



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**Cleaning Up the Nuclear Weapons
Complex: Exploring New Approaches**

Katherine N. Probst, Carolyn A. Pilling,
and Karen T. Dunn

Discussion Paper 96-25

July 1996

Resources for the Future
1616 P Street, NW
Washington, DC 20036
Telephone 202-328-5000
Fax 202-939-3460

© 1996 Resources for the Future. All rights reserved.
No portion of this paper may be reproduced without
permission of the authors.

Discussion papers are research materials circulated by their
authors for purposes of information and discussion. They
have not undergone formal peer review or the editorial
treatment accorded RFF books and other publications.

The research for this paper was funded in large part under a
cooperative agreement with the U.S. Department of Energy's
Office of Environmental Management (DE-FCO1-
95EW11960). The views expressed herein are those of the
authors and not of RFF or DOE.

Cleaning Up the Nuclear Weapons Complex: Exploring New Approaches

Katherine N. Probst, Carolyn A. Pilling, and Karen T. Dunn

Abstract

In recent years, policy experts have increasingly decried the "piecemeal" approach to environmental protection embodied in existing laws and regulations. This paper analyzes one aspect of the call for more integration: the feasibility and advisability of developing an integrated approach to regulating the cleanup of the nation's nuclear weapons complex. The Cold War has left an unprecedented set of difficulties at sites across the country where vast quantities of hazardous and radioactive materials must be properly managed. Regulatory fragmentation--particularly the phenomenon of multiple regulators and regulations driving the allocation of resources in an uncoordinated fashion--is nowhere more evident than in the current statutory and regulatory framework governing environmental management activities at this array of sites--the nuclear weapons complex.

The objective of an integrated approach is to give regulators and the regulated community incentives to look holistically at environmental hazards, both existing and future, and to develop creative ways of setting priorities such that risk, cost effectiveness, and public concerns are taken into account. This paper describes recent efforts to achieve integration in the environmental arena, surveys the unique technical, regulatory, and political circumstances surrounding cleanup of the weapons complex, and offers some preliminary thoughts on how integration might be attained in this vital area. While administrative and regulatory changes could achieve some important steps in this direction, the authors conclude that legislative change is necessary for implementation of a truly integrated approach.

Key Words: nuclear weapons complex, integration, environmental law, environmental regulation

JEL Classification No(s): H56, K32, Q28

Table of Contents

I.	Introduction	1
II.	Efforts to Achieve Integration	5
III.	The DOE Context	8
	Background	8
	Technical Challenges	10
	Multiple Regulators and Regulations	11
	A Multitude of Stakeholders	18
IV.	A Holistic Approach to Cleaning Up the Nuclear Weapons Complex	19
	Key Elements of a Holistic Approach	20
	Inching Towards Integration: Administrative and Regulatory Fixes	24
	A Radical Approach: New Legislation Governing Environmental Protection and Nuclear Safety at DOE Sites	28

Cleaning Up the Nuclear Weapons Complex: Exploring New Approaches

Katherine N. Probst, Carolyn A. Pilling, and Karen T. Dunn¹

I. INTRODUCTION

For some years now, policy experts in government, the private sector, academia, and some environmental groups have decried the "piecemeal" approach to environmental protection embodied in existing environmental laws and regulations. The current approach is widely criticized for its duplicative requirements, inconsistent standards, and, perhaps most importantly, premium on compliance with the "letter of the law" rather than the "spirit of the law." Put more directly, environmental regulation currently encourages compliance with long lists of requirements and discourages regulators and regulatees alike from looking at regulated facilities in a holistic fashion.

The current regulatory structure has evolved from more than two decades of legislation that often provided specific responses to particular controversies, such as those involving air pollution, water pollution, and hazardous wastes. Early environmentalists identified the need to force decision-makers to take into account the full social consequences of their actions. That the holistic approach to dealing with the environmental consequences of industrial operations is only now being considered for application to the pollution-control regulatory system is therefore somewhat ironic.

¹ The authors are, respectively, Senior Fellow, Research Associate, and Fellow, Center for Risk Management, Resources for the Future.

Staff at Resources for the Future's Center for Risk Management have initiated a study of one aspect of the call for a more integrated approach to environmental regulation: the feasibility and advisability of a more integrated statutory approach to the cleanup of the nuclear weapons complex--the vast network of facilities involved in the research, production, and testing of nuclear weapons. The legacy of the Cold War involves millions of acres of contaminated land, millions of gallons of mixed hazardous and radioactive wastes that were stored for decades in deteriorating tanks, drums, and buildings, and special nuclear materials stored and trapped in production lines.² Regulatory fragmentation--particularly the phenomenon of multiple regulators and regulations driving the allocation of resources in an uncoordinated fashion--is nowhere more evident than in the current statutory and regulatory framework governing environmental management activities at the nuclear weapons complex. Hence, the challenge of creating a more effective approach to cleaning up the nuclear weapons complex is both critical and complicated.

The fundamental objective of an integrated approach is to give both the regulators and the regulated community incentives to look broadly at environmental hazards, both existing and future, and to develop creative ways of setting priorities such that risk, cost effectiveness, and public concerns are taken into account. Discussions about integration have typically focused on the air and water programs--where compliance can be defined in terms of emissions of particular pollutants to particular media. Little has been written, or discussed, about what

² "Special nuclear materials" refers to fissile materials that can be used to construct nuclear weapons or to fabricate fuel for nuclear reactors; these materials are primarily plutonium and uranium enriched in the isotope uranium-235.

an integrated approach to waste management and cleanup should or would involve, largely because achieving integration in this area is far more difficult than in the traditional air and water programs. First, there are few ambient standards against which to measure the overall level of contamination. Second, the waste management and cleanup laws require "cleaning up" contamination, not simply reducing exposures to hazardous substances. This is especially complicated because the determination of "how clean is clean" influences possible future land use, and *vice versa*. In addition, much of the waste management and cleanup effort focuses on problems created in the past, meaning that the opportunity to "produce less" pollution--a key goal of most integrated approaches--has generally been missed. Integration in the area of hazardous waste policy therefore must concentrate primarily on unifying regulatory efforts at individual facilities, with pollution prevention and integration across media playing a more peripheral role.

