattentive to, and unfamiliar with, site-specific issues. Conversely, headquarters employees are concerned with generic issues and believe that site personnel have failed to recognize the need for control of decisions to enforce some degree of uniformity for similar issues and to recognize the costly consequences of extending local decisions into a national scale.

- Increasing Oversight of DOE Activities

  The change to a more public form of accountability of DOE operations has produced a large increase in oversight of the Department. Some of the oversight has been imposed from outside by Congress, while other oversight activities have been created by DOE headquarters to provide independent assessment of many activities in the complex. Finally, state and local governments have requested a role in reviewing and assessing local operations. Collectively these activities have had an impact on the organization in terms of resource consumption, added activities, and reorientation of priorities. All stakeholders agreed on the reality of increased oversight. Not surprisingly, there are varied opinions on the benefits of the oversight.

- Long Delays in Decision-Making

  The movement of authority to headquarters has had an obvious effect upon the time constant for decisions at the sites. In addition, there is a general desire amongst site personnel to refer decisions to HQ to avoid risks of making a bad decision. As a result the headquarters staff is overwhelmed with work to be done to prepare a decision. At the same time the continued uncertainty of the task makes it difficult to develop decision-making mechanisms to streamline the process. All of these combine to produce an almost universally held view that delays in decision-making are very long.

- There Exist Too Many Pathways for Reporting to HQ

  Some site people perceive another managerial complication resulting from the centralization change. In order to retain control, HQ personnel sometimes

communicate directly with contractor personnel rather than go through the field office. Further, there are many different offices within HQ, and most of these have adopted a separate communication path. This practice results in contradictory orders to contractors. In addition, the Department has retained the practice of allowing the field office to do the assessment and award fee grant to the contractor. Thus, the contractors find themselves dealing with too many supervisors and in a conflict over whose needs to satisfy.

5.3 Wrapping Up

The consequences listed in Sections 5.1 and 5.2 may lead to the impression that there is an overweighting of site views, an emphasis on site (contractor and DOE field office) dissatisfaction with their relationships with HQ. That impression probably derives from the fact that most of the interviewees were contractor and DOE field office people, and they were more likely to be critical of HQ than HQ was of the sites. HQ was as likely to be critical of itself. Most outside stakeholders did not make systematic distinctions between HQ and the field.

The fact remains that there is a widespread belief that EM has not been organized and managed as effectively as it could have been. Our review of the data so far suggests that disappointment with EM's effectiveness is importantly due to unrealistic expectations—by DOE itself about what it could accomplish, and by outsiders who generated their own unrealistic expectations or who relied on DOE's. DOE's overoptimism led to the making of promises which could not be kept, thereby increasing the dissatisfaction of outside stakeholders.

The difficulties posed by the changes experienced by EM have been widely underestimated. Therefore, a broad conclusion is that the management of

change deserves much higher priority as EM works to improve its effectiveness in the future and introduces further changes.

Table 5.1

Attitudinal/Behavioral Consequences of Change

(1) Morale impairment at sites

(2) Low external credibility of DOE

(3) Consensus that organization and management of EM is poor

(4) Sense that the internal DOE environment is punitive

(5) A belief that DOE EM is held to unrealistic expectations by external stakeholders

(6) The sense that DOE EM and contractor personnel believe that the EM mission is an important and legitimate activity

Table 5.2

Structural/Organizational Consequences of Change

(1) There has been little progress in the physical cleanup of sites

(2) DOE has made progress in its efforts at outreach to stakeholders, with mixed results

(3) DOE has rapidly changing and unclear priorities for accomplishing its many missions

(4) Relations between DOE and its contractors have deteriorated with serious results to progress

(5) The recruitment of capable personnel into DOE is unnecessarily difficult, as is retention of existing competent persons

(6) There is poor communication between DOE HQ and the various sites, as well as a lack of understanding of their respective roles and values

(7) There has been a dramatic increase in oversight of DOE and its different activities

(8) The time constant for decision-making within DOE has grown unnecessarily long

(9) There exist too many pathways for sites reporting to HQ with consequent confusion

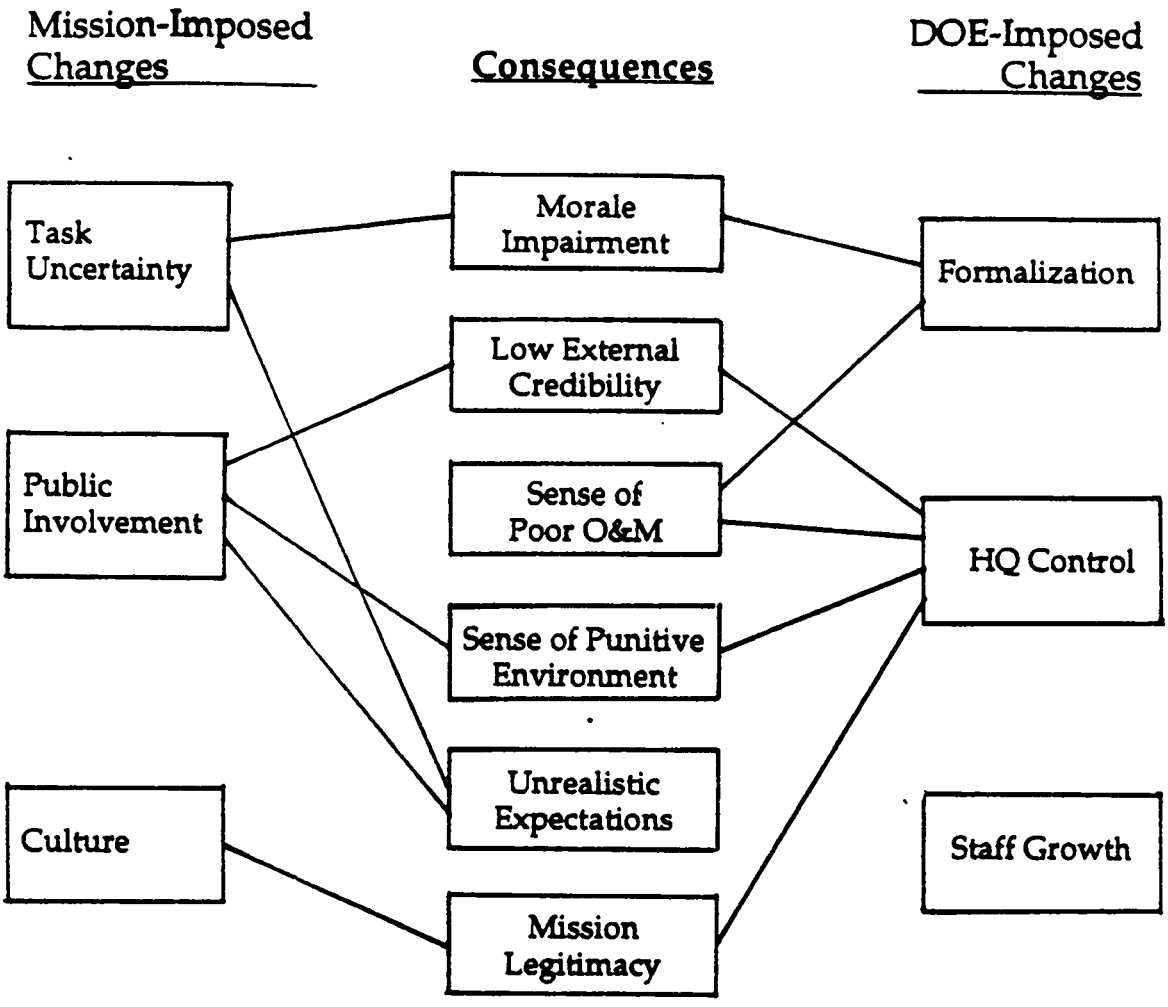


Figure 5.1 Attitudinal/Behavioral Consequences of Change

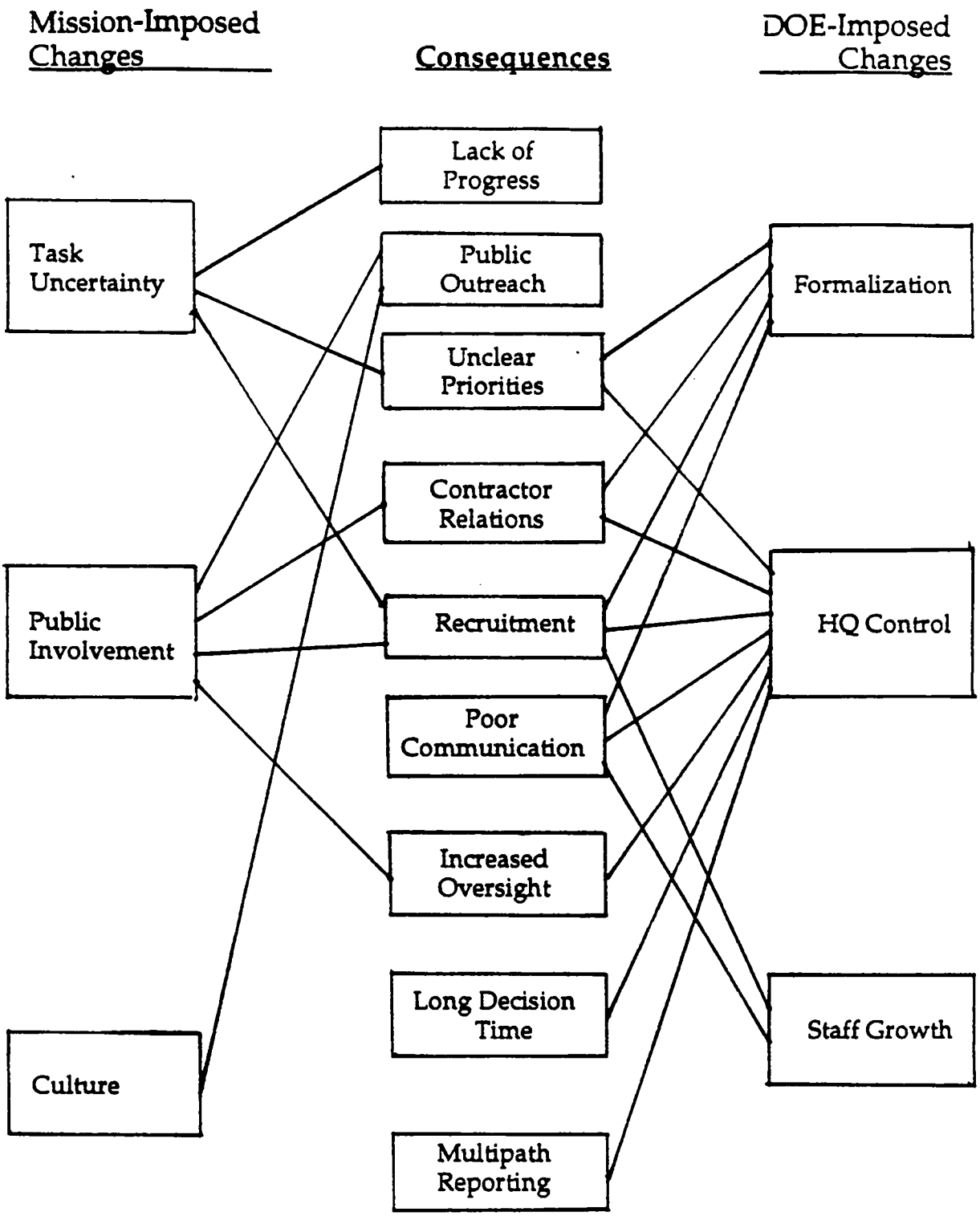


Figure 5.2 Structural/Organizational Consequences of Change

6. Phase II Research Topics

In this section, we present a number of research ideas that we think have potential for inclusion in our Phase II research program. We feel that these topics have the potential to make an important contribution to DOE's ability to fulfill its waste management mission and can be reasonably undertaken by the staff available through LANL and MIT (which may include staff who are not currently members of the research team, if needed to gain requisite skills). Research ideas are listed in a rough descending priority (i.e., with the first item listed being viewed as of the highest priority). We expect to be able to accomplish only three or four of these projects, given available funding; therefore, further refinement of the list is needed. We expect to consult both EM personnel and our advisory committee in determining the final projects to include in Phase II.

