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Nuclear Weapons Complex Reconfiguration Study

United States Department of Energy

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Nuclear Weapons Complex Reconfiguration Study

United States Department of Energy
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MASTER

The Secretary of Energy
Washington. DC 20585

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Shortly after assuming duties as Secretary of Energy, I reviewed the "Nuclear Weapons Complex Modernization Report" submitted to the Congress in January 1989 as required by the National Defense Authorization Act of 1988 and 1989. My review showed that several of the report's assumptions needed to be re-evaluated. Therefore, I informed the Congress that the Department of Energy would conduct a review in order to provide a new and more useful report.

During this eighteen-month review, dramatic world changes forced further reassessments of the future Nuclear Weapons Complex. These changes are reflected in the new report. The new report presents a plan to achieve a reconfigured complex, called Complex-21. Complex-21 would be smaller, less diverse, and less expensive to operate than the Complex of today. Complex-21 would be able to safely and reliably support nuclear deterrent stockpile objectives set forth by the President and funded by the Congress. It would be consistent with realities of the emerging international security environment and flexible enough to accommodate the likely range of deterrent contingencies. In addition, Complex-21 would be constructed and operated to comply with all applicable Federal, State, and local laws, regulations, and orders.

Achieving Complex-21 will require significant resources. This report provides an organized approach towards selecting the most appropriate configuration for Complex-21, satisfying environmental requirements, and minimizing costs. The alternative -- to continue to use piecemeal fixes to run an antiquated complex -- will be more expensive and provide a less reliable Nuclear Weapons Complex. As a consequence, implementation of the Complex-21 plan is considered necessary to ensure continued viability of our nuclear deterrent.

James D. Watkins
Admiral, U.S. Navy (Retired)

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Acronyms

LIST OF ACRONYMS AND ABBREVIATIONS

A&E	Architectural and Engineering
AD	Office of Administration and Human Resource Management
ADS	Activity Data Sheet
AEA	Atomic Energy Act
ALARA	As Low As Reasonably Achievable
ARPA	Archaeological Resources Protection Act
ASDP	Assistant Secretary for Defense Programs
B&R	Budget and Reporting (Code System)
CAA	Clean Air Act
CAMP	Capital Asset Management Process
CAS	Condition Assessment Survey
CDR	Conceptual Design Report
CE	Capital Equipment
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Complex	Nuclear Weapons Complex
Complex-21	The Envisioned Future Nuclear Weapons Complex
COP	Class of Property
CPP	Complex Privatization Plan
CRC	Complex Reconfiguration Committee
CRS	Complex Reconfiguration Study
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
Department	The Department of Energy
DOD	Department of Defense
DOE	Department of Energy
DP	Defense Programs
DPFC	Defense Programs Field Council
DPMB	Defense Programs Management Board
DU	Depleted Uranium
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM	Office of Environmental Restoration and Waste Management
ER	Office of Energy Research
ER/WM	Environmental Restoration and Waste Management
ESA	Endangered Species Act
ES&H	Environment, Safety, and Health
FIS	Financial Information System
FMPC	Feed Materials Production Center
FTE	Full Time Equivalent
FWPCA	Federal Water Pollution Control Act

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

FY	Fiscal Year
GOCO	Government-Owned, Contractor-Operated
GPP	General Plant Projects
HLW	High Level Waste
HEU	Highly Enriched Uranium
HMTA	Hazardous Materials Transportation Act
ICPP	Idaho Chemical Processing Plant
INEL	Idaho National Engineering Laboratory
IRB	Internal Review Budget
KC	Kansas City (Plant)
LCP	Life Cycle Plan
LANL	Los Alamos National Laboratory
LI	Line Item
LLCE	Limited Life Component Exchange
LLNL	Lawrence Livermore National Laboratory
LLRWPA	Low Level Radioactive Waste Policy Act
M&O	Management and Operating (Contractor)
MCL	Maximum Containment Level
MD	Mound (Plant)
MDC	Manufacturing Development Center
MDE	Manufacturing Development Engineering
MT	Maintenance
NCA	Noise Control Act
NHPA	National Historic Preservation Act
NEPA	National Environmental Policy Act
NMP	Nuclear Materials Production
NMP&M	Nuclear Materials Production and Manufacturing
NNM	Nonnuclear Manufacturing
NOI	Notice of Intent
NOVA	Glass Laser developed at Lawrence Livermore National Laboratory
NPR	New Production Reactor
NTS	Nevada Test Site
NWPA	Nuclear Waste Policy Act

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

NWP	Nuclear Weapons Production
OMB	Office of Management and Budget
OR	Oak Ridge
OSHA	Occupational, Safety, and Health Administration
P&S	Production and Surveillance
PCBs	Polychlorinated Biphenyls
PD	Project Development
PEIS	Programmatic Environmental Impact Statement
PFP	Plutonium Finishing Plant
PI	Pinellas (Plant)
PPP	Privatization Planning Panel
PP	Program Plan
PRMP	Plutonium Recovery Modification Project
PS	Private Sector
Pu	Plutonium
PUREX	Plutonium Uranium Extraction
PX	Pantex (Plant)
QA	Quality Assurance
RCP	Research, Development, and Testing Consolidation Panel
RCRA	Resource Conservation and Recovery Act
RDT&E	Research, Development Testing and Evaluation
RD&T	Research, Development and Testing
REP	Residue Elimination Project
RFP	Rocky Flats Plant
RPIS	Real Property Information System
ROD	Record of Decision
RPO	Reconfiguration Project Office
RTG	Radioisotope Thermoelectric Generator
S&S	Safeguards and Security
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
Secretary	Secretary of Energy
SEP	Site Evaluation Panel
SIG	Strategic Integration Group
SIS	Special Isotope Separation
SNL	Sandia National Laboratories
SNM	Special Nuclear Material
SP	Strategic Plan
SPG	Strategic Planning Group

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

SRS	Savannah River Site
t	Tonne (Metric Ton)
TADP	Technology Assessment and Development Program
TASP	Technology Assessment and Selection Panel
TBD	To Be Determined
TEC	Total Estimated Cost
The Study	*Nuclear Weapons Complex Reconfiguration Study*
TPC	Total Project Cost
TRU	Transuranic
TSCA	Toxic Substances Control Act
UMTRCA	Uranium Mill Tailings Radiation Control Act
UO3	Uranium Trioxide
WDSP	Weapons Design Standardization Panel
WG	Weapons Grade
Y-12	Oak Ridge Y-12 Plant

Foreword

FOREWORD

Much of the current Nuclear Weapons Complex was constructed more than three decades ago and is now in need of major repairs and modernization. Some critical production facilities have had unplanned shutdowns. Recognizing that a comprehensive rather than piecemeal approach is needed to address these problems, Congress directed in the *National Defense Authorization Act for Fiscal Years 1988/1989* (Public Law 100-180) that a study be conducted and a plan prepared by the President for the modernization of the Nuclear Weapons Complex that takes into account the overall size, productive capacity, technology base, and investment strategy necessary to support long-term security objectives. The product of that study, entitled the *Nuclear Weapons Complex Modernization Report (Modernization Report),* was submitted to the Congress on January 12, 1989. It called for extensive modernization of facilities over a 15-20 year period. This report also called for a major program of environmental restoration and waste management.

In February 1989, the Department of Energy (DOE) began parallel development of two five-year plans to implement the findings of the *Modernization Report*. One plan covered environmental restoration and waste management while the other focused on modernization of facilities. The *Environmental Restoration and Waste Management Five-Year Plan for FY 1991-1995* was published in August 1989 and revised for FY 1992-1996 in July 1990. As the companion *Modernization Five-Year Plan* was being developed, however, fundamental changes in DOE policy direction and in the structure of international political and military forces raised questions about the validity of assumptions underlying the original study and the adequacy of proposed solutions for the more serious problems of the Complex.

Consequently, in September 1989, the Secretary of Energy (Secretary) ordered the establishment of a Modernization Review Committee, chaired by the Under Secretary, to reexamine the modernization issue. The Committee was directed to review the assumptions and recommendations of the original *Modernization Report*; assess the capacity and capability requirements of the Nuclear Weapons Complex (Complex); and to review the process by which the immediate and future requirements for maintaining, updating, and cleaning up the Complex are developed. The ensuing effort involved forming a task force to coordinate and oversee the work of some 200 DOE and supporting contractor personnel involved to varying degrees.

In August 1990, the Secretary reviewed the progress of the study and issued additional guidance to focus the analysis more sharply on the realities of the emerging international security environment. This ensured flexibility to accommodate the likely range of deterrent contingencies and emphasized the objective of achieving a Complex which is smaller, less diverse, and less expensive to operate than today's. Subsequently, the Modernization Review Committee was redesignated the Complex Reconfiguration Committee. The Committee's product is the *Nuclear Weapons Complex Reconfiguration Study,* which replaces the January 1989 *Modernization Report*, and follows this introduction.

The Study presents an overview of the current problems of the Complex, outlines a vision of the future Complex (Complex-21), and charts the course to achieve this vision. It includes discussion of potential configurations of the future Complex and transitional activities. The transition to Complex-21 is expected to be completed early in the next century. The report also addresses key activities necessary to comply with the *National Environmental Policy Act* and to support the Record of Decision concerning Complex-21. Additionally, the report presents major recommendations to improve management of the Complex, which includes the establishment of a Capital Asset Management Process (CAMP). The *Reconfiguration Five-Year Plan*, which is derived from CAMP and details funding needed to pursue activities related to reconfiguration in the coming five years, is a separately published report.

Executive Summary

EXECUTIVE SUMMARY

As described in the Foreword, the *Nuclear Weapons Complex Reconfiguration Study* (the Study) is a revised and updated response to the *National Defense Authorization Act for FY 1988/1989* requirement to develop an integrated plan to reconfigure the Nuclear Weapons Complex (Complex). The Complex provides the nuclear weapons that support the nuclear deterrent policy of the United States. The mission of the Complex includes production of nuclear material; design, research, development, testing, and manufacture of new nuclear weapons; surveillance, maintenance and modernization of the nuclear weapons stockpile; and retirement and disposal of nuclear weapons at end-of-life.

The original need to reconfigure the Complex was driven primarily by its deteriorated state. This condition, together with an antiquated philosophy of operations, made it increasingly difficult for the Complex to meet expected standards for the protection of the environment and the safety and health of workers and the public. Within the last year, the rapidly changing world situation has further stressed the need for reconfiguration of the Complex.

The key assumption of the *Complex Reconfiguration Study* is that nuclear deterrence will remain a principal element of the security of the United States. While this is a prudent assumption, recent world events call into question the needed size and character of our nuclear deterrent stockpile. The precise answer to this question is not known. However, it is clear that the stockpile will shrink and that the resources provided to maintain it will be limited to those required to ensure an effective deterrent. The *Complex Reconfiguration Study* describes a process to define what resources are required to achieve this objective. The Study examines a wide range of potential stockpile sizes, down to less than 15 percent of its current size. The first priority of all courses of action examined by the Study is to protect the environment and provide for proper public and worker health and safety.

The Study's scope is extensive, covering all activities required to realize the reconfigured Complex and to keep the current Complex operational. Reconfiguration will change the Complex to different degrees within three functional elements: Nuclear Materials Production and Manufacturing (NMP&M); Nonnuclear Manufacturing (NNM); and Research, Development and Testing (RD&T). Among the options presented in the Study to accomplish this change are two which the Secretary has designated as "preferred options": to relocate the Rocky Flats Plant (part of the NMP&M element) and to consolidate the NNM element of the Complex at a single, dedicated site.

With these principle factors in mind, the Study charts a course in preparation for a Fiscal Year (FY) 1994 Secretarial decision on the future of the Complex. This decision will define the reconfigured Complex that will support future deterrence requirements. It is designated Complex-21.

Complex-21 will be more compact, less diverse, and less expensive to operate than the Complex of today. The goal is to safely and reliably support whatever nuclear deterrent objectives are set by the President and funded by Congress with fewer and smaller individual production sites. Consideration will be given to locating several NMP&M activities at a single site. Production of NNM will be transferred to the private sector to the maximum extent consistent with minimizing costs. Complex-21 will consider modular construction for flexibility in making capacity adjustments. The number and size of waste streams will be kept to a minimum, and Complex-21 will be constructed to comply with all applicable federal, state, and local laws, regulations, and orders.

To begin the process of defining the configuration of Complex-21, the Study identifies planning considerations, configuration alternatives, and activities necessary to support the FY 1994 Secretarial decision. Following that decision, components of Complex-21 will be brought online as rapidly as technical, legal, regulatory, and resource issues permit. Complex-21 should be fully operational early in the 21st Century and will sustain the nation's nuclear deterrent until the middle of that century.

The *Complex Reconfiguration Study* focuses on two fundamental alternatives for the Nuclear Weapons Complex: the "No Action" alternative and the "Reconfiguration" alternative.

Under the No Action alternative, only those projects required for compliance with federal, state, and local laws, regulations, and orders and those projects required to accomplish the Department's defense related mission would be pursued. This alternative promotes little action to stem the deterioration and technological obsolescence of the Complex other than that which would be included in the necessary compliance projects.

The Reconfiguration alternative focuses on two options for Complex-21. While variations of these or perhaps entirely new options might be developed during the completion of required studies of environmental and other impacts, the two options are representative of the reasonable range of options that could be considered:

- Configuration A: Downsizing and Modernizing in Place. Upgrade, replace, and/or consolidate facilities at their current sites, using existing support facilities and infrastructure as much as possible. As an exception to the existing site theme, the functions of the Rocky Flats Plant (RFP) would be relocated: NMP&M functions would be relocated to another site and nonnuclear functions would be transferred or privatized. The current facilities at RFP would then be transferred to the Office of Environmental Restoration and Waste Management for appropriate action. Other parts of the Complex would be downsized, with relatively minor consolidations and closeouts as missions change. Privatization of NNM would be expanded. Appropriate RD&T functions would be consolidated into individual "Centers of Excellence".

- Configuration B: Maximum Consolidation. Relocate RFP and at least one other NMP&M facility to a common location. The Pantex Plant and the Oak Ridge Y-12 Plant are candidates for collocation with the Rocky Flats functions, either singly or together. Functions of relocated plants would be handled as described for RFP in Configuration A. The probable outcome of this option would be an integrated site which could consolidate much of the NMP&M element at a single site. Other activities would be consolidated and closed out as dictated by changing missions and requirements. Maximum feasible privatization of NNM would result in maximum consolidation of nonnuclear production facilities. As in Configuration A, appropriate RD&T functions would be consolidated into single Centers of Excellence.

As required by the National Environmental Policy Act, a Programmatic Environmental Impact Statement (PEIS) will be developed to analyze the consequences of alternative configurations for the Complex. The Programmatic Environmental Impact Statement will serve as an effective planning and decision making tool by providing DOE and the public with information on the environmental consequences of possible reconfiguration alternatives before potential options have been foreclosed or irrevocable project-level commitments of resources have been made.

Because the PEIS process will not be completed until early FY 1994, it is conceivable that some interim actions may be necessary to sustain operations or comply with safety and health or environmental requirements at sites potentially impacted by reconfiguration options. Such interim actions will be evaluated and decided on a case-by-case basis. In no instance will actions be taken that would have the effect of foreclosing an alternative evaluated by the PEIS.

DOE must take positive action now to reconfigure the Complex if it is to reliably support the Nation's nuclear deterrent strategy. This program must be integrated with programs addressing waste cleanup and environmental restoration and with upgrades needed for current and near-term operations. This integrated approach should form a comprehensive and orderly program for DOE operations and capital investment in the future.

The reader desiring a more extensive summary should refer to Chapter 2, "The Complex Reconfiguration Study: An Overview."

Chapter 1

The Nuclear Weapons Complex Today

CHAPTER 1

THE NUCLEAR WEAPONS COMPLEX TODAY

1.1 THE MISSION

Congress, in the Atomic Energy Act of 1954, declared, as a matter of national policy, that–

> *a. the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and*
>
> *b. the development, use and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.*

To implement this policy, Congress provided for programs to:

- Conduct research and development;
- Disseminate, with appropriate safeguards, scientific and technical information to encourage scientific and industrial progress;
- Ensure Government control of atomic energy and special nuclear materials[1] in order to maximize national security and to ensure ability to enter into and enforce international controls;
- Encourage widespread participation in the development and utilization of atomic energy for peaceful purposes, to the maximum extent consistent with security and public health and safety;
- Promote international cooperation in common defense and security and make available to cooperating nations the benefits of peaceful applications of atomic energy; and to
- Promote technology transfer to assist United States competitiveness.

The fundamental mission of the Nuclear Weapons Complex (Complex) is derived from this national policy and congressionally approved programs. Simply stated, that mission is to ensure that the nation's nuclear deterrent remains effective. To accomplish this, the Complex must maintain the nuclear

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[1] Plutonium or uranium enriched in isotopes 233 or 235.

weapons stockpile in readiness, certify the reliability and safety of nuclear weapons, and modernize the stockpile based on requirements approved by the President. The Complex must also continually perform research, development, and testing to support these functions, to maintain technical superiority over the nation's potential adversaries and to prevent technological surprises. Additionally, a national capability will be needed to rapidly respond to unexpected actions taken by the nation's adversaries such as treaty violations or technological breakthroughs.

The specific products of the Complex have changed as the United States and threat force structures and military doctrine have evolved. The United States' nuclear delivery systems originated with manned bombers in the 1940s. Over succeeding decades, there has been a steady stream of new or improved strategic and tactical delivery systems to maintain nuclear deterrence and to counter an adversary's capability to amass overwhelming conventional forces at points of attack. The continuing modernization of delivery systems, requirements for improved performance, tailoring of weapons for specific purposes, and increasingly more stringent safety standards have resulted in replacement of bombs or warheads regardless of whether or not the stockpile size changed.

Nuclear weapons are extraordinarily complex devices that must meet rigorous quality and safety standards. These weapons must have the assured capability to perform as expected at any time during a stockpile life of 20 years or more and, of equal importance, to not operate unless all requisite conditions are met.

1.2 DESCRIPTION OF THE COMPLEX TODAY

The Complex as it exists today is illustrated in Figure 1.1. It comprises 13 government-owned, contractor-operated (GOCO) major facilities, distributed over 12 states. Many of them were constructed 30-40 years ago, were sized to meet programmatic workloads substantially larger and more diverse than those expected in the future, and were designed and built to standards and regulations very different and less stringent than those of today. These facilities are administered by the Department of Energy's Rocky Flats Office and the Albuquerque, Idaho, Oak Ridge, Richland, San Francisco, Savannah River, and Nevada Operations Offices. Prime contractors and sub-contractors providing support for the Complex are located throughout the nation.

The Complex is organized into three functional elements: laboratories and test sites used for Research, Development and Testing (RD&T); plants for Nuclear Materials Production and Manufacturing (NMP&M); and plants for Nonnuclear Manufacturing (NNM). There is functional overlap in that the Rocky Flats, Pantex, and Oak Ridge Y-12 plants have both nuclear and nonnuclear manufacturing responsibilities. The functional elements and major sites are described in the next three sections.

RESEARCH, DEVELOPMENT & TESTING SITES	NONNUCLEAR MANUFACTURING SITES	NUCLEAR MATERIALS PRODUCTION & MANUFACTURING SITES
Los Alamos National Laboratory Lawrence Livermore National Laboratory Sandia National Laboratories Nevada Test Site	Kansas City Plant Mound Plant Pantex Plant Pinellas Plant Rocky Flats Plant Oak Ridge Y-12 Plant	Hanford Site Idaho National Engineering Lab Oak Ridge Y-12 Plant Savannah River Site Rocky Flats Plant Pantex Plant
MISSION: Certify reliability and safety of stockpile. Design and test nuclear weapons. Support manufacturing engineering. Conduct exploratory research to avoid technological surprise, create advanced designs, and support national arms control objectives.	MISSION: Manufacture, process, assemble, disassemble, evaluate, and modify nonnuclear components for nuclear weapons.	MISSION: Manufacture, process, assemble, disassemble, evaluate, and modify nuclear materials (tritium, weapons-grade plutonium, and highly enriched uranium) and components from material of retired stockpile weapons and produce new material in nuclear reactor and uranium enrichment facilities.

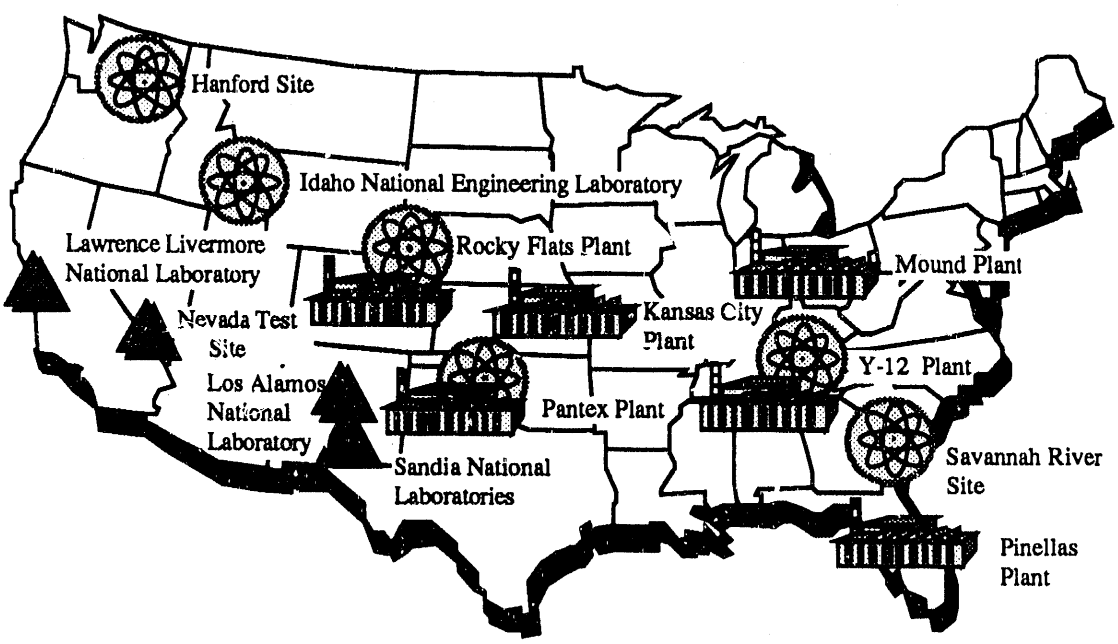


Figure 1.1.–The Nuclear Weapons Complex Today.

1.2.1 Research, Development, and Testing Sites

The Research, Development and Testing element of the Complex provides the technological underpinning for our nuclear deterrence. The laboratories provide the capability to sustain the reliability and safety of the current stockpile, to design and test new or modified nuclear weapons, to conduct exploratory research to avoid technological surprise and provide future weapon design options, and to support national arms control objectives.

The RD&T Program is concentrated in three laboratories and the Nevada Test Site. Unlike the Defense Department's RD&T programs, in which a multitude of industrial contractors participate and compete for new systems, nuclear weapons are designed and developed exclusively in government-owned facilities. Two of them, Los Alamos National Laboratory and Lawrence Livermore National Laboratory, have a similar mission in order to stimulate intellectual competition in highly classified physics research and nuclear device design. Sandia National Laboratories and the Nevada Test Site, on the other hand, perform functions not duplicated by any other facility.

Lawrence Livermore National Laboratory (LLNL) is located at Livermore, California and operated by the University of California. Its principal missions are nuclear weapons RD&T; basic research in experimental, theoretical, and computational physics; earth and life sciences; chemistry; and nuclear engineering. LLNL is the lead laboratory for development of the NOVA Glass Laser for the Inertial Confinement Fusion program. The lab conducts extensive research in such diverse fields as particle beams and electromagnetic rail guns, electromagnetic pulse effects, space systems, defense waste management, and seismic research. The latter is essential for verifying compliance with nuclear testing treaties. Approximately 40 percent of the work at LLNL is related to the Nuclear Weapons Complex mission.

Los Alamos National Laboratory (LANL) is located at Los Alamos, New Mexico, and is also operated by the University of California. Like LLNL, LANL's principal missions are nuclear weapons RD&T; basic research in experimental, theoretical, and computational physics; earth and life sciences; chemistry; and nuclear engineering. LANL is the lead laboratory for developing the Krypton Fluoride Gas Laser for the Inertial Fusion program and has the lead role for plutonium processing technology research and development and the transfer of this technology to the weapons production element. It also develops instrumentation for satellite surveillance systems and performs research in arms control verification, nuclear materials safeguards, and neutral particle beams. Approximately 41 percent of the work at LANL is associated with the Nuclear Weapons Complex mission.

Sandia National Laboratories (SNL) is operated by AT&T Technologies, Inc. Its principal site is Albuquerque, New Mexico, but there is also a sizable facility collocated with LLNL. SNL does ordnance engineering, nonnuclear component design and development, field and laboratory testing, and manufacturing engineering for the nuclear weapons developed by the other two labs. Its major responsibilities are the design and engineering of nonnuclear components for nuclear weapons systems. These include the electronic safing, arming, fuzing, and firing systems as well as non-electrical components such as aerodynamic casings and parachutes. Sandia also operates Tonapah Test Range, adjacent to Nellis Air Force Base bombing and gunnery range, for testing of ballistics trajectories, weapons parachutes, and nonnuclear explosives effects. SNL is developing the Particle Beam Fusion Accelerator for the Inertial Confinement Fusion program and is the DOE lead laboratory for pulsed power development, for developing databases for integrated computer-aided design/computer-aided manufacturing, and for developing safe and secure transportation systems and storage facilities for nuclear weapons and materials. About 57 percent of the work at SNL is associated with the Nuclear Weapons Complex mission.

The Nevada Test Site (NTS), located about 65 miles northwest of Las Vegas, is operated by multiple contractors and administered by the Nevada Operations Office. It is a remote, secure facility for safely conducting underground testing of nuclear weapons and for evaluating the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other materials. Since the signing of the Threshold Test Ban Treaty, it has been the only United States site for nuclear tests.

The RD&T program is the only source of nuclear weapons technological innovations available for the national nuclear deterrent to respond to evolving threats. Because projections of future threat capabilities and intentions are inherently uncertain, the RD&T program must maintain the flexibility to quickly respond to changing national requirements.

1.2.2 Nuclear Materials Production and Manufacturing Sites

The NMP&M element of the Complex supplies nuclear materials (i.e., tritium, weapons-grade plutonium, and highly enriched uranium) for nuclear weapons. In addition to the requirements for new weapons, tritium is also produced to replace that which has undergone radioactive decay in the stockpile. Nuclear materials for stockpiled weapons are supplied by a combination of recovery and recycle of material that has been in the stockpile and production of new material in nuclear reactors and uranium enrichment facilities. A by-product, depleted uranium, is used to make components of nuclear weapons, special armor for United States main battle tanks, and anti-armor projectiles. The NMP&M element also manufactures parts from nuclear materials and assembles nuclear weapons.

Six sites, the Hanford Site, Idaho National Engineering Laboratory (INEL), Pantex Plant, Rocky Flats Plant (RFP), Savannah River Site (SRS), and the Y-12 facility at Oak Ridge currently constitute the NMP&M portion of the Complex.

The Feed Materials Production Center (FMPC) at Fernald, Ohio has in the past produced uranium metal cores used in nuclear reactors at Savannah River Site.

Part of this site is the RMI Company mill at Ashtabula, Ohio, which extrudes and forges uranium castings. Effective October 1, 1990, however, FMPC's Defense Programs operations ended and the site was transferred to the Office of Environmental Restoration and Waste Management.

The Hanford Site is located near Richland, Washington. The Westinghouse Electric Corporation operates the materials production processes, which include the N Reactor (currently in dry standby), a fuel fabrication plant, a chemical separations plant, and a Plutonium Finishing Plant (PFP).

INEL is located in southern Idaho near Idaho Falls. Facilities at the site are operated by five major contractors. The principal NMP&M facility is the Idaho Chemical Processing Plant (ICPP), operated by Westinghouse Electric Corporation, which recovers enriched uranium from spent naval and research reactor fuels.

The Pantex Plant is located near Amarillo, Texas, and is operated by Mason and Hangar-Silas Mason Company. The plant assembles the high explosives, nuclear components, and nonnuclear components into nuclear weapons. Other activities include weapons repair and modification, weapons disassembly and retirement, and stockpile evaluation and testing.

The Rocky Flats Plant is located near Denver, Colorado, and is operated by EG&G, Inc. Its main function is to fabricate finished plutonium parts for nuclear weapons and conduct plutonium recycle and recovery operations.

The Savannah River Site is located near Aiken, South Carolina, and is operated by Westinghouse Electric Corporation. The primary function of the plant is the production of tritium. The major NMP&M facilities include fuel and target fabrication facilities, three tritium production reactors designated "K," "L," and "P," chemical separation plants used for recovery of plutonium and uranium isotopes, and a research and development laboratory to provide process support. The Tritium Facility at Savannah River Site purifies and loads tritium into reservoirs for use in nuclear weapons.