The nuclear weapons complex provides a unique opportunity to test the applicability of an integrated approach. Widespread support for finding ways to reduce public expenditures has created an opportunity for exploring new approaches to regulation in the public arena that might not be possible in the private sector. At the same time, DOE's environmental management program is widely perceived to have demonstrated little measurable progress, and many believe that a fragmented regulatory structure contributes to the program's difficulties. A new integrated approach that makes sense for DOE, however, almost certainly could not be applied *in toto* to the private sector: the fact that some of the most critical and costly activities at DOE sites relate to nuclear safety and to maintaining the security of nuclear materials constitutes an important difference between DOE facilities and typical private sector facilities.

We hope nonetheless that aspects of an integrated approach for DOE will yield some important lessons for integration in a broader policy context.

Congressional interest in changing the legislative framework governing the cleanup of the nuclear weapons sites is already evident. Two pieces of legislation seeking to streamline regulation of cleanup activities at the Hanford site in Washington State were introduced early in the 104th Congress. The first proposal, introduced by Sen. J. Bennett Johnston (D-Louisiana) and Sen. Frank Murkowski (R-Alaska) would have exempted Hanford cleanup from all current federal and state requirements and substituted a remedy-selection process focusing on future land use. The second proposal, introduced by Rep. "Doc" Hastings (R-Washington), which also sought to tie cleanup to future land use, contained provisions giving additional powers to the DOE site manager and the state regulators. Many of the "Hastings provisions" are expected to be incorporated into the National Defense Authorization Act for FY 1997.

The purpose of this paper is to offer some preliminary thoughts on integration and on how it might be achieved with respect to the cleanup of the nuclear weapons complex.³ In so doing, it is our hope that we will move the debate about how -- and whether -- to integrate existing requirements for environmental protection one step further.

³ In this paper, we focus our attention on integrating requirements related directly to hazardous and nuclear wastes and materials. A *comprehensive* effort to integrate environmental activities also would address requirements under other environmental laws, such as the Clean Air and Water Acts.

II. EFFORTS TO ACHIEVE INTEGRATION

Past efforts to construct an integrated statute or an integrated approach to implementing regulatory requirements (such as unified permits for regulated facilities) to achieve these goals have rarely made it past the conceptual stage in the United States. There are a number of reasons why this is the case:

- Members of the 16 full congressional committees and the scores of subcommittees with jurisdiction over the eight major environmental laws have little incentive to develop a new approach, as it is likely that integration would force many of the committees to relinquish their authority over the nation's environmental agenda.⁴
- There is little incentive for federal agencies to advocate an integrated approach to environmental regulation, as any approach that centralizes permitting or standard setting, for example, may reduce the need for agency staff and will change existing lines of authority.
- Some view an integrated approach as suspect--a clever ploy to dismantle the existing command-and-control system and ultimately to destroy environmental protection as we know it. There is some legitimacy to this concern, as any integration of requirements across programs will likely incorporate more flexibility than is currently allowed under

⁴ We include as the eight major environmental laws the Clean Water Act; Clean Air Act; Federal Insecticide, Fungicide, and Rodenticide Act; Toxic Substances Control Act; Comprehensive Environmental Response, Compensation, and Liability Act; Resource Conservation and Recovery Act; the Safe Drinking Water Act; and the National Environmental Policy Act. There are numerous other environmental laws, some of which could also be considered "major."

existing regulatory programs. Added flexibility has the potential to make the definition of "compliance" more elusive and enforcement more difficult.

- While the concept of integration has broad intuitive appeal, the task of actually turning this concept into a pragmatic, practical, and enforceable program is extremely difficult.

Nonetheless, the past year has seen renewed interest in crafting an integrated law and in developing more integrated approaches to environmental protection. This can be attributed to several factors. Congressional and public interest in regulatory reform in general, of which integration is an important element, is increasing. Also, current pressures to reduce federal expenditures make finding more efficient and effective regulatory approaches critically important. Finally, increasing unhappiness with the implementation of our nation's environmental laws is evident across the political spectrum. For these and other reasons, an august panel of experts under the auspices of the National Academy of Public Administration (NAPA) called on EPA to develop an integrated environmental statute in its April 1995 report. In response to the recommendations in that report, Senators Kit Bond (R-MO) and Barbara Mikulski (D-MD) formally requested that EPA Administrator Carol Browner develop an integrated statute for Congress' consideration.

The first comprehensive examination of what an "integrated" statute might look like was completed in 1988 by the Center's director, Terry Davies, then Executive Vice President of The Conservation Foundation. Davies drafted an overarching integrated environmental statute embodying two key principles. First, an integrated law should be organized by functions -- such as standard setting, public involvement, and enforcement -- rather than by

media. Second, the law should establish risk as a driving factor in setting priorities, and this should be accomplished by requiring the evaluation of risks to all media in a comprehensive (or integrated) fashion. While Davies' 1988 work proved it is possible to develop a single comprehensive environmental law, adoption of such a law was not then considered politically feasible for some of the reasons outlined above.

A number of organizations are currently working to craft integrated approaches to environmental protection. For example, the National Environmental Policy Institute (NEPI), under the direction of former Representative Don Ritter, is developing an integrated environmental statute. Also, the Center for Strategic and International Studies (CSIS), along with staff from NAPA, recently formed a group called "Enterprise for the Environment," one of whose primary objectives is to consider a single statutory mission for EPA.