6.1 A Systems Dynamics Model of Environmental Management Policy Analysis

The long-term goal of this policy research project is to provide DOE with a means for assessing the impacts of decisions and/or policy options on the overall performance of the EM mission.

We start with the observation that there are a large number of stakeholders interested in the EM program. Further, these stakeholders have a variety of goals for the program that are frequently in conflict with one another and the current DOE-EM goals. The simplest example of conflicting goals would be the priorities that different geographic locations have for cleanup work. Each local site would like to have first priority on resources to

conduct the cleanup. However, the estimated total cost of the cleanup is so large that it is evident that EM will function under severe resource constraints for many years. It is therefore inevitable that some stakeholders will be unhappy with the EM effort at their location. Presumably unhappy stakeholders will make some efforts to change the EM allocation of resources.

The above example is not the only type of goal conflict between stakeholders and DOE. In addition to resource allocation there have been struggles over priority systems, technology development, cleanup standards, public accountability, information availability, compliance with federal and state laws, and negotiations with local agencies. Independent of external stakeholders there have been conflicts between headquarters and the field offices over decision-making authority, reporting requirements, operating policies and procedures, etc. Finally, there are conflicts between EM and other DOE offices that impact the functioning of the EM program.

We believe that the overall EM program is very complex with many different pathways for information and influence to propagate throughout the system. Mathematically, the system would be characterized as a nonlinear feedback system. Characteristic of such systems is the difficulty of predicting overall behavior to individual inputs. From the management perspective the key inputs are the decisions or policies that are adopted to reach certain goals. However, the actual system behavior may be more subtle than imagined by the policymaker, with the result that the system does not respond as expected. This can be frustrating to the policymaker leading to further steps that also may be unproductive. It is also plausible that a given policy may produce unanticipated results that are undesirable. For example, a new reporting mechanism may be enforced which gives higher quality data to

headquarters. However, the cost of preparing the reports may be very high in terms of staff time leading to a loss of productivity. A loss of productivity may be harmful to field office or contractor staff morale, and potentially decreased progress in certain cleanup activities. This in turn could increase the level of discontent amongst local external stakeholders, and they in turn might create bad publicity via the media or the courts.

The fact that complex systems are difficult to understand is the primary motive for the research proposal in this task. Our objective is to develop a model of a portion of the EM system that is sufficiently realistic that major components of the system behavior can be simulated. It should then be possible to analyze the system behavior under a variety of different policy options to gain some insight into its behavior. Particularly important is the ability to determine policy impacts on different stakeholder groups.

In the next section we present a brief review of the modeling language and tools we propose to use. We then discuss the application of the language to an EM problem.

6.1.1 System Dynamics Modeling

The method we propose to use in the modeling is termed "system dynamics" and was developed by Prof. J. Forrester of MIT. The method carries over the approach of engineering systems analysis to business, economic, and social systems. The approach simulates system behavior in terms of explicit models of internal variables and their interaction through cause-effect relations. The method has been applied to industrial systems, i.e. marketing, management, R&D policies, etc., in a variety of industries. It has been very widely used to analyze large-scale design and construction projects

such as nuclear power plants, ship construction, and aerospace projects. Social applications have occurred in the housing and urban development area, health care delivery, and primary education fields. The current DOE National Energy Model is a system dynamics based model. A summary of applications, and users' views of the applications, are presented by Forrester (1968).

The basic idea behind system dynamics modeling is that any complex system can be represented in terms of a set of interacting, simple components. Complexity arises because there may be many components and/or because the components interact through complex pathways. Almost always systems include feedback of signals and information between various components. This feedback may be direct or indirect.

Two fundamental descriptors are used to develop a system dynamics model. The first of these is termed a "level" and represents the magnitude of a dependent variable that obeys a conservation rule; i.e. for which the rate of change is given as the difference in the rate of inflow less the rate of outflow. The mathematical statements of many physical laws are frequently in the form of conservation equations. In social systems there are similar quantities of interest, for example, staffing levels on a project, or resources available, or materials requirements, etc.

The second descriptor is called a "rate" and represents the rates of flow into and out of levels. Rates are controlled or determined by decision variables or policies that characterize cause/effect relations. For example, the rate of addition to a staff of engineers would be determined based upon

perceptions of the amount of engineering work to be done, the productivity of engineers, the resources available, and the schedule.

System dynamics models are created with the intent of simulating the dynamic behavior of systems. They are not designed to find steady-state or equilibrium behavior. They are purposely designed to allow insight into how complex systems behave, in time, under changing conditions. A general description of the system dynamics approach is found in Senge (1990). A discussion of the managerial applications is contained in Forrester (1961). More advanced topics are presented in "System Dynamics Review," a journal which is published by the System Dynamics Society.

6.1.2 System Dynamics Application to the EM Complex

The overall EM complex consists of the DOE headquarters staff and 14 major facilities distributed across the United States. Each facility has a DOE field office and one or more contractors working at the site. However, neither DOE headquarters nor the sites operate without other influential organizations. Figure 6.1 is a simplified picture of the EM complex including internal and external stakeholder groups, a picture developed in our Phase I study of management under the collaborative research program. The picture is designed to show how influence and information flow around the system. The dotted line in the middle of the figure separates local from national stakeholders.

The methodology of system dynamics can be applied to management of the EM program at several levels of aggregation. At the highest level it would be possible to build a model that represents the totality of the program. The model would then represent the DOE headquarters and each separate site

with EM activities. Such a model would be strategic in the sense that it would be designed to analyze such issues as resource competition between sites, centralized versus decentralized control, national standards for cleanup work, etc.

An alternative, disaggregated model might focus on DOE headquarters and a single site. The model would incorporate the relations between headquarters, the field office, contractors, and local external groups such as state regulators, state and local officials, and public interest groups. Such a model would then focus on addressing such questions as policies that affect stakeholder perceptions, the importance of compliance agreements, contractor-DOE relations, etc.

We propose to develop such a disaggregated model for our first application. The objective is to determine if this class of models can be applied usefully for DOE-EM's purposes. If successful, the research will provide a policy planning and analysis tool for a select class of problems, and will provide experience with an approach that can be used for more elaborate problems.

The first model will contain the following sectors:

- DOE Headquarters
- DOE Field Office
- Contractor
- Local external stakeholders, e.g. regional EPA office, state regulators, state officials, and public interest groups.

These sectors all interact with each other in a variety of ways. In general the functions of each sector, and measures of performance used to assess other sectors, are the key descriptors needed to build a model. The functions and

measures of performance we propose here are for the purposes of illustration. Actual variables and measures will be derived from extensive discussions with informed stakeholders.

(1) DOE Headquarters Sector

- Functions
  - -- Distribute resources to field offices
  - -- Distribute work of various types to be accomplished
  - -- Distribute priorities
  - -- Review and approve plans
- Measures of Performance of Field Office
  - -- Accomplishment of work to be done
  - -- Satisfaction of milestones in agreements
  - -- Lack of complaints by local external stakeholders
  - -- Avoidance of high publicity events

(2) DOE Field Office

- Functions
  - -- Communicate with and satisfy headquarters
  - -- Distribute work to be done and priorities to contractor
  - -- Review contractor plans and procedures
  - -- Monitor performance of work
  - -- Negotiate with local external stakeholders
  - -- Satisfy other local external stakeholder requests/demands
- Measures of Contractor Performance
  - -- Work accomplishment
  - -- Meeting compliance/agreement goals
  - -- Assistance in dealing with local external stakeholders

(3) Contractors

- Functions
  - Manage work to be done
  - Carry out work
  - Support the field office in dealings with local external stakeholders
- Measures of Own Performance
  - Customer satisfaction, i.e. DOE field office
  - Staff morale and productivity
  - Public credibility and trust of site
  - Award fee

(4) Local External Stakeholders

- Functions
  - Negotiate with regard to site cleanup
  - Monitor site performance
  - Assure compliance to any agreement
- Measures of Performance at Site
  - Credibility/trust of site (DOE field office and contractor)
  - Difficulty of negotiation
  - Responsiveness of site to requests for information, etc.

We illustrate the concepts of levels and rates by reference to a few functions and performance levels. Thus, in the DOE Headquarters sector the functions of resource distribution and work allocation represent headquarters acting as a source of input, or an initial value, into a level within the DOE field office. Likewise, the task of reviewing and approving plans is a level of

work within the headquarters sector that must be processed. The headquarters distribution of priorities are control or decision variables to be implemented by the field office.

Consider the following simple case in which headquarters assigns a field office N_1, man-years of cleanup work to perform, N_2 man-years of technology development work, and N_3 man-years of bureaucratic work. In addition headquarters provides funding for N persons per year. Finally, headquarters gives a priority to each piece of work. The field office management would use the work to be done of each type, and the available resources, to set a schedule for completing each task. Headquarters would then review the schedule and approve, or modify based upon reallocation of resources or priorities. As work progresses, changes may occur which affect the level of work to be done, or the level of work already accomplished. For instance, the cleanup work may be performed based on a certain standard. Imposition of a new standard may create the need for additional man-years to accomplish the work.

The types of work being done at any site consists of assessment work, cleanup work, technology development, bureaucratic work, negotiation work, and possibly litigation. It is likely that all these different types of work will be represented because each requires resources to accomplish. Any policy that increases bureaucratic work is likely to reduce the available resources for other types of work. Much of what was learned in the Phase I management study suggests that DOE headquarters imposed a great deal of bureaucratic work on the field office and contractors. Similarly, preparing information for external groups is a potential time sink for the field office that can reduce work accomplished elsewhere.