The Y-12 Plant is located in Oak Ridge, Tennessee, and is operated by Martin Marietta Energy Systems, Inc. The major nuclear production and manufacturing operations are processing of depleted uranium, highly enriched uranium, and fabrication of uranium components. Materials are also recovered from the fabrication process and retired weapons.

Nuclear materials production and manufacturing is critical to operation of the Complex. Assurance of an uninterrupted tritium supply, including provision for a tritium contingency, has high priority in planning for modernization of NMP&M facilities. Supply of weapons-grade plutonium is also critical, but, because of its long half-life, plutonium from weapons being retired can be reused with little loss. The manufacturing portion of the Complex is essential to fabricate and assemble nuclear weapons parts.

1.2.3 Nonnuclear Manufacturing Sites

The NMP&M and nonnuclear elements of the Complex together constitute an interdependent, essentially single-track production system with few redundancies. Six nonnuclear manufacturing plants contribute to the production of nuclear weapons. In contrast to high volume factories, the nonnuclear manufacturing plants generally produce relatively small quantities of technologically sophisticated products which require a lifetime guarantee. This results in a very large infrastructure with relatively high fixed costs, irrespective of the production rate.

The six nonnuclear manufacturing sites include the Kansas City, Mound, Pantex, Pinellas, and Rocky Flats Plants and the Y-12 facility at Oak Ridge.

The Kansas City Plant is located in Kansas City, Missouri and is operated by Allied-Signal, Inc. The primary missions are manufacture, surveillance, and evaluation of components for nuclear weapons. The major products are electromechanical, electrical, rubber, plastic, and metallurgical components used in arming, fuzing, and firing systems. Many of these components must be made under rigidly controlled manufacturing environments from materials which are, in some cases, not commercially available. The plant also produces customized precision instrumentation and apparatus for use in the research programs of the Weapons Complex laboratories.

The Mound Plant is located near Dayton, Ohio and is operated by EG&G, Inc. Its primary missions are manufacture and evaluation of pyrotechnic components for nuclear weapons and surveillance testing of explosives and electrical components drawn from weapons in the stockpile. Components manufactured and tested include detonators, timers, transducers, firing sets, and actuators. Activities also include recovery of tritium from some retired weapons. Recovered tritium is shipped to the Tritium Facility at Savannah River for recycling. In addition to its defense work, Mound also produces and distributes stable (non-radioactive) isotopes for commercial and medical applications.

The Pantex Plant is located near Amarillo, Texas and is operated by Mason and Hangar-Silas Mason Company. In addition to its NMP&M assembly functions, the plant fabricates high explosive components.

The Pinellas Plant is located in Clearwater, Florida and is operated by the General Electric Company. This plant produces miniaturized neutron generators, radioisotopically powered thermoelectric generators, thermal batteries, speciality capacitors, crystal resonators, neutron detectors, special switches, and product testers.

The Rocky Flats Plant is located near Denver, Colorado and is operated by EG&G, Inc. In addition to its NMP&M functions, the Rocky Flats Plant also fabricates nonnuclear components from beryllium, stainless steel, and depleted uranium.

The Y-12 Plant is located in Oak Ridge, Tennessee and is operated by Martin Marietta Energy Systems, Inc. In addition to its NMP&M functions, Y-12 assembles lithium parts, performs precision machining, and provides specialty subassembly of structural components.

Together, the RD&T, NMP&M, and NNM sites constitute an integrated Complex with extensive interrelationships. Figure 1.2 shows a simplified schematic of the material flows between sites.

1.3 CURRENT PROBLEMS

DOE is acutely aware of problems that have evolved over many years which must be solved if the Complex is to continue to fulfill its mission. Recently, the problems have become serious enough to cause shutdowns of several facilities and raise the specter of similar shutdowns and prolonged outages at others.

Within the limitations imposed by budgetary constraints, DOE has initiated projects to upgrade its facilities and capabilities. However, piecemeal improvements have proven inadequate. A firm, long-term commitment to modernize the Complex must start now. The most pressing problems are listed below and are addressed in succeeding sections:

- Age, long term deterioration, and technological obsolescence of some facilities and equipment;
- Difficulty in achieving satisfactory progress in meeting and maintaining standards for environment, safety and health;
- An excessive and growing maintenance backlog, stemming both from the age and deterioration of facilities and equipment and the past practice of deferring maintenance to meet production and other programmatic requirements within the funding levels authorized;
- Population encroachment on formerly remote sites; and
- Changing safeguards and security threats and difficulty in meeting new standards and requirements in the existing facilities.

1.3.1 Facility and Equipment Age, Long-Term Deterioration, and Technological Obsolescence

The majority of facilities in the Complex were designed and built between the late 1940s and mid-1960s. These facilities reflect the strong emphasis placed on nuclear deterrence during the post-World War II period. A significant reduction in projected military requirements during the mid-1960s resulted in excess

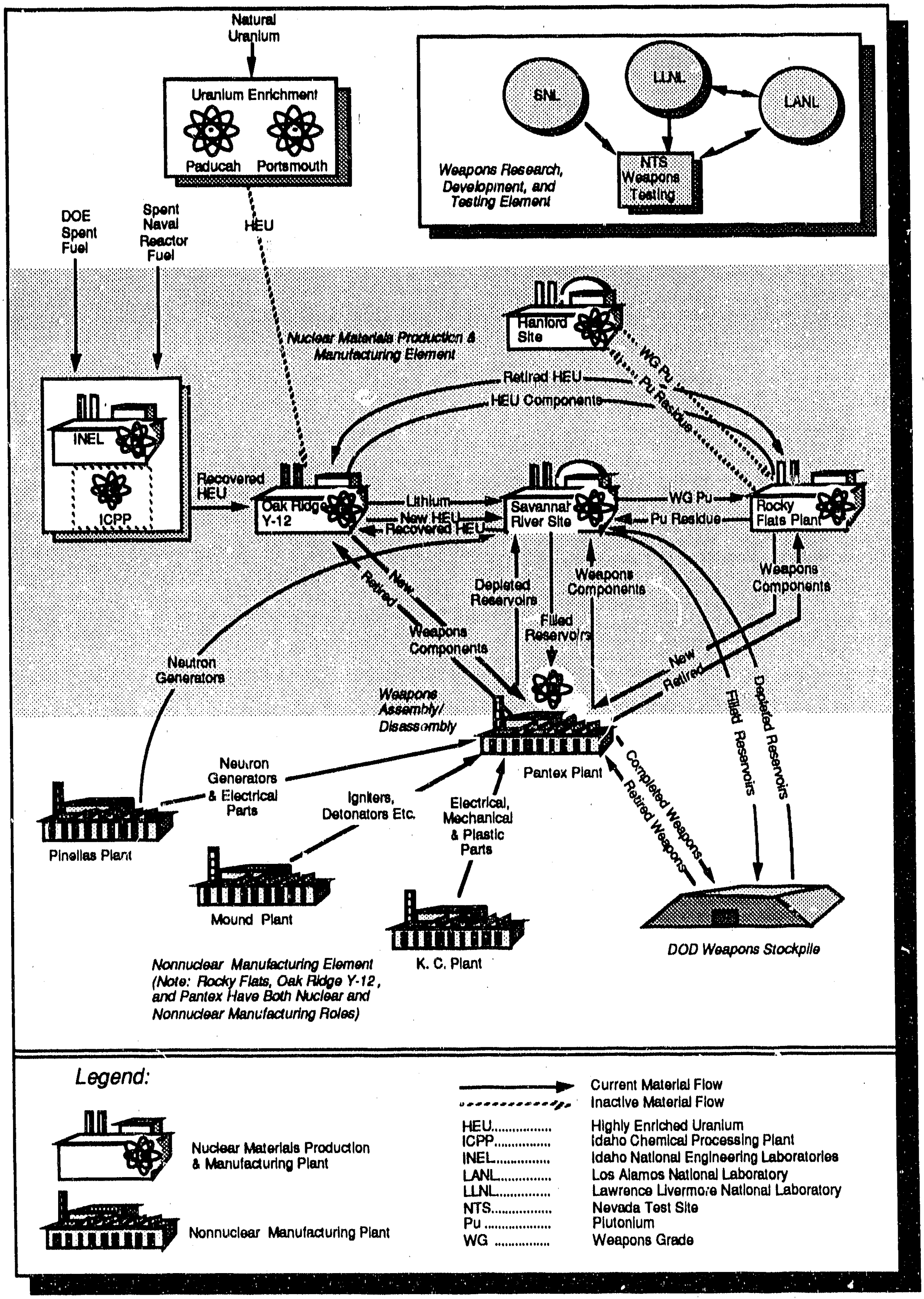


Figure 1.2.–Simplified Material Flow in the Nuclear Weapons Complex.

production capacity. This capacity has been reduced gradually as a consequence of limited funding, the aging of the Complex, and the acceptance of increased risk in meeting production requirements.

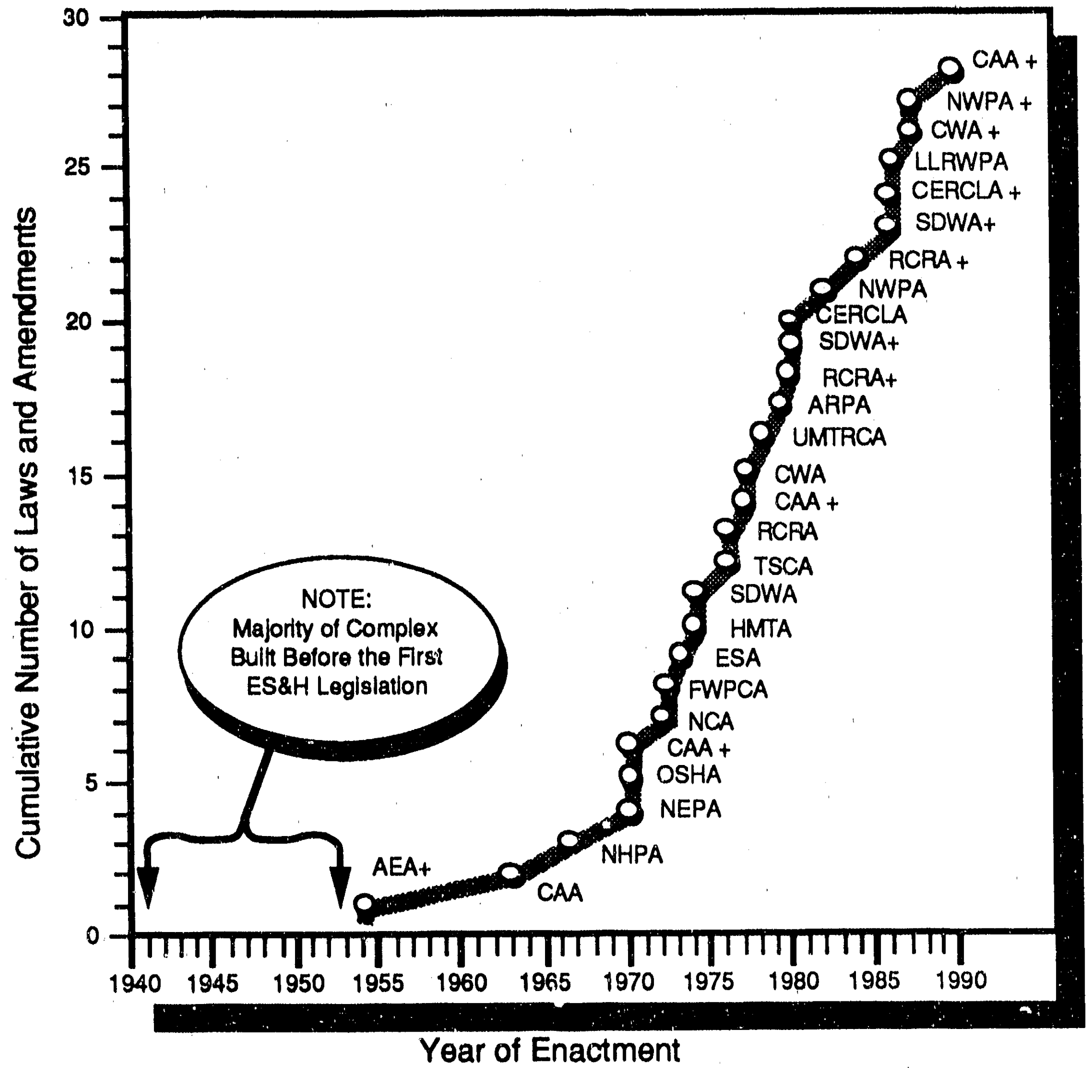
Although needed facilities are being upgraded, their basic design and construction reflect standards of the late 1940s through 1960s. For several facilities, selective upgrades and renovations have extended their useful life. This approach has worked reasonably well at such places as the Kansas City and Pinellas weapons components plants, where modular designs and the nonnuclear nature of the operations are well suited to modernization by replacement of production lines. However, in other facilities where the cost of major upgrades and renovation is high, especially those with nuclear materials production operations, renovation and upgrades have only provided temporary relief. Additionally, increased safety oversight has identified major technical questions concerning the safety of production operations, resulting in reduced operations and extended outages for further facility upgrading and backfitting.

In addition to the facilities themselves, production machinery and processes have not kept pace with modern technology. This is particularly true with regard to the installation of automated operations to replace manual processes. Some manufacturing processes are further handicapped by reliance on obsolete technologies that limit productivity.

1.3.2 Difficulty in Achieving and Maintaining Standards for Environment, Safety, and Health

Throughout the life of the Complex, DOE has recognized the importance of environment, safety, and health (ES&H) for both DOE and contractor personnel at the sites and for the public in general. However, in the early days, protection of both employees and the public was achieved through DOE initiative with little guidance, regulation or oversight by other government agencies or environmental groups. Today, there are many government agencies at the federal, state, and local levels with cognizance over DOE facilities. Compliance with the increasing number, complexity, and stringency of regulations has become very difficult. Figure 1.3 shows the pace of introduction of new or revised federal legislation affecting DOE's environment, safety and health program.

Many of the problems currently facing the Complex can be traced to the fact that the majority of its facilities were not designed to meet today's more stringent environmental, safety, and health regulations. The bulk of the existing Complex reflects the construction and engineering practices of the 1950s and 1960s. Since then, there have been major advances in the understanding of not only the health and safety aspects of weapons production, but also of the basic materials and engineering sciences that affect the technical performance of the Complex. Current trends indicate the likelihood that future health and safety regulations will be more restrictive, particularly in radiation exposure and radioactive materials release guidelines.



+	Amendment to An Original Act	LLRWPA	Low Level Radioactive Waste Policy Act
AEA	Atomic Energy Act	NCA	Noise Control Act
ARPA	Archaeological Resources Protection Act	NEPA	National Environmental Policy Act
CAA	Clean Air Act	NHPA	National Historic Preservation Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	NWPA	Nuclear Waste Policy Act
		OSHA	Occupational Safety and Health Act
CWA	Clean Water Act	RCRA	Resource Conservation and Recovery Act
ESA	Endangered Species Act	SDWA	Safe Drinking Water Act
FWPCA	Federal Water Pollution Control Act	TSCA	Toxic Substances Control Act
HMTA	Hazardous Materials Transportation Act	UMTRCA	Uranium Mill Tailings Radiation Control Act

Figure 1.3.–Federal Environment, Safety, and Health Legislation Affecting DOE.

More stringent requirements are, in part, the result of a new understanding of the risk and consequences inherent in operating industrial and nuclear facilities and of a change in public attitudes regarding acceptable levels of risk. These attitudes have been, and will continue to be, affected by external events such as Bhopal's chemical disaster, the serious Chernobyl nuclear reactor accident, and the Three Mile Island reactor incident. Changing requirements and their strict interpretation make it difficult to achieve compliance in facilities that are 30 or more years old. The criteria to which most facilities in the Complex were designed and constructed often do not meet current standards for seismic design, fire protection, and environmental protection (air emissions, liquid effluents, and solid wastes). Modernization of facilities is essential to meet ES&H requirements in order to prevent shutdown of key sites or facilities in the Complex for significant periods of time.

1.3.3 Excessive and Growing Maintenance Backlog

Historically, due to higher funding priorities of other needs, maintenance has frequently been limited to repairs of the most critical nature. Less urgent repairs have been deferred. As any facility ages, unless it is properly maintained, significant deterioration occurs and the extent of needed refurbishment increases rapidly. Examples of major types of repairs accumulating across the Complex are:

- Repair or replacement of building utilities systems (water, sewer, electrical, steam, and ventilation) and site drainage systems;
- Roof replacements on older buildings. Roofs, although patched, have leaked to the point at which underlying structures have been damaged;
- Repair and refinishing of buildings that have been subject to excessive weathering;
- Major road repairs; and
- Upgrading or replacement of base telephone systems.

Consistent with a realistic spending profile, and as a part of its reconfiguration planning, DOE is thoroughly examining all areas in need of repairs and scheduling them in the *Reconfiguration Five-Year Plan* based upon urgency of need.

1.3.4 Population Encroachment on Formerly Remote Sites

Since the Complex began operating, the United States population has increased by more than 110,000,000 people, leading to vastly increased demands for residences, services, shopping centers, industrial areas, and recreational facilities. Some of this population growth has taken place in the areas surrounding DOE sites.

Rocky Flats and Mound are perhaps the best examples of how facilities in once sparsely populated rural areas have been surrounded by sprawling urbanization. Originally built 16 miles from Denver, the Rocky Flats Plant is now on the edge of the metropolitan area's bedroom communities. The Mound Plant is now virtually surrounded by Dayton's suburban community of Miamisburg. Furthermore, the state has designated the ancient Indian burial mound directly adjacent to the plant's perimeter security fence as a state memorial, thus drawing tourists close to the plant. To a lesser degree, the present day community adjacent to LLNL is another example of population migration to what was once a relatively isolated area 50 miles from San Francisco.

This growing public proximity will likely increase pressure over time for even more rigorous environment, safety and health standards than exist today. DOE must plan for the inevitability of more stringent ES&H requirements and try to avoid the introduction of yet another compliance crisis such as the Complex now faces.

1.3.5 Difficulty in Meeting Modern Threats, Standards, and Requirements for Safeguards and Security

Most DOE facilities were originally constructed with safeguards and security systems that cannot assure protection against current threats and do not incorporate modern systems and technology. To mitigate this problem, DOE undertook an expensive and difficult program to incorporate more effective protection systems. In some cases, vulnerabilities were addressed by temporary systems. In other cases, DOE incorporated permanent, effective, and efficient upgrades. The long-term focus will be on developing systems to protect against potential insider-threats and measures to cope with sophisticated terrorists seeking nuclear materials or weapons.

Chapter 2

The Complex Reconfiguration Study: An Overview

CHAPTER 2

THE COMPLEX RECONFIGURATION STUDY: AN OVERVIEW

This chapter presents an overview of the major aspects of the Nuclear Weapons Complex Reconfiguration Study (Reconfiguration Study). Included are descriptions of the assumptions, planning considerations, and options developed by the Complex Reconfiguration Committee (CRC) in conducting the study; the two major components of Complex reconfiguration; and the activities supporting each of those components. While these topics are treated in more detail in later chapters, this chapter provides a framework indicating their roles within the overall reconfiguration effort.

2.1 THE STUDY FRAMEWORK

To start the *Reconfiguration Study* effort, the Complex Reconfiguration Committee defined the scope of the Study and developed a set of assumptions to serve as the basis for reconfiguration analysis and planning. The CRC focused on six major areas: stockpile sizing criteria; environment, safety, and health; Complex configuration; the Programmatic Environmental Impact Statement; management structure; and capital asset management. Separate study teams formed for each major area produced analyses and recommendations based on the CRC's planning assumptions. The Study scope, the planning assumptions, and the mission of each team are discussed in Sections 2.1.1-2.1.3. The remainder of the chapter presents an overview of the organization of this study report.

2.1.1 Study Scope

The Reconfiguration Study considers all present and planned Nuclear Weapons Complex (Complex) functions, facilities, and activities. The study does not cover the following related areas for the reasons discussed:

- The New Production Reactor (NPR) program. The NPR requirement has already been recognized and is being developed under a separate program reporting directly to the Secretary. When completed, the NPR(s) will become part of Complex-21.

- Facilities for the enrichment of uranium. These facilities are under the cognizance of the Assistant Secretary for Nuclear Energy. Under anticipated future nuclear weapons stockpile requirements, no new enriched uranium will be needed by the weapons program.

- Environmental Restoration and Waste Management (ER/WM) activities at Complex sites. These activities are covered separately under the Office of Environmental Restoration and Waste Management, which reports directly to the Secretary. A Programmatic Environmental Impact Statement (PEIS), being developed under the auspices of the National Environmental Policy Act (NEPA), will describe the Department's ER/WM program. Specific ER/WM projects, including costs, are described in *The Environmental Restoration and Waste Management Five-Year Plan*, published annually.

Reconfiguration, as used in this study, means the creation of a smaller, less diverse, but more efficient Complex at the present sites, or at relocated or consolidated sites. This reconfigured Complex will meet requirements for production of nuclear weapons and for protection of workers, the public, and the environment through the middle of the next century.

For purposes of the Study, the Complex is divided into three elements: Nuclear Materials Production and Manufacturing (NMP&M); Nonnuclear Manufacturing (NNM); and Research, Development, and Testing (RD&T).

2.1.2 Assumptions

The CRC, comprised of senior representatives of the National Security Council, Department of Defense (DOD), and Department of Energy (DOE), found that the assumptions of the January 1989 *Nuclear Weapons Complex Modernization Report* needed revision to reflect evolving strategic requirements, trends, and environmental considerations. The revised planning assumptions follow:

- The Complex will meet all ES&H, safeguards and security (S&S), and waste management laws and regulations, and all DOE requirements. In achieving this:
  - Flexibility to respond to future laws, regulations, and requirements must be built into the Complex;
  - The technical competence of the national laboratories will be utilized;
  - The Complex will pursue minimization or, where possible, elimination of carcinogens in weapons and materials manufacture; and
  - The Complex will pursue the total recycle of effluents.
- Nuclear deterrence will remain a prime component of national security.

- The Complex will respond to DOD requirements authorized by the President.

- The Complex relies on high technology that must be continually emphasized. The Complex will provide for human as well as technical resources.

- The existing Complex is aging, fragile, and subject to shutdown.

- Reconfiguration will be sequenced and prioritized within fiscal constraints and a sound business strategy.

- The Complex must become more efficient in its overall operation.

- The Complex must recognize the impact of the social and political environment in which it operates.

- The Complex must ensure that acceptable treatment/disposal plans and processes exist for all wastes from weapons activities.

- The stockpile must be upgraded to meet changing threats and enhance the safety and operational characteristics of weapons. The workload will consider continued incorporation of weapon safety features.

- The Complex will be responsive to arms control treaties. Reconfiguration will plan for:

    - On-site inspection,

    - Build-down of the stockpile, and

    - Continuous support to our allies under existing defense agreements.

These assumptions became the foundation for the work of six study teams that assisted the CRC in developing the data and performing the analyses for this study.

2.1.3 The Study Teams

The study teams, designated Teams A through F, were composed of DOE and contractor personnel representing all functional areas of Complex operation and levels of management, beginning with the sites and extending through field offices to DOE headquarters. The Complex Reconfiguration Task Force, under the CRC, coordinated the efforts of the study teams. The *Complex Reconfiguration Study* is primarily based on the work of these teams.

In order to focus the reconfiguration review, the study teams were organized and chartered in six functional areas as summarized below.

2.1.3.1 Stockpile Sizing Criteria (Team A)

The CRC selected four stockpile cases for analyzing the impact of stockpile characteristics on Complex configuration. These cases were defined in terms of stockpile size, mix of strategic and tactical weapons, the annual build and retirement rates, the rate of new weapon starts, and the amount of tritium and special nuclear materials required. The cases were sufficiently different to bracket the range of stockpile scenarios that may reasonably be expected in the future.

Stockpile cases considered could result from arms control agreements or changing threats to our national security. However, it should be emphasized that the particular cases chosen for this study are not intended to predict the terms of specific arms control treaties or force structure configurations, but rather to provide a reasonable range of cases against which to analyze the effects of stockpile characteristics on Complex configuration.

2.1.3.2 Environment, Safety, and Health (Team B)

The Environment, Safety, and Health (ES&H) Team concentrated on development of a reasonable set of assumptions to anticipate new or modified environment, safety, and health laws, rules, or regulations that may significantly affect the cost, design, or location of the modernized Complex. The team used its best judgment to analyze relevant factors such as radiation exposure limits, contamination control limits, safety analysis requirements, acid rain legislation, use and control of carcinogens, fire protection, Occupational Safety and Health Administration (OSHA) standards, seismic criteria, criticality safety measures, waste category definition, and hazardous waste requirements.

2.1.3.3 Complex Configuration (Team C)

The Complex Configuration Team developed specific, long-term options for reconfiguration of the Complex, including major relocations and closeouts. The team based its efforts on the study assumptions and on the conclusions of the Stockpile Sizing Criteria and ES&H teams. The team examined technical issues, cost, and schedules of the major projects required to complete each option developed. The team also identified key areas where mission execution requires duplicate capabilities. Innovative concepts for fostering beneficial technology transfer and privatization of nonnuclear manufacturing were also pursued.

2.1.3.4 Programmatic Environmental Impact Statement (Team D)

The Programmatic Environmental Impact Statement (PEIS) Team developed a National Environmental Policy Act (NEPA) strategy for reconfiguration, including investigation of the scope and appropriate content of a Reconfiguration PEIS and subordinate site- and facility-specific Environmental Impact Statements (EISs). This effort was coordinated with other Departmental projects and activities that involve EIS preparations pertinent to modernization to avoid potential duplications and future conflicts.

2.1.3.5 Management Structure (Team E)

The Management Structure Team focused its main effort on developing a methodology to institutionalize modernization in DOE, including developing processes to improve management, efficiency, and operations of the reconfiguration effort. The major recommendations focused on the development of a strategic planning system and its integration with program (five-year) planning and budgeting processes.

2.1.3.6 Capital Asset Management (Team F)

This team developed a site-by-site life cycle plan for the management of Defense Programs (DP) facilities, infrastructure, and capital equipment. Life Cycle Plans (LCP) schedule key actions such as major inspections and adequacy reviews, major overhauls or upgrades, and replacement at end-of-life. The plans also incorporate provisions for adequate maintenance to ensure efficient operation. This Capital Asset Management Process (CAMP) is vital to keeping the current Complex operating through transition to the reconfigured Complex (called Complex-21) and for proper stewardship of the reconfigured Complex.

The contributions of each of the above teams are integrated in this report's discussion of Complex conditions, the vision of the future, and recommended actions to achieve that vision.

2.1.4 Organization of the Study Report

The Reconfiguration Study is organized toward achieving two major objectives: realizing Complex-21 and keeping the current Complex operational until Complex-21 is online.

The report starts with a description of the various options considered for Complex-21. This is summarized in Section 2.2 and detailed in Chapter 3 under the title "Complex-21: A Vision of the Future."

Next, the report discusses the activities needed to support all aspects of developing Complex-21. This is summarized in Section 2.3 and detailed in Chapter 4 under the title "Setting a Course Toward the Future Vision: Activities Supporting Development of Complex-21."

The report then shifts to discussing how to keep the Complex operational during the transition to Complex-21. This includes both suggestions for improved management of the Complex and an outline of the activities needed to meet the defense mission and to reach and maintain compliance with applicable federal, state, and local laws, regulations, and orders. This is summarized in Section 2.4, entitled "Activities Supporting Ongoing Complex Operation." It is detailed in Chapter 5, "Improved Management of the Complex," and Chapter 6, "Transition Activities: Maintaining and Sustaining Required Facilities Until Complex-21 Is Operational."

Finally, the study presents estimated costs associated with reconfiguration. These costs are summarized in Section 2.6 and detailed in Section 3.7.

2.2 COMPLEX-21: A VISION OF THE FUTURE

In view of the realities of the emerging international security environment, it is clear that requirements for the number and types of nuclear weapons will decrease from current stockpile levels. It is also clear that further, unpredictable changes are likely. The reconfigured Nuclear Weapons Complex that will be required to provide the flexibility to respond to these events and subsequent changes is designated Complex-21.

Complex-21 will be smaller, less diverse, and less expensive to operate than the Complex of today. The goal is to safely and reliably support whatever nuclear deterrent stockpile objectives are set by the President and funded by Congress with fewer and smaller individual production sites. Consideration will be given to locating several nuclear material production activities at a single site. Production of nonnuclear materials will be transferred to the private sector to the maximum extent consistent with minimizing the costs associated with weapons production and maintaining the weapons stockpile. The thrusts to downsize, consolidate, and privatize, however, must be balanced with a level of prudent redundancy in selected key capabilities which, if lost, would cause significant and rapid degradation of overall Complex effectiveness.

Complex-21 will employ modular construction for flexibility in making capacity adjustments. The number and size of waste streams will be kept to a minimum. It will be constructed to comply with all applicable federal, state, and local laws, regulations, and orders.