There are several other initiatives underway--both in government and in the private sector--that seek to integrate regulatory requirements at the facility level. For example, EPA has initiated "Project XL," an experiment in alternative enforcement strategies that allows firms more regulatory flexibility in exchange for superior environmental performance. Concerns have been raised, however, that current regulations stand in the way of the successful implementation of Project XL and other initiatives aimed at increasing flexibility without major statutory changes. As a result, there is increasing interest -- especially among major corporations -- in adopting legislation that would explicitly allow individual facilities to deviate from current rules and requirements under a petition process. This approach has been dubbed "alternative compliance."

Environmental agencies in three states--Massachusetts, New York, and New Jersey--also have taken notable strides toward exploring the possibilities for integrating environmental regulation. Each of these states has taken a different path toward integration: Massachusetts has begun to conduct multimedia, facility-wide inspections; New York has assigned state employees as "facility managers" at a number of plants to coordinate media-specific regulatory activities; and New Jersey has initiated a program of facility-wide permits governing releases to all media. All three states have encouraged a focus on the environmental implications of whole facilities, rather than on the impacts of those facilities on separate media. While these state efforts mark important steps toward acceptance of integrated approaches, they have all concentrated on integrating pollution-prevention efforts across media and therefore do not provide direct models for dealing with existing hazardous waste.

III. THE DOE CONTEXT

Background

Throughout the Cold War, decisions regarding the production of nuclear weapons were made on the basis of expedience in the drive to ensure national security. Threats to health, safety, and the environment were considered to be of secondary importance. This narrow focus on production was facilitated by the secrecy under which the complex operated from the time of its construction in the 1940s and 1950s until recently. While the rest of American industry was becoming aware of environmental concerns and regulation in the 1960s and 1970s, DOE's cloak of secrecy gave rise to an isolated population of workers and managers unaccustomed to interacting with regulators and other stakeholders.

With the end of the Cold War in the late 1980s came a shift of attention at the nuclear weapons sites from weapons production to environmental management. A new openness on the part of DOE toward the public--set in motion by a 1984 court case, *Leaf vs. Hodel*, which set the stage for DOE to become externally regulated under the major environmental laws--has unveiled an unprecedented magnitude and complexity of environmental and nuclear safety problems that must be dealt with at the nuclear weapons sites. Recent estimates by DOE place the lifetime cost of addressing these problems in the hundreds of billions of dollars. One report predicts that American taxpayers will spend between \$230 billion and \$350 billion to clean up the legacy of the Cold War over the next 75 years.⁵ DOE's annual environmental management expenditures have totaled about \$6.5 billion in recent years, and about \$1.5 billion has been spent annually at the Hanford site alone.⁶

The responsibility for addressing this broad range of problems is housed in DOE's Office of Environmental Management (EM). EM facilities are located in 34 states. There are six major sites: Hanford, Savannah River, Rocky Flats, Idaho National Engineering Laboratory (INEL), Oak Ridge, and Fernald. These sites account for about 70 percent of EM's annual expenditures.⁷

The nature of environmental management activities in the DOE context merits some clarification. These activities involve much more than "cleanup"; in fact, less than 30 percent of EM's FY 1996 budget is slated for what most would consider to be cleanup activities.

⁵ US DOE, *Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report*, 1995.

⁶ US DOE, *Environmental Management Program FY 1997 Proposed Budget Overview*, 1996.

⁷ Ibid.

Securing and safeguarding plutonium and enriched uranium and other non-environmental "landlord" activities account for nearly one-quarter of the budget, and the storage and treatment of mixed and radioactive wastes account for almost 40 percent. The cost of guarding the plutonium at Rocky Flats, for example, amounts to \$130 million--approximately 20 percent of the plant's FY 1995 operating budget.⁸

DOE's EM facilities are substantially different from most industrial operations. They often involve extraordinary volumes of wastes, and almost every activity undertaken at the facilities is complicated by the presence of radioactivity. Most EM facilities, although not all of them, are located in areas of low population density, meaning that the most pressing risks are to workers, not to the general public. These features stand in contrast to the situation at most Superfund sites, which tend to be located in more populous areas and rarely require workers to deal with radioactive materials.

Three primary characteristics of the nuclear weapons complex particularly complicate the task of environmental management: the technical complexity of the tasks involved, the presence of multiple regulators and regulations, and the multitude of stakeholders with which DOE must contend. Each of these issues is discussed in the sections that follow.

Technical Challenges

The task of cleaning up and safeguarding the weapons complex is fraught with tremendous technical complexity. Much of the contamination at these facilities is radioactive

⁸ Dan Miller et al., *State Task Force Report: Environmental Obligations at Federal Facilities and an Analysis of the Environmental Management Program of the Department of Energy*, 1995.

and therefore cannot be eliminated or neutralized. Dilapidated buildings contaminated with radioactive isotopes is in need of costly and sometimes dangerous decontamination in preparation for decommissioning. Solutions often involve interim storage of nuclear waste, the politics of which are fraught with difficulty. As mentioned above, these facilities are remarkable in both their sheer size and the volume of wastes they contain. For example, the Hanford site occupies 560 square miles in southeastern Washington state. Sixty-one million gallons of hazardous and radioactive wastes are stored in Hanford's 177 underground tanks, and 66 of them have already leaked. At most of the major sites, weapons production activities have ceased; ongoing site operations involve cleanup, waste management, and the stabilization of special nuclear materials. In some sense, "environmental management" is the primary business at major EM sites like Hanford.

Even if federal dollars for the EM program were unlimited, it would not be possible today to treat and dispose of much of the waste at EM's six major sites. This is because of a lack of treatment technology for some types of wastes and a lack of capacity for treatment and storage of other types of wastes. For some wastes, the treatment technology exists, but the repository for the wastes' ultimate disposal will not open for decades. As a result, wastes must often be contained, stabilized, and stored for decades before they are treated and disposed.