Describing the exact manner in which these sectors are tied together is a major part of the model development. The process to be followed is iterative between the model developers and stakeholders familiar with conditions at a site.. We envision the first step as the development of a "causal loop diagram" of the system. A causal loop diagram is a logic flow diagram that provides an explicit representation of the proposed model. Figure 6.1 is not a causal loop diagram but an overall picture of the major stakeholder groups and how they communicate.

In Figure 6.2 we present a small portion of a causal loop diagram that indicates how a contractor might accomplish some type of work and attempt to adjust his staffing level to maintain the schedule. We assume there is a certain amount of work of some type, say type A, to be done. The contractor assigns personnel to the work. The rate at which work is done is the combination of the staffing level and the worker productivity. The amount of work accomplished is compared with the schedule to determine the perceived progress. This in turn is used to decide if the size of the available staff should be increased to maintain schedule. The actual staff available may be increased with new hires. Finally, the total available staff and the priorities for all different types of work are used to assign staff to work of type A.

The example is a very elementary illustration of a causal loop diagram. Many important feedback paths are not represented. For example, the productivity of the staff is a function of many factors, such as schedule pressure, concern with legal liabilities, unwillingness to take risks that might anger DOE, etc. These factors can be incorporated into a system dynamics model, which illustrates the complexity of the real world and the versatility of the approach. After we have generated the initial diagram we will meet

with field office personnel, contractor personnel, and local external stakeholders to refine the causal loop. The hope is that after discussion with a reasonable number of knowledgeable persons we can reach a consensus on how the system functions and how different individual components of the system should be modeled.

The conversion of the causal loop diagram into a dynamic model will be done using a system dynamics software package called "STELLA" which is commercially available. The basic task is to review the causal loop diagram and identify the set of variables that represent quantities whose values satisfy a conservation principle. For example, the staffing level is such a quantity. The staff size changes due to new hires, or due to firing. The rate of change is the difference between additions and subtractions, which is the conservation principle. There are likely to be many such variables, which are termed "levels" in the system dynamics nomenclature. Examples of levels that will be represented in our model include staffing of all kinds and work to be done or work accomplished of all types.

The flows into or out of a level are rate relations and those are determined by the basic cause/effect relations used in the model. For instance, the rate at which available staff is increased by hiring would be determined by perceived needs and by available resources (not illustrated in Figure 6.2). Presumably the model will have a cause/effect relation built in to decide if hiring can take place, and at what rate.

Much more subtle cause/effect relations are involved in quantifying such variables as morale or credibility. These quantities are influential in the actual behavior of human beings that are the stakeholders being represented.

There exists a reasonably rich literature in the system dynamics field on how to represent such matters. For example, productivity is a key factor in determining the rate at which work is accomplished. This factor is important in the engineering design process and has been modeled in great detail in system dynamics applications to large-scale design/construction projects.

A major effort in developing our model will be given to representing cause/effect relations that describe human reactions and attitudes, and their influence upon key factors such as productivity. The process to be used is also iterative. We will hypothesize relations based upon past experience and then discuss the proposed relation with knowledgeable persons. We will again seek a consensus on what is to be modeled and how it is modeled. The second stage will involve sensitivity studies with the overall model to identify the cause/effect relations that appear to have the greatest impact on system behavior. We will then invest further effort in refining the relation to achieve some degree of confidence in the actual relations to be used.

The use of the final model will be illustrated by studying a variety of "what if" scenarios. One obvious example is the impact of different resource allocation priorities on stakeholder perceptions. Assuming the site managers are given a fixed level of resources they may opt to place emphasis on pleasing DOE headquarters, pleasing their own staff, or pleasing the set of external stakeholders. Each option has benefits and losses to the decision makers, and these can be quantified to a reasonable extent. Further, the delays inherent in each part of the system will produce a temporal distribution of results that may carry interesting possibilities. As an example, investing heavily in bureaucratic work will produce near-term satisfaction at DOE headquarters. The effect upon DOE field office or contractor staff may be

immediate and harmful, for example by lowering morale. This will reduce the rate of progress in other types of work. However, the lack of progress may not be apparent to external stakeholders for some time. Their response, in terms of loss of credibility and trust, will lead to delayed pressures on the site, and possibly headquarters, for greater action. It is conceivable that headquarters would be favorably disposed to increasing resources for the site due to satisfaction with the site management in the near term, and be unhappy in the long run due to pressure from dissatisfied stakeholders. Obviously, results can be different than proposed here, or other strategies can be evaluated. The object of the model is to allow managers to study a host of allocation policies to gain some insight into what effects are created in what stakeholders as a function of time. Such insight should be useful in developing overall strategies.

Other types of "what if" studies can be imagined that deal with maximizing or minimizing certain stakeholder attitudes; the merits and/or demerits of negotiating strategies; how to respond to sudden events such as a resource allocation increase or decrease; the potential benefits of technology developments; and the assessment of new proposed compliance agreements. The uses of the model are very large and the focus is on analyzing policy options that are complex in their impacts, and therefore hard to assess by other means.

6.1.3 Study Location

We propose to make the first model development for the Hanford Waste Tanks. We pick this particular problem for several reasons. First, the tank farms represent one of the most serious problems for EM in terms of

public risk. Second, the problem is well-defined in terms of the stakeholders, the nature of the work to be done, the set of agreements in place between DOE and the local external stakeholders, and the difficulty of the tasks. Third, the problem has been the subject of plans, analysis, and negotiation for several years. This implies that there exist many knowledgeable stakeholders who can help us develop a model by constructive criticisms and suggestions. Finally, the problem has a large set of interested stakeholders and a successful application of our approach would be a very important contribution to the EM cleanup program.

It is important to gain the interest and cooperation of all the stakeholders at Hanford. We cannot develop a reasonable model without the insights and experience present at the site. We also recognize that the DOE field office and contractor staffs are very busy. They have a very difficult task and will not welcome extraneous interferences unless they are likely to be very beneficial. Thus, an important initial task is to make contact with Hanford management personnel and gain their cooperation with our study. We can do this if we can convince them that the work proposed is reasonable and that, if successful, can be of significant benefit to them. We must also show that we will not produce excessive demands on their time or other resources. A few discussions with site personnel indicate positive interest in the work.

6.2 An Organizational Issue: The Role of DOE's Field Offices

The field offices represent the Department of Energy/EM to the two broad constituencies who are the most important ones in determining EM's effectiveness over the long run: the contractors and the outside site constituents (regulators, state officials, local community, activists). By

"effectiveness" we mean how well EM accomplishes its basic cleanup mission while balancing to tolerable levels of dissatisfaction the often-conflicting demands of the various important groups--in and out of Washington, DC--that are concerned with its activities. In the long run, what happens at the sites determines--through the influence of site-affected voters and lobbies--the behavior of Congress and the Administration in controlling DOE and allocating its material and human resources.

In dealing with these two broad constituencies, the field office has two types of responsibility which are discordant with each other. One responsibility is to be the professional opposition. That is, the field office must oversee the performance of the contractors in living up to their contractual obligations, and the field office must also resist those requests and demands of site constituencies which would consume EM resources unreasonably or inequitably by national standards, such as they are.

However, the second field office responsibility is to be a constructive part of the coalition. That is, the field office has to work *with* the contractors to get effective cleanup performance, and the field office has to work *with* the site constituencies to achieve détente on the inevitable compromises in carrying out the cleanup program.

The organizational problem then is to define the field office role that balances these two types of responsibility in a way that maximizes organizational effectiveness (which needs to be characterized). A non-trivial element in defining the role is the relationship between the field office and DOE headquarters and how *that* relationship affects the field offices' relationships with contractors and site constituencies. The recent shift to

headquarters control has tilted the overall opposition/coalition balance toward opposition. Has that shift increased or decreased overall effectiveness?

A set of questions whose answers would help define the field office role is:

- What measures of effectiveness should be used to assess field office performance and how are those measures weighted by key stakeholder groups?
- How do (selected) field offices in fact work with (a) contractors, and (b) outside site constituents to discharge both their opposition and coalition responsibilities?
- How are those working relationships affected by the field office relationship with headquarters?
- How do different field office relationships correlate with measures of effectiveness?

6.3 Analysis of Compliance Agreements

DOE has entered into compliance agreements with the EPA and state governments to serve legal, management, and political purposes. But, compliance agreements have also caused legal, management, and political problems. These problems exist in both a macro- and a micro-sense. Macro issues are concerned with the political agendas for which compliance agreements are used by various stakeholders as well as difficulties that exist in negotiating agreements that are realistic, fair at the local level, and nationally equitable. Micro issues are concerned with the ability to negotiate

agreements, deploy resources, and develop constructive relationships with stakeholder groups interested in the agreements.

Both DOE and Congress certainly have their political agendas in fostering compliance agreements. DOE relies upon compliance agreements to prove the point that it is responsive to public needs at the sites. Congress, according to at least one stakeholder, favors compliance agreements as a way of avoiding the issue of a nationally equitable approach to cleanup. Lack of accepted standards for cleanup and differing interpretations of those standards by federal, state, and local regulators exacerbates the problem of national equity.

EM, in its July 1992 Strategic Plan, acknowledges the regulatory obstacles to negotiating locally and nationally equitable agreements. These include:

- Lack of risk-based criteria in present regulations, and the differing stakeholder perceptions of what constitutes acceptable risk that further complicates development of risk-based regulations.

- The rapid growth of regulations and the lag of technologies and methods that are adequate to comply with the regulations.

They note that program planning must be conducted in "a manner that anticipates and helps shape the future of regulatory requirements (p. 9)," that they must develop mechanisms for DOE participation in the regulatory process, and that they must support risk-based national prioritization.

Even if there were national standards, however, differences would exist in compliance agreements nationwide. Over time, negotiation strategies have differed, for example, in terms of HQ involvement in particular

negotiations. Likewise, implementation details have varied, with some agreements being more flexible than others.

There is no prospect that compliance agreements will go away. On the contrary, more will be negotiated and an increasing share of all EM activities is likely to be devoted, directly or indirectly (as in technology development), to satisfying commitments made in current or future compliance agreements. Therefore, the first issue for EM is to negotiate equitable and realistic agreements; the second is to appropriately manage the implementation of those agreements, ensuring that necessary resources are available and that constructive relationships are maintained with cognizant regulators and other involved parties so that the inevitable changes and failures to meet milestones can be dealt with. These issues are addressed in the research topics below.

6.3.1 Research Topics on Compliance

Macro issues are largely addressed in the section below on National Priorities, as it considers the relationships between standards, technology development, and priorities. This work should go a long way in helping EM understand how they might conduct program planning to be on the leading edge of technology and regulatory developments. One macro issue not addressed in that section, however, is the political agenda served by compliance agreements for national-level stakeholders. Therefore, the first step for the work on compliance agreements would be a more detailed analysis via interviews of stakeholders interpretations of the needs served by compliance agreements at a national level.