The majority of the work in making the transition to Complex-21 will begin after a Record of Decision, developed within the NEPA process, is issued early in FY 1994. Following this decision on the future of the Complex, elements of Complex-21 will be brought online as rapidly as technical, legal, regulatory, and resource issues permit. Complex-21 should be fully operational early in the 21st Century and will sustain the nation's nuclear deterrent until the middle of that century. To begin the steps of defining, designing, and deciding on the configuration of Complex-21, this report identifies planning considerations, configuration options, and activities necessary to support the development of the Complex through the FY 1994 decision.

2.2.1 Planning Considerations

It is important to identify relevant planning considerations during the early stages of the process in order to define the size and nature of facilities to be constructed and assess the effect of these facilities on the environment. The *Complex Reconfiguration Study* (CRS) presents three major categories of planning considerations: Complex sizing (workload), ES&H laws or regulations, and emerging technologies that could have a significant impact upon design requirements and costs. These categories are discussed in Chapter 3 of this report.

2.2.2 Reconfiguration Options

The CRS focuses on two alternatives for the Nuclear Weapons Complex, the "No Action" alternative and the "Reconfiguration" alternative. Under the No Action alternative, only those projects required for compliance with federal, state, and local laws, regulations, and orders and those projects needed to accomplish the Department's defense mission will be pursued. Repairing or replacing facilities would be considered through the Capital Assets Management Process (CAMP) (see Sections 4.3.4 and 5.2). Additional projects to address facility deterioration or technical obsolescence would continue to be considered over time on a case-by-case basis. A privatization initiative is discussed briefly in Section 2.3.4 and in greater detail in Sections 3.6.6 and 3.6.7. This initiative to increase the outsourcing of nonnuclear components will continue under both the No Action alternative and the Reconfiguration alternative. The outsourcing decision, however, will be consistent with NEPA requirements.

The Reconfiguration alternative includes two options for Complex-21. While variations of these or perhaps entirely new options might be developed during the completion of required studies of environmental and other impacts, the two options are representative of the reasonable range of options that should be considered.

For the Nuclear Materials Production and Manufacturing (NMP&M) element of the Complex, these two options are:

- Configuration A: Downsizing and Modernizing in Place. Upgrade, replace, and/or consolidate current facilities at their current sites, using existing support facilities and infrastructure as much as possible. As an exception to the existing site theme, the functions of the Rocky Flats Plant (RFP) would be relocated: NMP&M functions would be relocated to another site and nonnuclear functions would be transferred or privatized. The current facilities at RFP would then be transferred to the Office of Environmental Restoration and Waste Management for appropriate action. Other parts of the NMP&M element would be downsized with minor consolidations and closeouts as missions change.

- Configuration B: Maximum Consolidation. Relocate RFP and at least one other NMP&M facility to a common location. The Pantex Plant and the Oak Ridge Y-12 Plant are candidates for collocation with the Rocky Flats functions, either singly or together. Functions of relocated plants would be handled as described for RFP in Configuration A. The probable outcome of this option would be an integrated site which could consolidate much of the NMP&M element at a single site. Other activities would be consolidated and closed out as dictated by changing missions and requirements.

For the nonnuclear manufacturing (NNM) element of the Complex, Configuration Option A would upgrade and/or replace existing facilities at their present sites. Privatization would be vigorously pursued to reduce costs and the number of nonnuclear components made in government-owned plants. Under Option B, maximum privatization and consolidation would result in the greatest possible reduction in the number of dedicated nonnuclear sites, leaving no more than one dedicated nonnuclear manufacturing site for those products and subassembly activities that could not be placed in the private sector. This remaining plant would be downsized and modernized. For the NNM element, Option B is the Secretary's preferred option.

While additional study is needed to determine the extent to which outsourcing from the NNM element is possible, two management concepts could be used: Manufacturing Development Centers (MDC) and Manufacturing Development Engineering (MDE). The former retains some of the current functions of the government-owned, contractor-operated (GOCO) plants while the latter concept would essentially eliminate the role of the GOCO plants in design and manufacturing engineering for the outsourced components. The MDE concept implies a greater laboratory role in the oversight of production.

The preferred method for Reconfiguration of the NNM element would involve six phases. Some phases can be pursued in parallel.

- Phase 1 continues analysis of the nonnuclear manufacturing activities to identify those that are suited for privatization and to identify the appropriate management concept, MDC or MDE, for the privatized activities.

- Phase 2 is the selection of a single GOCO site for consolidation of unprivatized nonnuclear production.

- Phase 3 involves development of implementation plans for transferring the privatized activities and the consolidation of remaining operations at a single site.

- Phase 4 implements the privatization actions planned in Phase 3.

- Phase 5 consolidates MDC activities at the selected single nonnuclear GOCO site.

- Phase 6 is continuing operation with the new management concepts, including no more than one GOCO nonnuclear site.

For the RD&T element of the Complex, Options A and B are the same. The size and capabilities of the RD&T element must reflect a weapons program that is changing in light of ongoing arms control efforts and potential changes in United States military strategy. A Weapons RD&T Consolidation Panel has been formed to consider options for reducing RD&T expenditure while retaining essential functions required to support the Nation's deterrent strategy. In particular, this panel will examine existing duplication of facilities and resources within the laboratory system and propose creating Centers of Excellence to operate shared resources for all users. This effort may reduce RD&T operating costs and should eliminate the need for future construction of duplicative facilities.

All Complex configuration options and related initiatives will also be subject to a weapons design standardization effort that will seek to minimize capital investment and operating costs by minimizing the number of different technologies, parts, and processes used in manufacturing the future family of stockpile weapons.

To properly address all these variables, the activities supporting development of Complex-21 during the next few years will be heavily oriented toward design and analysis of alternative courses of action.

The Complex-21 configuration options and related activities are detailed in Chapter 3.

2.3 SETTING A COURSE TOWARD THE FUTURE VISION: ACTIVITIES SUPPORTING DEVELOPMENT OF COMPLEX-21

This report is only the beginning of an initiative to restructure the Complex to meet future defense needs. More than two decades will be required before Complex-21 becomes fully operational. Dedicated management is needed to provide leadership and oversight of the varied and complicated activities necessary to guide the development of Complex-21 to ensure that the reconfigured Complex fills the Nation's needs, at the lowest possible overall cost. Advanced technologies must be made available and should be developed, demonstrated, and integrated into new plant and process designs. The CRC concludes that a Reconfiguration Project Office (RPO) is needed to provide continuity and orchestration of all activities leading to full operation of Complex-21. Several panels should also be employed to assist the RPO. The RPO and associated panels are described in subsequent sections.

2.3.1 Reconfiguration Project Office

The RPO is envisioned as the central line management organization in headquarters responsible for planning, coordinating, and executing all activities necessary to realize Complex-21. The RPO Director reports to the Assistant Secretary for Defense Programs (ASDP). The RPO will oversee coordination and implementation of activities related to the designs, decisions, authorizations, and funding of Complex-21. Affected line managers will be kept informed and involved, but must be allowed to concentrate their efforts on implementing the transition activities needed to keep the Complex operational until Complex-21 comes online. Cognizant line management will assume responsibility for Complex-21 facilities once they are online.

The major initial activities for which the RPO will be responsible include developing the Programmatic Environmental Impact Statement (PEIS) to comply with NEPA; developing detailed reconfiguration options and appropriate design criteria for use in preliminary conceptual design reports; and contracting with an Architecture and Engineering (A&E) firm to develop more detailed preliminary designs and costs for these options. The RPO will also provide guidance and oversight for the activities of the panels discussed in the paragraphs below and will support the strategic planning process by providing input to the ASDP for activities related to Complex-21.

2.3.2 Programmatic Environmental Impact Statement

A DOE study team developed a long-term NEPA strategy for reconfiguration of the Nuclear Weapons Complex. The strategy has two phases: first, to prepare a PEIS to analyze alternatives for the configuration of Complex-21; and second, to ensure continued NEPA compliance by using the PEIS as a basis for later project-specific and site-wide reviews. Preparation of the PEIS will begin immediately, and is expected to take about 3 years. The Secretary will then issue a Record of Decision (ROD) to document his selection of the final configuration of Complex-21. The ROD is expected in early FY 1994. The ROD will describe the environmental considerations (including a discussion of alternatives addressed) and other factors – costs, engineering constraints, and national security requirements – that bear on the decision and explain the rationale for the course of action selected. The PEIS will also serve as the basis for other RODs concerning transition activities, if necessary.

2.3.3 Site Evaluation Panel

The Site Evaluation Panel (SEP), composed of DOE employees from across the Complex, is developing evaluation criteria and identifying suitable candidate sites for the relocation of Complex facilities. These sites will be referred to the RPO for investigation and analysis in the PEIS.

2.3.4 Privatization Planning Panel

The Privatization Planning Panel (PPP) is pursuing an initiative to control costs of modernizing and operating the Complex by developing a plan to outsource or privatize the production of a greater proportion of nonnuclear components. The PPP is developing options, including plans for closing as many nonnuclear manufacturing sites as possible, with the goal of having no more than one dedicated nonnuclear manufacturing site in Complex-21.

2.3.5 Weapons Design Standardization Panel

Over the years, the Complex has tended to develop "custom" parts for many nuclear weapon components. While this practice maximized military effectiveness and minimized the sensitivity to common failures, it also resulted in higher development costs, production inefficiencies, and higher costs for support and surveillance. As a result, some production facilities have low utilization rates and some expensive capabilities are infrequently or irregularly used. The Weapons Design Standardization Panel (WDSP) has been formed to determine what degree and types of cost-reducing standardization in weapons design, specification, and technologies are feasible and what trade-offs in weapons performance or characteristics will result.

2.3.6 Technology Assessment and Selection Panel

The selection of technology to be incorporated in Complex-21 will be one of the most important factors affecting the performance of the new Complex. Therefore, this selection must be accomplished with the assistance of the most skilled and forward-looking scientific, engineering, and management talent available to Defense Programs. The selection process will incorporate several interim stages in order to provide key inputs to the ongoing planning and design of Complex-21. The Technology Assessment and Selection Panel (TASP) has been formed to ensure that the technologies and processes used in Complex-21 represent the best balance achievable among cost, performance, risk, and schedule. This is expected to enhance the performance of Complex-21 by:

- Choosing technologies that are sufficiently mature and that meet operational reliability, maintainability, and availability requirements;
- Selecting promising emerging technologies and developing them to the level of maturity that warrants application in Complex-21;
- Minimizing Complex modernization costs through specifying technologies that maximize the flexibility of Complex-21 and reduce its physical size and infrastructure requirements; and
- Selecting technologies that minimize the number and volume of waste streams, minimize use while maximizing containment of hazardous materials, and minimize exposure of workers to radiation and hazardous environments.

2.3.7 Weapons Research, Development, and Testing Consolidation Panel

The weapons research, development, and testing (RD&T) element of the Complex constitutes an important part of Defense Programs (DP) capital assets and consumes a significant portion of the total DP budget. Accordingly, the CRC concluded that a panel should be established to improve DP's economy and efficiency in this mission area. The Weapons RD&T Consolidation Panel (RCP) will examine the missions, facilities, and operations of the RD&T element and recommend changes which will help DOE satisfy essential requirements while reducing the costs to operate and modernize the RD&T element. This examination will include delineating the RD&T activities and capabilities essential to support the Nation's nuclear deterrent; identifying those RD&T activities for which peer review and competition between the laboratories are needed to assure the safety and performance of the nuclear weapons stockpile; and specifying those instances in which peer review and competition require duplicate facilities and capabilities rather than common resources shared by several laboratories.

The Weapons RD&T Consolidation Panel will also examine options to reduce the future costs of laboratory facilities needed to support the weapons RD&T mission. The panel will recommend the consolidation of weapons RD&T activities into specific laboratories and facilities whenever this can be accomplished without jeopardizing national security.

A full discussion of the RPO, the PEIS process, the A&E contract, and the five reconfiguration panels is included in Chapter 4.

2.4 ACTIVITIES SUPPORTING ONGOING COMPLEX OPERATION

In addition to efforts dedicated to developing Complex-21, other activities are required to maintain current facilities in a safe, reliable operating condition until Complex-21 is operational. Because of the generally poor condition and obsolescence of the current Complex, investments will be needed to sustain these facilities until Complex-21 is fully operational. There are two components to this effort: transition activities and improving the management of the Complex.

2.4.1 Transition Activities

Transition Activities include all projects necessary to maintain and upgrade existing facilities to ensure the department's defense related mission can be accomplished during the transition to Complex-21. Resources expended in this effort will be minimized. Eight major areas are addressed:

- Improving safety and health performance, including full compliance with all laws and regulations;
- Restoring disrupted operations and assuring their future continuity;
- Addressing environmental corrective actions, restoration, and waste management problems;
- Accommodating increased weapons retirements as the stockpile is downsized;
- Improving safeguards and security for facilities and nuclear material;
- Planning and budgeting for sustained Complex capabilities;
- Upgrading infrastructure which must last until Complex-21 is operational or which might transition into Complex-21; and
- Raising the importance and visibility of maintenance.

Several near-term major projects are needed to sustain Complex operations. These include the restoration of tritium production, implementation of a transition tritium strategy to satisfy weapons stockpile needs, and implementation of a strategy for plutonium processing and plutonium research and development during transition. The plutonium strategy provides options to support Complex-21 technical development and to allow curtailment of plutonium operations at RFP. These projects are not considered to be part of Complex-21, because they resolve well-documented, immediate needs that must be addressed regardless of decisions related to Complex-21.

2.4.2 Improved Management of the Complex

A major shortcoming noted by the CRC is the current lack of an integrated planning, budgeting and management process to help line managers relate current and projected conditions of capital assets to future mission requirements and funding streams. This, coupled with shortcomings in DOE maintenance practices, resulted in a situation in which line managers were reacting to problems in mission performance and regulatory compliance rather than planning for the orderly and cost-effective upgrade or replacement of facilities over the longer term. To remedy this, the CRC proposes the revision and integration of planning and budgeting processes, establishment of a Capital Assets Management Process (CAMP), and organizational changes to improve system-wide coordination.

2.4.2.1 Planning and Budgeting Processes

The most significant recommendation to improve planning is to institute a strategic planning process, instilling a long-range view of DP missions, future usefulness of specific kinds of facilities, and the cost-effectiveness of alternative applications of limited resources. The resulting Strategic Plan and its implementing guidance would be the foundation for an annually updated Five-Year Program Plan defining, justifying, and prioritizing specific projects and funding requirements across the Complex to support the development of the DP budget. An important tool to support this integrated planning and budgeting process is the Capital Asset Management Process (CAMP).

2.4.2.2 Capital Asset Management Process

CAMP is an initiative to help ensure that the Complex's capital assets are maintained in a safer, more reliable, and more available state. CAMP has been implemented as a management tool within DP and is applicable regardless of future Complex configuration decisions. In the course of this study, an interim version of CAMP was developed and used to help generate the first *Reconfiguration Five-Year Plan.*

The interim CAMP consisted of a 20-year Life Cycle Plan for each "functional unit,"[2] a Maintenance Plan for each site, and an electronic data base for storing

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[2] A separable, identifiable grouping, at a single site, of logically-related assets that are essential for accomplishing a site mission or a requirement of the Complex. See Chapter 5 for more details.

and processing planning and budgeting information about each functional unit of the Complex. The full scale CAMP will include a periodic Condition Assessment Survey (CAS) of all capital assets to evaluate their condition in accordance with a comprehensive and consistent set of inspection and evaluation standards. Full implementation of CAMP (with CAS) will require about three years.

CAS, in conjunction with a revised and standardized Maintenance Order, will ensure that capital assets are maintained to common standards throughout the Complex and establish a uniform method for determining serviceability and need for replacement. Using the information that will be generated by CAS and stored in an electronic data base, the ultimate CAMP will support detailed analyses of capital asset related funding requirements including maintenance, project development, line item construction, and other capital costs. These analyses, initiated by CAMP data calls, will be prepared annually by the site contractors, and, once approved by line management, will be the basis of the annual *Reconfiguration Five-Year Plan* and the DP Internal Review Budget submission.

2.4.2.3 Organizing for System-Wide Coordination

Implementation of the recommended changes to the planning and budgeting processes and institutionalization of CAMP will require organizational changes. New organizational elements to be created at DP Headquarters include a senior level Defense Programs Management Board (DPMB), headed by the Assistant Secretary for Defense Programs (ASDP), to oversee and implement the Strategic Plan and the Program (Five-Year) Plan, a Defense Programs Field Council to advise the DPMB, a Strategic Integration Group to provide full-time staff support to the DPMB, and Strategic Planning Groups (within the offices of DP Deputy Assistant Secretaries) to integrate strategic and program planning actions into program management functions. This organization is shown in Figure 2.1.

Initiatives for improved management of the Complex are detailed in Chapter 5. Transition activities supporting ongoing Complex operation are detailed in Chapter 6.

2.5 Funding Categories

This study covers a wide range of activities which, if implemented, will require funding from several sources. For clarity, these funding requirements can be divided into four categories. The following paragraphs describe these categories, together with the expected method of identifying specific annual budget needs:

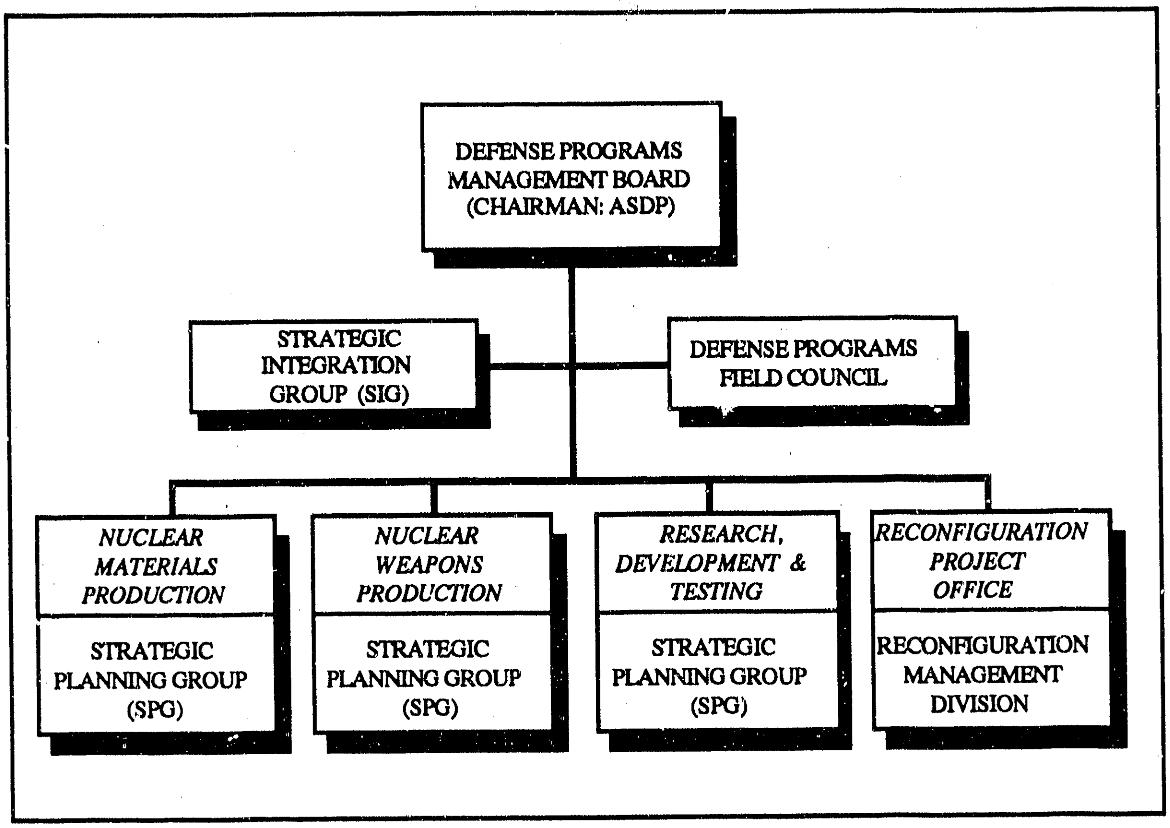


Figure 2.1.–Organization of the Defense Programs Management Board.

- Funds for capital and non-capital activities required to reconfigure the Complex. These activities are summarized in Section 2.2 and discussed in detail in Chapter 3 of this study report. As specific decisions are made concerning reconfiguration, the resources required will be incorporated into the *Reconfiguration Five-Year Plan* and attendant budget submissions.

- Operational funds and personnel required to improve management of the Complex and to provide oversight and technical advice concerning reconfiguration. These activities are summarized in Sections 2.3 and 2.4 and described in detail in Chapters 4 and 5 of this study. Specific resource requests will be made through normal budget submissions.

- Capital activities funds required during the transition period to maintain the existing Complex. These activities are summarized in Section 2.4 and discussed in more detail in Chapter 6. It should be noted that for the "Downsizing and Modernization in Place" reconfiguration option, these funds also help to provide and preserve much of the infrastructure and support structure required for Complex-21. Detailed discussions and funding profiles are included in the *Reconfiguration Five-Year Plan*, which serves as the basis for specific budget submissions.

- All other capital activity and maintenance funds required by the Complex as part of the Complex's improved management practices. The methodology to include these funds is summarized in Section 2.4 and discussed in detail in Chapter 5. Specific resources required are part of the *Reconfiguration Five-Year Plan* and attendant budget submissions.

2.6 RECONFIGURATION COST ESTIMATES

2.6.1 Cost Estimates for NMP&M

The estimated costs to reconfigure the Complex are shown in Tables 2.1 through 2.3 and Figure 2.2 that follow.

Tables 2.1 and 2.2 consist of capital costs for reconfiguration Options A and B, respectively. For Option A (Reconfiguration in place), a significant amount of the existing infrastructure can be used and costs are, therefore, significantly lower than for Option B (Maximum Consolidation). Costs are displayed by stockpile cases, with Case IV being the lowest case. Costs assume a modular construction approach which sizes buildings and equipment to meet each stockpile case. Cost estimates have an accuracy of plus or minus 50 percent.

Table 2.3 displays the non-capital costs considered. These also have an accuracy of plus or minus 50 percent. The combination of capital and non-capital costs is Total Project Cost (TPC). Figure 2.2 graphically displays TPC. A detailed presentation of TPC is in Section 3.7. Because of the large uncertainties involved in Decontaminating and Decommissioning (D&D) and environmental remediation, these costs are not included here, but are discussed, along with rough estimates of their magnitude, in Section 3.8.

2.6.2 Cost Estimates for NNM and RD&T

There are no major, costly reconfiguration items in the NNM and RD&T elements. For NNM, reconfiguration means downsizing, consolidating, and privatizing. The expenses incurred are not expected to be significantly greater than those required to run the NNM element today. Some modest transition costs may result from the analysis conducted by the Privatization Planning Panel. For RD&T, reconfiguration means consolidation of facilities into common user Centers of Excellence. This is expected to reduce, not increase, costs and, therefore, should not exceed the funds needed to run the RD&T element today.

OPTION A (Approach 1)	Stockpile Cases I	II	III	IV
RFP	2.9	2.6	2.4	2.2
Y-12	2.9	2.5	1.8	1.6
Pantex	0.5	0.5	0.4	0.4
Total	6.3	5.6	4.6	4.2

Table 2.1.–Capital Costs (FY 1992 $B) by Site for Reconfiguration Option A.

OPTION B (Approach 1)	Stockpile Cases I	II	III	IV
RFP	2.9	2.6	2.4	2.2
Y-12	5.3	4.8	4.0	3.6
Pantex	2.9	2.7	2.4	2.2
Total	11.1	10.1	8.8	8.0

Table 2.2.–Capital Costs (FY 1992 $B) by Site For Reconfiguration Option B.

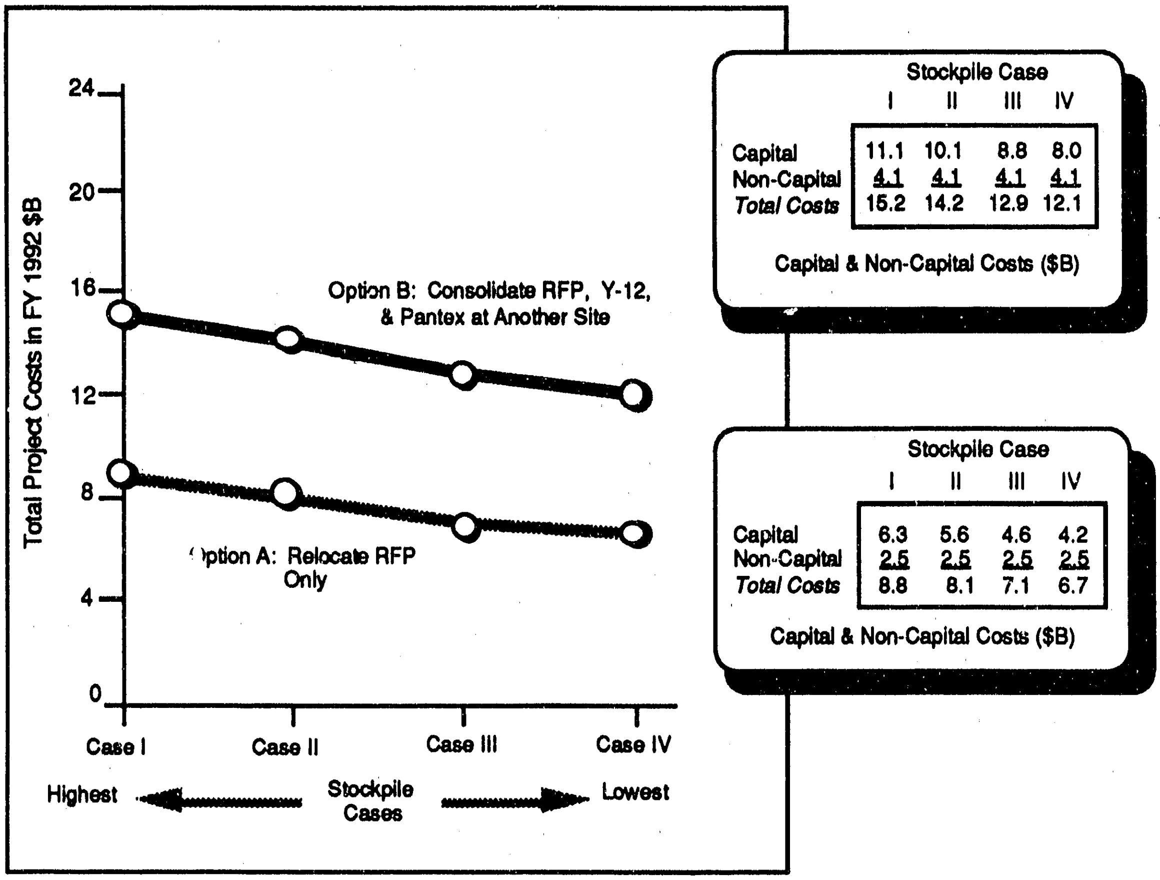
Costs in FY 1992 $B

OPTION A (Relocate RFP Only)	Project Planning & Support	Startup/ Switchover	Total Non-Capital Costs
Pantex	N/A	N/A	N/A
RFP	0.4	1.0	1.4
Y-12	0.3	0.8	1.1
Total	0.7	1.8	2.5

Costs in FY 1992 $B

OPTION B (Relocate All 3 Sites)	Project Planning & Support	Startup/ Switchover	Total Non-Capital Costs
Pantex	0.1	0.5	0.6
RFP	0.4	1.0	1.4
Y-12	0.6	1.5	2.1
Total	1.1	3.0	4.1

Table 2.3.–Non-Capital Reconfiguration Costs by Site.



	Stockpile Case I	II	III	IV
Capital	11.1	10.1	8.8	8.0
Non-Capital	4.1	4.1	4.1	4.1
Total Costs	15.2	14.2	12.9	12.1

Capital & Non-Capital Costs ($B)

	Stockpile Case I	II	III	IV
Capital	6.3	5.6	4.6	4.2
Non-Capital	2.5	2.5	2.5	2.5
Total Costs	8.8	8.1	7.1	6.7

Capital & Non-Capital Costs ($B)

Figure 2.2.–Total Project Costs for Reconfiguration of RFP, Y-12, and Pantex.

Chapter 3

Complex-21: A Vision of the Future

CHAPTER 3

COMPLEX-21: A VISION OF THE FUTURE

This chapter discusses the analyses and recommendations resulting from the work of the Complex Sizing, ES&H, and Complex Configuration Teams (Teams A, B, and C). Complex sizing considerations, especially stockpile size and composition, drive mission workload and are presented first. ES&H planning considerations affect the designs, locations, and costs of future facilities and are discussed in the context of trends toward future standards that should be considered in designs of Complex-21 facilities. Following ES&H considerations is a list of emerging technologies that could significantly improve efficiencies and lower costs of Complex-21 facilities. With these planning considerations in mind, the reader is introduced to the philosophy of operation for Complex-21 and the configuration options to be analyzed. The chapter concludes with a presentation of some preliminary cost estimates for the reconfiguration options and a discussion of the process for selecting the best configuration alternative.