Multiple Regulators and Regulations

DOE sites are subject not only to all the environmental laws--which involve multiple regulators and overlapping regulatory requirements--but also to numerous additional requirements related to nuclear safety and security. Further, these sites are regulated both

externally and internally. External regulation occurs primarily under federal environmental laws implemented by EPA and state environmental agencies. Under the Atomic Energy Act, DOE is responsible--through a procedure known as "self-regulation"--for ensuring nuclear safety at its own facilities. Traditionally, the regulators have approached EM sites in a fragmented and uncoordinated fashion, often pursuing their own agendas while focusing little attention on overall progress and safety.

Waste management and cleanup activities are governed by two major federal environmental laws: the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), better known as Superfund, and the Resource Conservation and Recovery Act (RCRA). DOE's major sites are subject to these and a number of other major environmental laws.

CERCLA provides EPA with broad authority to require the cleanup of sites contaminated with hazardous substances, including radionuclides, which are a major contaminant of concern at DOE sites. The law specifies that cleanup remedies must protect human health and the environment, use permanent solutions to the maximum extent practicable, and demonstrate a preference for treatments that permanently and significantly reduce the volume, toxicity, or mobility of the substances in question. EPA has ultimate responsibility for remedy-selection decisions at the sites it deems most problematic--those listed on the National Priorities List (NPL). All six of the major DOE sites in the EM program are listed on the NPL. CERCLA provides EPA with the authority, through cooperative

agreements, to grant states the lead regulatory role at private sites on the NPL, but it expressly prohibits states from taking the lead at federal facilities.⁹

RCRA regulations apply to the treatment, storage, and disposal of hazardous wastes and "mixed" wastes (wastes that are both hazardous and radioactive).¹⁰ Under RCRA, facilities that manage hazardous wastes must obtain permits and comply with a variety of technical standards and record-keeping requirements. Most states are authorized by EPA to implement the RCRA program. Since many EM sites have a tremendous volume of mixed wastes stored on-site as the result of decades of weapons production, RCRA-authorized states play a key role in the regulation of DOE's environmental management program. The authorized states were given responsibility, for example, for reviewing and approving DOE's mixed waste plans, which were required by the Federal Facility Compliance Act of 1992.¹¹ These plans, which were submitted in late 1995, outline DOE's strategy for developing needed future treatment and disposal capacity for mixed wastes.

RCRA also requires operators of any facility with a RCRA permit for the treatment, storage, or disposal of hazardous wastes to investigate contamination on the facility's property. EPA or the state (if authorized) has the power to compel these facilities to conduct "corrective action," i.e., Superfund-like cleanup, as a requirement of their permits. Radionuclides,

⁹ Federal facilities on the NPL include sites under the purview of the Departments of Energy, Defense, Interior, and Agriculture and the National Aeronautics and Space Administration.

¹⁰ Technically, RCRA regulation of mixed wastes governs only of the hazardous component of the mixed wastes.

¹¹ The FFCA of 1992 amended the Solid Waste Disposal Act (SWDA), which was amended by RCRA in 1976.

however, are explicitly excluded from regulation under RCRA, meaning that states must rely on federal Superfund authority to address this type of contamination.

Because of the way RCRA and Superfund are structured, both EPA and the states have jurisdiction over cleanup and waste management activities at EM sites. It does not appear that any of these laws result in conflicting standards and requirements, however, as some have argued. What does seem clear is that the two laws provide overlapping regulatory authorities whereby both the states and EPA can, and often do, assert their regulatory authority, leading to duplicative efforts on the part of DOE and confusion about who is in charge.

EPA and the states negotiate site-specific agreements with DOE regarding implementation of the major environmental statutes. Typically, these agreements contain two parts. The first part outlines administrative mechanisms--enforcement, dispute resolution, and the process for reviewing documents--and the second part outlines the action plan for completing technical work at the site. There are, generally, two types of agreements: compliance agreements, which are used when DOE is in violation of an environmental law (e.g., the Clean Water Act or the Clean Air Act) and cleanup agreements, which are used to address DOE's waste cleanup responsibilities under CERCLA and RCRA. Cleanup agreements are typically signed by DOE, EPA, and the relevant state regulatory agency.

Many sites are subject to multiple compliance and cleanup agreements at once, each generating a list of requirements and deadlines, often without regard to the most pressing problems at the site. For example, these agreements typically do not cover nuclear safety issues, since these issues do not fall under RCRA or CERCLA authority. Perhaps the best known of these agreements is the Hanford Tri-Party Agreement (TPA), so-called because it

was one of the first agreements signed by DOE, EPA, and a state. This document has been criticized by many as unworkable because it contains arbitrary schedules for completing projects, fails to recognize the importance of nuclear safety and DOE's responsibilities under the Atomic Energy Act (AEA), and does not provide a framework for prioritizing work at the site. In fact, it is almost impossible to get a sense of the real problems and their relative priorities from this document -- unfortunately, this is true of most of the compliance and cleanup agreements at EM sites. In recognition of these weaknesses, DOE has recently re-negotiated some of its agreements with EPA and state agencies in an effort to assure that they address the most pressing problems, have realistic schedules, and reduce costs.

DOE also must comply with the provisions of the National Environmental Policy Act (NEPA). NEPA requires federal agencies to prepare an environmental impact statement (EIS) for each major action or decision that affects the quality of the environment. In the past, DOE interpreted this requirement to apply to its actions taken under Superfund and RCRA on a unit-by-unit basis, which added delays to an already lengthy process. More recently, DOE has been given permission to streamline the way it complies with NEPA requirements: EIS's can now be conducted on a site-wide basis, which should reduce the number of reviews and the associated delays and cost.¹²

In addition to facing an abundance of strictly "environmental" requirements, enforced by EPA and the states, DOE is subject to its own "self-regulation" under the AEA. The AEA sets out broad requirements regarding nuclear safety, which DOE implements through a system

¹² The Department of Justice recently confirmed that NEPA does not apply to actions taken under Superfund.

of internal rules and requirements referred to as "DOE orders." The entire orders system has recently come under scrutiny, with some arguing it is duplicative, wasteful, and unnecessary. DOE has responded by initiating a major effort to streamline the system.