The second step would be to trace at least two existing or in-progress compliance agreements to determine what the motivations for seeking the agreements were among the actual participants, what the negotiating terms were and how they evolved, and how satisfied the parties to the agreement are with the outcome. We would expect both to examine pertinent documents and to conduct interviews with direct participants. The outcome of this project would be not only a report of what worked and didn't work in the negotiations, but also insight into what could be done better in future negotiations to help ensure stakeholder satisfaction.

The third step would follow up on an observation contained in the EM Strategic Plan that, because the Department of Defense is faced with environmental concerns that are in many ways similar to DOE's, it is reasonable to expect that each department can benefit from the other's knowledge and experience. Therefore, we would conduct an analysis of the differences between compliance agreements negotiated by the two departments with the intent of identifying which of the successful DOD components might reasonably be used by DOE and with what effects.

6.4 Project Management Systems

DOE has a long history of engaging in large-scale projects and has successfully used project management methods that were chiefly derived from traditional endeavors, such as construction engineering, production processes, and cost-accounting for management control. At one level, EM projects are treated no differently from other DOE projects; they are subject to the reporting requirements of DOE order 4700.1, which lays out project development steps, including program requirements, cost estimation, and

project tracking systems. At another level, EM has developed its own system of Activity Data Sheets, implicitly recognizing that some things do need to be tailored specifically to its needs. That need is explicitly recognized in the strategic plan, which states that insufficiently developed program management capabilities inhibit program effectiveness.

Many stakeholders argue that traditional project management methods don't work very well for the kinds of projects EM finds itself engaged in. Those comments suggest that EM's work is fundamentally different from work for which traditional project management systems were devised. A distillation of stakeholder comments follows.

- DOE order 4700.1 is an off-the-shelf project management model that wasn't designed for the type of work we are engaged in.
- The politics of funding drives project implementation; budgets are not related to project management schedules.
- DOE order 4700.1 doesn't work well in an environment where change is the norm.
- There's no room for flexibility or to find improvements by experimentation.
- Documentation and reporting requirements are burdensome.
- Input from the field is discounted or ignored.

EM's programs have many features that are characteristic of what can be called "mega projects," defined as "any collaborative project which requires knowledge, skills, or resources that exceed what is readily or conventionally available to key participants." All projects are subject to change, and traditional project management systems anticipate that fact and have change-control mechanisms to cope with it. In mega projects, however, the complex

interrelationships and unprecedented scope of the tasks result in a level of uncertainty that can't be dealt with effectively by using traditional project management methods. Some of the features of EM programs that, collectively, make those programs different in nature from other engineering or construction programs are:

- Very expensive
- Multi-year
- Many scientific and technical uncertainties
- Complex interrelationships
- One-of-a-kind
- Critical interactions with outside groups

In addition, the context in which EM finds itself working leads to schedules and modes of work that should not and cannot be judged according to traditional models. For example, the time used to negotiate compliance agreements, achieve consensus, and solve problems can put a project off schedule, and is typically labeled "delay" in a pejorative sense. The fact that there may be no alternative to taking the time necessary to reach consensus isn't likely to be accommodated by traditional project management models. Those models set up expectations, both explicit and implicit, that can't be met because of the high degree of complexity, ambiguity, expense, risk, and uncertainty that constitute EM's arena.

There are other consequences of the misfit between traditional project management and EM's unique needs. When expectations for performance are not met and cannot be met due to operational uncertainties and lack of technical information inherent in much of EM's work, those responsible--contractors and DOE employees--become dissatisfied with their performance

yet feel helpless to do better, which leads to morale problems. When external stakeholders see expectations go unfulfilled, DOE/EM credibility suffers.

6.4.1 Proposed Research on Project Management

We will begin by identifying EM's program uncertainties and information deficits, in the belief that by identifying uncertainties, it should be easier to design strategies required to reduce them. But because those uncertainties will always be a part of EM's cleanup operations, we will examine ways in which they affect its ability to manage projects. For example, how does a system that requires meeting firm schedules and milestones mesh with a process in which unpredictable delays occur because of uncertainties that are inherent in that process?

We will study traditional project management methods to see if modifications can be adopted to make them more responsive to uncertainty and changes that accompany uncertainty. It has been stated, for example (by a DOE HQ stakeholder), that because EM's work is operational in nature, the existing project management system is appropriate, even though it may need to be modified to closely track those things that seem to need something more. Perhaps by identifying and characterizing different kinds of "non-standard" activities EM is engaged in, such as prototyping, trial-and-error, and simulating, we can begin to understand where refinements and improvements to existing project management systems may work.

We believe, though, that many of EM's activities are fundamentally different in nature from the activities for which traditional project management systems were developed, and that new paradigms for project management must be considered. The management of R&D projects may

help shed some light on this area. R&D is clearly a situation where managing under uncertainty applies, and it may turn out that some R&D management systems have something to offer EM in that regard.

In considering refined or alternative project management systems, we will evaluate the fit between capabilities of those systems and EM's unique needs and characteristics. In particular, we will examine suitability in light of:

- the state of scientific and technological knowledge
- the processes involved in reaching compliance agreements
- the federal appropriations cycle
- iterative work processes involved in EM's mission
- social, political, and organizational processes involved in decision-making
- organizational feedback and learning processes

Our goal will be to evaluate project management systems based on how they improve on current practice and meet strategic objectives, and to lay out the implications for EM of adopting or refining different systems.

6.5 National Priorities

EM has tried, with little success, to put into effect a national prioritization plan to direct its efforts. Ideally, such a prioritization scheme needs several characteristics in order to be successful. It must be understood and accepted by both the people who employ it and by stakeholders who will be affected by it. It should be equitable and, equally important, appear to be equitable. It must be workable, which includes being flexible enough to take into account changing requirements brought on by, for example, new information about the nature of the contamination at a certain site.

Phase I of our research showed that people are concerned about unclear priorities, or about conflicts over priorities. This lack of consistent direction causes problems in allocating resources, which results in other problems. Some of those difficulties are listed below.

- Work efforts delayed and disrupted by changes in funding.
- Resources not used effectively.
- Excessive planning and paper studies, little remediation work.
- Reactive mode, with everything essentially equal in priority.
- No focus on the most significant problems.
- Lack of integration of efforts.
- Lowered morale because of changing directions.
- Perception that EM is inefficient and/or wasteful.

There is, of course, a prioritization of EM activities that exists de facto. To a large extent, EM's activities are driven by regulation, including compliance agreements. Because those agreements are negotiated with local entities, it's likely that national needs take a back seat to local desires. There may be serious consequences of that failure to put national needs to the front in setting priorities.

To be sure, there are legitimate reasons for why it is difficult to set priorities. Chief among those reasons is the fact that the very nature of the work entails a significant amount of uncertainty, and that's not likely to change.

To people with a technical background, it is only logical that a prioritization plan should be risk-based. If we are to agree on risk-based priorities, however, we must first agree on certain standards--what level of

risk is acceptable, how clean is clean, etc. There is currently no agreement on what criteria to use to evaluate risk. Many people feel DOE/EM needs to adopt a set of radiological standards that are based upon a recognized external authority, such as ICRP, NCRP, or use of BEIR committee recommendations. At a minimum, discrepancies in standards between the NRC, EPA, and the States need to be resolved. Without an agreement on standards, any attempt at establishing a risk-based prioritization scheme is doomed to failure. Some other reasons for the difficulty in setting priorities follow.

- Competition between States/sites.
- Non-standard compliance agreements.
- Conflicts within DOE (between HQ and FOs, between DP and EM, etc.) and between DOE and other agencies, such as EPA.
- Uncertainty as to the nature and level of contamination.
- Lack of direction from Congress.

In addition to the link between standards and priorities, there is a link between standards and technology development that plays in the setting of priorities. The standards that do exist tend to be technology-based, because that's easier to measure than would be a standard based on, say, a long-term health effect. If standards are technology-based, and priorities depend in some sense on standards, then we must study the cause and effect chain that runs from technology to standards to priorities.

6.5.1 Proposed Research on National Priorities

In light of the technology--standards--priorities chain and its negative effect on DOE's ability to set national priorities, we propose to study the relationship between standards and technology development. It may turn out, for example, that the relationship is circular: technology affects

standards, but technology development is affected by standards. We will collect data and analyze how standards and technology development influence each other. We expect that gaining an understanding of that relationship will be useful in itself, as a means to pointing out which new technologies would contribute most to accomplishing cleanup, for example. That understanding would also be used to study the effect of technology development/standards on priorities.

We have evidence from Phase I that the lack of clear standards and priorities has consequences, the first of which is the failure to use resources efficiently and effectively. Many stakeholders mentioned that during our Phase I research. That failing, in turn, has other consequences, such as morale problems among employees and perception problems among other stakeholders. There may be other consequences which, if understood, would point to the urgency of establishing a national priority system. It may be, for example, that there have been inequities in allocation of resources, which could have had effects on DOE's planning and management. Other problems might also be identified, problems which haven't been tied to the lack of priorities because no one has been looking for those ties. In this second part of our study, we will look for other consequences of the failure to agree on a national priority system. In addition to providing an impetus to the effort to find ways to establish such a system, we believe that identifying other consequences can point toward ways around the obstacles that have stood in the way of reaching consensus on a priority system.

6.6 Planning for Staff Growth in the EM Organization

There is widespread agreement among stakeholders that the changes that have recently faced DOE EM have made it very difficult to recruit, develop, effectively deploy, and retain the numbers of technical staff needed to operate and manage the EM task. Both DOE HQ and field offices are considered to be understaffed, due to the rapid expansion of the EM mission and to the unavailability of qualified candidates. Consequences of this understaffing expressed by the field offices include inability to: fully protect government interests in overseeing the contractors, establish expertise in all necessary areas, live up to agreements made with regulators, or satisfy demands made by HQ. Similarly, HQ people expressed reservations that they could oversee the field offices and respond to departmental and other governmental demands without more resources. One additional consequence is that contractors are doing many of the jobs that DOE itself should be doing.

Recruitment presents several difficulties. First, there are relatively few persons available either inside or outside the complex with a strong EM-type background. Competition for these people is fierce, due to high demand, and DOE often finds itself in a non-competitive situation because contractors and other private-sector sources offer more attractive salaries and working conditions (i.e., with less risk) than DOE.

The most oft-cited category of concern among stakeholders with regard to human resources was that of competence and expertise of the current staff. One consequence of the rapid staff growth has been that some EM employees, both at HQ and in the field, are inexperienced in the EM arena, having been

moved to EM from Defense Programs or newly recruited. Management and technical oversight were areas specifically cited as lacking experienced personnel. Questions related to competence can occur at two distinct levels: how can the talent pool be increased to provide larger numbers of qualified candidates and how can staff development practices (i.e., training) be improved to enhance the competence of incumbents?

Several other observations made by stakeholders are important to consider in dealing with staff planning for EM:

- There are not enough dollars and qualified people in the world to satisfy every order, requirement, rule, statute, and other demand--staff prioritization is required.

- There are major stresses on the organization because of rapid staff growth. Organizational and management methods adequate for the small staffs of the past may be inadequate for large ones--O&M demands must be considered in staff planning.