3.1 FACTORS INFLUENCING THE COMPLEX CONFIGURATION

This Section outlines the major considerations that were used in developing the Complex-21 configuration options. These considerations include (1) Complex sizing elements (workload requirements); (2) environment, safety, and health planning considerations; (3) a revised philosophy of operations; and (4) impacts of emerging technologies.

All options regarding reconfiguration of the Nuclear Weapons Complex are to be considered as preliminary, pending completion of adequate review under the National Environment Policy Act (NEPA) of 1969. The options discussed in this report may be revised in determining the alternatives to be considered in DOE's NEPA review. Further, options discussed in the NEPA review of reconfiguration alternatives will not necessarily be limited to those included in this report. However, all options ultimately considered will have been addressed first in the PEIS.

3.2 ELEMENTS FOR SIZING NUCLEAR WEAPONS PRODUCTION CAPACITY

One of the fundamental issues affecting the design of Complex-21 is a future workload that will be markedly reduced from current levels. Any analysis of future stockpile requirements and annual weapons production, modification, testing, and retirement rates must consider the significant volatility and uncertainty of world events. To limit the elements of national risk and the time required to respond to unforeseen developments, the Complex must be designed with a certain degree of flexibility in production capacity. Several nuclear weapons stockpile requirement scenarios were developed as a basis for determining materials production and manufacturing capacity. These scenarios are intended to bound the reasonable range of possibilities for planning purposes. Elements used to develop Complex capability and capacity requirements include:

- Total number of warheads in the stockpile;
- Number of different weapons types/systems;
- Annual production and retirement rates;
- Annual start rates for new systems and stockpile improvement programs;
- Total nuclear materials inventory requirements and related production/processing rates; and
- The material reserves needed to ensure continuity of operations and the need for duplicative facilities or contingent capabilities.

The ultimate stockpile size that must be supported by the Complex is a function of many external variables such as changes in future threat conditions, budget constraints, and arms control agreements. However, each of the stockpile cases considered in this study involves considerably smaller requirements than those projected in the January 1989 *Modernization Report.*

One of the major challenges in developing and evaluating reconfiguration options is the sizing of facilities to meet production requirements 10 to 20 years into the future. A modular approach to sizing facilities may simplify the sizing problem and mitigate the risks associated with political, military, economic, and technological uncertainties. This concept involves designing production modules for relatively small capacities and building only as many modules as needed to accommodate production requirements.

Ideally, an extra module would be built as a "standby" module that would allow facility upgrading without impacting production or that could be used as a research and development facility for technological advancement. Experience has shown that in the current NMP&M configuration, it is very difficult to systematically and efficiently introduce new technology because of the limited time that existing one-of-a-kind facilities can be taken out of their production role for either research and development or upgrading.

In some cases, the modular concept would also allow the replacement of one relatively small unit (module) at a time without having to replace the Complex's entire production capability at once, as is the case today. Consequently, this study used the modular concept to estimate the variation in costs corresponding to the stockpile cases considered.

3.2.1 Stockpile Cases

Four cases were defined to represent reasonable bounds to the parameters described above and to permit sensitivity analysis of the various levels and rates of production on Complex configuration. In developing these cases, consideration was given to the impacts of arms control, emerging technologies, safety enhancements, potential evolution of the Soviet threat, and use of a combination of defensive and offensive forces as the nation's nuclear deterrent. In all cases, nuclear weapons were assumed to remain a central part of the United States national security policy.

In each case examined, the nuclear weapons stockpile was reduced below the level of the FY 1990 stockpile. As shown in Figure 3.1, Stockpile Cases I through IV were respectively assumed to be approximately 70 percent, 50 percent, 30 percent and 15 percent of the current level. It is important to stress that these scenarios are not necessarily a prediction for the future, but a mechanism to examine the sensitivity of Complex configuration to external factors.

In addition to weapons-grade plutonium, tritium, and highly enriched uranium, the Complex must have available other specialized isotopes for radiochemical tracing of nuclear tests, for dynamic testing, and for radioisotope thermoelectric generators. These include certain isotopes of plutonium, uranium, neptunium, americium and curium.

3.2.2 Nuclear Materials Production Sizing Elements

The study determined that, for all stockpile cases considered, sufficient special nuclear materials[3] (SNM) exist to meet new weapons needs if nuclear materials can be expeditiously recycled. However, all cases eventually require production of tritium, which has a half-life of only 12.3 years.

In addition to SNM, the Complex must have available specialized isotopes for radiochemical tracing of nuclear tests and for dynamic testing. These requirements may affect nuclear materials production and processing capacity requirements.

DOE is planning to provide tritium by recycling tritium in retired nuclear weapons and resuming operation of the reactors at SRS at least until proposed New Production Reactor (NPR) capacity is available. When this capacity has

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[3] Plutonium or uranium enriched in isotopes 233 or 235.

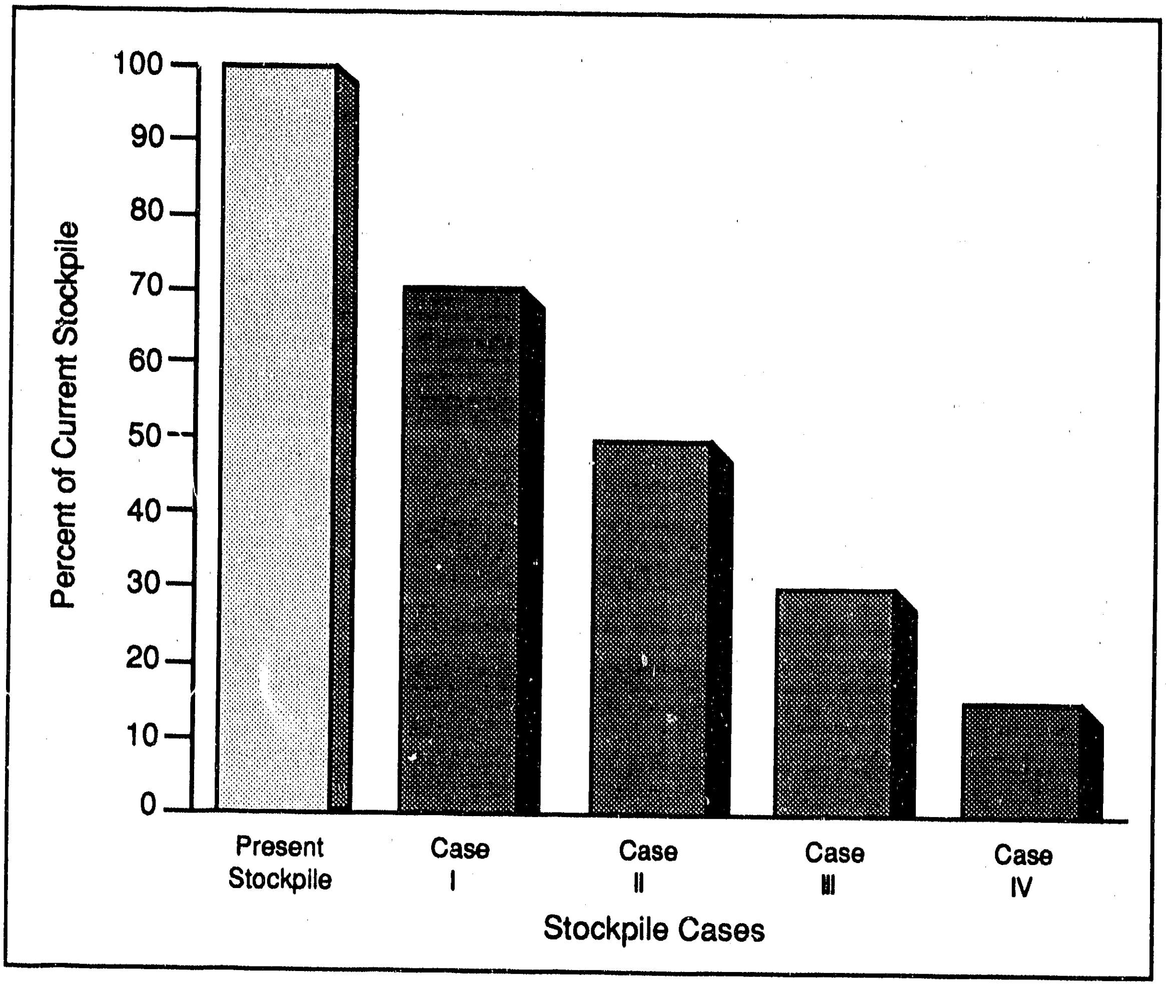

Figure 3.1.–Comparison of Stockpile Cases.

been completed, it will be included in Complex-21. However, the planning for construction of this capacity is being conducted by the Office of New Production Reactors. Accordingly, it has been treated separately from the present study. The Department will also maintain a tritium reserve to protect against future loss of tritium production capability.

Since all scenarios envisioned future weapons stockpiles smaller than that of the present, net weapons retirements will be a significant source of tritium for the remaining weapons and the reserve. Not only do these scenarios provide a near-term net return of tritium, but the smaller stockpiles require less long-term tritium reserve and production capacity. Accordingly, the total NPR capacity requirement, and the timing of construction, may require reassessment as decisions are reached concerning viable stockpile cases.

The CRC concludes that the ASDP should request the Nuclear Weapons Council to select, by the end of FY 1991, the specific sizing case(s) upon which the Complex configuration should be based. If it is not possible to select a specific case, a minimum number of cases should be identified to carry forward in the planning process. The case(s) selected need not necessarily be the same as the cases developed by Team A.

3.2.3 Research, Development, and Testing Sizing Elements

As long as nuclear weapons remain a central part of the United States national security policy, a vigorous RD&T program will be needed to maintain confidence in the nuclear weapons program and the deterrent stockpile. The RD&T element provides the technological underpinning of the entire nuclear deterrent. This includes basic and applied science and engineering. Since the sizing scenarios all indicate a smaller stockpile, the relationship between RD&T and the stockpile must be carefully examined. A Weapons Research, Development, and Testing Consolidation Panel, as described in section 4.2.6, has been proposed to examine this relationship. Unless supplanted by major new initiatives, a reduction in weapons related research would not only directly affect the weapons program but also negatively impact on basic research programs which, through technology transfer, could help restore American competitiveness in international markets.

One possibility that could have major effects on the RD&T element sizing is further nuclear testing restrictions. An imposition of severe restrictions on nuclear testing would significantly change the character of the RD&T element. Restrictions of this kind would require extensive computational and nonnuclear testing facilities, vigorous programs in related nuclear weapon theoretical, experimental, and engineering sciences, and programs of inter-laboratory peer review in order to slow the eventual decline of weapons expertise. Further testing restrictions and related program changes have not been included as part of this reconfiguration study. This topic is covered in the *Program Status of Preparation for Further Limitations on Nuclear Testing,* a Report to Congress being prepared as required by Section 1436, National Defense Authorization Act of FY 1989.

3.3 ENVIRONMENT, SAFETY, AND HEALTH PLANNING CONSIDERATIONS

The planning of Complex-21 must incorporate many ES&H considerations to ensure that it will meet all applicable laws, regulations, and DOE orders both during and after construction. Complex-21 will take a number of years to complete. Therefore, planning must address future ES&H considerations, as best as they can be predicted, as well as current considerations. Current considerations are grouped into eight functional areas:

- General Planning,
- Facility Safety,

- Radiological Protection,
- Emergency Preparedness,
- Environment Protection,
- Waste Management,
- Occupational Safety and Health, and
- Packaging and Transportation.

A review of these functional areas to highlight potential future concerns resulted in a separate list of possible ES&H requirements and estimates of their impacts as planning considerations. More restrictive environmental protection, waste management, and radiological protection laws will probably have the greatest impact on future compliance requirements. Based on these predicted requirements, three broad categories have been identified for future consideration:

- General Planning,
- Facility Siting/Design, and
- Waste Management.

These current and future considerations do not represent a comprehensive list, but rather are presented as examples of issues with the potential for major impact on design, cost, and/or schedule which must be addressed.

3.3.1 Scope and Applicability

Consistent with the CRC Charter, the planning considerations described in this study apply only to the reconfiguration of the DP Complex through construction of new facilities or future modifications to existing facilities. This report does not set new Department policy, standards, criteria, or requirements, nor does it address compliance of existing facilities with current requirements. In fact, much has been accomplished in the past two years toward bringing existing facilities into compliance with current requirements.

The purpose of this study is not to provide a comprehensive list of requirements, as would be found in design basis documents, but rather, to set forth important considerations for the planning and development of Complex-21. As outlined above, these considerations have been placed into two major categories: current requirements that deserve highlighting because of their potential impacts on the Complex, and new requirements that, in the judgment of the CRC, are likely to exist in the future.

These considerations are based on the best judgment of the CRC as of the date of this report and should be applied to future site selection, design, construction, operation, and decommissioning of DP facilities. The future considerations have been identified to ensure that Complex-21 will be constructed to meet the more stringent ES&H standards of the future rather than today's standards, which will likely be outdated by the time construction is complete. These considerations should be updated and modified continuously to provide planners with the latest, best judgment and the flexibility necessary to deal with changing ES&H standards as the Complex evolves.

3.3.2 Summary of Considerations

The planning considerations applicable to new or modified facilities are outlined below.

3.3.2.1 Future ES&H Planning Considerations

- *General Planning Assumptions.* Environmental issues such as global climate change, ozone depletion, and acid rain will require the establishment of stricter requirements. In addition, the use of carcinogens will be severely limited.

- *Facility Siting/Design.* Protection of groundwater will become a key siting/design issue. No disposal facilities for hazardous or radioactive waste will be allowed above a Class 1 aquifer. All other facilities above a Class 1 aquifer will have to be designed for zero discharge of hazardous or radioactive effluents to ground water. All facilities above Class 2 aquifers will have to be designed or retrofitted to limit contamination to levels below Maximum Contaminant Levels (MCLs). Additional siting restrictions will result from RCRA siting standards, and seismic, floodplain, wetland and sensitive ecosystem considerations.

- *Waste Management.* Interstate disposal of radioactive waste and radioactive mixed waste could be restricted, thereby requiring DOE's large waste generators to construct treatment, storage, and disposal facilities on-site. Hazardous waste generators will probably be required to maximize source reduction and pursue total recycling capability.

Table 3.1 describes impacts of the future planning assumptions.

3.3.2.2 Planning Considerations Based on Current ES&H Requirements

- *Facility Safety.* Meeting safety requirements will require

GENERAL PLANNING	IMPACTS/COMMENTS
1. More stringent requirements related to acid rain, global climate change, and ozone depletion may be established.	• New operating facilities will require best available control technologies. • Existing facilities will have to meet emission standards by implementing emission controls or by converting fuel sources. • Further restrictions on the use of chlorofluorocarbons and halons are not expected to significantly impact modernization.
2. The use of carcinogens will be strictly limited or eliminated where possible.	• New facilities will be designed with this target; existing processes will require modifications.

FACILITY SITING/DESIGN	IMPACTS/COMMENTS
1. Degradation of Class 1 groundwater will be strictly prohibited.	• No disposal facilities for hazardous or radioactive waste will be allowed above Class 1 groundwater. • All other facilities (e.g., production or storage/treatment facilities) above Class 1 groundwater will have to meet a zero-degradation standard. • Existing hazardous or radioactive disposal facilities above Class 1 groundwater will be closed. • Other existing facilities above Class 1 groundwater will need to be modified or closed, as appropriate.
2. Class 2 groundwater will be protected to Maximum Containment Levels (MCLs) established in the Safe Drinking Water Act.	• All new and existing facilities, including disposal facilities, above Class 2 groundwater will have to limit contamination of the groundwater to As Low As Reasonably Achievable (ALARA), but in no case to exceed MCLs (e.g., 4 millirem annual effective dose equivalent for radioactive contaminants). • Where existing manmade contamination in Class 2 groundwater already exceeds MCLs, a zero-degradation standard will apply.

Table 3.1.–Summary of Future ES&H Planning Considerations.

3. In addition to more stringent groundwater protection standards that will apply to all facilities, siting standards under the Resource Conservation and Recovery Act (RCRA) for new hazardous treatment, storage, and disposal facilities will be more stringent. Restrictions will include seismic, floodplain, wetland, and sensitive habitat protection considerations.	• Siting new facilities and the expansion of existing facilities in areas with adverse geologic settings, unstable areas, important ecological resources, and complex hydrogeology will be avoided to the degree practical, or mitigating measures will have to be designed as a part of the proposal.
4. Acceptable radiation exposure of the public at the site boundary from routine operations at all DOE facilities will continue to decrease. The target for DOE facilities, all pathways, should be assumed to be 1 millirem effective dose equivalent per year.	• New facilities and the expansion of existing facilities should be sited and designed to meet this target.
5. Acceptable radiation exposure for workers at DOE facilities will continue to decrease. The target for DOE facilities should be less than 0.5 rem effective dose equivalent per year.	• New and existing facilities should be designed/retrofitted to meet this target.
6. Decontamination and decommissioning (D&D) requirements will need to be specifically included in design considerations for minimizing waste generated and personnel exposures.	• Design of replacement and new facilities and modifications to existing facilities will require consideration of D&D.
<u>WASTE MANAGEMENT</u>	<u>IMPACTS/COMMENTS</u>
1. Interstate disposal of radioactive waste and radioactive mixed waste will be restricted.	• For large waste generators, DOE will need to site, design, and construct treatment, storage, and disposal facilities <u>on the sites.</u> • Exceptions include disposal of transuranic waste at the Waste Isolation Pilot Plant and disposal of High Level Waste (HLW) at the proposed federal repository. • Intrastate transportation and disposal of wastes at DOE facilities will not be restricted. Some latitude will exist for small-quantity generators.
2. Hazardous waste generators will be required to maximize source reduction and pursue total recycle.	• New and existing facilities will have to meet waste minimization goals. • Planning for minimization of all waste from decommissioning must be considered in modernization.

Table 3.1.–Summary of Future ES&H Planning Considerations – Continued.

consideration of low probability/high consequence events or accidents. Adequate safety margins must be maintained, and so demonstrated, throughout their operating life.

- *Radiological Protection.* DOE facilities will be required to implement standards of excellence similar to the commercial nuclear plant standards.

- *Emergency Preparedness.* Fully compliant equipment and facilities for emergency response will be required. DOE 5500-Series Orders on emergency planning, management, and preparedness are currently being updated and are eventually subject to rule-making. They contain requirements on emergency response facilities, communications and process monitors, and emergency action levels for all DOE programs.

- *Environmental Protection.* Federal and state environmental laws and regulations will continue to have major impacts. This is especially true in the storage, treatment, and disposal of hazardous materials. More Environmental Assessments and Environmental Impact Statements can be expected. NEPA requirements will remain stable, but DOE facilities application will be demanding and costly.

- *Waste Management.* DOE facilities waste management will have a significant impact on siting, design, construction, and operation of new facilities. In addition, DOE facilities will need to minimize or eliminate use of underground storage tanks. All tanks will be required to meet RCRA tank standards.

- *Occupational Safety and Health.* Compliance with OSHA industry and construction standards will be considered when modifying facilities, or when designing, costing, and scheduling new facilities. Fully compliant fire protection systems will be required.

- *Packaging and Transportation.* The five-year program to bring DOE's non-weapons packaging into compliance with Department of Transportation regulations is nearing completion. A Transportation Safety Committee with representation from all major DOE sites is drafting requirements for intra-site transportation and packaging.

Table 3.2 addresses impacts of the current requirements and planning considerations by category.

GENERAL PLANNING ASSUMPTIONS	IMPACTS/COMMENTS
1. Baseline ES&H compliance costs will increase for record keeping, monitoring, reporting, epidemiological studies, training, personnel resources, public outreach, emergency planning, OSHA compliance, etc.	• Extensive lead time will be required for new facilities. Upgrades to old facilities will be required to span this time period. • Environmental and safety issues will affect direct hardware costs and lead times, as well as the decision to fund upgrades. • Intervention by state and local governments and the public should be expected and can affect cost and schedule. • Improved management systems and controls will be required. • Training is an essential element of facility modification in all phases and will increase cost and scheduling. • DOE will need to adopt state-of-the-art methods in all phases of modernization.
2. NEPA requirements will remain stable; DOE's application will be demanding.	• Implementation of different controls existing between DOE-imposed policy and external requirements will affect cost and schedule. • More EAs (as opposed to Memos-to-File) can be expected and one-year lead time should be expected. • More EISs (as opposed to EAs) can be expected for reconfiguration projects than in the past and lead times of two years should be anticipated.
FACILITY SAFETY	IMPACTS/COMMENTS
1. Demonstration of facility safety will require expanded scope, detail, complexity, and documentation of facility safety analysis.	• Strict attention to safety analysis, quality assurance, and documentation is required. • Comprehensive safety analysis and review requirements add time and cost to construction projects.
2. Expanded use of risk assessment will be needed to demonstrate facility safety.	• Results from risk assessments will be used to improve design and operations.

Table 3.2.–Summary of Major Current ES&H Requirements and Planning Considerations.

3. Analysis of low-probability, high-consequence events (severe accidents) will be a necessary component of safety analysis and NEPA review.	• Analysis of these events is expected to result in more stringent features to meet siting and emergency preparedness requirements.
4. DOE requirements are in place to analyze natural phenomena and fires. Analyses using current techniques and estimates of severity levels will be required.	• These analyses are likely to demonstrate needs for facility modifications. • New facilities and existing facilities may be required to meet seismic and wind requirements from DOE Order 6430.1A.
5. Adequate safety margins need to be maintained throughout the facility lifetime.	• Facilities will be required to demonstrate safety throughout lifetime, which could lead to modifications.
6. DOE is developing an effective backfit policy.	• The cost of backfitting existing facilities with upgrades will be high; without an effective backfit policy, efforts may be inconsistent and misdirected.
<u>RADIOLOGICAL PROTECTION</u>	<u>IMPACTS/COMMENTS</u>
1. Implementation of standards of excellence in radiological controls is essential.	• New and modified facilities will require design features which improve contamination control and release prevention.
<u>EMERGENCY PREPAREDNESS</u>	<u>IMPACTS/COMMENTS</u>
1. Adequate emergency preparedness, including emergency response facilities and communications must be an integral part of facility planning.	• Failure to ensure adequate emergency preparedness may prevent operation of some facilities, which will affect the DOE Complex, cost, and schedules.

Table 3.2.–Summary of Major Current ES&H Requirements and Planning Considerations–Continued.

ENVIRONMENTAL PROTECTION	IMPACTS/COMMENTS
1. Strict compliance with applicable Federal/ state environmental laws and regulations is expected of DOE facilities.	• Need to negotiate compliance agreements with Federal/state regulators to address potential noncompliance issues.
WASTE MANAGEMENT	IMPACTS/COMMENTS
1. Disposal options for Defense Program orphan wastes have yet to be identified.	• New treatment facilities or disposal in a deep geologic repository will be required.
2. DOE facilities will need to minimize the use of underground storage tanks; above- and below-ground tanks will be designed to meet RCRA tank standards.	• Implementation of these regulations for underground and above-ground tanks will require decommissioning and decontamination of existing tanks and replacement, or backfits. • New tank construction will need to be designed to meet RCRA tank standards.
OCCUPATIONAL SAFETY AND HEALTH	IMPACTS/COMMENTS
1. DOE facilities will need to comply with Occupational Safety and Health Administration standards.	• Costs to incorporate OSHA requirements in design of new and modified facilities may be large. • Fully compliant fire protection systems will be required.
PACKAGING AND TRANSPORTATION	IMPACTS/COMMENTS
1. Need to comply with all applicable Department of Transportation and Department of Energy regulations.	• Costs of compliance with regulations and requirements are likely to increase. • Minimizing hazardous and radioactive material shipments will need to be incorporated into modified facilities. • New facilities should be designed to minimize materials movement and intra-site shipping requirements. Complex reconfiguration should carefully consider shipping and transportation impacts. • Processes should be designed such that material shipments, when required, move materials in the most stable intermediate forms possible.

Table 3.2.–Summary of Major Current ES&H Requirements and Planning Considerations–Continued.

3.4 PHILOSOPHY OF OPERATIONS

The philosophy of operation for the reconfigured Complex (Complex-21) is to ensure that the nuclear deterrent mission is accomplished in an efficient, accountable, safe, secure, and environmentally sound manner. This philosophy emphasizes increased reliance on the private sector for manufacture of nonnuclear components and on streamlined laboratory and production functions. Implementation of this new philosophy requires that DOE, operating contractors, and laboratories have an effective management system. This new system will be characterized by clear lines of responsibility and authority. Oversight will provide independent review of operations.

The philosophy cited above is a key operational component in the accomplishment of DOE's defense mission. To ensure required productivity, DOE must fully exploit the scientific and engineering expertise that exists at the manufacturing facilities and national laboratories. In addition, DOE should foster advances in the private industrial sector through technology transfer and procurement.

The following specific tenets of this overall philosophy of operation are to be applied in all facets of Complex-21 development:

- Comply with all applicable federal, state, and local laws, regulations, and orders;
- Minimize the size and total cost of Complex-21;
- Formalize conduct of operation;
- Develop measures to promote the effective use of limited resources, including funding, personnel, natural resources, land, materials, and equipment;
- Be vigilant to manage the sources of institutional cost growth;
- Make decisions based on a balance of risks, costs, and benefits;
- Optimize the use of advanced technology in the design of new facilities and in upgrading existing facilities;
- Increase communications and planning between the laboratories and the processing and production operations to standardize and simplify weapon designs, and to minimize the use of hazardous materials;
- Maximize reliance on the private sector for nonnuclear component production; and
- Increase technology transfer to and from industry.

3.5 EMERGING TECHNOLOGIES

A major goal of Complex reconfiguration is to improve operating efficiency. Some improvements will be achieved by the configuration itself. Others will be achieved by advanced technologies for specific production activities as they become available. Types of emerging technologies that may impact reconfiguration include:

- Computer technologies,
- Advanced manufacturing technologies,
- Storage and retrieval technologies,
- Safeguards and security technologies,
- Extraction/purification/elimination technologies, and
- Waste minimization and treatment technologies.

3.6 RECONFIGURATION OPTIONS AND EFFECTS

Reconfiguration will change the Complex to different degrees within the three functional elements: Nuclear Materials Production and Manufacturing (NMP&M); Nonnuclear Manufacturing (NNM); and Research, Development and Testing (RD&T).

The following sections discuss specific aspects of the reconfiguration options as they apply to each functional element of the Complex.

3.6.1 Basic Reconfiguration Options

In the broadest sense, reconfiguration would be divided into two alternatives: "No Action" and "Reconfiguration Options."

NEPA requires evaluation of the No Action alternative. Under the No Action alternative, Complex-21 would not be developed and the existing configuration would continue. However, the No Action alternative would not be static. DOE would continue to make modifications and upgrades to ensure compliance with applicable federal, state, and local laws, regulations, and orders and to accomplish its defense mission. Repairing or replacing facilities would be considered through the Capital Assets Management Process (CAMP) (see Sections 4.3.4 and 5.2). Additional projects to address facility deterioration or technical obsolescence would continue to be considered over time on a case-by-case basis.

Under the Reconfiguration alternative, two options have been identified for scoping issues and evaluating configuration changes in the three functional groupings of the Complex. These options are:

- Configuration A: Downsizing and Modernizing in Place. Upgrade, replace, and/or consolidate current facilities at their current sites, using existing support facilities and infrastructure as much as possible. As an exception to the existing site theme, the functions of the Rocky Flats Plant (RFP) would be relocated and the current facilities at RFP would be transferred to the Office of Environmental Restoration and Waste Management for appropriate action. Under this option, the Complex would be downsized with relatively minor consolidations and closeouts as missions change. Privatization of nonnuclear component manufacturing would be expanded. Appropriate RD&T functions would be consolidated into single Centers of Excellence.

- Configuration B: Maximum Consolidation. Relocate RFP and at least one other NMP&M facility to a common location. The Pantex Plant and the Oak Ridge Y-12 Plant are candidates for collocation with the Rocky Flats functions, either singly or together. Functions of relocated plants would be handled as described for RFP in Configuration A. The probable outcome of this option would be an integrated site which could consolidate much of the NMP&M and/or weapons assembly and disassembly at a single site. Other activities would be consolidated and closed out as dictated by changing missions and requirements. Maximum feasible privatization of nonnuclear component manufacturing would result in maximum consolidation of nonnuclear production facilities. As in Configuration A, appropriate RD&T functions would be consolidated into individual Centers of Excellence.

Common to both Reconfiguration Options is the relocation of plutonium processing functions currently performed by RFP, near Denver, Colorado. This is because what was once considered a sufficiently remote site is now on the verge of becoming part of an expanding urban area. The growing population of the Denver metropolitan area continues to encroach on the downwind edge of the site and the watershed on which RFP is located now supplies drinking water for some adjacent communities.