DOE's self-regulation in the area of nuclear safety is one of the primary reasons for public mistrust of DOE. The Advisory Committee on External Regulation of Department of Energy Nuclear Safety -- a panel of leaders in government, industry, academia, and other interested groups -- recently concluded that the era of self-regulation should come to an end.¹³ Specifically, the Advisory Committee recommended that facility safety at DOE sites should be regulated by either the Nuclear Regulatory Commission or the Defense Nuclear Facilities Safety Board, that worker safety should be regulated by the Occupational Safety and Health Administration, and that environmental protection matters should be regulated by EPA. It is too soon to know whether the Administration or Congress is interested in implementing this far-reaching recommendation.

DOE is also subject to the recommendations of the Defense Nuclear Facilities Safety Board. The Defense Board advises the Secretary of Energy on public health and safety issues related to the design, construction, operation, and decommissioning of defense nuclear facilities. In recent years, many of the Defense Board's recommendations have related to safety activities at sites under EM control. Recommendations by the Defense Board require a response from the Secretary of Energy. To date, almost all of the Defense Board's

¹³ The only exceptions to the Advisory Committee's conclusion that safety at DOE nuclear facilities should be externally regulated were that DOE should retain responsibility for the specialized area of "nuclear explosives safety" and, at least initially, for safeguards and security.

recommendations have been officially accepted, but critics (both inside and outside DOE) contend that DOE has failed to implement many of them. While the Defense Board is not technically a regulatory agency, its recommendations often require specific actions at EM facilities. As a result, there is in essence a fourth regulator--after EPA, the state, and DOE itself--at these facilities: the Defense Board.

One distressing outcome of the current regulatory framework is that DOE's internal structure at headquarters mirrors the fragmented external structure. The role of the Defense Board is duplicated by DOE's Office of Environment, Safety and Health, the internal office charged with overseeing nuclear safety issues for the entire complex. EM contains two key offices that mirror the fragmentation within EPA: Waste Management operates all of DOE's facilities subject to RCRA, while Environmental Restoration implements Superfund. A third EM office, Nuclear Material and Facility Stabilization, is responsible for managing nuclear materials and facilities.

The compartmentalization of EM's responsibilities, often referred to as "stovepiping," is widely criticized, inside and outside EM, for causing communication difficulties that border on the bizarre. For example, the fact that exhumation is a responsibility of Environmental Restoration while disposal is a responsibility of Waste Management makes it possible for one site to decide to exhume and dispose of waste without planning where to send it, or to decide to send the waste to another site without notifying the recipient site. Finally, there are a plethora of EM and DOE initiatives, all intended to improve the system, that in practice often contribute to the confusion. The result is a huge bureaucracy that can only be described as Kafkaesque.

A Multitude of Stakeholders

DOE must also contend with a large number of diverse stakeholders. First, a number of citizens groups have formed with the goal of playing an active role in EM decision-making. Great distrust on the part of many of those living near the sites is a natural outcome of the secrecy with which DOE historically carried out its mission and the subsequent abundance of information made public in recent years about contamination at the sites. Second, as already noted, DOE must respond to input from many regulators and overseers--EPA, the Defense Board, state agencies, and the Department's own internal regulators. Elected officials, for whose constituents DOE is often the major local employer, also actively influence EM's activities.

Finally, there are EM's many contractors, who constitute an unusually important stakeholder group. While contractors are not signatories to DOE's cleanup and compliance agreements with its regulators, they are co-permittees with DOE for permits issued under RCRA, the Clean Air Act, and the Clean Water Act. With more than 42,000 contractor employees and only about 3,200 federal employees, oversight of contractor activity is inevitably thin. As DOE's contracts have typically been written, the contractors are given little incentive to find ways to reduce costs, to limit the scope of activities, or to bring projects to completion. Instead, their incentive to assure the continued flow of money to the facilities has become apparent; by virtue of their numbers relative to those of the federal employees overseeing them, they are in an opportune position to identify and pursue minute and possibly unnecessary intricacies of EM's regulatory requirements. Observations such as these have brought about accusations that the contractors at EM sites are "running the show." EM has begun experimenting with performance-based contracting and privatization, with the objective

of remedying some of the weaknesses in their current contracting system. In recent years, EM also initiated a pilot project to convert some support service contractors into federal employees for the purpose of improving contractor oversight.

The stakeholder dynamics at EM facilities are unusual for several additional reasons. First, the fact that almost all stakeholders stand to benefit from high annual expenditures at these sites stands in stark contrast to the typical dynamics of a regulated private facility, where the regulator can be accused of not caring about compliance costs but the regulated entity has every reason to--and does--fight for less costly alternatives.¹⁴ Second, since the regulated entities are federal facilities, it is ultimately up to Congress to decide how much money is appropriated for environmental compliance at them. Hence, regulators cannot demand compliance with requirements without regard for the costs of that compliance. In particular, the state's role as regulator is essentially limited by the federal budget. All of this is further complicated by the unusual configuration of power at these sites, whereby the contractors often have the ability to obscure the true nature of costs associated with site activities. Finally, regulatory oversight of DOE's activities is quite difficult and often inadequate because of the complexity of the sites, the key role of contractors, and, again, because the regulated entity is a federal agency.