DOE EM has recognized that human resources are and will remain a problem area unless actions are taken to systematize resourcing. In the July, 1992 Strategic Plan, EM defines two objectives that deal with the issues surrounding staff recruitment, development, retention, and deployment:

- INFRASTRUCTURE: Ensure sufficient infrastructure to complete EM's mission by effectively estimating, developing, and providing the program's human-resource and capital-asset requirements.

- EFFICIENT USE OF RESOURCES: Aggressively pursue innovative approaches to development, acquisition, and management of resources.

These issues present the fodder for the research ideas described in Section 6.6.2.

6.6.1 Background Relevant to Research Proposals

Strategies for enhancing infrastructure called out in the Strategic Plan include:

- Institute credible resource-needs-assessment approaches and establish a prioritization process for funding and personnel requirements that is tied to specific program milestones.

- Develop broad-spectrum public outreach and education programs at all levels to support EM's long-term human resource requirements and foster development of an effective EM staff recruitment network.

The desire for credible resource-needs-assessment approaches is directly tied to an existing DOE-funded project at LANL. The High-Level Waste Tank Safety Workshop on Staffing has as its main thrust the development of functional responsibilities and qualifications of technical and administrative personnel required to effectively operate the HLW tank storage systems. On the surface, this definition is fairly straight forward, asking only "What functions must be performed?" and "What skills and/or education are necessary to perform them?" In answering these questions, however, additional issues arise, including:

1. How is human resource planning conducted? What systematic methods exist or should exist to ensure that staffing needs are known and met, that existing resources are used optimally, and that staff relations are maintained in a manner that promotes safe operations?

2. What staff recruitment programs exist or should exist, both for internal and external recruitment, to ensure the availability of qualified staff? Is recruitment competitive? How is the staff recruitment program monitored and evaluated for effectiveness?

3. What programs exist or should exist for staff development, training, and certification to ensure that only fully qualified staff are assigned to safety-critical operations?

4. What programs exist or should exist to assess the fitness-for-duty of qualified personnel performing safety-critical functions?

The final product of this work is expected to be a guidance document for staff planning at the tank sites which will address the aforementioned issues. This work could be extended to address similar issues as they apply to DOE EM as a whole.

Similarly, prioritization methods developed at LANL could be adapted to the question of prioritization of research requirements. (See the section on National Priorities for a description of these activities.)

With respect to the second strategic concern, DOE has been aggressively engaging in science education outreach activities at levels ranging from grade school (with programs such as SWOOPE) through college (WERC is an example). Further, EM has been in contact with organizations such as MIT to provide training for incumbent staff. Therefore, the research proposal outlined below purposely omits training development and implementation activities. Because the extent to which systematic analysis of strategic training needs has been included in the aforementioned activities is unknown, however, their effectiveness in providing a recruitment network and staff development opportunities for EM is unclear. Therefore, training analysis may still be considered.

Strategies for the efficient use of resources described in the Strategic Plan include:

- Develop better understanding on the part of both DOE field and headquarters upper management and OMB of the need to develop additional and improved management capabilities and systems.

- Establish programs to promote "team-building" within and among EM headquarters and field organizations.

- Establish a program that continually re-evaluates resource allocations in terms of mission requirements.

Because one of the specific purposes of the aforementioned Workshops Program is to promote the exchange of information among sites on organization and staffing requirements, the approaches being used in that project should fulfill the first two strategic concerns listed above if applied EM-wide. Use of a prioritization approach would address the third strategic concern.

6.6.2 Research Tasks for Staff Growth

Two major research tasks will be carried out. In the first stage, detailed interviews will be conducted with EM personnel and other stakeholders with first-hand knowledge of staffing issues (i.e., OMB) to determine current staffing practices and to gather views regarding the ways in which resource-needs-allocation should be organized and managed. Additionally, human resource planning and development models found in the literature will be evaluated for their applicability to EM. This activity will result in the development of a staffing model for EM that will be responsive to current and future needs in recruitment and staff development and that will provide guidance on the proper organizational structure to enhance staff effectiveness. Ideally, model development will include consensus building activities, such as those being performed in the Workshops Program, that will bring together multiple stakeholders and will foster mutual agreement between field office and headquarters personnel regarding appropriate staffing practices given the mission of each organizational entity. (Definition of an

appropriate organizational mission for the field office might be one area of study for the proposed research on the Role of the Field Office.)

In the second stage, stakeholder input will be employed to develop a prioritization model for making staffing decisions that will be consistent with the staff planning model developed in step one. This prioritization model will be based on multi-attribute decision theory, thus, will facilitate decision-making in the context of conflicting criteria, for example, the need to have an adequate size staff *and* the need to conserve financial resources. It will also allow for appropriate allocations to be made at different organizational levels in such a way that the rationales for such allocations will be transparent to the consumers. Finally, as mission requirements, hence staffing criteria, change, such a prioritization model will facilitate systematic re-evaluation of staffing practices.

6.7 Unintended Consequences of Accountability

There exists a widespread perception amongst many stakeholders that the environmental damage from the weapons complex occurred due to inadequate headquarters control of the field offices, inadequate field office control of contractors, and a system-wide overemphasis on production. The reaction of the public, Congress, public interest groups, regulators, and the media has created strong pressures for DOE to respond. The consequences of these pressures include a new degree of public accountability of DOE regarding its operations, legal requirements of compliance to various environmental laws, increased oversight by special boards, and increased Congressional scrutiny of DOE actions.

The Department has reacted to all of the above by numerous changes. Headquarters control has been strengthened by centralizing decision-making and reducing field office authority. Further, HQ has increased its oversight by imposing new directives, orders, and reporting requirements upon the sites. Finally, HQ has initiated a set of site reviews by Tiger Teams designed to identify site failures in responding to new priorities.

All of these steps have changed the "culture" within the Department, particularly at the sites. However, many of the changes have produced unintended effects on the system. One notable effect has been the lowering of morale for site personnel, both DOE and contractors. These people see themselves as innocent victims of a dramatic shift from production to cleanup. They believe they were doing a good job in the past and are now being made scapegoats for matters beyond their control. Their morale is further impaired by the manner in which they must now work. Thus, a lack of local control puts them in a reactive rather than proactive mode. Excessive paperwork consumes resources with little actual work accomplished.

A second consequence of the changes has been an atmosphere of fear with regard to punitive judgments by HQ. There is a belief that mistakes will be severely punished regardless of the merits of steps taken. This fear is compounded by the legal liabilities attendant to various environmental laws. Together these concerns lead to an atmosphere that engenders risk-avoidance, buck passing, and low initiative.

A final consequence is a degree of bureaucratization that is making work very costly to conduct and very slow to progress. Many site personnel have suggested that too much work is wasted in preparation for visits of

oversight groups. Others suggest that many inappropriate procedures are imposed that consume vast resources for little or no benefit. Further, the existing managerial processes lead to a slow-responding system that is frustrating to local external stakeholders. These stakeholders interpret the delays as further DOE disinterest in actually cleaning up the site. All of which reduces public trust of DOE.

6.7.1 Research Tasks on Unintended Consequences of Accountability

The research to be carried out on the project will consist of three steps. In the first stage, the set of measures created to achieve accountability will be identified, and the reasons and expectations for the measure developed. Measures have arisen from outside DOE, e.g., the Defense Nuclear Facility Safety Board, as well as internal to DOE, e.g., SEN notices. A key matter to be developed is the expected impacts and benefits to be derived from the measure, as seen by the creator/advocate of the measure.

The second stage of the work will be to trace the impacts of the measures upon the system at several sites. This will involve extensive discussions with field office, contractor, and local external stakeholders. We will look for evidence that the measure produced effects in line with original expectations. In addition, we will look for unexpected effects that may be positive or negative from the perspectives of HQ and the site.

The final stage of the research will be an assessment of how the set of benefits initially desired might be achieved with minimal introduction of undesirable side-effects. We do not anticipate that a perfect set of measures can be found with no unanticipated effects. Nevertheless, we hope we are able to produce a pattern of cause-effect relations that would permit

assessment of various measures, collectively or individually, that might be tailored toward an optimization of the problem in the sense of achieving the desired degree of accountability with minimal undesirable consequences.