These circumstances have naturally led to increasing public concern about the reasonableness of retaining plutonium operations at the site. DOE is sensitive to these concerns and has ensured that all discharges, releases, and protective barriers and safety systems strictly comply with applicable federal, state, and local laws, regulations, and orders. There is no doubt that RFP can, and will, be operated safely. Reconfiguring RFP in place would further enhance the overall safety of the plant. Nevertheless, DOE recognizes that prudent consideration of the public's concern, coupled with the magnitude of investment required to sustain plutonium operations at any site, dictate that relocation of RFP functions should be integral to both Reconfiguration Options. The effect of not relocating RFP functions will, of course, be evaluated under the No Action alternative.

The application of these basic options differs within the three functional elements. The following sections contain an expanded discussion of the effect of the reconfiguration options on these elements.

3.6.2 Reconfiguration Options for Nuclear Materials Production and Manufacturing (NMP&M)

Figure 3.2 displays the potential relocation, consolidation, and privatization effects for each of the major NMP&M functions. The specific site(s) to which functions might be relocated are to be determined (TBD) following completion of candidate site evaluations and a PEIS.

Nuclear Materials Production and Manufacturing Functions	Current Siting	No Action Alternative	Configuration Option	
			A	B
Plutonium				
Virgin plutonium	RL, SRS	----	----	----
Plutonium recycle/recovery	RL, SRS, RFP, LANL	RFP, SRS, LANL	TBD	TBD
Tritium				
Production	SRS	SRS*	*	*
Extraction	SRS	SRS*	*	*
Recycle/purification/loading	SRS	SRS	SRS	SRS
Backup loading	MD	MD	TBD	TBD
Stockpile surveillance	MD	MD	SRS	SRS
Uranium				
Depleted uranium supply	FMPC	PS	PS	PS
HEU recovery (nonirradiated)	Y-12	Y-12	Y-12	TBD
DU/HEU fabrication	Y-12	Y-12	Y-12	TBD
Spent reactor fuel recovery	SRS, INEL, Y-12	SRS, INEL	INEL, *	INEL, *
Other Isotopes				
Pu-238	SRS	SRS	*	*
Pu-242	SRS	SRS	----	----
Assembly/Manufacturing				
Pits	RFP	RFP	TBD	TBD
Weapons	PX	PX	PX	TBD

Legend:

FMPC	Feed Materials Production Center
INEL	Idaho National Laboratory
KC	Kansas City Plant
LANL	Los Alamos National Laboratory
MD	Mound Plant
PS	Private Sector
PX	Pantex Plant
RFP	Rocky Flats Plant
RL	Richland Site
SRS	Savannah River Site
TBD	At a Relocated Site To Be Determined Via the NEPA Process
Y-12	Oak Ridge Y-12 Plant

Note:

* SRS and/or INEL are the preferred locations subject to final selection and Record of Decision (ROD) for the New Production Reactor

Figure 3.2.–NMP&M Configuration Options.

Because of the variety of possible outcomes, the only NMP&M facility which is not a candidate for either relocation or privatization of functions under one or more options is INEL. The Idaho Chemical Processing Plant (ICPP) processes spent fuel from naval reactors and ships the recovered enriched uranium to the Y-12 Plant for conversion to uranium fuel for the SRS reactors. Since it has already initiated major modernization upgrades, it would not be economical or practical to relocate this facility. Other facilities associated with the Naval Reactor Program were also not considered in this study because they are not considered to be part of the Nuclear Weapons Production Complex, the focus of this study.

Although relocation of SRS is not currently defined in a reconfiguration option, a separate analysis of alternative sites for NPR capacity includes the possibility that SRS might not be chosen as a site for an NPR. Should that decision occur, there are other facilities currently at SRS that may be advantageously relocated to the chosen NPR site(s). The Reconfiguration PEIS will consider the impacts of such relocation(s) after the NPR decision is made.

The following paragraphs address the implications of the NMP&M configuration options and some of the major factors affecting them.

3.6.3 New Production Reactor Capacity

NPR capacity is required to provide an assured, reliable tritium production capacity regardless of the reconfiguration option eventually selected. The Department is, therefore, proceeding with an EIS and plans to acquire NPR capacity to replace the current production reactors.

The NPR program constitutes a reconfiguration activity that is being developed as a separate programmatic effort by the Office of New Production Reactors, reporting directly to the Secretary of Energy. To preclude duplication and subsequent confusion, requirements of the NPR Program are not included in the Reconfiguration Study. When completed, however, the NPR will become part of Complex-21.

3.6.4 NMP&M Activities Required Regardless of Reconfiguration Option

It should be recognized that a number of NMP&M activities are common to both options. These are discussed in the following sections.

3.6.4.1 Backup Tritium Loading Facility

Currently, tritium is removed from retired and recycled reservoirs, and added to new and recycled reservoirs in Building 234-H at SRS. After 1992, these functions will be carried out in the Replacement Tritium Facility, presently under construction.

In the early 1980s, a backup loading facility was constructed at Mound for filling both gas and solid-state reservoirs. The January 1989 *Modernization Report* proposed relocating nuclear materials operations from Mound to other nuclear materials sites (SRS in the case of tritium). The backup loading facility should be maintained in standby at Mound even after the other nuclear materials operations have been moved. However, this may not be an acceptable long-term solution, since trained personnel and support services would no longer be located at Mound. It might be possible to provide a backup capability at one of the design laboratory facilities for the lowest stockpile case. For higher stockpile cases, a new backup loading facility could be built. To avoid common failures, it should be located somewhere other than SRS. The preferred location would be with a production reactor located at a site other than SRS. If analysis shows that common failures involving several facilities at SRS are unlikely, then, as an alternative, Building 234-H could be refurbished and used as a backup. As another alternative, the backup could be provided by a redundant "shelf reserve" of filled tritium reservoirs that could permit replacement of aging reservoirs from the field for a limited time. The shelf reserve approach becomes more attractive for the lower sized stockpile scenarios because current SRS facilities are designed to support considerably larger workloads.

The desirability of a shelf reserve of filled reservoirs together with the workload necessary to support this approach should be evaluated against the permanent establishment of a new backup loading facility. If the analysis favors the construction of a second backup loading facility, DOE should maintain the capability to load tritium at Mound until the second facility is operational.

Regardless of the approach ultimately chosen, the configuration of the future Complex should include a backup tritium loading facility. Current backup loading facilities at Mound should be maintained until this protection is established.

3.6.4.2 Virgin Plutonium Infrastructure

Analysis of the workload cases indicates that no additional reactor production of plutonium will be required. For all stockpile cases, plutonium requirements are reduced sufficiently to be satisfied by plutonium from retired weapons alone. It should be noted, however, that a modern plutonium recycle and recovery capability is essential to extract plutonium from retired weapons and to minimize wastes.

Elimination of the virgin plutonium requirement would allow the eventual shutdown of the major target manufacturing and processing facilities that currently support plutonium production from reactors. These include the F-Canyon, FB-Line, and the A-Line uranium trioxide (UO_3) facilities at SRS and the PUREX/uranium trioxide (UO_3) facilities at Hanford. After the existing inventories of irradiated fuel and targets are processed as needed to facilitate disposal, these facilities could then be phased out, except as noted in the next paragraph.

The FB-Line and F-Canyon at SRS are also used for recycle and recovery operations and are needed for the current mission. When alternate recycle and recovery facilities are available, either for the transition to Complex-21, or for the final reconfiguration option, these facilities could also be phased out. Accordingly, the configuration of the future Complex should not contain a virgin plutonium infrastructure.

3.6.4.3 Mound Nuclear Materials Operations

The primary nuclear activities at Mound consist of the tritium and Pu-238 Radioisotope Thermoelectric Generator (RTG) operations.

The tritium operations at Mound involving component evaluation, tritium recovery, tritium heat material technology development, and tritium storage should be moved to SRS. This relocation would result in reduced transportation of nuclear materials, less radiation risk to the public, savings from consolidation with other activities, and improved public acceptance.

Under current planning within the Office of the Assistant Secretary for Nuclear Energy, the assembly of the encapsulated Pu-238 heat sources into RTGs for the National Aeronautics and Space Administration and Department of Defense will continue to be performed at Mound for the next several years. A long-range program document will be prepared to review the possible relocation of the RTG assembly operations to various Department sites. The document will include technical, cost, schedule, safety, environmental, and institutional issues as well as savings from consolidation with other program activities.

Planning for this relocation should be consistent with plans to reconfigure the Complex and should be conducted on a schedule that would support relocation of RTG operations from Mound no later than the year 2000.

3.6.4.4. Phaseout of Hanford Defense Production

With the phaseout of virgin plutonium production at Hanford, the PUREX/UO_3 Plant will be shut down. The N Reactor has been placed in dry standby as a tritium production contingency. The only defense production remaining at Hanford will be the residue recovery/metal conversion capabilities at the Plutonium Finishing Plant (PFP). While some plutonium metal satisfactory for weapons production could be produced at Hanford, none of the stockpile size options considered require it. Therefore, current planning would process residue inventories, as well as weapons-grade plutonium nitrate from PUREX, only as needed to facilitate final disposal. Hanford could then go into a terminal cleanout of defense production facilities, finishing with terminal cleanout of the PFP itself.

Phaseout of the Hanford DP plutonium production mission is a natural result of the decrease in demand for plutonium production and processing. Within the system, there is enough capability at SRS and RFP to recover and recycle plutonium; accordingly, PFP plutonium processing capability is not needed. Thus, by phasing out PFP, the last of the Hanford DP capabilities would be terminated, allowing those resources to be diverted to other missions.

3.6.4.5 Phaseout of the Feed Materials Production Center

The FMPC has provided both slightly enriched uranium feed for N Reactor plutonium production and Depleted Uranium (DU) for SRS reactor plutonium production. The FMPC has also supplied Y-12 with DU billets for weapons component manufacturing, but that mission could be performed by a commercial vendor. Because the N Reactor is in dry standby for tritium production only, and the SRS reactors will only be used for tritium production as an interim for NPR, there is no longer a need for FMPC as a reactor feed materials producer.

The FMPC has been the subject of recent ES&H compliance issues that threaten its ability to resume operations. Therefore, DOE has secured a qualified vendor for DU material previously supplied by FMPC.

Because there was no practical long-range mission identified for FMPC and Y-12 has transitioned to commercial sources for DU, FMPC has been phased out of Defense Programs operations. Effective October 1, 1990, FMPC was transferred to the Office of Environmental Restoration and Waste Management.

3.6.5 Activities Related to NMP&M Reconfiguration Options

Under NEPA, the Record of Decision (ROD) to choose a configuration option cannot occur until the necessary studies of environmental impacts have been completed. Consequently, a Programmatic Environmental Impact Statement (PEIS) will be developed to examine the consequences of each option. The ROD is expected in early FY 1994. The No Action alternative must also be considered in the PEIS. The PEIS is discussed in Chapter 4.

For NMP&M sites, the No Action alternative allows facility upgrades and modifications only as required to achieve and maintain compliance with applicable federal, state, and local laws, regulations, and orders and to accomplish the Department's defense related mission. Related activities in FY 1992-1994 will be handled through CAMP (see Sections 4.3.4 and 5.2).

Under Reconfiguration Option A, RFP functions will be relocated to another site and all other facilities will be reconfigured at a location within their existing sites. As noted previously, a reconfiguration goal is to replace current facilities with facilities that are smaller, less diverse, and less expensive to operate. Related activities required during FY 1992-1994 to support the ROD include preparation of preliminary conceptual designs for a relocated RFP.

For relocation of RFP, the entire process of site evaluation and selection, development of new process technologies, detailed design of facilities, staging of construction projects for affordability, parallel operation for certification, and final production cutover will probably require up to 20 years. If earlier closure of RFP is deemed necessary for political, social, or environmental reasons, accelerated construction or relocation of plutonium facilities at another site would be required. Relocation of the plutonium operations could be accelerated. This is particularly true for lower stockpile requirements. A discussion of plutonium operations transition planning is contained in Chapter 6, sections 6.1.2.2 - 6.1.2.2.4.

Like Option A, Option B relocates the plutonium functions from RFP. In addition, Option B relocates the uranium operation of the Y-12 Plant and/or the component assembly functions of the Pantex Plant to the same site chosen for the relocation of RFP. Thus, there are three possible suboptions for consolidation to be evaluated:

B1. RFP and Y-12; or

B2. RFP and Pantex; or

B3. RFP, Y-12, and Pantex functions at a single site.

All NMP&M facilities not consolidated by the suboption chosen will be reconfigured in place. Attractive advantages of Option B are the potential for savings in the overhead and infrastructure costs necessary to operate multiple sites, managerial and production efficiencies of collocation, and a substantial reduction in transportation of nuclear materials. Related activities required during FY 1992-1994 to support the ROD include preliminary design of the facilities appropriate for the three potential suboptions.

3.6.6 Reconfiguration Options and Related Activities for Nonnuclear Manufacturing (NNM)

For the NNM sector, both options include the vigorous pursuit of privatization and shifting some production of nonnuclear components from DOE facilities to the private sector. The primary differences between the options are the extent to which nonnuclear manufacturing is either consolidated into a single dedicated government site or transferred out of government facilities altogether, and the division of responsibilities for production engineering and procurement functions between the DOE production plants and the design laboratories. Figure 3.3 illustrates the changes contemplated under each option.

Functions that may be maintained in DOE facilities for both options are neutron generator production, special or unique heavy machining, lithium salt opera-

Nonnuclear Manufacturing Functions	Current Siting	No Action Alternative	Configuration Option A	Configuration Option B
Electrical				
Thermal batteries	PI	PI	PI or PS	PS*
Magnetics	PI	PI	PI or PS	PS*
Lightning arrestor connectors	PI	PI	PI or PS	PS*
Neutron generators	PI	PI	PI	PS*
Other electrical	KC	KC	KC or PS	PS*
Explosive components				
Main charges	PX	PX	PX	TBD**
Main charge detonators	MD	MD	PX	TBD**
Actuators & igniters	MD	MD	MD or PS	PS*
Explosive timers & other detonators	MD	MD	MD or PS	PS*
Pyrotechnics	MD	MD	MD or PS	PS*
Mechanical				
Conventional metals				
–Light machining	RFP, KC, Y-12	RFP, KC, Y-12	PS	PS
–Heavy machining	RFP, Y-12	RFP, Y-12	Y-12	TBD**
Beryllium machining	RFP, Y-12	RFP, Y-12	PS	PS
Other mechanical	KC	KC	KC or PS	PS*
Chemical				
Y-12 salt	Y-12	Y-12	Y-12	TBD**
Rubber & plastics	KC	KC	KC or PS	PS*

Legend:

KC	Kansas City Plant	PX	Pantex Plant
MD	Mound Plant	RFP	Rocky Flats Plant
PI	Pinellas Plant	TBD	To Be Determined
PS	Private Sector	Y-12	Oak Ridge Y-12 Plant

* A goal of Complex-21 is to place the maximum amount of these nonnuclear manufacturing functions in the private sector. Specific functions retained by the government will be concentrated in one dedicated nonnuclear manufacturing site. That site has not been selected.

** These functions will remain with the plants specified in Option A, relocating with them if they should be subsequently moved or consolidated.

Figure 3.3.–Nonnuclear Manufacturing Configuration Options.

tions (not found in the private sector), and a variety of very unique components and assemblies. Likewise, the nonnuclear manufacturing operations at RFP would be terminated under both options of the Reconfiguration Alternative. These include the machining of stainless steel, beryllium and depleted uranium, all of which would be procured from the private sector or shifted to other production agencies. Depleted uranium work would terminate at the end of production for current weapons systems and be consolidated at the Y-12 Plant. These actions would increase private sector participation, reduce RFP overhead costs, and take advantage of the private sector's existing capabilities related to beryllium operations.

As discussed for NMP&M in Section 3.6.5, NEPA requirements must be fulfilled.

Except as noted above, the No Action alternative replaces or upgrades nonnuclear facilities at the same site only as required to achieve and maintain compliance with applicable federal, state, and local laws, regulations, and orders.

Privatization would continue to be pursued whenever economically advantageous for specific products.

Option A increases the outsourcing of nonnuclear components manufacturing. Many of the nonnuclear components currently produced at the Kansas City Plant, the Mound Plant, and the Pinellas Plant could be produced in the private sector. This would allow consolidation of the remaining components production into fewer plants with correspondingly smaller infrastructure support requirements. Near-term activities would include identification of the components most suitable for transfer to the private sector and determination of the savings that will result. The determination of specific sites to be considered for consolidation is dependent upon the particular components found suitable for outsourcing and the savings to be realized.

Option B er ions maximum possible DOE reliance on private industry for production of piece parts, components, and subsystems. As a result, much of the production engineering and procurement of nonnuclear components would be performed by the design laboratories; the Mound, Pinellas, and Kansas City Plants would thereby become candidates for consolidation into a single dedicated NNM plant. If possible, all dedicated nonnuclear production sites would be eliminated. The near-term activities conducted for Option A also support the analysis of Option B for the ROD. Option B is the Secretary's preferred option.

3.6.7 Possible Management Concepts for Nonnuclear Manufacturing

DOE has several programs with large costs underway or being considered. These include the New Production Reactor program, Superconducting Super Collider, Environmental Restoration and Waste Management, and the potential relocation of nuclear operations at one or more sites. With DOE facing these large expenditures, it will be difficult to obtain the additional capital improvement resources for the full spectrum of Nuclear Weapons Complex reconfiguration.

Although contractors from private industry are hired to operate the DOE production sites, it is DOE that bears the ultimate responsibility for conditions at the plants and capital investment costs for environment, safety, and health actions and for infrastructure modernization.

DOE maintains a significant fixed cost burden in the support and overhead costs associated with keeping the doors open in Complex facilities, regardless of production throughput. The fixed costs of operation are relatively insensitive to changes in workload and the direct cost to manufacture components. This means that, unless the six-site nonnuclear manufacturing element is reduced, it is unlikely that DOE will realize substantial savings from a decrease in nuclear weapons workload.

Today, the six nonnuclear manufacturing sites contain a broad range of capabilities, many of which, at the time of installation, were not available in private industry. However, the aging of the Complex, and the ability of the private sector to rapidly assimilate advanced technologies has shifted the balance of technology and capability. There are now increased benefits and opportunities for moving production to the private sector.

DOE will take a critical look at whether some current in-house capabilities and capacities could and should be accomplished in the private sector. This critical look must start with an assessment of which capabilities the Department is statutorily required to maintain. The Atomic Energy Act mandates that special nuclear materials production as well as research and development of nuclear weapons be performed exclusively in government facilities. Although that act could be amended, there are continuing, valid reasons for retaining the highest degree of government control over special nuclear materials and nuclear devices. On the other hand, statutes do not expressly require that nonnuclear components and products be produced in government facilities. In the 1950s and 1960s, as the stockpile was being built and the threat to National Security was perceived as much more urgent than today, security classification, schedule, and quality control were cited as reasons to perform virtually the full spectrum of nuclear weapons work in government facilities. In the future, the cost to maintain and operate the six nonnuclear sites may be excessive, given the needs and priorities facing the Department.

Outsourcing of some nonnuclear manufacturing may offer DOE an opportunity to better control future costs, improve the technology and competitiveness of the private sector, and allow DOE management to focus its attentions on higher priority efforts.

The configuration implications of this change are quite significant. As changes push a greater reliance for manufacturing onto the private sector, and with the successful commercialization and development of emerging technologies, the Department could have an opportunity to achieve a net reduction in personnel, equipment, and space requirements as in-house efforts shift from manufacturing to vendor support. Over time, this change will lead to further opportunities to consolidate those products and processes that must remain in-house into space made available at other sites.

Savings in DOE infrastructure costs could then be realized. Consolidation of sites under direct DOE management could reduce the level of future investments required for ES&H compliance (but not cleanup) and safeguards and security, and the management burden associated with those multiple responsibilities. This concept promotes a smaller Complex over the reconfiguration period. For those sites which have no continuing national security mission, alternative uses will be considered.

These configuration changes cannot be fully implemented until later in the reconfiguration effort. However, an aggressive program to implement these changes can start immediately, and DOE could make significant progress during the next five years. By the time Complex-21 is fully operational, DOE might maintain in-house only those technologies and processes that are vital to the maintenance of the nuclear stockpile and which, for security or technical reasons, cannot be reliably obtained from the private sector. In this scenario, the weapons laboratories and the private sector suppliers would replace DOE production plants as focal points for developing future nonnuclear technology and manufacturing capability.

In order to develop those private sector sources, two management concepts could be used: Manufacturing Development Centers (MDC) and Manufacturing Development Engineering (MDE). These concepts have already been employed to a limited degree but could be used more extensively to support objectives of increasing efficiency and effectiveness, increasing accountability, and improving access to state-of-the-art technology. Most nonnuclear components could probably be manufactured by private industry under one of these management concepts.

3.6.7.1 The Manufacturing Development Center (MDC) Concept

The MDC Concept includes three organizations in the production process: the design laboratories, nonnuclear GOCO plants, and private industry. The GOCO plants would be responsible for the maintenance of a limited backup production capability. However, that capability would also be used to develop and support private industry production, with in-house production exercised only in preproduction, test device, and backup production roles for those situations where there are questionable or minimal vendor capabilities. Although this MDC concept is currently used for some products such as thermal batteries, future production would employ this concept more extensively.

The MDC concept would reduce the size of GOCO plant operations, reduce operating and capital costs required to reconfigure the Complex, trim the future cost of operation, increase operational flexibility, promote the transfer of technology to and from private industry, and assure that a credible nuclear deterrent can be maintained.

3.6.7.1.1 Design Laboratories Role

As part of the MDC concept, the design laboratories would maintain their research, development, and weapons design functions. The major change for the design laboratories under this concept would be an increased role in technology transfer and manufacturing interface. The design laboratories would increase their role in identifying potential commercial sources for the new products and would assume a larger responsibility for the interface with commercial sources. This latter would include some of the manufacturing engineering and process design efforts.

3.6.7.1.2 Nonnuclear GOCO Plant Role

Under this concept, GOCO plant operations (exclusive of final assembly operations) would include four major responsibilities: develop potential commercial sources and assist in the process design and manufacturing engineering efforts, procure products, pursue an aggressive technology transfer program, and retain a limited backup production capability for selected products.

The GOCO plants would be responsible for performing process development and building prototypes, transferring technology, developing commercial sources, and retaining backup capabilities with limited capacity for some components. In many cases, manufacturing lines would not be retained for specific components, but a generic capability, such as production of electronics assemblies, would be maintained.

Under the MDC concept, the GOCO plants would place increased emphasis on technology management and reduced emphasis on in-house production. The MDC concept would require the GOCO plants to establish and maintain a technology base for manufacturing engineering. It also requires the plants and the design laboratories to pursue a more aggressive technology transfer process in conjunction with establishing competitive private industry sources for weapons components and materials. The goal of increasing procurement of weapons components and materials should minimize in-house production equipment, avoid modifications to facilities, reduce internal direct labor requirements, and, in some cases, eliminate the need for additional facilities.

3.6.7.1.3 Private Sector Role

Under the MDC concept, the private sector would become the primary manufacturer of nonnuclear weapons components. This would require close coordination with the GOCO plants and the design laboratories. The private corporation, as a manufacturer, would be required to supply the necessary capital and personnel resources to deliver the specified product.

3.6.7.2 <u>The Manufacturing Development Engineering (MDE) Concept</u>

The MDE concept would eliminate the production agency from the design and manufacturing process. Thus, there would be only two entities involved in the production process: the design laboratories and the commercial vendor(s). Components would be manufactured by a vendor, with the laboratory-vendor interface becoming one of product design, development, manufacturing engineering, and production liaison. The GOCO plants would mothball or even eliminate existing production capabilities and would no longer have a manufacturing or development capability for those products managed under this concept.

The MDE concept may produce essentially the same benefits as the MDC concept with potentially greater savings, but at the risk of no retained in-house capability.

In implementing this concept, the first task would be to thoroughly review the implementation issues associated with procurement procedures, contracting, and product and quality acceptance. While in theory these responsibilities would be assigned to the design laboratories when there is no direct DOE production plant involvement, in practice it may be more practical to assign these responsibilities to the next receiving site for assembly or to an integrating contractor.

3.6.7.2.1 Design Laboratories Role

As the primary organization involved in the production cycle, the design laboratories would have two major responsibilities: weapons design and interface with private industry for manufacturing.

The role of the design laboratories under the MDE concept would be greatly expanded. Design laboratories would continue to provide both the research and development and the design of weapons components. Beyond this current role, design laboratories would assume the role of commercial interface. This includes activities such as identifying and developing private sector suppliers, maintaining a technology transfer program, and increasing involvement in process design and manufacturing engineering.

The first part of the commercial interface role is to be aware of the state of the art in private industry. This includes identifying those vendors capable of manufacturing the components today or in the process of entering the business area. Once potential vendors have been identified, the design laboratory will participate in qualification and selection. A vigorous technology transfer program would be an important part of the commercial interface role. The designer would need to know that new developments in the commercial sector could improve the product and must actively encourage the use of private industry in manufacturing components. Under the MDE concept, there would be a rapid transfer of useful design and manufacturing technology between private industry and the Complex.

The design laboratories would assume a large role in manufacturing development. The component design laboratories would be continually active in incorporating new technology and new components into stockpile weapons. Thus, there would be components in development and production that are based on either mature or emerging technologies. For fully mature technologies, the manufacturer would provide most of the manufacturing development support. The design laboratory would provide a liaison to the manufacturer to ensure that the product line would meet design specifications.

For those emerging technologies, the design laboratory would have to play a substantial role in process design and manufacturing engineering, since the vendor would not yet be experienced in manufacturing new technology products. In order to optimize the reliability and cost benefits of procurement from private industry, there would be a continual emphasis on component maturation.

3.6.7.2.2 Nonnuclear GOCO Plant Role

Although a GOCO plant would always maintain the responsibility for final weapons system assembly, the universal application of the MDE concept would eventually eliminate the need for any in-house manufacturing functions but might require some in-house intermediate assembly operations.

3.6.7.2.3 Private Sector Role

Under the MDE approach, the private sector would contribute to the product through technological improvements in both component design and manufacturing processes. The private sector designers would be expected to contribute to maturing the design and technology of the product to improve manufacturing and production efficiency. They would continue to improve the technology and processes after the product has entered production to achieve further cost reduction and greater efficiency.

3.6.7.3 Differences in Management Concepts

An essential difference between the two concepts lies in the nature of the interface between the laboratories and private sector suppliers. Under MDE, the design laboratories would interface with both the private sector and GOCO plants. That is, early involvement in design and engineering for manufacturability, developmental hardware purchases, specification and schedule negotiations, product liaison, and specification exception releases. Responsibility for procurement contracts and product acceptance could be assigned to the plant performing "next assembly," as is done now, or to the design agency. Under MDC, all interfaces operate as they do today, with the essential difference being a strong push toward replacement of GOCO plant production with procurement from the private sector.

The advantages of the MDC approach lie in the utilization of the GOCO plants to interface with the private sector production plants. The experience of the GOCO plants in the establishment of optimum production practices would be utilized. As they already do extensive procurement of materials, standard parts, and high technology items, the GOCO plants have in place a sizable procurement organization. A disadvantage of the MDC approach is the cost of moving the product design from the design laboratory to the GOCO plants before it is passed to the private sector. This disadvantage is more likely to apply to new components that are based on emerging technology, because the emerging technology must be matured and transferred with the design. Examples include polymer and metal structural components, electrical devices, some detonators and batteries.

The MDE concept increases laboratory responsibilities for design and cost accountability beyond the level experienced when manufacturing is done within the DOE production plants. In addition, the designer would have to interface directly with the private sector production plant. This interface would help maintain a modern dimension to the weapons stockpile and facilitate the transfer of technology to United States industry. Extensive relationships have to be established between the designer and the producer in order to successfully meet all functional, reliability, manufacturing, and scheduling requirements. Under the MDE approach, multiple suppliers would be uncommon for emerging technologies, and new procurement procedures would have to be developed to separately fund the development (labor and new facilities) and production segments of the designer-producer relationship. These advantages are especially valid for components based on emerging technology. The MDE concept is already being applied to products such as fiber optics, specialty metals and polymer components.

The MDC and the MDE concepts may reduce the size of the DOE nonnuclear manufacturing agencies, reduce the scope of efforts necessary to modernize the nonnuclear manufacturing complex, minimize DP cost of operations, improve flexibility in order to meet changing needs, and promote the transfer of technology to and from the private sector.

3.6.7.4 Risks and Concerns of Moving to New Concepts

With the deliberate shift to the implementation of the MDC and MDE modes of operation, the nonnuclear manufacturing element would have to address and solve problems associated with the increased reliance on procurement from the private sector.

General issues are control over possible single point failures in production, classification procedures, flexibility for changes in weapons component design and build rates, and control of overall production schedules. DOE must be prepared to manage potential compromises in schedule, quality, and reliability as these approaches are implemented.

The major implementation issues involve the private sector. These include small quantity orders, reluctance to enter into government contractual agreements, technology lock-in for long build periods, classification controls, and the fact that there is little or no commercial application or interest in some technologies. It must be recognized that many unique laboratory-vendor partnerships will need to be established to assure reliability and to encourage manufacture of unique items and small quantity production runs.