IV. A HOLISTIC APPROACH TO CLEANING UP THE NUCLEAR WEAPONS COMPLEX

The purpose of crafting an integrated approach to cleaning up the nuclear weapons complex is to create a framework that allows, and encourages, both the regulatory agency and

¹⁴ This is not to suggest that no one works to bring costs down -- there are in fact many instances in which EPA and state agencies have suggested ways to reduce costs and encouraged DOE in these efforts. However, there is really no one "holding the purse strings" other than Congress.

the regulated entity to look at each site in a holistic manner. What do we mean by a "holistic approach?" We mean a system that focuses on the actual problems at hand, and the types of risks and contamination at each site, and where both the setting of priorities and the choice of remedies is based on a frank examination of the realistic (but ambitious) alternatives available, rather than being hobbled by arbitrary legal constraints.

In this section of the paper, we first outline the key elements that we believe should be incorporated in a holistic approach to cleaning up the nuclear weapons complex. We then describe some steps that could be taken today--under the existing legislative and regulatory framework--to achieve a more integrated approach to environmental management of the major DOE sites. Finally, we sketch the broad outlines of a more radical mechanism to create a holistic approach--a single unified statute governing nuclear safety and environmental management activities at the major nuclear weapons sites.

Key Elements of a Holistic Approach

We have identified seven key attributes of a holistic approach for cleaning up the nuclear weapons facilities. It is important to note that none of these elements are "new." Others before us have identified them as desirable attributes of the pollution control system. Our purpose here is to identify those that we believe are critical to a holistic environmental program in the context of the particular challenges of the nuclear weapons complex.¹⁵

¹⁵ There are some elements that are *not* included in our list which would be included if the topic were integrating environmental laws more generally, i.e. not in a federal facility context. For example, as discussed above, one of the major objectives of some integrated approaches is to create incentives and opportunity for pollution prevention. This is not one of the major objectives in the DOE context where, in effect, the mass of "pollution" has already been generated.

The seven key elements are outlined below.

1. *The strategy for each of the major EM sites should be built from the ground up.*

The ranking of priorities and the selection of activities at each site should be grounded in the real-world options that are available today, with an eye towards encouraging the development of better alternatives in the future. This is perhaps the most crucial element of a holistic approach. The current disjointed approach to setting priorities and selecting remedies yields no clear understanding of what the major problems are at each site, nor of whether the activities committed to (and funded) will in fact address the most pressing problems. Thus, the cornerstone of a holistic approach is to focus first on the problem, rather than on what must be done to comply with a multitude of specific regulatory requirements.

2. *The starting point for deciding what needs to be accomplished at each EM facility should be a characterization of the full range of current and future risks, contamination, and other problems at each site--as these matters are currently understood--in language that a lay person could understand.* This information should be incorporated into a single document that describes the greatest risks at each site (current, future, or catastrophic), the population affected by these risks, the geographic areas with the greatest contamination, the real-world choices available today to address these problems, the tradeoffs among alternative strategies, and, finally, the expected costs of each alternative.

3. *Overlapping regulatory authority should be eliminated and lines of authority and responsibility should be clearly articulated.* DOE is subject to regulation from many external sources and by its own "self-regulation" under the AEA. The need for DOE to satisfy multiple regulators is a major cause of delay and duplicative effort. The roles and responsibilities of key

agencies should be clarified to eliminate ambiguity and overlap of regulatory authority wherever possible.

4. *An inclusive and iterative process should be used to make decisions and to obtain feedback from key stakeholders.* The basic principles of democracy require that the multitude of stakeholders with strong interest in the fate of these sites have meaningful opportunities to voice their concerns and influence the decision-making process. Regulators, DOE, and the public should be able to obtain information, digest it, and together reach agreement on what makes sense. While final decision-making authority rests with either the federal or state government, the decision-making process should be open, information should be actively shared, and all key documents should be written in non-technical language understandable by all interested parties. Further, the process should be iterative, allowing regulators to delay some decisions if the parties involved cannot reach agreement, either because more information is needed or because an issue is politically charged and must be appealed to more senior officials.

5. *Risk should be incorporated into the priority-setting process. The risks posed by the nuclear weapons sites are numerous, complex, and diverse.* They derive from both hazardous and nuclear materials--and they result in risks to workers, the public, and the environment. There are known current risks, likely future risks, and risks associated with catastrophic events. In addition, there are sometimes risks to national security, as these facilities contain materials that could be used to make nuclear weapons. All of these threats must be considered together in determining site priorities since efforts to ameliorate one kind of risk may well exacerbate others.

6. *Decision-makers should look for opportunities to achieve results in a cost-effective manner.* Examples abound where investing more money in ameliorating a specific problem today would greatly reduce future costs, especially those related to security and maintenance. Strategic investment now could free up money that could be used to address important risks in the future.

7. *Finally, there must be an effective mechanism to assure accountability for actions taken.* A holistic approach, by definition, incorporates some flexibility. As a result, particular care must be taken to assure that both the regulated entity (DOE) and the regulators are held accountable and that there are consequences for actions *not* taken. This is an especially difficult challenge where the regulated entity is a federal agency, where much of the work is done by contractors, and where Congress holds the purse strings.

In determining how best to achieve the elements articulated above, it is important to consider the *scale of change* that might be required. A continuum of changes can be envisioned, ranging from administrative or regulatory to statutory. For years, many have argued that we should seek those solutions that involve the least dislocation to the current system. In other words, we should look first for administrative fixes to the problems in the current system, and only when these will not work should we consider changes in the statutory framework. In this paper we contend that administrative changes can indeed bring about improvements--and that some already have done so. If, however, one's goal is to create a holistic approach to address the problems at the nuclear weapons complex and to assure that all risks--environmental and nuclear safety related--are truly considered together, then a new law is needed.

Inching Towards Integration: Administrative and Regulatory Fixes

While the current legislative structure makes it difficult to allocate resources on the basis of risk and impossible to fully untangle the regulatory system, there are some actions that could be taken today to create a more holistic understanding of the problems at the nuclear weapons sites and to clarify the roles of regulatory agencies. Over the past few years, in fact, DOE and other stakeholders have been working to implement this type of change, with some success. It is important to note, however, that administrative changes will almost certainly fall far short of creating a truly *integrated* approach to the nuclear weapons complex, which we discuss later in the paper.