Figure 6.1 The EM Complex

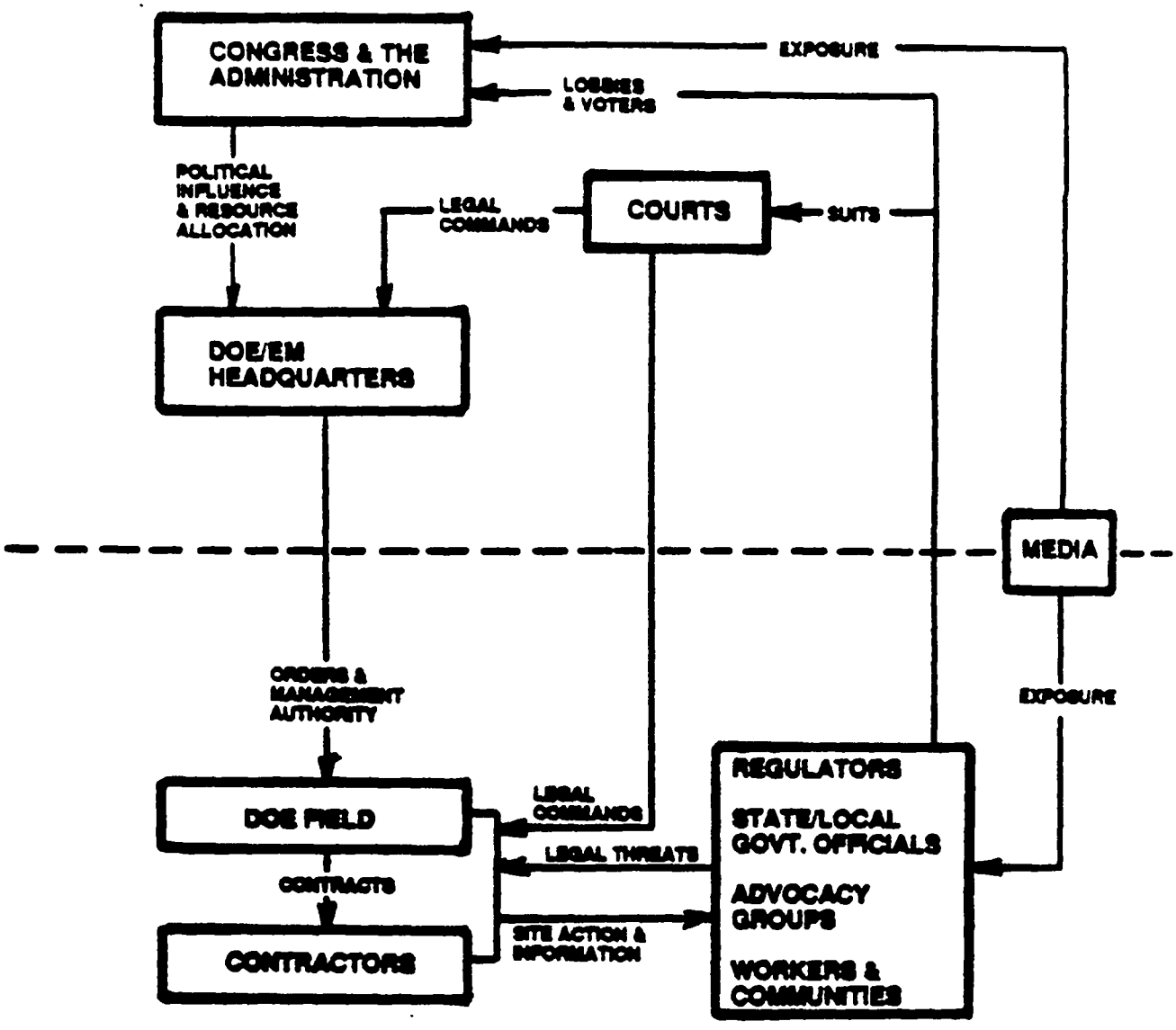
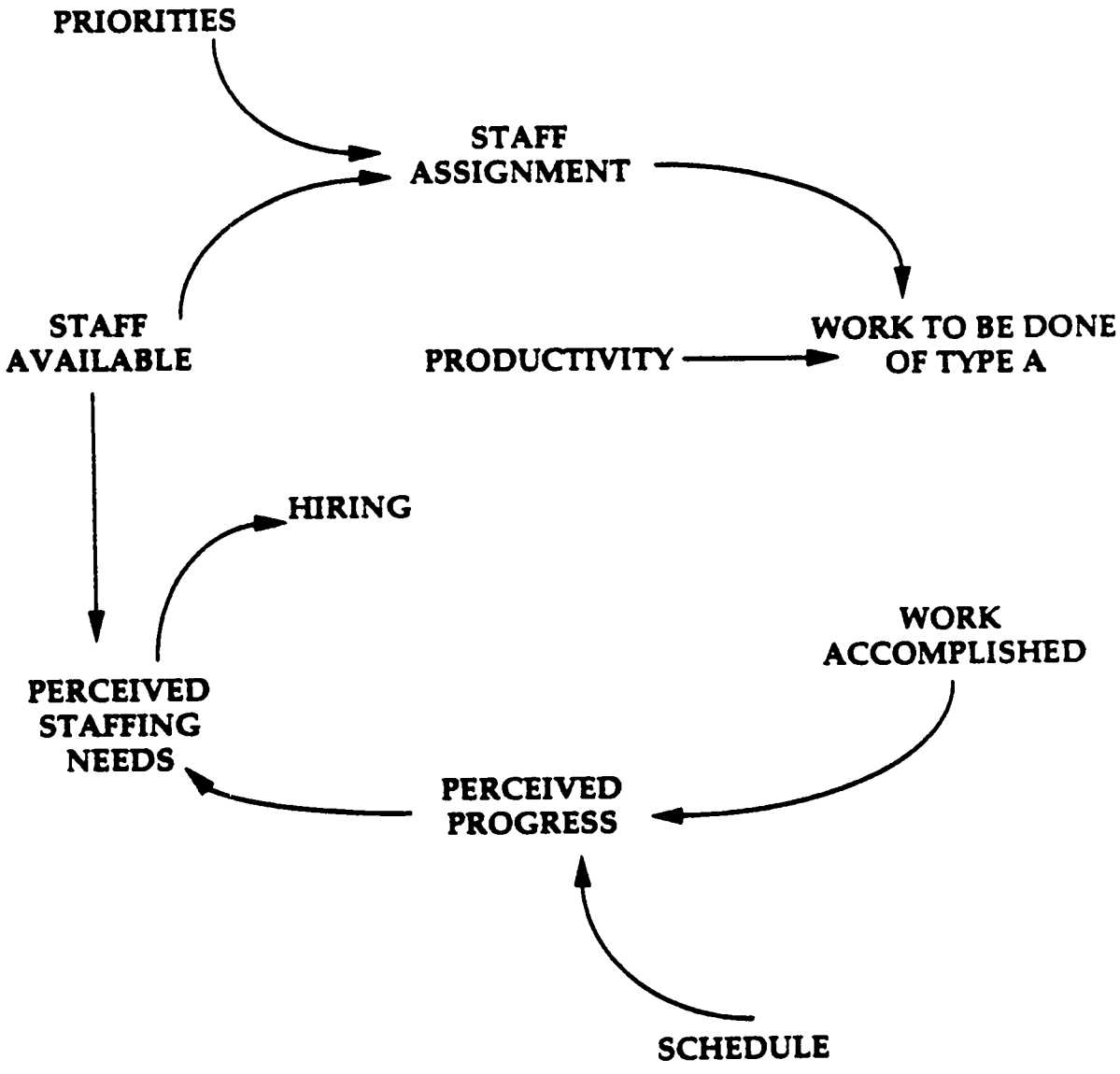


Figure 6.2. A Simple Causal Loop Diagram for Work Accomplishment



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Appendix A

Memo from Leo Duffy to Field Offices

United States Government Department of Ener

memorandum

DATE: October 1, 1991

REPLY TO ATTN OF: EM-35:Tseng:FTS 233-7170

SUBJECT: Organization and Management Study on the Environmental Restoration and Waste Management Complex

TO: Manager, Albuquerque Field Office
Manager, Chicago Field Office
Manager, Fernald Office
Manager, Idaho Field Office
Manager, Nevada Field Office
Manager, Oak Ridge Field Office
Manager, Richland Field Office
Manager, Rocky Flats Office
Manager, San Francisco Field Office
Manager, Savannah River Field Office

At my request, Los Alamos National Laboratory (LANL) and the Massachusetts Institute of Technology (MIT) are conducting an Office of Environmental Restoration and Waste Management (EM)-sponsored research program focused on the organization and management (O&M) issues that serve as drivers for the performance of the Department of Energy (DOE) nuclear waste management complex. This program will occur in two phases and will be conducted over several years. Phase I, which will be described below, is under way now. Your cooperation in talking with researchers and/or allowing individuals within your organization to be interviewed by the researchers during this phase is vital to the success of the effort.

The long-range purpose of this research is to help EM improve the management of its waste operations and environmental restoration activities through a better understanding of O&M relationships and behavior in the system, and of the effects of those relationships and behavior on the performance of the system. It is particularly important to understand how management functions can adjust effectively to changes in externally imposed objectives, resources, and constraints. It is also important to understand how the special characteristics of the DOE waste management system--its high visibility, broad array of stakeholders; physical and geographical scope and diversity; and extraordinary needs for reliability--create special demands on management.

In order to develop this type of understanding, Phase I of this research program, will identify the O&M issues associated with the DOE waste management complex and will determine which of those issues most influence management objectives and behavior. These issues will be identified through a series of interviews conducted with members of various "stakeholder" groups, including DOE itself; its contractors; other federal agencies, including regulators; Congress and its agencies; state and local governments; media representatives; and local and national public interest groups. Those interviewed will be asked to identify and discuss what they feel to be the major issues governing DOE's waste management performance--it is expected that the issues will include (but not be limited to)

communication within and outside the DOE; public trust; regulations and compliance; the DOE Field Office structure and its use and oversight of contractors and priorities assigned to environmental vs production goals.

Based on these interviews, LANL/MIT will develop broad, descriptive models of the identified O&M issues as they are seen by the various stakeholders. These models will go beyond the direct line management concepts that are generally used when studying facility management, and will include the relationships between DOE Headquarters and its Field Offices; between Field Offices and their site contractors; among Field Offices, site contractors and public interest groups; etc. These models will be used to guide Phase II studies aimed at developing insight into how O&M actions on the part of DOE will be perceived and influenced by various stakeholders.

This work will be performed in full confidentially regarding the sources of all information--neither name nor other identifying information (such as job title or position) will be shared with anyone outside the research team. Further, it should be emphasized that the purpose of our efforts is research--LANL/MIT researchers are not auditors, inspectors, or critics of individuals or their organizations. The intent is to provide EM with a better understanding of those stakeholder positions which influence its ability to manage the environmental restoration and waste management complex.

My staff contact for this study is John Tseng (FTS 233-7170). The study will be managed by Heidi Hahn of LANL (FTS 855-4606), and Malcolm Weiss of MIT (617-253-3441). I appreciate your cooperation in this important study for EM.

Leo P. Duffy
Director
Office of Environmental Restoration
and Waste Management

Appendix B

Sample of Extracts from Transcripts

Num	Code	Rank	StCat	Segment	Pg
11318	F8	M	LDE	Weiss: On the grounds that no one contractor is so rich in management talent, in numbers of people, not necessarily quality, that they can staff all that adequately. And therefore questions were raised whether they should be allowed to bid for still other jobs because they would rob Peter to pay Paul. Do you have any comment on that? Int: My general impression is that it is less a problem for Contractor X than it is for Contractor B. I think that Contractor X, for whatever reason, has a much larger pool of good management talent. Does a better job of training or indoctrinating or attracting good management to it.	16
11412	F3a, F5	M	LCO	There always has to be some oversight and QA role on their part. (Coder's Note: By the DOE site office) I think the balance is getting closer to being about right. And part of that has been because they've been able to staff up with enough help and technical expertise so that they can respond better to what we provide. Also taking their orders and their guidance from on high and being able to react to what we give them. We, in turn, have been able to wrap up. We, in turn, have become the integrator, stronger role as the integrator, so that we can pull things together and work with them. It is not working ideally yet. I think, in part, because they are DOE site office, they are still in the reactionary mode. Because, and that's not really--I didn't mean that to be negative, it's either they are understaffed or they're getting too much help from headquarters. Or there are too many things impinging on them at once, and, and differences of direction, so do all of this all at once, yet have a good relationship with the contractor. Well, sometimes that's hard to do.	9
11506	G3a	M	LCO	No, this preliminary Tiger Team management report says that the salaries paid for environmental health and safety staff is below the average rates and we don't have enough of them over and over again. It happened also to be talking with local Ops people and headquarters and having their requests for personnel and staff response laughed at. And this was regarding federal employees. The Tiger Team reported that the rates....to be competitive with going rates in this region. But it is very challenging. We are attracted... We've got some very good people. But it will be hard to keep them a long period of time.	5
11701	G5b, G6b	M	NCS	Leo's got big problems and a lot of them are within the Department, a lot of them with OMB, a lot of them are perceptions. Some of it is that external [indistinguishable] environmental groups, in terms of seeing what we should do. A lot of the environmental groups [feel] that all of these funds should be devoted to cleanup activities only, and that the waste management activities which are in support production don't belong in his shop and that they should be in DP and there's constant conflicts between Leo and DP. Because DP sees Leo as taking the money, on the other hand, I think DP is hurling projects over Leo's side of the transom without the plumbing that needs to go with it. That, that is the kind of, you know, that's going on. Nobody realizes the phenomenal rate of growth is, I think in some instances probably real, on the other hand, I don't think Leo has an adequate management team and staff to deal with the rate of growth--Uhm, he doesn't listen to the ES&H management people enough to really get some experience. He's got tons and tons of new people in here who aren't familiar with DOE and who aren't familiar with the background, which is making it very difficult for him to get stuff up and running. His relationships with EPA for awhile were all right, within the last year I think we're going downhill and right now they are not great at all at both headquarters and the region. I don't think he--he's not bringing EPA folks, particularly at the regional level, in early enough. They're not	1