3.6.7.5 Conclusion on Nonnuclear Manufacturing

DOE should continue work toward developing and implementing the MDE concept. To develop needed information, a Privatization Planning Panel is evaluating the feasibility and cost-effectiveness of expanding the outsourcing of nonnuclear components and downsizing the NNM element of the Complex. Furthermore, the Reconfiguration Project Office should coordinate the results of these efforts, determine a final position, and execute a plan to achieve maximum practical outsourcing and to downsize to one dedicated NNM facility.

3.6.8 Reconfiguration Options and Related Activities for Research, Development, and Testing

An RD&T program that supports an effective and survivable nuclear deterrent is vital. The configuration of the RD&T element depends on its role, the makeup of the nuclear weapons stockpile, and broader national security issues. To reduce RD&T costs and improve efficiency, both reconfiguration options emphasize consolidation of appropriate RD&T functions into individual Centers of Excellence. Since such consolidation is also applicable under the NEPA-required No Action alternative, it is expected to continue in the near-term and thereafter. While complete relocation of the weapons-related functions at one or more of the three national weapons laboratories is not currently defined in a reconfiguration option, further evaluation of this possibility will be undertaken.

3.6.8.1 Role of RD&T

Unlike most other types of research and development programs, the RD&T program has broad responsibilities over the entire life cycle of nuclear weapons. These responsibilities extend from maintenance of the essential scientific, engineering and materials science technology base, through advanced research, development and production of weapons for the stockpile, to maintenance and retirement of the existing stockpile. The RD&T program also has responsibilities in both safety and operational functionality. These responsibilities mean that as long as informed decisions about nuclear weapons are required, as long as a stockpile of nuclear weapons is maintained, and as long as nuclear weapons must be safely manufactured, handled, transported, repaired, tested (nuclear or nonnuclear), modernized (for safety or military requirements), or dismantled, a healthy and vigorous RD&T program is required.

3.6.8.2 Future Stockpile Requirements

As changing defense requirements and arms control initiatives reduce the number of nuclear and conventional weapons, it is imperative that the nation retain the highest confidence in the safety and reliability of its remaining weapons. To retain that confidence, it is essential to recognize that the security environment and the level of risk which society will accept may change and the character of the stockpile may evolve in response to these external forces. Greater restrictions on testing may require fundamental changes in both the character of the weapons program and of the weapons in the stockpile. The changing nature of deterrence and the continued evolution of nonnuclear technologies will likely alter weapon characteristics requirements, necessitate more flexible and robust weapons, and reduce the yield of the weapons in the stockpile. The United States may be less concerned by the threat of massive concentrations of military forces and more concerned by rearmament or proliferation of threats by smaller nations. In order to respond effectively to these challenges, fundamental changes in the design and material processes used in the production of nuclear weapons may be required.

3.6.8.3 Broader National Security Issues

Defense research and development and the strong United States scientific and technology base provide both the technological underpinnings to accomplish national security objectives and the response capability should diplomacy fail. While deployment of military hardware will decrease, research and development programs will continue to provide for selective development of appropriate hardware and, more importantly, provide assurance that threatening actions can be thwarted. A strong research and development program can promote arms control by providing protection and safeguards against accidents or cheating. It is vitally important that the United States maintain a vigorous RD&T program to avoid technological surprise and be capable of expeditiously responding to technical advances by potential adversaries.

Equally important in today's environment are the expanded roles which the national laboratories can play in the broader national security context. For example, technology transfer to United States industry can enhance economic competitiveness.

3.6.8.4 Impact on the Future RD&T Configuration

All of these factors indicate that the importance and workload of the RD&T element will probably not diminish in the future.

An important factor which influences the size of the RD&T element, is the need for independent scientific judgment, beneficial competition and peer review. In an era of fewer weapons, our confidence in the remaining ones will become more important. With large numbers of weapons of very different characteristics, isolated failures or problems may not have a major significance. On the other hand, with smaller stockpiles the potential impact of a single failure may be great. Thus, the diversity of scientific thought and the unique experience represented in the nuclear weapons laboratories will be even more important than it has been in the past. Since each successive decision will take on increased significance, it is vitally important that political and military leaders have access to a diverse pool of advisers before making a decision. Historically, only separately operated laboratories have been able to provide independent advice.

Reconfiguration of RD&T facilities includes upgrading existing operations to meet all ES&H regulations and developing new facilities to stay abreast of technology. But since the major asset of the RD&T element is scientific and engineering talent, facility investment does not dominate the yearly operating costs for the laboratories and the test site. On the other hand, some facilities are similar and, while they have unique capabilities when examined in detail, may be candidates for consolidation. Facility consolidation should be pursued to achieve operating efficiencies. Such consolidated facilities would become Centers of Excellence for common use by all laboratories.

Significant savings have already been realized at the NTS through cooperative efforts by Nevada Operations Office, the laboratories, and contractors. These efforts are continuing. Changes were addressed on an activity rather than facility basis, and could serve as a model for other studies, although activities on a single site may not be representative of those that are dispersed.

To identify other candidates for RD&T facility consolidation, feasible options should be defined and evaluated by a panel of senior consultants and DOE and laboratory management personnel. Issues basic to RD&T consolidation planning include competition, peer review, and cooperation in areas of overlap. Consideration of these policy issues should yield guidance for planning laboratory facility and activity consolidation into Centers of Excellence and user facilities.

3.6.8.5 Conclusion for Research, Development and Testing

The CRC concludes that DOE should consider consolidating laboratory facilities and activities aggressively to achieve operating efficiencies while maintaining scientific independence, needed competition, and peer review. A senior panel should be established to examine the basic defense missions of the laboratories and the issues of peer review, competition, and cooperation. This panel should provide suggestions for consolidation of RD&T facilities when such consolidation would not adversely effect the national security. Such a panel, termed the Weapons RD&T Consolidation Panel (RCP), is discussed in Section 4.2.6.

3.7 COST ESTIMATES FOR NUCLEAR MATERIAL PRODUCTION AND MANUFACTURING RECONFIGURATION OPTIONS

3.7.1 Scope of Cost Estimates

Preliminary cost estimates were developed for Reconfiguration Options A and B. These estimates, expressed in constant FY 1992 dollars, pertain to the Rocky Flats Plant, the Oak Ridge Y-12 Plant, and the Pantex Plant only.

"Reconfiguration costs" include all capital construction, capital equipment, and capital-related funding needed to relocate the functions currently performed at RFP to a new site and to either renovate or replace the Y-12 and Pantex Plants. Sensitivity analyses examined the differences between reconfiguring Y-12 and Pantex at their current sites and reconfiguring them at the same site as that selected for the relocated functions of RFP. Not included in the reconfiguration capital cost estimates are Capital Asset Management Process (CAMP) costs[4] for interim operation of existing facilities (addressed in the *Reconfiguration Five-Year Plan*). Furthermore, any potential cost avoidances associated with relocation of RFP and possibly Y-12 and/or Pantex functions to particular sites (with varying amounts of infrastructure already existing) have not yet been developed. The elements considered in the reconfiguration cost estimate are summarized below:

- Capital costs included in reconfiguration relate to those facilities at Rocky Flats, Y-12, and Pantex which will be replaced or substantially upgraded as a result of the Secretarial Record of Decision (ROD) on Complex reconfiguration. As mentioned above, capital costs of facilities required to keep the Complex operational regardless of the outcome of the ROD are part of "transition activities" and are not included in reconfiguration costs. Capital costs, as used in this study, are equivalent to the Total Estimated Cost (TEC) used in project descriptions.

- Planning and project support includes those operating funds required to examine technical options for facilities to be reconfigured and to prepare the Conceptual Design Reports for those facilities. Subsequent planning costs would be included within the Line Item Construction funding for the approved projects.

- Startup/switchover costs include interim operations; personnel costs for employee relocations, terminations, hiring, security clearances, and training; and operational transition/startup costs related to the process of testing new facilities and switching operations from existing facilities to replacement facilities.

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[4] It should be noted that the costs developed through CAMP are primarily to support the capability of the current plants to continue operations in today's environment and are not the same as costs that would be incurred in reconfiguration of the Complex.

It should be noted that capital costs combined with planning and project support and startup/switchover costs are equivalent to Total Project Cost (TPC) commonly used in project descriptions. As noted above, all costs are shown in constant FY 1992 dollars.

3.7.2 Cost Estimating Techniques

Several techniques were used to estimate costs of the various elements described in Section 3.7.1. The techniques applied to each of the cost elements are described below:

- Capital costs were estimated by analyzing costs experienced for representative, fully compliant facilities and conducting parametric studies for the specific facilities evaluated. Where possible, costs were derived from similar facilities already constructed. Equipment costs were based on current pricing information from appropriate manufacturers.

- Planning and project support cost estimates were obtained by applying appropriate scaling factors to the actual costs of completed projects.

- Startup/switchover costs were also estimated from cost experience with facilities of similar complexity.

With a substantial reduction in stockpile requirements anticipated and a significant degree of uncertainty as to how much those requirements might vary during the lifetime of Complex-21, the CRC examined the use of modular facilities to minimize life cycle costs and provide future flexibility. A two-step process was used for assessing the cost implications of modular reconfiguration. The first step was a technical analysis of the feasibility of applying modularity to the missions of NMP&M plants within the context of expected workload scenarios. The second step was to develop estimates of resource requirements (funding, floor space, personnel, etc.) necessary to reconfigure the Complex using the number of modular units appropriate to each of those scenarios or cases. For this step, parametric estimates from previous studies and projects along with scoping estimates were employed to develop cost estimates for each set of conditions evaluated.

Both one-shift and two-shift operations (five-day work week) were examined where feasible. Four annual workload levels, corresponding to the four stockpile cases of Section 3.2.1, were examined. Workload Level I represented the highest, and Level IV the lowest, production rate.

All variables are sensitive to change with the possible exception of shift numbers, particularly for Pantex and RFP. There are functions where some equipment is, by design, required to operate during more than one shift, which thereby limits the capacity for the overall process. Therefore, adding shifts at other points in the process will not increase the total mission output. Estimates provided by Y-12 tend to confirm that two shifts could produce more than a single shift. However, the lower capital costs of a smaller sized plant would be offset at least partially by higher operating expense (i.e. additional payroll). The preliminary analysis early in this study indicated insufficient productivity gain and cost-effectiveness to warrant second shift operation as the contingency method of meeting unforeseen increases in demand. Consequently, the later analysis focused on single shift operation in the development of total costs for modular plant operation.

The resulting costs should be considered rough approximations because the best available data on cost of similar processes is derived from old technical designs and facilities of considerably larger capacity. At this early stage of concept formulation, the accuracy of estimates is considered to be within plus or minus 50 percent. The uncertainty introduced by reliance upon scaling ratios and older technical designs will be reduced prior to the early FY 1994 Record of Decision by hiring an architectural and engineering firm to develop preconceptual designs of facilities optimized for specific production rates, geographical sites, and process technologies.

It should also be noted that cost estimates did not account for expected savings and efficiencies which will accrue from such efforts as standardizing weapons designs, not requiring production facilities to produce several diverse product streams at once, and selection of state-of-the-art technology. Development of cost-saving initiatives in these areas is being aggressively pursued and will be available when the decision for the configuration of Complex-21 is made in early FY 1994. Likewise, cost increases which will result from the ES&H considerations developed by Team B have not yet been well defined. These will also be ready for the decision on Complex-21.

3.7.3 Costing Methodology for Capital Costs

As discussed in Section 3.2, the modular facility concept offers an opportunity to reduce the capital cost of reconfiguration while preserving both the flexibility to rapidly accommodate changes in workload level and to efficiently incorporate future significant advances in technology. Since the Complex has not extensively employed modularity in recent years, a methodology was needed to develop estimated costs for reconfiguration of the NMP&M element.

Two fundamentally different concepts of applying modularity were considered to provide upper and lower bounds on costs for facilities that could satisfy the production requirements for each stockpile case.

- Approach 1. The physical plant (structure) and equipment could both be sized to the lowest capacity case (i.e., Stockpile Case IV). The basic module's size would be governed by either the lowest build rate or the minimum feasible capability/capacity. (In some situations the minimum feasible capability/capacity may be higher than the minimum build rate). Further increments (modules) of both structure and equipment would then be added as needed to meet capacity requirements of higher stockpile cases.

- Approach 2. The physical plant could be sized to meet the highest expected build level (i.e., Stockpile Case I) but the plant's equipment would be sized for the lowest capacity case. Equipment modules would then be added to the vacant space in the plant as stockpile requirements increase.

Figure 3.4 illustrates the differences between these two approaches to achieving modularity. In addition to the basic differences in approach, there are also practical problems of real world application.

While there are many functions that can readily be scaled up or down by the addition or subtraction of equipment, there are also many functions in which the basic module of equipment would far exceed the capability needed for the smallest stockpile case and, in some cases, even exceed the capacity requirements for the largest stockpile case considered. One example of this is X-Ray equipment needed for nondestructive analysis. Once the equipment has been procured and installed, it has the capacity to analyze from one to many hundreds of weapons per year. Consequently, for such items, there is no difference in cost between that required by the module for the smallest stockpile case and the module appropriate for the largest stockpile case.

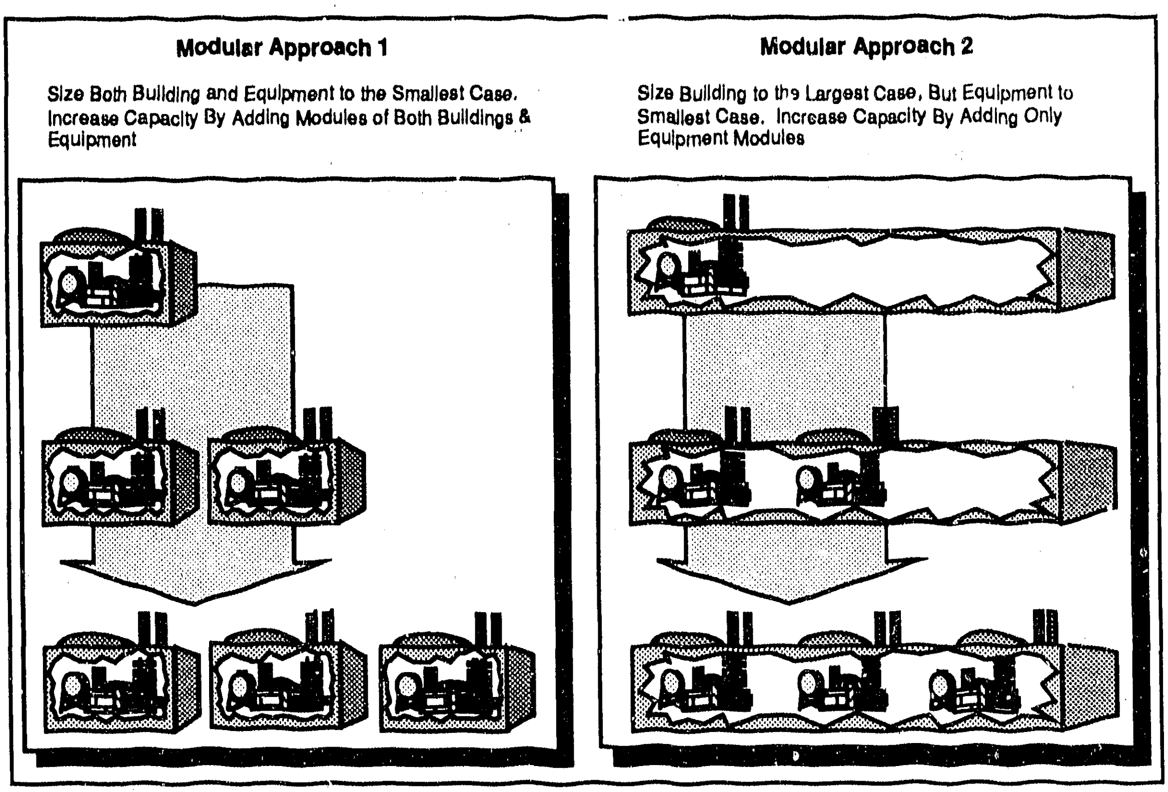


Figure 3.4.–Alternative Approaches to Modular Facility Design.

In this study, modularity was applied to reconfiguring the Rocky Flats, Y-12, and Pantex Plants by:

- Identifying the major components of each plant to be reconfigured,
- Identifying the functions within each component, and
- Dividing the functions into equipment modules. Administrative facilities do not have manufacturing or processing equipment and are, therefore, handled as a single unit.

The Rocky Flats Plant can be divided into three components: a manufacturing facility, a plutonium processing facility, and infrastructure. Infrastructure includes utilities and production support. Equipment modules were defined only for the functions in the manufacturing facility and plutonium processing facility since the other RFP components cannot be efficiently modularized. The modular equipment structures for the four stockpile cases are shown in Figures 3.5 (Plutonium Component Manufacturing Facility) and 3.6 (Plutonium Processing Facility). The approximate capability of each module and the number of modules required to achieve the production level specified by each stockpile case are indicated.

It should be noted that the basic modules for the functions of fabrication, inspection, classified process, and nondestructive testing have an inherent capability/capacity to exceed even the requirements for the largest stockpile case examined. Thus, for those functions, modularity offers no opportunity to reduce investment by sizing for the lowest stockpile case. For other functions such as foundry or alloy stream "B," however, there are potential cost savings should it be decided to purchase only the capability needed for stockpile cases II, III, or IV.

The Y-12 Plant can be divided into five major components: an enriched uranium facility, a depleted uranium facility, a lithium facility, production support facilities, and utilities. The production support facilities and utilities need be considered only in Reconfiguration Option B. Existing production support facilities and utilities would be used if Option A is selected. Each of the first three components are further segmented into functions, and then into equipment modules.

Figures 3.7 through 3.9 depict the approximate capability of each module and the number of modules required in an enriched uranium facility, a depleted uranium facility, and a lithium facility, respectively, to achieve the production levels required for each of the four stockpile cases. The basic unit capabilities for many of the modules exceed the requirements for the largest stockpile case examined.

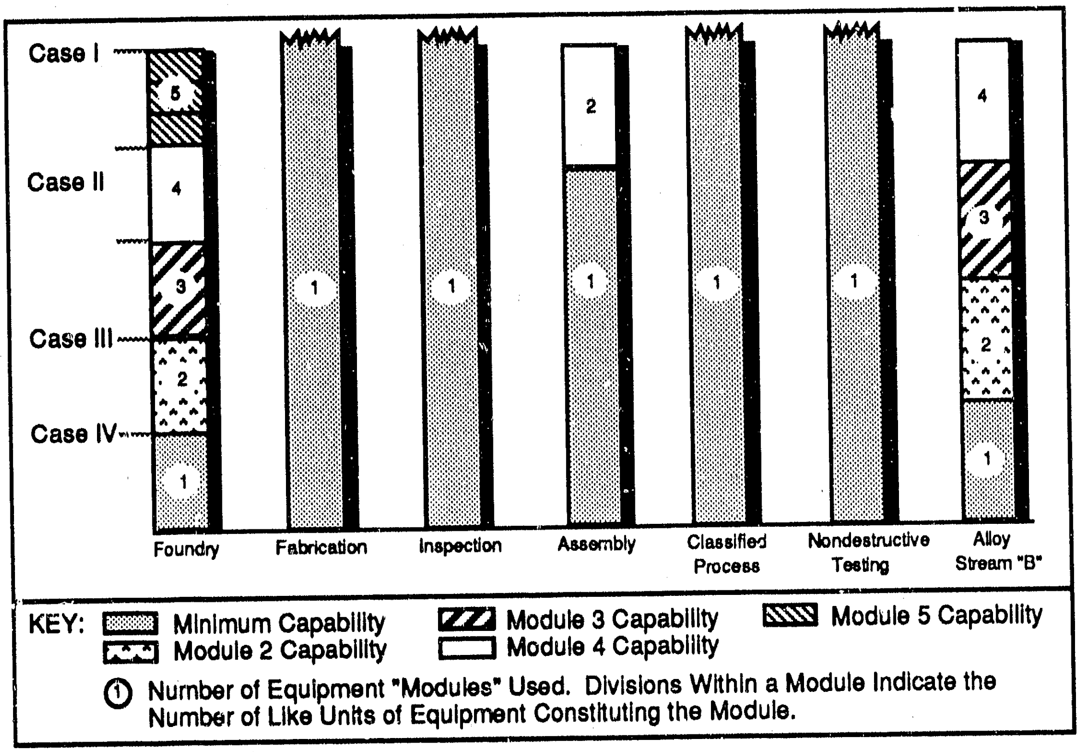


Figure 3.5.–Modules Required to Size a Plutonium Component Manufacturing Facility for Various Stockpile Cases.

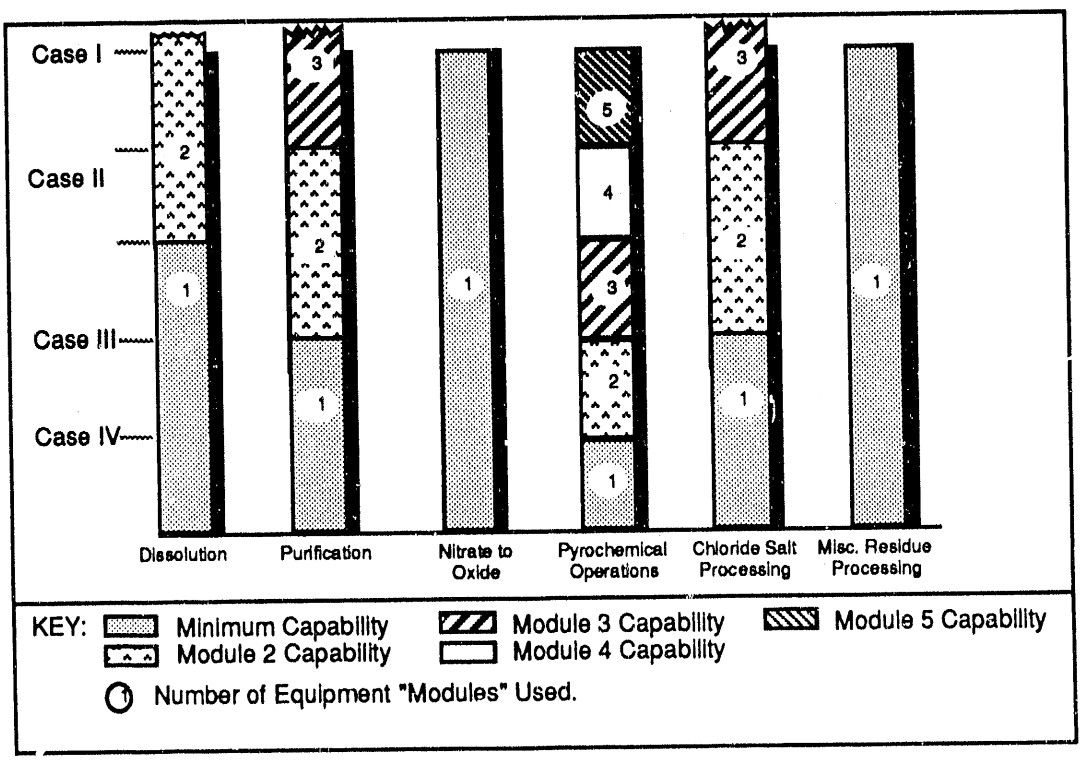


Figure 3.6.–Modules Required to Size a Plutonium Processing Facility for Various Stockpile Cases.

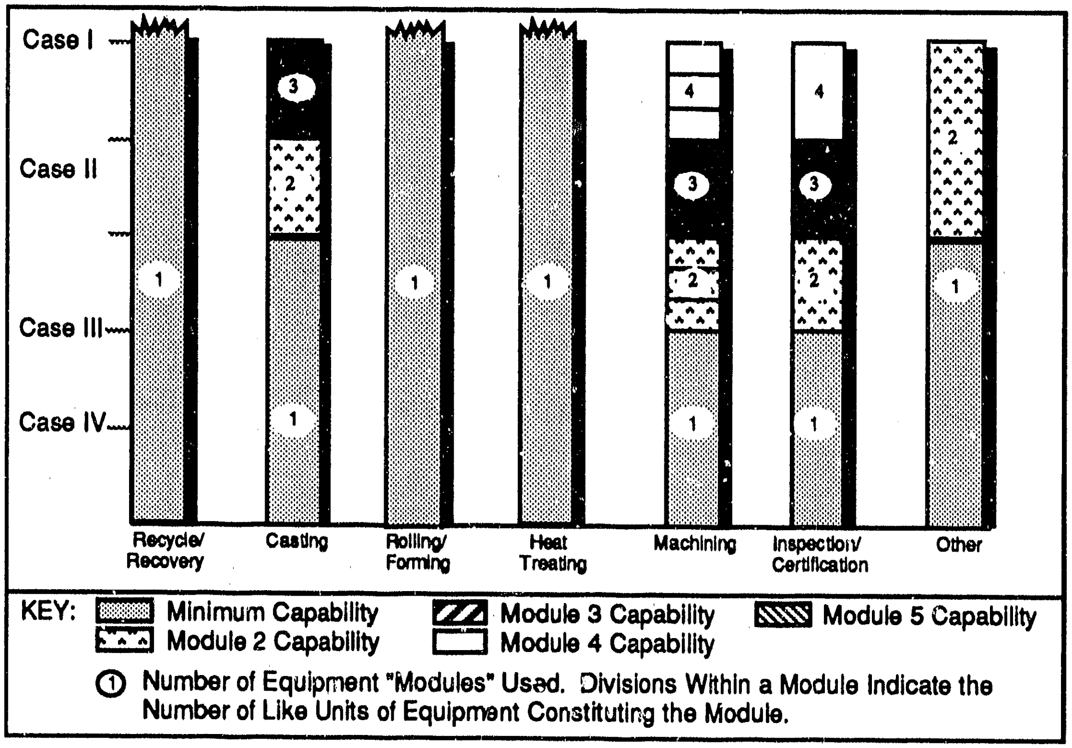


Figure 3.7.–Modules Required to Size an Enriched Uranium Facility for Various Stockpile Cases.

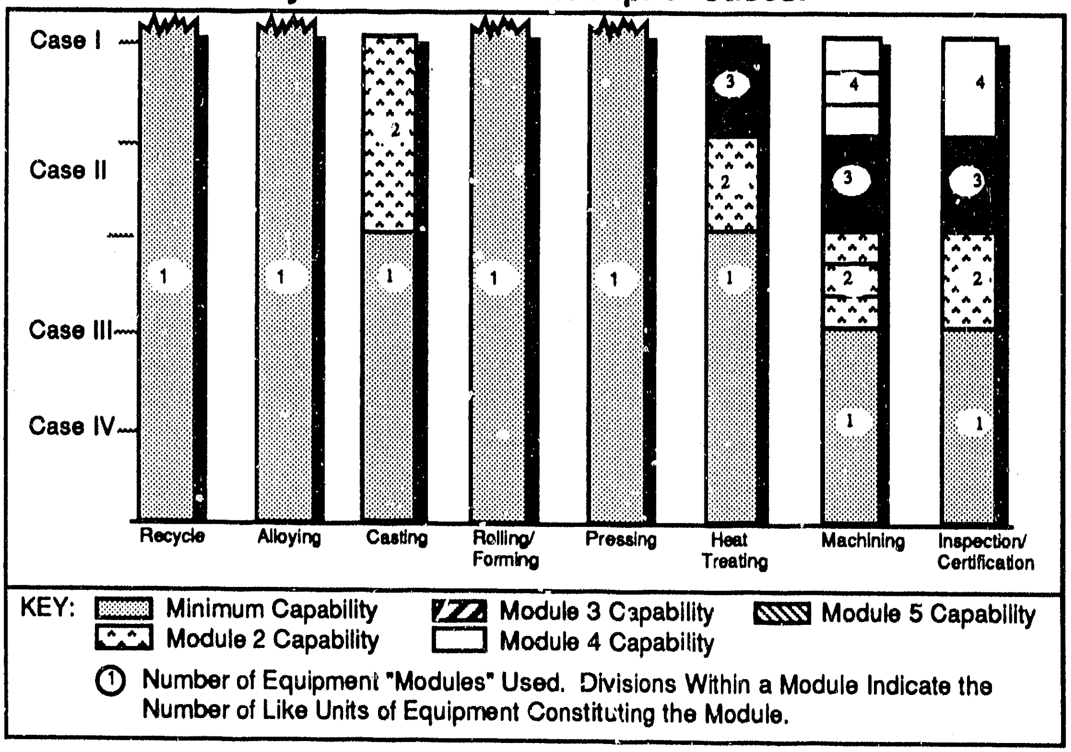


Figure 3.8.–Modules Required to Size a Depleted Uranium Facility for Various Stockpile Cases.