Creating a More Holistic Understanding of EM Sites. As discussed earlier, a holistic approach to decision-making will require a full characterization of the major concerns at each site. EM could achieve this by mandating the development, at each site, of an assessment--or Strategic Alternatives Report--that clearly identifies the problems and the choices that need to be made at the site. No legislative change would be necessary for this undertaking.

The Strategic Alternatives Report (SAR) that we propose would provide DOE, the state, and other stakeholders with a single, comprehensive document that describes--in non-technical language accessible to policy makers and the public--the current and future risks at the site as they are now understood, the alternative approaches that could be taken to ameliorate these risks, and the costs and benefits (broadly construed) of each of the possible approaches. The likely future land uses at the site would be described, as well as the impact of assumptions about future land use on the range of alternatives. The report would be prepared based on what is currently known quantitatively and/or qualitatively. In cases where there is

not enough information to provide even a qualitative description of risks or other concerns, this would be explicitly noted along with a description of the information that needs to be collected or analyzed so that future decisions can be made. All groups integrally involved with the site--including the DOE site manager, the state regulatory agency, EPA, the DNFSB, and concerned citizens--would participate in the development of the SAR. DOE's field offices, however, would be ultimately responsible for preparing the report.

There is currently no single, comprehensive document like the SAR. EM has, however, recently undertaken a variety of initiatives to pull together information needed for improved decision-making. Most significantly, two of the major sites--Hanford and Rocky Flats--have developed mission statements that clarify the objectives at the sites. These initiatives provide an important step toward the type of approach we envision in the SAR, as their goal is to create a shared understanding among stakeholders regarding cleanup plans and the future use of the site. A second initiative is the annual *Baseline Environmental Management Report* (BEMR), first issued in 1995, which fulfills a congressional request for life-cycle cost estimates for the EM program. Using data generated at the field level, the BEMR presents cost estimates, tentative schedules, and projected activities under alternative land-use assumptions in non-technical language. Finally, the activities to be proposed in EM's budget request are decided upon and documented in an open process that encourages public input. The FY 1998 budget-formulation process is employing a qualitative risk-ranking system whereby impact levels are assigned to the various activities on the basis of seven "core criteria"--risk to the public, risk to workers, risk to the environment, compliance, mission impact, cost-

effectiveness, and social/cultural/economic factors. The information generated from this system is being used in EM's process of prioritizing activities for budget-planning purposes.

Each of these activities has characteristics of the process we recommend for the development of the SAR and could contribute substantially to its preparation. None of them, however, individually provides the level of integration we envision.¹⁶ Our recommendation entails preparation of a single document that includes the full range of information a decision-maker--whether a senior DOE or EPA or state official, or an active citizen--would want in front of her or him to be able to engage in practical discussions regarding site activities and priorities. In sum, the Strategic Alternatives Report would serve as the source document for negotiations among these parties regarding the site's future use and the disposition of all wastes, structures, and special nuclear materials. While DOE and its regulators would still be required to comply with current regulatory requirements, the SAR would help to place these compliance issues in a much broader, more holistic context.

Clarifying Who is In Charge: Addressing RCRA and CERCLA Overlaps. Taking steps to reduce the existing RCRA and CERCLA overlaps has potential to offer an administrative method of bringing about integration of waste cleanup requirements. As discussed above, both EPA and the states (when authorized under RCRA) have regulatory authority at EM sites, often with regard to the same unit or area. Since the goals of the RCRA

¹⁶ Interestingly, the new Assistant Secretary for Environmental Management, Alvin Alm, has recently mandated an Integrated Strategic Planning, Budgeting, and Management System, the central goal of which is the achievement of complete cleanup at most EM sites within ten years. This system will entail the development of a ten-year plan for each site, making use of previously generated information such as that described above.

corrective action and CERCLA programs are similar, attempts to eliminate the application of both authorities can be expected in many cases to reduce duplicative efforts and to bring about more effective use of resources.

Two methods of accomplishing this objective are evident: (1) "carving up" individual sites and assigning either EPA or the state as the "lead regulator" for each component or area of the site; and (2) declaring entire sites to be the exclusive domain of either RCRA or CERCLA. Under the first approach, multiple regulators continue to operate at each site, but the overlap of their authority is curtailed by the "carve out." This approach would result in DOE having to deal with only one regulator for each area of a site.

The first approach is being implemented at both Hanford and Rocky Flats. At Rocky Flats, representatives from DOE, EPA, and the state are currently negotiating a new cleanup agreement that clarifies which regulator is in charge of specific geographic portions of the site. At Hanford, a similar effort resulted in the site being "carved up" on a unit-by-unit basis. These departures from past practices represent major steps toward streamlining the regulatory process and minimizing the overlap of state and federal authority within the confines of the existing legislative framework.

The second method of reducing overlap would be for EPA to declare that the whole cleanup process at each site is subject to only one cleanup statute. This statute would have to be CERCLA because RCRA's corrective action provisions are not applicable to radionuclide contamination. Because it is unlikely that states would relinquish their corrective action authority under RCRA unless statutorily forced to do so, this approach may be limited to those

cases where the state is not authorized for RCRA corrective action (i.e., cases where EPA is solely responsible for implementing both RCRA corrective action and CERCLA).

While these two formulas for change have the potential to streamline cleanup requirements to some degree, they fail to coordinate environmental protection efforts with activities undertaken to ensure nuclear safety. Both RCRA and CERCLA focus primarily on waste management, but the challenge faced at the nuclear weapons complex embodies nuclear safety hazards that are largely ignored in these statutes. Genuine integration would assure that all risks--environmental and nuclear safety related--would be considered together. The existing legal framework encompassing RCRA, CERCLA, and the AEA, however, makes this level of integration impossible--the statutes mandate that distinct agencies have responsibility for regulating these two aspects of the work at EM sites. Absent significant statutory changes, any attempt to streamline regulatory authority and to ensure priorities are set on the basis of *all* relevant risks at these sites ultimately relies on the good-faith efforts of regulators and DOE to work together.