Interview I.D. #

Topic

Stakeholder Group (DOE on site)

Contractor on site

Congr. Staff

Num	Code	Rank	StCat	Segment	Pg Ln
				involved enough in some of the issues. They don't know technical problems have arisen. DOE is keeping problems close to their vest.	
20519	G4	H	LCO	This really gets into the fundamental issue of whether Mr. Duffy likes field offices or not. And I understand there's a lot of issues involved in that. But let me say my bias is toward having a very strong, technically oriented, technically oversight field office. That's what the Rocky Flats office is and has been developing into. They've grown from about 50 people on their staff, when the organization here was shut down in 1989, to something around 200 now. They used to be simply an administrative group that managed the contract and those types of things. They are evolving as rapidly as possible into a technical oversight group. And I say that not just with regard to production, but also with regard to the environmental and waste areas. And so my bias [telephone rings] as [indistinguishable] my background, I think, and experience is, that having an on-site, highly qualified, technical oversight group is the best way to go. Now how that interacts with the headquarters element that controls the resources and does that is something that merits careful consideration and study. But I think trying to control the activities directly from the headquarters is a loser.	12
20524	F5	H	LCO	I don't think it takes an extremely large organization to do adequate technical oversight. The tendency, when you try to set up oversight is to very much fall out of the oversight role into the management role. And you have a healthy tension between field offices and contractors over that issue all the time, in any place where you have that kind of relationship, I think is you have to be moderately experienced. And at least a little sophisticated to be able to maintain your oversight role without getting into management of the facility. Particularly when you're trying to raise standards.	13

Appendix C

Sample Topical Summary

Communication
John Carroll

A search through various words identified with communication (such as information, agree, lie, communicate) produced a very large set of materials to read. In many instances, an entry word that can be used in multiple ways, e.g., "I would argue that..." is not directly expressing a communication regarding an argument. However, the materials were useful for pulling various themes.

ANALYSIS

1. A great deal of centralization is going on. However, most observers seem to think that HQ is taking too much direct authority, reflected in lengthy and unreliable review processes and demoralization of field personnel. There are some indications that this centralization is needed, including comments about lack of FO competence. Both Watkins and Duffy are seen as highly controlling. Some wonder if centralization is a trend that the next Secretary will reverse.

2. HQ seems to have left major policy questions about goals and standards unresolved, or not to have communicated clear policy downwards and outwards. There is a major conflict between the technical logic of risk-based systems and the demands of stakeholders. There is lack of follow-through on programs. There appears to be some conflict between regulatory imperatives such as RCRA and CERCLA. SEN 6, Tiger Team reports, and 5 Year Plan seem inconsistent.

3. Various groups at HQ lack coordination. They make directives, requests for information, management "improvements" and other demands that generate high-priority work yet lack policy consistency and temporal coordination. The contractors and FO feel bombarded by these pressures and unable to carry out their "real" work. Agreements with one HQ group are undone when the next group appears; only Watkins seems to be the last word.

4. Interagency cooperation could be improved. DOE's centralization and DPA's decentralization seem mismatched. Some suggest DOE should become decentralized; others suggest DOE should negotiate a uniform process with EPA. The Congressional budgeting process seems out of synchrony with the requirements of planning for cleanup.

5. There are signs that some organizational problems are due to turnover and growth. With training and time, these may be alleviated. However, it is unclear whether the situation is structural or temporary. Contractors hire away good DOE people. Some observers point to encouraging recent trends.

6. The DOE has a long history of secrecy and misinformation that colors current perceptions by the public and contractors. Efforts to communicate are seen as manipulative, efforts to solicit participation are seen as pro forma or disorganized and thereby frustrating, and observers interpret as symbolic communications actions such as promotions and transfers of personnel.

7. Local relations between contractors and FO are better than either's relation with HQ. Local efforts to educate and communicate with the public have had some success. The contractor workforce is becoming an important "public" with links to activist organizations. Various local groups do not have much contact with each other, including contractors and FOs. There is considerable variation among contractors and State regulators from site to site.

8. Parts of the HQ and contractor organization appear "frozen" or resistant to change. They are being bypassed in the information flow, are demotivated, and are losing authority.

correspond to progress in solving problems (15701). There are lots of mixed signals from DOE to subcontractors (15708) and to Congress (15709). Letters are sent and rescinded, people start programs and leave (15708).

21. Openness. DOE has historically been secretive, even misleading. They have held back reports (11019) for decades. They are sincere in being more open, but it will take time to bridge the communication gap. DOE speaks for the contractors to the public, e.g., Contractor X should have a chance to talk to the public directly (11012).

31. Contractor Labor Practices. Unions have been ignored for many years. Middle managers seem to be blocking communication upward and downward, and to be threatened by new policies (16904). DOE and contractors have dodged responsibility for labor agreements (16915). Lots of rhetoric from the company about being the "people" company, yet they deal in confrontational and deceptive manner with the workforce: "We have a lot of managers in Contractor B that are flat liars" (16905 & 6).

32. Union - Activists. The union interest in worker health and safety is joined with the environmentalists' interests in public health and safety in a coalition, in part because the two issues are linked administratively in ES&H (16912).

Activists

11. HQ - FO. Ops office people don't seem to know what's going on (14704).

15. HQ Organization. DOE has endless meetings with the public, but they are not coordinated -- multiple meetings and hearings in a short time period about various topics exhaust the ability of public representatives to be present (14703).

21. Openness. DOE has gotten a lot slicker in talking to the public but it's frustrating because they're "not communicating any better." More meetings; not more communication. Public input is obtained too late in the process to effect how DOE makes budget decisions, which is the real driver of the system. DOE style is to tell rather than to discuss. (14704) It's Duffy's job to talk to the public about cleanup, but HQ seems to have a "fantasy" about the process. Better information comes from the assistant plant manager, who makes presentations about the cleanup. But he isn't in EM. There seems to be a disconnect between the HQ policy makers and the field operators, and the field people are more informative. (14702) DOE is supposed to give information to the public, but worries about revealing noncompliance and then being sued (14705). There is a "siege mentality" (10310) and deceptiveness coming mostly from HQ (19311). DOE tells the public their budgeting is based on a model (PLS), yet DOE personnel can't explain the budget request priority system, which leads to the conclusion that the budget requests are not based on the model (14706). DOE wants trust yet it handles criticism poorly and continues to hide embarrassing information, which of course comes out later and undermines trust (14707). DOE is less cooperative now because it is staffed with ex-defense program people, "retreads" (18202). "They view openness as a form of opposition management" (18226). Openness is fine as long as it's positive information under the control of DOE; when it's negative information, Watkins says DOE is being "punished for our openness" (18220). You get information and access to people in unimportant ways, but less access to key people and key problems. There is frustration with access to information (18232). DOE wants "legitimacy" but the public wants "accountability and input and public participation" (19309). It took 1-2 years to get crucial info into public reading room (19501). Encouraging signs of recent improvement in openness and useful meetings (19509, 19511, 19711, 19716).

22. Public Perceptions. When "weaponeers" are shifted to waste management, including top management levels of EM, it undermines credibility by suggesting that DOE will keep its old priorities (14708). People effective at finding safety problems get put aside (T18205). DOE still sees its mission as nuclear weapons production (19308).

26. DOE - States. States are going to be very angry when they find out that compliance agreements are going to be disregarded and instead have a national priority system (19306).

29. DOE - Contractors. There seems to be a disconnect between the HQ policy makers and the field operators, and the field people are more informative (14702).

32. Union-Activists. Workers are communicating more in the meetings and to the activists (19722). Other activists get attracted to the public environmental forums, such as stopping the arms race through environmental regs. (19712)

33. Sites are Different. Different sites have different relationships with activists.

State Gov't

11. HQ - FO. Need counterparts at the facilities for direct talks; facilities people are good and experienced, why should DOE be involved? (13212) Site office and waste management and ER have to sort out their responsibilities (15504).

13. Need Policy. Mixed messages and competing priorities within DOE about operations vs cleanup (12907). HQ and local give different messages, and local gets mixed signals from HQ about old vs new culture (13209).

15. HQ Organization. Site office and waste management and ER have to sort out their responsibilities (15504).

16. HQ Slow. Negotiations go through too many intermediate people. DOE takes too long making decisions. (13210). Field offices negotiate agreements, hold public hearing, and then it takes many months to be ratified by HQ (15510). CERCLA process is very bureaucratic and lengthy. DOE internal review process is "monstrous" (16619).

21. Openness. DOE cites security and it prevents State involvement (13206). Communication has improved since August and the new mission statement (16602). Everyone is suspicious of how the national priority system will be used (16613).

25. DOE-EPA. Leo doesn't understand EPA (16605). DOE has to learn how to be regulated, and it will take time (16607).

26. Newness. Lot of give and take in our meetings with DOE; it's new for a lot of people (16610). DOE has to learn how to be regulated, and it will take time (16607).

33. Sites are Different. Some states have more input, high public trust on the project (11901). Some state agencies pay low salaries, thus high turnover, and hard to have stable relationships with facilities (13213). Different oversight agreements for states, DOE would like to standardize (15512). State vs EPA role varies by state, and must be careful not to send mixed signals to DOE (16601).

35. Contractor Cooperation. Contractors battle each other for a lot of money (16622).

Fed Gov't

11. HQ - FQ. Too many things bubble up to senior managers yet they want more command and control. Not enough delegation from the Secretary (17302). Watkins needs to know what's going on, yet the field has the experience; competence is not as high in field offices as many have assumed, especially in cleanup (18107). Watkins and Duffy have centralized everything (20013).

12. Chain of Command. Watkins is closing down communication channels for efficiency and accountability (Rickover tradition) but the chain of command is weak because its mostly contract employees. (15402) DOE Congressional Liaison are not helpful/knowledgeable and need approval to say anything. Staff go directly to program offices for "anonymous" information (17303). People at DOE can't talk unless they go through CL, so I go to the contractors (20016). Secretary's staff thinks only they can handle Congressional relations (20017).

15. HQ Organization. EM and DP have to negotiate over who has oversight and who pays (18110).

21. Openness. Revelations about past problems have come from outside pressure (14618). States don't trust DOE. Bad history. They think DOE would intentionally commingle waste in order to avoid regulation. (20005) Some in the House think DOE just does things and tells Congress later (20010). Previous Secretaries opened channels with the public and Congress. Watkins is closing down communication channels for efficiency and accountability (Rickover tradition) but the chain of command is weak because its mostly contract employees. (15402) There is progress at being more open (20605).