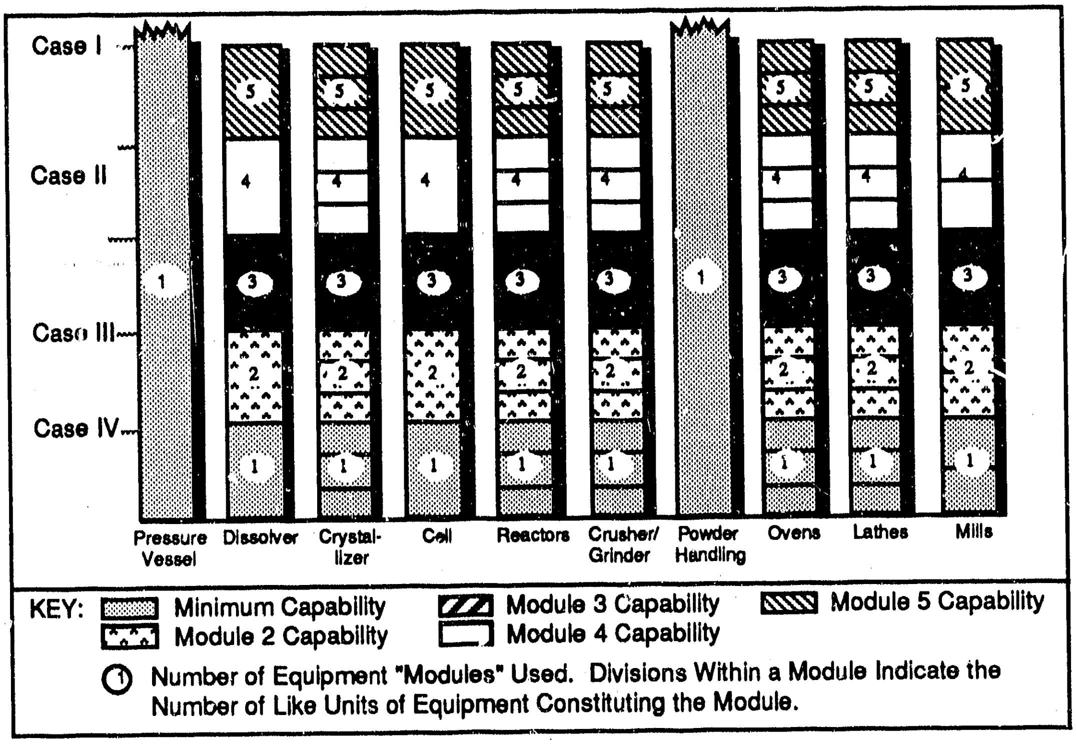


Figure 3.9.–Modules Required to Size a Lithium Facility for Various Stockpile Cases.

Figure 3.9 provides an example of the variation in equipment modules required for specific functions of a modular lithium factory at various levels of production. As shown in this figure, the basic pressure vessel and powder handling modules would not only fulfill requirements for the smallest workload case, but also meet or exceed the requirements for the largest workload case. The number of equipment modules needed for other functions varies from one to five, depending upon the workload anticipated.

The Pantex Plant can be divided into four components: explosives fabrication, weapon assembly/disassembly, production support facilities, and utilities. Costs of replacing the production support facilities and utilities need be considered only if Reconfiguration Option B is selected.

Figure 3.10 depicts the approximate capability of each module for the explosive fabrication and weapon assembly/disassembly components and the number of modules required to achieve the production levels specified by each stockpile case examined.

When the capacity of the basic module represents a large increment of the total workload, the advantage of add-on modules begins to diminish. At some point it becomes less expensive to initially build the functional structure to the higher workload requirements and to add more equipment within the structure to meet increases in demand when they develop. The determination of that point is an

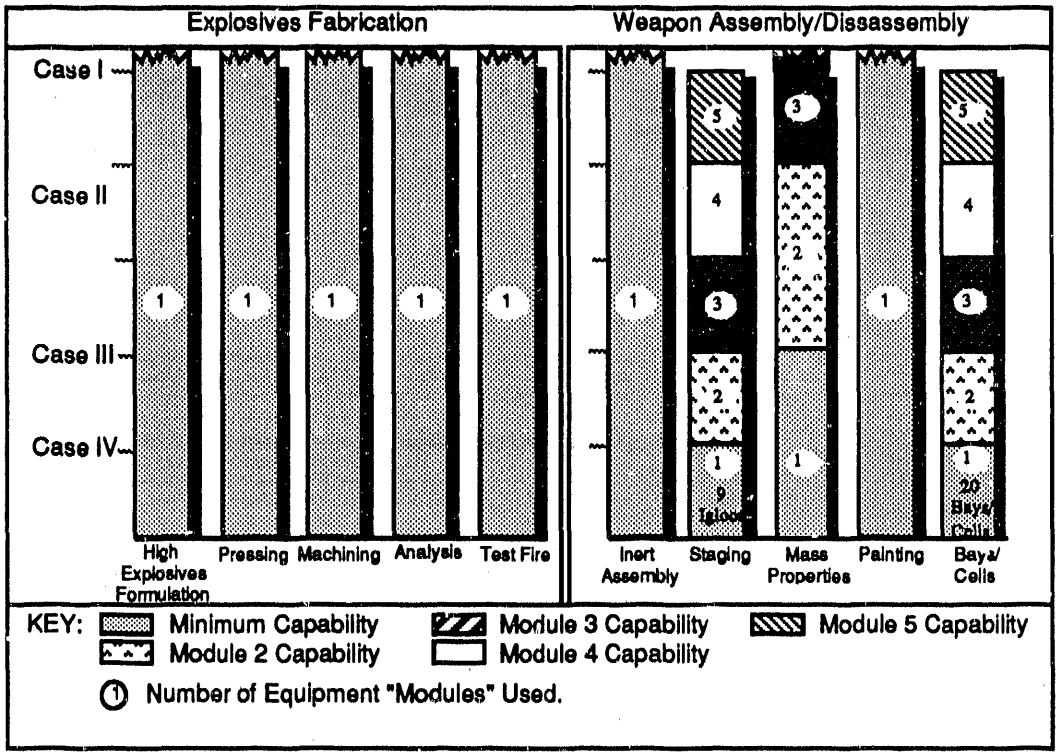


Figure 3.10.–Modules Required to Size an Explosives Fabrication Facility and Weapons Assembly/Disassembly Facility for Various Stockpile Cases.

important part of the cost analysis and a significant consideration in selecting the preferred approach to modular design.

3.7.4 Costing Assumptions

For purposes of this resource analysis, the following assumptions were used:

- Utilities/Production Support– Utilities such as electricity, water, and gas/oil were assumed to exist at site boundaries, but the necessary on-site utilities (steam, sewers, radioactive and hazardous chemical treatment, storage and shipping, electrical distribution systems, communications, emergency backup systems, etc.) are also included in the cost estimates. Production support functions such as fire stations, administrative offices, laundry, and cafeterias are also included in the estimates. This is a particularly important cost element in moving to a new or "green field" site.

- State of Site Development– The site for consolidation of NMP&M plants was assumed to be a green field site; i.e., no support infrastructure was assumed to be already available. This assumption simplified the costing problem by eliminating from consideration the significant variations in types and condition of supporting infrastructure preexisting at individual sites. The result was to conservatively estimate the upper bound of costs by assuming the worst case of supporting infrastructure construction costs for Reconfiguration Option B.

- Stockpile Drawdown– Those Recovery and Storage Facilities necessary to support stockpile drawdown (weapons retirements) were assumed to be provided during the transition period and costs were not calculated.

3.7.5 Results of Cost Analysis

3.7.5.1 Specific Functions Covered in Reconfiguration Capital Costs

- For the relocation of the Rocky Flats Plant the following capital costs are included:
  - Manufacturing functions (see Figure 3.5),
  - Plutonium processing functions (see Figure 3.6), and
  - Utilities/production support.
- For the analysis of the Y-12 Plant, the following costs are included:
  - Enriched uranium facility (see Figure 3.7),
  - Depleted uranium facility (see Figure 3.8),
  - Lithium facility (see Figure 3.9), and
  - Utilities/production support (only if the Y-12 Plant is relocated as part of option B).
- For the analysis of the Pantex Plant, the following costs are included:
  - Explosives fabrication facility(see Figure 3.10),
  - Weapons assembly/disassembly facility (see Figure 3.10), and
  - Utilities/production support (only if the Pantex Plant is relocated as part of Option B).

3.7.5.2 Reconfiguration Capital Cost Estimates

The capital costs of reconfiguring the three sites via Options A and B are illustrated in Figures 3.11 through 3.12. As indicated in Figure 3.11, the relocation of RFP occurs in both Options A and B. Consequently, the cost of relocating RFP does not vary by option. There are, however, cost differences due to the choice of using either Modular Approach 1 or Modular Approach 2. For Y-12 and Pantex (Figures 3.12 and 3.13), costs vary both by choice of reconfiguration option and modular approach. In all three figures, the costs shown are the total capital costs for the facilities described in Section 3.7.5.1. The sums of the reconfiguration capital costs for all three sites are provided in Figure 3.14.

In reviewing these figures and tables it should be remembered that there is a significant degree of uncertainty in the precision of cost data at this stage of data development. Yet, there appear to be trends in the relationships between the two modular approaches that would be very meaningful if confirmed by subsequent, more definitive cost analysis. Some of the more significant observations concerning these costs are described below:

- Total capital costs of downsizing and modernizing Y-12 and Pantex in place and relocating RFP (Option A) range from $4.2B to $6.3B, depending upon the stockpile case selected for sizing. It is worthy of note that the cost difference between the lowest and highest cases is $2.1B using Approach 1, but only $0.5B under modular Approach 2.

- Similarly, Approach 1 has the greatest variation in costs for the consolidation of RFP, Y-12, and Pantex (Option B), ranging from $8.0B to $11.1B, depending upon sizing case. With Approach 2, there is only $0.6B difference between the highest and lowest sizing cases. This indicates the relative influence of structure costs versus equipment costs and the degree to which the basic modules of equipment for heavy metals processing and manufacturing are relatively insensitive to workload differences in the range of stockpile sizes considered.

- The cost of downsizing and modernizing Y-12 and Pantex in place and relocating RFP (Reconfiguration Option A) is expected to be about 50-60 percent of the total cost of consolidating RFP, Y-12, and Pantex at a green field site. Thus, the decision on disposition of RFP functions is perhaps the key decision of the entire Complex-21 ROD.

- If one is confident that there is little likelihood that the future stockpile requirements will be greater than Cases III or IV, there is a significant cost advantage to choosing modular Approach 1. Approach 1 would also have the further advantage of a significantly lower cost in the early years, during which there will almost

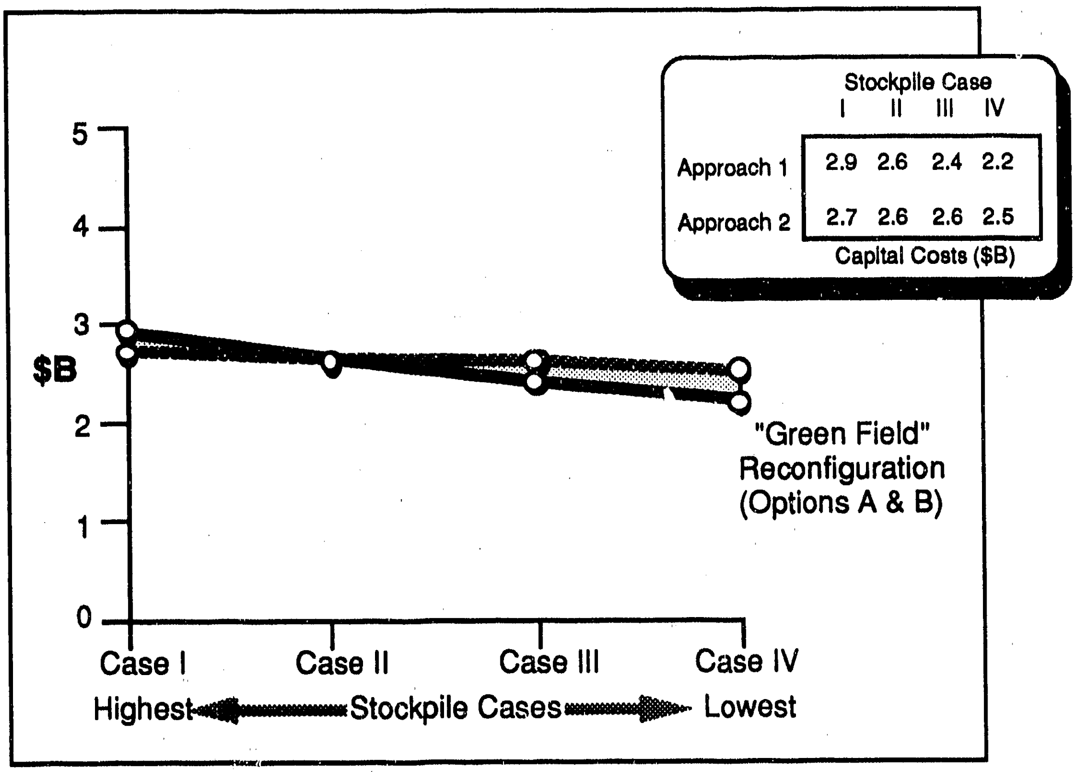


Figure 3.11.–Capital Costs for Reconfiguration of Rocky Flats Plant.

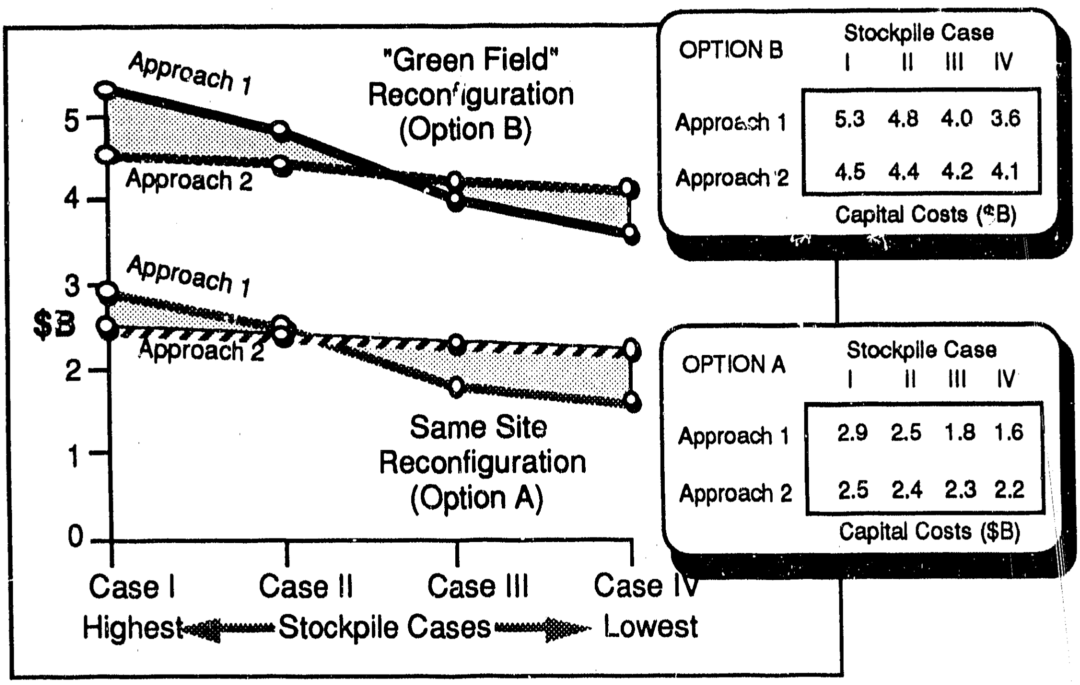
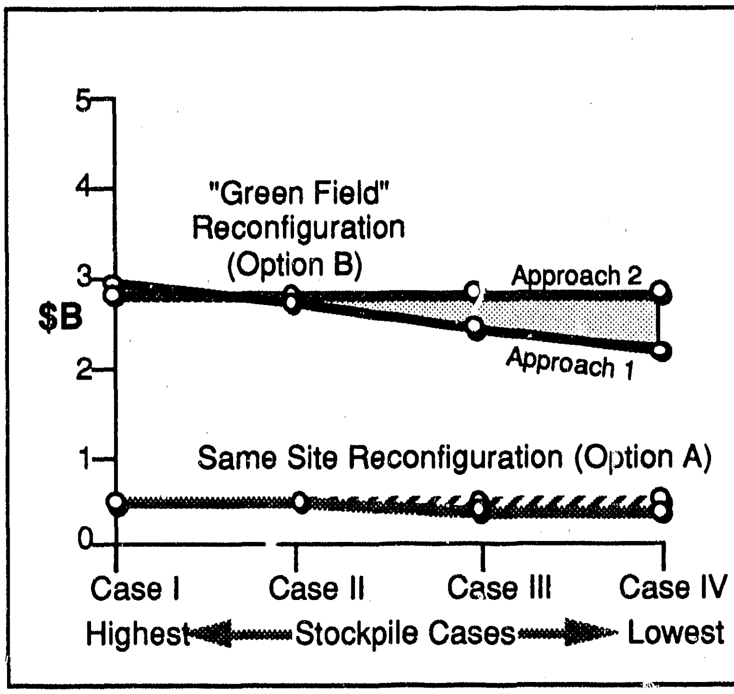


Figure 3.12.–Capital Costs for Reconfiguration of Y-12 Plant.



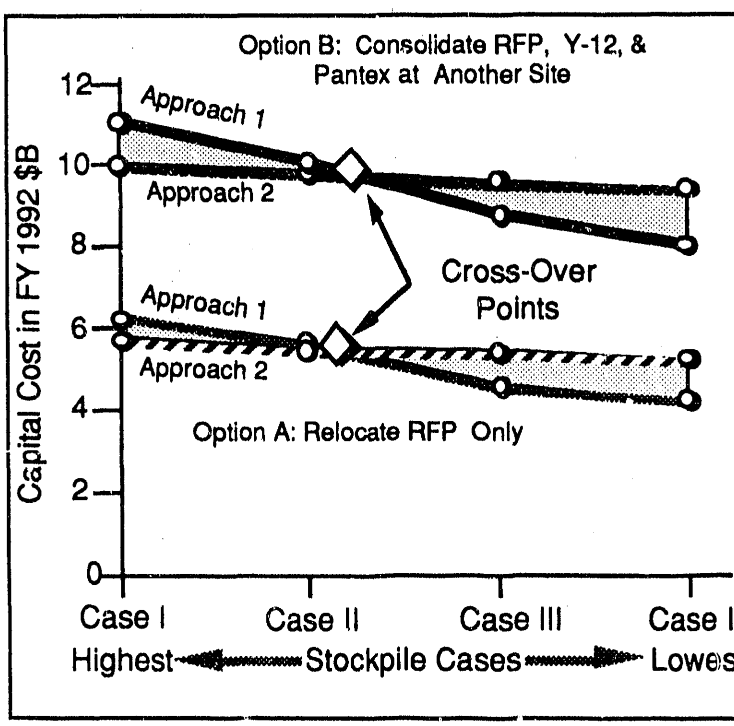
OPTION B	Stockpile Case I	II	III	IV
Approach 1	2.9	2.7	2.4	2.2
Approach 2	2.8	2.8	2.8	2.8

Capital Costs ($B)

OPTION A	Stockpile Case I	II	III	IV
Approach 1	0.5	0.5	0.4	0.4
Approach 2	0.5	0.5	0.5	0.5

Capital Costs ($B)

Figure 3.13.–Capital Costs for Reconfiguration of Pantex Plant.



OPTION B	Stockpile Case I	II	III	IV
Approach 1	11.1	10.1	8.8	8.0
Approach 2	10.0	9.8	9.6	9.4

Capital Costs ($B)

OPTION A	Stockpile Case I	II	III	IV
Approach 1	6.3	5.6	4.6	4.2
Approach 2	5.7	5.5	5.4	5.2

Capital Costs ($B)

Figure 3.14.–Total Capital Costs for Reconfiguration of RFP, Y-12, and Pantex.

certainly be intense competition for resources. On the other hand, if there is a perceived need to support stockpile requirements on the order of Cases II or I at some point within the life of Complex-21, modular Approach 2 could potentially produce savings of $0.6B to $1.1B.

- Although the data appears to suggest significant differences between the two options, those differences would probably not be as great if cost savings resulting from shared infrastructures were developed. For example, support and utilities infrastructure alone accounts for $1.5 billion of the Y-12 relocation estimate. Additionally, the cost estimates for the lower stockpile projections would probably be reduced if conceptual designs incorporating optimum modular construction concepts were to be developed.

- A new concept now being evaluated would capitalize on the extensive architectural and engineering work already done for the recently terminated Special Isotope Separation (SIS) Plant. Although the SIS Plant will not be built, the design of the structure which would have been built to house it is almost complete. That design includes all of the safety and health protection features needed for working with plutonium and the highest level of safeguards and security. It includes chemical separation processors and could be relatively inexpensively modified to house plutonium recycle and recovery and plutonium pit fabrication instead of the Atomic Vapor Laser Isotope Separation process of the SIS.

  By adapting this structural design for the different mission and for characteristics of the yet-to-be-chosen site, a plutonium processing facility to replace Rocky Flats Plant could be completed more quickly and at lower cost than a new start design. The design of this plant would accommodate production requirements at a level between Level II and Level III. This approach also assumes greater use of some advanced technologies and assumes a greater degree of weapons standardization than do the other estimates. Standardization of weapons design and use of advanced technologies is an integral part of the next step in Complex-21 development. This example may give an indication of the cost savings which could be achieved.

3.7.5.3 Reconfiguration Non-Capital Cost Estimates

Non-capital cost estimates by site for reconfiguring the Complex are presented in Table 3.3. Several clarifying explanations are needed to understand these results:

- The RFP non-capital costs are the same for Options A and B because RFP is relocated in both cases. The startup/switchover costs reflect

OPTION A (Relocate RFP Only)	Project Planning & Support	Startup/ Switchover	Total Non-Capital Costs
	Costs in FY 1992 $B		
Pantex	N/A	N/A	N/A
RFP	0.4	1.0	1.4
Y-12	0.3	0.8	1.1
Total	0.7	1.8	2.5

OPTION B (Relocate All 3 Sites)	Project Planning & Support	Startup/ Switchover	Total Non-Capital Costs
	Costs in FY 1992 $B		
Pantex	0.1	0.5	0.6
RFP	0.4	1.0	1.4
Y-12	0.6	1.5	2.1
Total	1.1	3.0	4.1

Table 3.3.–Non-Capital Reconfiguration Costs by Site.

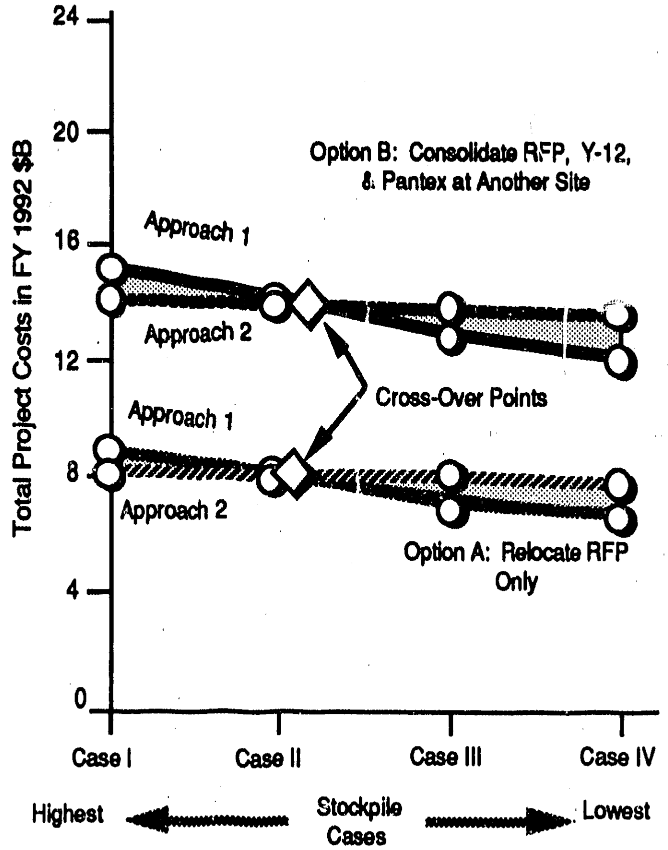
the need to maintain plutonium operations at RFP and begin the operation at the new site during the switchover period (assumed to be three years).

- At the Y-12 Plant, Option A (Downsizing and Modernizing in Place) non-capital costs are also high. Most of these costs are due to the need to concurrently operate old and new facilities during transition.

- The non-capital costs associated with consolidation of Y-12 and Pantex with a relocated RFP are estimated to be about $1.6B greater than they would if Y-12 and Pantex were modernized in place. This is principally due to the additional startup and switchover costs associated with the establishment of dual work forces (at a different site) if Y-12 and Pantex are relocated.

3.7.5.4 Total Project Costs

Figure 3.15 illustrates the Total Project Cost relationships between the two reconfiguration options and the two modular approaches. Total Project Costs are



	Stockpile Case I	II	III	IV
Approach 1				
Capital	11.1	10.1	8.8	8.0
Non-Capital	4.1	4.1	4.1	4.1
Total Costs	15.2	14.2	12.9	12.1
Approach 2				
Capital	10.0	9.8	9.6	9.4
Non-Capital	4.1	4.1	4.1	4.1
Total Costs	14.1	13.9	13.7	13.5

Capital & Non-Capital Costs ($B)

	Stockpile Case I	II	III	IV
Approach 1				
Capital	6.3	5.6	4.6	4.2
Non-Capital	2.5	2.5	2.5	2.5
Total Costs	8.8	8.1	7.1	6.7
Approach 2				
Capital	5.7	5.5	5.4	5.2
Non-Capital	2.5	2.5	2.5	2.5
Total Costs	8.2	8.0	7.9	7.7

Capital & Non-Capital Costs ($B)

Figure 3.15.–Total Project Costs for Reconfiguration Options.

the sum of capital and non-capital costs of reconfiguration. As discussed above, Approach 1 would be the preferred modular concept for both Option A and Option B if one felt confident that the future stockpile requirements would be closer to Cases III and IV than I and II. The crossover point for Option B is at Case II and very near Case II for Option A, indicating that Approach 2 is significantly favored only if Case I were a likely requirement.

3.8 DECONTAMINATION AND DECOMMISSIONING (D&D) COSTS AND REMEDIATION COSTS

The Department of Energy and its predecessors have been operating at most of these sites for 30-40 years. At some sites, the Department's operating history exceeds 40 years. The nature of the Department's operations are such that, in many cases, contaminated equipment and material is produced. This equipment and material must be removed and disposed of when DOE's operations are terminated. In most cases, this is a fully anticipated consequence of production operations. In these instances, the costs associated with laying-up or disassembling, decontaminating, removing, and disposing of property and equipment are referred to as decontamination and decommissioning (D&D) costs.

The costs associated with cleaning up contamination or mitigating or reversing adverse impacts which exceed normal limits are referred to as remediation costs. While the Department has always sought to observe the best engineering and management practices with regard to the operation of its plants, there have been dramatic changes in both the Department's understanding of the impacts of its operations on workers, the public, and the environment, and the standards and acceptable practices, particularly in the areas of the environment, safety, and health, with which the Department must comply. Consequently, a significant amount of remedial action is needed at some DOE sites.

The D&D and remediation costs which may be required at various DOE sites are a consequence of the Department's operating history and are not directly related to reconfiguration. They are expected to be substantial, and a significant part of the Department's budget for years to come. There is a possibility that the Department might be able to reduce the total costs of decontaminating and decommissioning retired facilities and remediating abandoned sites through the use of advanced technologies. For this reason, it may be desirable to defer some remedial actions or D&D activities. In these cases, the affected facilities would be placed in a safe, stable condition, and the sites would be secured and restricted for other uses.

The DOE Office of Environmental Restoration and Waste Management (EM) was formed by the Secretary of Energy specifically to address the complicated issues associated with the treatment and disposal of the DOE's waste products and the D&D and remediation of its production sites. EM will be responsible for developing and implementing the Department's policies with regard to the cleanup and restoration of any facilities which are shutdown or relocated as a result of reconfiguration. Such facilities will be transferred to EM once DP operations are terminated.

The D&D and remediation costs presented in the paragraphs below are included in this study only to provide a clearer estimate of the total funding which DOE will require. It should be noted that substantial uncertainties remain in establishing these costs, including such issues as what environmental standards must be met by cleanup activities. Thus, these costs are primarily useful to compare the relative costs of the options presented. For the purposes of analyzing Complex configuration options, the CRC has determined that D&D and remediation costs should be estimated for the potentially affected sites in FY 1992 dollars.

Decontamination and decommissioning costs were estimated by the same methodologies used by EM in developing their *Environmental Restoration and Waste Management Five-Year Plan.* Only the costs associated with the Pantex, Y-12, and Rocky Flats Plants were estimated because only those plants are being considered for reconstruction and/or relocation. Where possible, estimates were derived through comparisons with similar projects in that plan and with historical data for completed and ongoing activities. Remediation costs were estimated using the same techniques and comparisons.