A Radical Approach: New Legislation Governing Environmental Protection and Nuclear Safety at DOE Sites

There are two types of legislative change that could be implemented to achieve better integration: incremental and radical. An incremental approach would amend existing laws--RCRA and CERCLA--in order to streamline regulatory authority. However, this would not advance the effort to integrate the currently distinct nuclear safety and environmental regulatory frameworks. Achieving full integration would require a more radical approach--the enactment of a new piece of legislation. This approach holds the most promise for providing a

vehicle whereby all seven key elements of a holistic approach could be incorporated. A new law--the Nuclear Weapons Facilities Management And Cleanup Act--would provide a unique opportunity to clarify regulatory authority and to mandate the development of regulations and standards that recognize the unique nature of--and the risks associated with--the wastes, structures, and nuclear materials present at DOE's EM sites.

The downside of enacting new legislation for the EM program is first and foremost that the many congressional committees overseeing DOE's environmental management program are unlikely to agree on a single, integrated statute to govern the sites. Some objection to new legislation arises from concern that it might provide an opportunity to weaken regulation of DOE's environmental management activities. Even if these committees could agree on such a statute, it would take time to put the new regulatory structure into place and to develop the new regulations. The process of reallocating regulatory authority among existing government agencies--and possibly creating a new regulatory agency--could be lengthy and difficult.

Even with these obstacles, however, it may be worth pursuing such legislation, given that annual appropriations at the top six EM sites are about \$5 billion, and, over time, are expected to cost the American taxpayer hundreds of billions of dollars. The benefits of a more cost-effective regulatory system could outweigh the costs and delays involved in developing and implementing a new law, thereby justifying a new DOE-specific regulatory system. If attention is paid to clarifying the rules to be followed during the transition period--for example, by specifying that existing regulations are applicable until superseded by the new regulations--some of the costs of moving to a new regime could be reduced.

A range of alternative statutory frameworks could be explored for regulating environmental management activities throughout the weapons complex. Within the existing family of environmental laws, there is already wide variation. Superfund, for example, focuses on creating a process whereby cleanup decisions are made, while RCRA, the Clean Water Act, and the Clean Air Act focus primarily on the development of regulations and standards applicable to certain types of facilities and pollutants. All require standards to be set at the federal level but allow for some form of state implementation. Many of the major environmental laws were quite general in their initial drafting but have become more and more prescriptive over time, usually in response to perceived inaction on the part of EPA.

In exploring what new legislation for EM should "look like," many decisions need to be made. What would be better, a law with broad overarching goals that leaves much discretion to the lead regulatory agency, or one that prescribes exactly what kinds of regulations should be promulgated? Should the new law enumerate specific standards, require the federal government to set all standards, or allow the states to play a role in standard-setting? What role should be assigned to future land use in the selection of remedies? How can the law be tailored to the specific challenges of EM sites while in no way weakening the stringency of the environmental requirements placed on EM? Should the law give the lead in assuring that DOE complies with the new regulations to EPA, NRC, the states, or some new agency? Should DOE continue any "self-regulation," or should that era be brought to an end? What goals should the new law set forth regarding the extent and pace of cleanup? How might the new law address the tradeoffs between risks to workers and risks to the general public? How should the national security risks arising from the politically sensitive nature of special nuclear

materials factor into the law? How can the law create positive incentives for DOE to perform its tasks prudently and cost-effectively? These are the kinds of questions would need to be addressed in a new law.

Among the most daunting of these questions are those relating to the institutional structure that would implement the new law. Key among these involves the appropriate roles for the states and the federal government. Given the complexities of environmental management at EM sites, a realistic answer will almost certainly involve assigning responsibility to specific agencies while at the same time recognizing that no one entity or branch of government can reasonably be vested with responsibility for all of the decisions to be made. States are currently playing an important and effective role in many aspects of environmental regulation, and there is widespread public support for devolution of authority to the states. For at least five of the six major EM sites, however, DOE is a major local employer, and this raises doubt about whether the states would truly aim to "get the sites cleaned up." (Of course, the same could be--and is--said about DOE.) In addition, the national and even international significance of the issues surrounding nuclear materials and the ultimate disposition of nuclear wastes clearly warrants federal involvement. If states had total authority over EM sites, shipping all hazardous and nuclear wastes out-of-state might, understandably, become their primary objective. Some federal regulatory role is inevitable for all federal facilities--in any case--since Congress decides how much money will be allocated to these facilities and since federal officials ultimately determine the use of land owned by the federal government.

A radical departure in institutional arrangements from the current structure might also be considered. For example, a new organization modeled along the lines of the Resolution Trust Corporation could be tasked with implementing all environmental management activities at EM sites. Such an organization would stay in business only as long as needed to get the facilities cleaned up and stabilized and to set in motion any necessary long-term monitoring and maintenance activities. In a sense, therefore, the organization's objective would be its own dissolution.

Prevailing wisdom suggests that Congress is unlikely to enact a single unified statute governing environmental protection and nuclear safety at DOE sites and, therefore, that we should not even try to figure out what such a law would look like. This self-fulfilling prophecy discourages creative thinking about solutions to the problems that plague the cleanup of the weapons complex and the U.S. pollution-control system more broadly. We believe that exploring what an integrated statute might look like will encourage discussion of creative new approaches to managing the cleanup of the nuclear weapons complex. It is even possible that some of the ideas generated in this process will prove persuasive enough that new legislation will become worthy of pursuit. We plan, as our next steps, to solicit comment on this paper from a broad audience and to conduct additional research on alternative approaches to crafting a single integrated statute governing the management and cleanup of the major DOE sites.