22. Public Perception. Public thinks the environment should be returned to "pristine" condition. With that standard, we will negotiate forever and never reach closure (17709).

25. DOE-EPA. EPA wants each site on its own; DOE wants specialized technologies and waste to be moved to where it can be handled. EPA wants flexibility for each site; DOE wants standard clauses in cleanup agreements (18103). DOE has no

14. Demands from HQ. Frustrating lack of control over requests for support information from HQ (11321). To meet with Duffy I have to meet all his staff to make sure they're not "blindsided" (14418). Too many meetings and personnel dedicated to support HQ initiatives (15008). Different camps at HQ vying for power; each requires different management exercises/tools that demand resources (17611). Multiple demands and improvements from separate organizations at HQ confuse the line organization in the field - need help prioritizing from Duffy on waste management (17909). EM makes short-fused requests for information, duplicated work, inability to make decisions, and good people leave DOE frustrated (17910). Frustrated spending all his time responding to audits, information requests, requirements, from Albuquerque, HQ, subcontractors (18606).

15. HQ Organization. "I've got more stakeholders and more people making decisions and helping me make decisions than I ever dreamed of. None of them are accountable" (10809). Too many customers (DP, NE, EM, ONS, Conway, EH) with their own priorities (14403). Multiple customers - state, local, EPA, NRC (20113). Different procedures for prioritizing activities in DP, NE, EM, ER (20419). Conflicting direction EM, EH, ONS, etc. (21106). Conflicting directives and orders from NE, EH, BP, EM (18501). People don't understand the DOE organization (21206). Leo's shop is so fragmented with individual groups; Secretary doesn't force consistency among DP, NE, EM, ER; should have Tiger Team do HQ (20419). Several HQ teams or subcontractor teams doing similar things (21501). DOE HQ groups can finish a review and then a different HQ group comes in and reviews (21504). Need more integration across EM20, 30, 40, 50 (20108). No back up in execs who will retire in next 4-5 years (13109). Leo doesn't consult his direct reports on calendar; "they're just immediately summoned" to meetings (15109). TD and ER don't communicate well at HQ (18713). HQ talks to States with no involvement of RL, but blames us if things go sour (14442). Who has responsibility for ES&H - SEN 6 says line, Tiger Team says the manager (17008). Takes forever to negotiate agreements with DOE because DOE doesn't place authority properly (17820) - management by consensus (17821). Confusing DOE structure - contractor has to deal with overlapping organizations (21205). Tiger Teams make findings that are inconsistent with DOE orders -- "catch-22" requirements (10702).

16. HQ Slow. Everything goes through HQ for approval; too slow (10519). HQ review of documents takes time; they use contractors whose incentive is to make comments and generate work for us (17614). Lots of broken communication at HQ that costs time (20808). Slow document review process (21101). EM failed to support negotiation of agreements with regulators with timely policy information -- flippant attitude (13414).

17. FO Organization. Reorganization of the FO by creating more deputy managers without consulting assistant managers really undermined their authority and motivation (13110). Separate DOE facilities in same state have a hard time cooperating (17802). Poor communication within FO (18608). Too many levels of management (14502); information doesn't feed up well (14503).

24. FO-Contractor. Site office sits in on contractor meetings, managing, free flow of information, makes contractor management nervous (20302). DOE should insist that multiple contractors at one site communicate more, and get the ES&H message past the frozen middle (20405). Contractors must integrate their action plans (20413). M&O contractors doing more review of contracts because of new liability issues (20207). Contractors perform to standard set by gov't, it's been sloppy for 10 years (10807). Who is accountable - contractor or FO? FO is being forced to tell contractors what to do because of direction by DOE, and contractor hides behind directives (17816).

25. DOE-EPA. EPA is decentralized, different guidance for different areas of US; DOE HQ should coordinate this and get EPA to be more uniform (20108). Hard to get clear direction from RW and NRC, EPA; EPA and NRC don't agree on repository (15002).

26. DOE-States. DOE commitments assumed more money than we have; now we are behind on our commitments (18901, 2). Lack of resources for ER (19601). Regulators talk a different language, get different understanding from me in the same meeting (19207).

27. Task Inconsistencies. The demands of a two-year Congressional budget process are inconsistent with the nature of project planning and unknowns (12112). The review protocol on clean-up agreements means that the review starts before the document is written (13405). "Between working budgets and talking to the public, who's doing the work?" (13811) Changing requirements outpace authorizations to hire and time to train (14305). Positions change too fast: while we incorporate revision 3, rev. 4 is published and rev. 5 underway (15004). Catch-22 of RCRA is that waste that is undisposable is also unstorable - need national treatment plan (18919).

28. Need Flexibility. Need better prioritization. Sites are different. DOE wants immediate implementation but doesn't make sense for us. (15008) Agreements must provide for continuing dialog and adjustments (19105).

29. DOE-Contractors. OSHA the biggest Tiger Team problem – nobody doing that in M&O contract although DOE orders say to do that (12115). Waste producers talk to RW which talks to NRC, EPA; we want to talk to the regulators directly (15001). Contractors had a history of hiding problems from DOE; now evolving to not sit on problems (11304).

34. Contractor Management. Contractor X site management team disintegrated when they went after another contract; little depth of executive talent to service multiple contracts (13114). Contractor hires away good DOE people (14319).

Contractors
Budget cuts delay schedules which upsets external local stakeholders pushing for cleanup (10305).

11. DOE - FO. EPA delegates, Watkins doesn't (10315). Typical Navy centralization and accountability/blame, e.g., approve exclusions from NEPA (12211). HQ and FO battle over a restart (13007). Program managers should get the money and the responsibility (14903). HQ should do more to unify DOE, but can't run it all from HQ; nothing gets through; must delegate (18401). Rulings on exceptions from management practices have to go up through DOE to Watkins and subcontractors just sit around (19004). HQ pulling back FO authority, e.g., NEPA documentation (19411). I want a strong, technical oversight FO, control from HQ is a loser (20519). HQ bypasses FO to give direction to contractors or contractors go to HQ to get ratification (16002). DOE doesn't allow FOs to interpret orders to adjust them to site realities; every auditor takes the most conservative viewpoint (14105).

12. Chain of Command. HQ directives don't have contractor or project office input (10308). HQ bypasses FO to give direction to contractors or contractors go to HQ to get ratification (16002).

13. Need for Policy. Needs consensus on what is compliance with regulation, led by HQ, but with people in the field (12605, 6). HQ must set clear national standards (12607). Need clear vision of nebulous job of clean-up (13601) and organizational goals so people can take ownership for local goals (13606). Need policy setting by HQ; FOs are very different (18401). Somebody from HQ can tell you to do something and you find other plants don't do it - we should be rational and uniform and "stop spending money on rote compliance that buys us nothing in terms of environmental safety" (18404). DOE needs to clarify what's enough (20905). DOE could prioritize better (21701).

14. HQ Demands. HQ requests for information take top priority and keep FO from managing the work (10903). HQ is not managing its business (10904). Many overlapping audits, Tiger Team (10710), inefficient or ineffective reviews by subcontractors (10807). Too much time in meetings with task forces and not enough with contractors on technical problems (13705). Order of magnitude increase in audits and overview since Duffy/Watkins and ER and WM (14104). HQ demands information and it goes into a black hole (12204). Several HQ groups came for a start-up, required stacks of information, none of them had any experience in the facility being reviewed, mostly Beltway contractors (17129).

15. HQ Organization. "The DOE came after them in waves from Headquarters" - local DOE, then EM, then EH, then NS, each evaluating what the others did. Should establish the process so everyone knows what it is. (13007) Need teamwork to funnel funding from multiple sources to operating site; DOE system doesn't work at the bottom where teamwork among program offices and HQ is needed (14013). "Dual systems" -- one produces (out-of-date) reports for display and the other produces money (14202). DOE should go back to being the program function rather than regulating; DOE is hiring regulator rejects, doesn't know what it wants (14209). HQ went from 20 to 200 people in 20 years, overseers, lacking technical credentials, went

from 55 to 200 in 2 years, with major new oversight responsibilities (14912). 15-16 groups report to Secretary, making uncoordinated assessments of FOs which have to combine policy and integrate impacts (17519). Should combine separate safety reviews by EM, NE, DP (18407). DOE offices all feed to program groups, who get 25 #1 priorities, hard for site to prioritize (20901). Get contradictory letters and information from DOE (21303). DOE agreements get second-guessed; Watkins is the only last word (21602). Each HQ group wants its own turf; lacks common goals and agenda (21605). Need one set of priorities for a site (21613). Multiple levels of DOE management with own expectations (21706). DOE has two worlds - strategic planning and budget cycles (21806). Unwieldy problem resolution process across five levels, most of which were not on site during the review, are not technically qualified, but have strong opinions (19803). conflicting parts of DOE; lack of soliciting input from contractors on regulations or too little time (13004). Duffy doesn't communicate well (14206). Watkins is cut off by the palace guard of staff and outside advisors (former Rickover employees) (14901). HQ demands information and it goes into a black hole (12204). Several HQ groups came for a start up, required stacks of information, none of them had any experience in the facility being reviewed, mostly Beltway contractors (17129). Overlapping programs independent up to HQ; need to be more teamwork (17207).

16. HQ Slow. HQ reviews take too long (10615). Central control is doomed to failure because it creates a bottleneck (12608). Central review means sent out to subcontractors (12607). Everything goes to HQ for decisions; late; they are scared to give up control (14012). Time lag between what the field needs and HQ guidance due to HQ centralization (19401).

17. FO Organization. Too many assistant general managers in field office (14904).

21. Openness. DOE was very secretive and earned its mistrust (11502). Little information shared even within sites; HQ still not willing to issue reports that would attract bad press (12005). DOE too secretive to regulate itself (14210). Legal staffs from contractors shut down communication when Tiger Teams give everything to Justice (10323).

22. Public Perception. Public wants action, conflicts with need for date (10908). Public education is vital regarding risks of radioactivity and sources of standards (10910). Community is getting educated (11106). Must listen to the public and make managers accountable for what they say to the public (12025). The public and activists can learn to understand the challenges (12816). Activists on advisory groups can be helpful if you are truly committed to giving them information (10822). Public meetings and tours are wonderful but take up a lot of resources (17124). Public is worried about site, so we give them a lot of information to overcome sins of the past (20516).

23. Regulatory Demand. More budget goes to facilities that are out of compliance (12704).

35. Contractor Cooperation. Contractors are competitive; rarely share information; need INPO-type organization for GOCOs (10309). Individuals share, not organizational initiatives (11112). Let the workers have input - lower managers should visit each others' sites (11121). Westinghouse has cross-fertilization committees for their sites (11202). 9 or 10 committees among the GOCOs that meet quarterly on ops, maintenance, environment, etc. (12208). Extensive interchange among Westinghouse GOCOs (21710).