Table 3.4 illustrates the estimated D&D and remediation costs for all three sites. Notice that there are some differences depending upon the reconfiguration option being considered. The D&D and remediation costs for the Rocky Flats Plant are the same for Options A and B, because the site would be shutdown and handled in the same manner regardless of which option were chosen.

D&D and remediation costs at the Y-12 Plant are high for both options, because of the large amount of physical plant involved and the fact that significant act-

Costs in FY 1992 $B

OPTION A	D&D	Remediation
Pantex	0.1	0.0
RFP	1.5	0.3
Y-12	1.8	1.2
Total	3.4	1.5

Costs in FY 1992 $B

OPTION B	D&D	Remediation
Pantex	0.5	0.1
RFP	1.5	0.3
Y-12	3.0	2.0
Total	5.0	2.4

NOTE: Costs Are Rough Estimates Only

Table 3.4.–Estimated D&D and Remediation Costs for Pantex, Rocky Flats, and Y-12 Plants.

ions must be taken to allow the plant to be rebuilt. Even if the Y-12 Plant is rebuilt in its current "footprint," a large amount of contaminated equipment and material must be removed or stabilized to facilitate construction. If the site is to be abandoned and restored to unrestricted use, significantly more intensive operations are required. Thus, the D&D and remediation costs for the Y-12 Plant associated with Option B are considerably higher.

The Pantex Plant is relatively new, in generally good condition, and involves activities which do not produce large amounts of waste or contamination. Thus, its D&D and remediation costs would be relatively small if it were to be relocated. The primary costs associated with relocating the Pantex Plant (Option B) are those arising from the decontamination of routine work areas.

3.9 SELECTING THE BEST CONFIGURATION FOR COMPLEX-21

The selection of the best configuration option for Complex-21 is one of the most important and far-reaching decisions regarding nuclear deterrence to be faced by the nation since World War II. The process leading to that decision must develop and consider best estimates of the national security needs of the nation, the still evolving concerns and requirements for ES&H assurance, environmental impacts on each of several prospective site choices, the potential for reducing costs through technological innovation, and the relative costs and benefits of options and suboptions. Preparation for that decision should, therefore, involve detailed analysis and risk assessment as well as full and open public disclosure and participation in identifying and addressing the relevant issues. The centerpiece of that process will be a PEIS. It will include public participation and be supported by site evaluation studies, architectural and engineering studies, technology assessments and trade-off analyses, as discussed in Chapter 4. The culmination of the process will be a formal Record of Decision, currently expected to occur in early FY 1994.

Chapter 4

Setting a Course Toward the Future Vision: Activities Supporting Development of Complex-21

CHAPTER 4

SETTING A COURSE TOWARD THE FUTURE VISION: ACTIVITIES SUPPORTING DEVELOPMENT OF COMPLEX-21

The purpose of this chapter is to describe the process of achieving Complex-21. It begins with a discussion of the types of activities occurring during the three phases of developing Complex-21. Next is a description of the Reconfiguration Project Office, the proposed organization to steer the course toward Complex-21. Finally, the chapter addresses the strategy for National Environmental Policy Act compliance and the plan for development of a Programmatic Environmental Impact Statement. Much of the information in this chapter was developed by Team D.

4.1 PHASES OF DEVELOPING COMPLEX-21

Chapter 3 discussed the vision of Complex-21. This chapter discusses activities that will help achieve that vision. These activities will begin now and culminate in the full operation of Complex-21. Executive level management and leadership will be provided by the Reconfiguration Project Office (RPO). Key phases of this process include:

- Phase I: Developing the Reconfiguration Programmatic Environmental Impact Statement (PEIS), required by NEPA, which will lead to a Secretarial Record of Decision (ROD) covering the specific configuration selected for Complex-21.

- Phase II: Developing detailed designs and satisfying project specific and site specific NEPA requirements for the selected Complex-21 configuration.

- Phase III: Constructing, testing, and certifying Complex-21, resulting in full operation.

These phases are depicted in Figure 4.1. It should be noted that Phase III stretches to about 2015. It is a goal of the reconfiguration effort to have Complex-21 fully operational well before 2015. This is technically possible. However, potential legal and regulatory requirements and resource limitations may impose delays that are difficult to predict. Recent history indicates substantial delays are not only possible, but likely. Thus, 2015 was selected as a date by which either option for Complex-21 could be fully functional, even with many delays. The succeeding sections describe the activities in more detail.

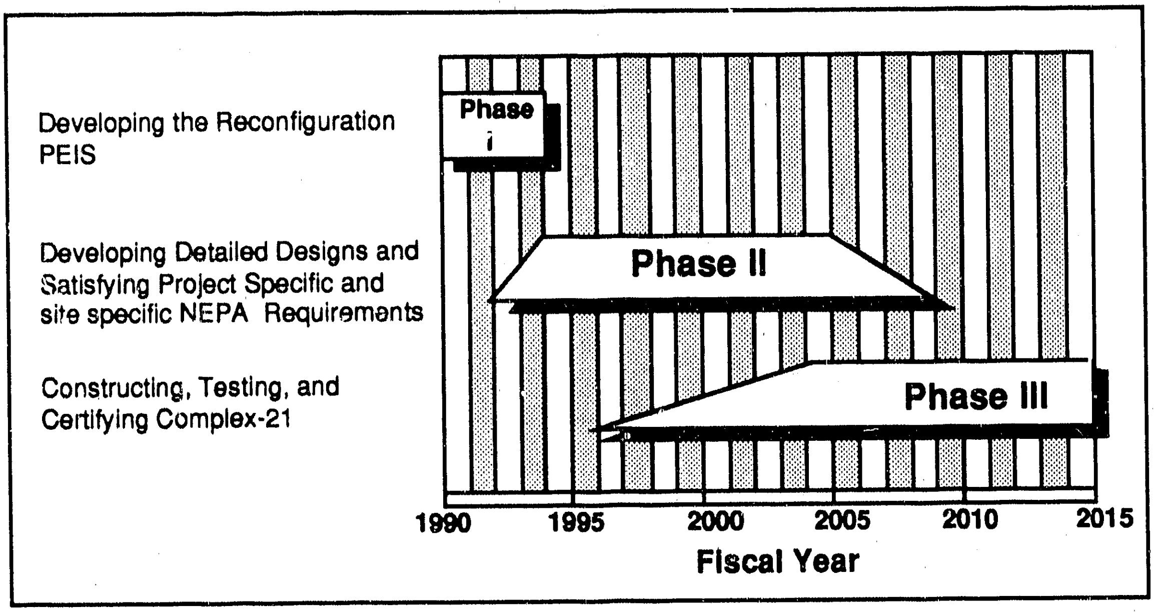


Figure 4.1.–Phases of Development.

4.2 ESTABLISHING A RECONFIGURATION PROJECT OFFICE

Reconfiguration of the Nuclear Weapons Complex is a multi-year, multi-billion dollar task. The CRC has begun the task. Continuing successful execution will require constant management, leadership, and advocacy. It is clear that a dedicated organization will be required to continue the effort. The RPO is that organization. It will be the headquarters office responsible for planning, coordinating, and executing all activities leading to Complex-21. As such, it will have line management as well as programmatic responsibilities.

The RPO will be responsible for a wide range of actions. To adequately perform these demanding tasks, the RPO must be staffed with highly competent, technically qualified individuals. Staff members must have the technical background necessary to properly integrate the diverse efforts involved in achieving Complex-21. To ensure proper visibility in selecting technical professionals for assignment to the RPO, the CRC concludes that the Secretary should personally approve assignment of senior personnel (Division Directors and above) to the RPO. Additionally, the ASDP should approve technical personnel being hired to fill all other positions. Inherent in staffing the RPO with competent managers possessing strong leadership traits is the need to allow these managers some latitude to organize the RPO and its support structure as they find necessary. Much of the rest of this chapter describes the duties of, and a proposed organization for, the RPO. The CRC considers these proposals to be a good starting point, but fully recognizes that, once staffed, the RPO Director may modify the proposed structure.

The RPO must take several actions in the near-term to prepare for implementation of Complex-21 activities. Some must be completed as a prelude to the ROD on Complex-21 options, while others must follow that decision. Still others, such as the evaluation of nonnuclear components for outsourcing, are natural extensions of current operating practices and ought to be pursued immediately. The planned near-term actions include:

- Development of a PEIS on reconfiguration of the Complex, as discussed in Section 4.3 and elsewhere.

- Management of a Site Evaluation Panel which has been established to specify selection criteria and select candidate sites for relocation of RFP, Y-12, and Pantex activities as described in NMP&M Reconfiguration Options A and B. These sites will be evaluated in the PEIS.

- Contracting for an Architectural and Engineering firm developing conceptual designs and determining the feasibility and costs of relocation activities for NMP&M Reconfiguration Options A and B. The results will be available to assist in preparation of the PEIS.

- Management of a Privatization Planning Panel which has been established to identify candidate products and functions for privatization and to develop a Complex Privatization Plan (CPP) for outsourcing the production of as many nonnuclear components as possible.

- Management of a Weapons Design Standardization Panel which has been established to investigate the standardization of elements of nuclear weapons design that would result in lower production costs and less expensive production facilities. The results will be available to assist the A&E firm in developing designs and costs.

- Management of a Technology Assessment and Selection Panel which has been established to investigate the entire range of available and emerging technologies with acceptable development risk which could be applied in Complex-21. This will be a semi-permanent panel, with panel reports available to assist in the PEIS and subsequent design decisions.

- Formation of a RD&T Consolidation Panel to determine which technical areas of the RD&T element (LANL, LLNL, SNL, and NTS) could be combined to produce significant cost savings, but without causing unreasonable laboratory or NTS disruption. Panel reports would be available to assist in the PEIS.

These reconfiguration support panels are ad hoc organizations without formal funding or appropriations. The DOE and Management and Operating contractor organizations providing the personnel who serve as members or chairpersons of these panels will provide for their salaries, travel, and administrative support costs as a part of their planning and development responsibilities. A small amount of funding has been provided to the RPO to cover the costs of outside technical consultants and support contractors needed by the panels to complete their assignments.

The recommended organization of the RPO is shown in Figure 4.2. Initially, the RPO will require a funding level of about $2.1 M per year and a staff of 35 personnel (Full Time Equivalents). These resources do not include the direct costs of performing the PEIS, panel actions, or A&E actions.

The CRC concludes that a Reconfiguration Project Office, as described above, should be established as soon as possible.

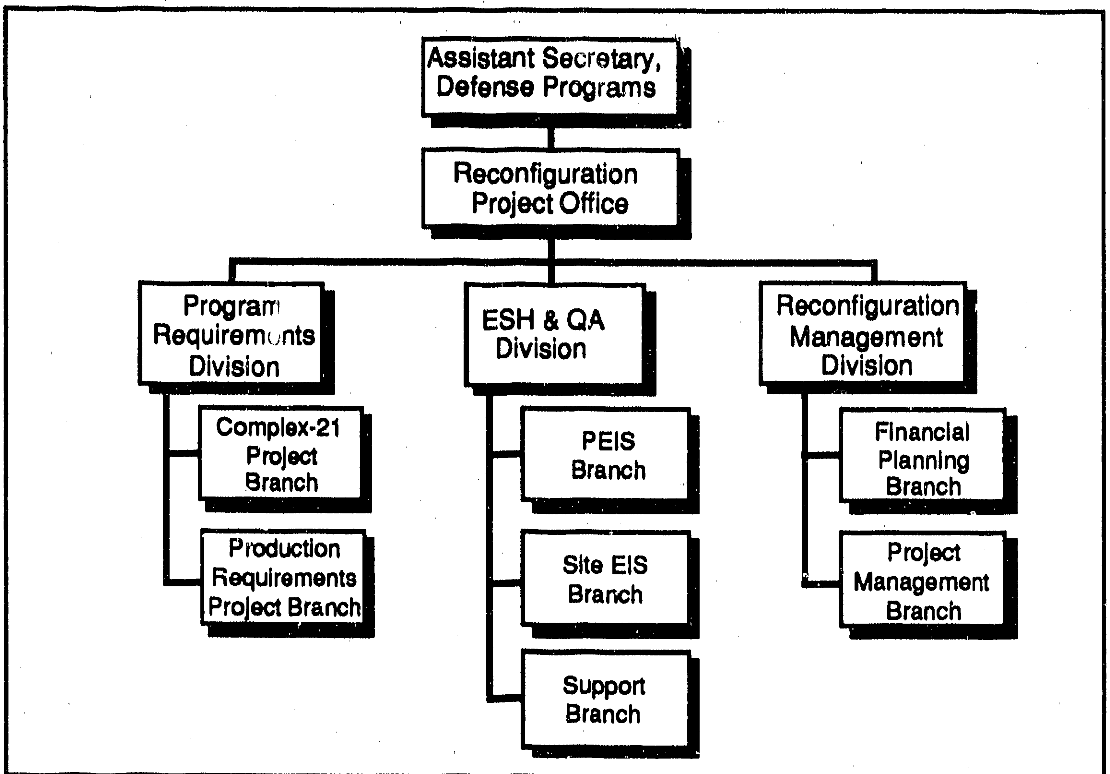
4.2.1 Site Evaluation Panel (SEP)

To facilitate the development of critical information for the PEIS, the Under Secretary of Energy has established a SEP to determine candidate sites for relocating and consolidating the Complex production facilities into fewer logically related and mutually supportive sites.

The panel is chaired by a senior executive associated with the Office of the ASDP and includes at least one senior executive from each of the Offices of the Assistant Secretaries for Environment, Safety, and Health; Congressional and Intergovernmental Affairs; the Offices of Environmental Restoration and Waste Management; and the General Counsel.

The panel's purpose is to select a reasonable set of candidate sites for each reconfiguration option. In selecting candidate sites, the SEP will not preclude any reconfiguration option, but will consider all factors which affect the suitability of the site. These include, but are not limited to:

- Geological activity and seismic stability,
- Groundwater characteristics,
- Adequacy of supporting transportation facilities,
- Adequacy of local technical work force and centers of academic and technical excellence available,
- Prevailing winds and weather conditions,
- Perceptions and attitudes of people affected by the site,
- Impacts of diverting the site from its present use to use as a DP facility, and



• Organizes, Initiates, Administers, and Participates in the work of the Site Evaluation, Weapons Standardization, Technology Assessment, RD&T Consolidation, and Privatization Planning Panels • Supervises & Coordinates Feasibility /Cost Study • Participates in Strategic Planning Groups	• Coordinates and Participates in Preparation of the PEIS • Tracks ES&H Laws, Regulations, Agreements and Problems to Insure Proper Consideration in Reconfiguration Planning • Reviews and Participates in Site Evaluation and Feasibility /Cost Studies to Insure ES&H Issues are Adequately Considered	• Participates in Defense Programs Strategic and Program Planning Activities • Participates in and Reviews Results of Feasibility /Cost Studies • Prepares Materials for Reconfiguration Funding Plans a,.d Requests • Maintains Project Management Cadre

Figure 4.2.–Reconfiguration Project Office Organization.

- Impacts of foreseeable future ES&H considerations.

The panel should complete its work by August 1, 1991.

4.2.2 Architectural and Engineering Study

DOE intends to retain an A&E firm to assist with the preparation of feasibility and cost studies in support of Complex reconfiguration. The initial task of the A&E contractor will be to develop conceptual designs and accompanying cost estimates for each of the reconfiguration alternatives and options contained in the CRS. The primary focus of this effort will be to refine the reconfiguration cost estimates contained in the CRS as questions surrounding the size of the stockpile, the production capacity required of the Complex, and the technical capabilities needed to ensure national security are answered. The A&E contractor will support the RPO through well-defined engineering design and analysis tasks.

The RPO organization establishes a cadre of individuals whose primary mission is to analyze alternative configurations for Complex-21 and to determine the mission requirements which Complex-21 must satisfy. Highly qualified individuals will be sought to fill these billets. DOE will also stress the continuing professional development of RPO personnel to create and sustain a Headquarters management group that is highly skilled in directing technical contractors.

The A&E contractor will assist the RPO by developing conceptual designs in response to standards, performance, and capabilities requirements, and criteria specified by the RPO. These conceptual designs will form the basis for determining construction cost and schedule estimates, site constraints, technology assumptions and requirements, risks, and other factors which influence performance and suitability of Complex-21 facilities. The RPO will review the work of the A&E contractor and subject promising preliminary designs or design elements to successively more rigorous analysis.

The RPO will ensure that the findings and recommendations of the five reconfiguration support panels are incorporated into Complex-21 facility conceptual designs. Thus, through an iterative process, the RPO will converge on a set of preliminary facility designs and cost estimates that will be considered in the Reconfiguration PEIS and the ROD. The RPO will ensure that information flows efficiently between the PEIS contractor, the A&E contractor and the appropriate reconfiguration support panels to allow the efficient, concurrent performance of their diverse tasks.

The configuration alternatives and options to be considered include:

- No Action, other than those required to achieve and maintain compliance with applicable federal, state, and local laws, regulations, and orders;

- Downsizing and modernization of key existing facilities in place and relocation of RFP plutonium functions to another site (Option A);

- Collocation of the uranium activities of the Y-12 Plant with the plutonium functions of RFP (Option B1);

- Collocation of the component assembly activities of the Pantex Plant with the plutonium functions of RFP (Option B2); and

- Collocation of the uranium activities of the Y-12 Plant and the component assembly activities of the Pantex Plant with the plutonium functions of RFP (Option B3).

For each alternative and option considered, the facility designs and cost estimates would:

- Define a project scope which satisfies Complex-21 needs;

- Assess project feasibility and attainable performance levels;

- Develop reliable cost estimates and realistic schedules in order to provide a complete description of the project; and

- Specify the project criteria and design parameters for all engineering disciplines and identify applicable codes and standards, quality assurance requirements, environmental studies, construction materials, space allocations, energy conservation features, health and safety factors, safeguards and security requirements, and any other features or requirements necessary to accurately describe the project.

The A&E studies and associated M&O contractor support are estimated to cost $29M and require 18 months to complete. The schedule of A&E deliverables will support PEIS development.

4.2.3 Privatization Planning Panel (PPP)

Minimizing the size of the Complex is essential to controlling the costs of modernization and future operations. To that end, the Under Secretary has established the PPP to determine which nonnuclear[5] manufacturing activities can be outsourced to the private sector and which activities can either be most economically provided by a GOCO facility or must be retained under total government control for national security reasons. The PPP is also developing a plan to maximize outsourcing of nonnuclear production and service functions and to consolidate the remaining activities into as few dedicated, nonnuclear production sites as possible. The goal is to have only one dedicated, nonnuclear production-site in Complex-21 and, if feasible, eliminate all dedicated nonnuclear production-sites. Information developed would be considered in the ROD.

The panel includes DOE employees and representatives of Complex Management and Operations Contractors. The panel is chaired by a senior executive associated with the Office of the Assistant Secretary for Defense Programs, and includes at least one representative each from the Offices of the Deputy Assistant Secretaries for Nuclear Materials (DP-10) and Military

[5] For the purposes of the PPP effort, all Complex activities that do not directly involve the production or manufacturing of plutonium, enriched uranium, other radioactive isotopes, or the production of tritium, are considered to be nonnuclear.

Application (DP-20); the Albuquerque Operations Office; Rocky Flats Office; Pinellas, Kansas City, Mound, Y-12, Pantex, and Rocky Flats Plants; and the three design laboratories.

The overall objective of the PPP is to develop a Complex Privatization Plan (CPP) which ensures that the Department makes maximum, cost-effective use of privatization as a means of minimizing operating costs and capital investment requirements of Complex-21. This is to be accomplished in a manner which releases as many nonnuclear manufacturing sites as possible to other uses. Accomplishment will be in two phases:

- Phase I consists of an analysis of nonnuclear manufacturing activities and the development of a recommendation to privatize, retain, or consolidate each activity.

- Phase II is the development of the CPP for use by DP line management in maximizing privatization and minimizing government facility requirements.

In developing recommendations regarding transfer of candidate activities (both manufacturing and service) to the private sector, the panel will consider:

- Availability of an adequate and reasonably competitive technical base for the candidate activities within the private sector;

- The national security issues (including nonproliferation) associated with the candidate activities;

- Manufacturing tolerances, performance requirements, or economic issues associated with the candidate activities; and

- Any other factors that may materially influence the suitability of an activity for performance by the private sector.

The panel should complete its work by October 1991. Cost of the support contract for the study is estimated to be $0.4M.

4.2.4 Weapons Design Standardization Panel (WDSP)

Standardization of nuclear weapons components and design criteria has not been a principal goal in the weapons acquisition process. Overall, optimization of military effectiveness has had a higher priority. As a result, the Complex is required to produce a large number of custom parts that are often unique to an individual weapon system. To some degree, this requirement determines facility size and complexity. In Complex-21, standardization could potentially achieve overhead reductions and production streamlining that would limit facility size and complexity, thereby helping to control modernization costs and follow-on operational costs.

With this in mind, the Under Secretary has established the WDSP to investigate the standardization of design and production of nuclear weapons and define the smallest practicable set of production capabilities needed to meet nuclear weapon requirements. The results will assist the A&E firm in developing designs and costs for use in the PEIS and ROD.

The panel is chaired by a senior executive associated with the Office of the Assistant Secretary for Defense Programs and includes at least one senior executive each from the Offices of the Deputy Assistant Secretaries for Nuclear Materials (DP-10) and Military Application (DP-20); the Albuquerque, Oak Ridge, and San Francisco Operations Offices; the Rocky Flats, Pantex, Y-12, Pinellas, Mound, Savannah River, and Kansas City production plants; the national laboratories; and the Office of Environmental Restoration and Waste Management.

The primary objective of the panel is to simplify Complex facilities through the standardization of weapons designs and manufacturing processes, while meeting national security requirements. Associated objectives include:

- Minimizing Complex modernization costs by simplifying and reducing the size of replacement facilities;

- Limiting Complex operating costs by maximizing the utilization of assets, reducing overhead, and minimizing contaminated production lines; and

- Controlling ES&H compliance costs by reducing the use of hazardous materials which incur waste management and decontamination and decommissioning requirements.

The production capabilities being considered for standardization include:

- Types of materials used in weapons designs, including the various alloys;

- Component sizes, shapes and tolerances that casting, forging, welding, and machining operations, both nuclear and nonnuclear, must support;

- Types and characteristics of fusing and arming systems used in weapons designs;

- The solvents, adhesives, plastics, and other materials and their related processes in weapons fabrication;

- Composition of high explosives used in weapons designs;

- Testing, evaluation, and quality assurance equipment and procedures that are required to assure weapon performance; and

- Permissive Action Link systems and other command and control devices used in weapons designs.

The panel should complete its work by February 1991.

4.2.5 Technology Assessment and Selection Panel (TASP)

The selection of the technologies and processes to be incorporated into Complex-21 will be one of the most important factors affecting its performance. The selection process must incorporate several interim stages in order to provide key inputs to the ongoing planning and design process for Complex-21. A major step in this process will occur when DOE retains an A&E firm to develop preliminary designs and cost estimates for Complex-21. The information developed will be used to prepare the ROD which will specify the configuration of Complex-21. As Complex-21 is developed, other A&E contracts will be let for the detailed design and engineering of specific Complex-21 facilities.

A Technology Assessment and Selection Panel, established by the Under Secretary, will assist the RPO with the creation and implementation of a Complex-21 Technology Assessment and Development Program (TADP), evaluation of the data developed by the TADP, and recommendation of technical baselines to specify the technologies and processes to be used in each Complex-21 facility. The Complex-21 TADP will identify mature and emerging technologies with the greatest potential benefit and will recommend programs to further refine and evaluate them for use in Complex-21. Multiple revisions of the TADP will be required to support various phases of the Complex-21 design and development process.

The TASP has a standing membership consisting of a Chairperson and eleven members drawn from DOE and Complex Management and Operating (M&O) contractors. Additional members with specific areas of expertise may be added by the TASP Chairperson. The TASP Chairperson may also employ outside technical consultants and support contractors. The TASP is chaired by a senior DOE executive and includes one senior representative from each of DP-10 and DP-20; the Albuquerque, Oak Ridge, and San Francisco Operations Offices; the three national weapons laboratories; two selected M&O contractors; and the Office of Environmental Restoration and Waste Management. The Chairperson and members of the TASP shall serve renewable three-year terms.

The primary objective of the TASP is to ensure that the technologies and processes used in Complex-21 represent the best achievable balance between cost, performance, schedule, and risk. Associated objectives include:

- Enhancing the performance of Complex-21 by choosing only technologies that are sufficiently mature and that meet operational reliability, maintainability, and availability requirements;

- Selecting promising emerging technologies and developing them to a level of maturity that warrants consideration for use in Complex-21;

- Minimizing Complex modernization costs by specifying technologies that maximize the flexibility of Complex-21 and reduce its physical size and infrastructure requirements;

- Controlling Complex-21 operating costs by selecting technologies that are the most cost-effective means of providing the required production capabilities, given projected workload and schedule requirements; and

- Limiting ES&H costs and contingent liabilities by selecting technologies that minimize the number and volume of waste streams, minimize use and maximize containment of hazardous materials, and minimize exposure of workers to radiation and hazardous environments.

In determining the cost-benefit of a particular technology, the TASP is considering both initial capital costs and operating costs – including direct labor and materials, maintenance, energy consumption, waste processing and disposal, and foreseeable contingent liabilities (primarily ES&H driven). The most cost-effective technology will generally be the one which meets all minimum requirements and results in the lowest unit production cost when all costs, both capital and operating, are amortized over the projected lifetime of Complex-21. Cost-effectiveness is not the sole selection criteria, however, and other technologies may be chosen if compelling performance reasons exist.

The TASP is a semi-permanent body which will operate at least until all Complex-21 facilities have completed Title I and II design.

4.2.6 Weapons Research, Development and Testing Consolidation Panel (RCP)

The weapons research, development, and testing element of the Complex constitutes an important portion of the DP budget. Controlling the cost of modernizing and operating the RD&T element is essential to minimizing the cost of the nation's nuclear deterrent. The major concern when investigating opportunities to reduce the size and/or the cost of the RD&T element is to ensure that any actions proposed do not unacceptably impact the laboratories' abilities to perform assigned missions. Reducing the size and funding of the RD&T element are not ends in and of themselves. It is clear, however, that the future fiscal environment will be austere. Therefore, it is imperative that the entire

Complex focus on essential missions and capabilities to preserve the effectiveness of the Nation's nuclear deterrent.

In view of the above, a Research, Development, and Testing Consolidation Panel (RCP) will be established to examine the current operating and funding practices of the RD&T Complex and recommend ways to reduce the cost of weapons RD&T without unacceptably impacting upon mission performance. The RCP will be comprised of a Chairperson and six members. Three of the members will be selected by the Directors of the three weapons laboratories: Lawrence Livermore, Los Alamos, and Sandia National Laboratories. One member will be selected by the Manager, Nevada Operations Office, to represent the Nevada Test Site. The remaining two members and the Chairperson will be appointed by the Under Secretary of Energy from outside the Department of Energy and its M&O contractors. The ASDP will be tasked to provide a senior executive as a liaison to help the RCP Chairperson obtain any technical or administrative support required. The RCP would also coordinate its actions with the Secretary of Energy's Advisory Board and solicit inputs from other government agencies.

The primary objective of the RCP will be to examine the missions, facilities, and operations of the RD&T element and recommend changes that could help DOE satisfy essential weapons RD&T requirements, while minimizing the RD&T Complex. Secondary objectives would include:

- Delineating the weapons RD&T activities and capabilities that are essential to support the Nation's nuclear deterrent and for the maintenance and modernization of the nuclear weapons stockpile;

- Identifying those weapons RD&T activities for which peer review and competition are essential to assure the safety and performance of the Nation's nuclear weapons stockpile; and

- Specifying those instances in which peer review and competition require duplicate facilities and capabilities rather than common resources shared by multiple working groups.

The RCP will evaluate other activities such as factors that impact the efficiency and total cost of weapons RD&T activities when developing conclusions and recommendations. It will also project RD&T element capital investment and operating costs that can be avoided through consolidation or elimination of programs and facilities.

The RCP will prepare and deliver to the Director of the Reconfiguration Project Office a report with recommendations based on an analysis of RD&T activities and capabilities that are essential to maintain the nation's nuclear weapons superiority and nuclear deterrent; and an analysis that identifies the weapons RD&T activities and capabilities that require peer review and/or competition, specifying for each any duplicate facilities and resources required. The recommendations will include changes to the organization, operations, management, and capital plant of the RD&T element that have the potential to improve the efficiency or lower the cost of weapons RD&T without unacceptably impacting the weapons RD&T mission. These recommendations should be directed at structuring an RD&T element that emphasizes essential missions, has the greatest likelihood of maintaining the viability of the RD&T Complex and the superiority of the nation's nuclear deterrent in an austere fiscal environment, and makes maximum use of consolidated programs and shared resources to improve efficiency and performance.

If convened promptly, the RCP will probably need to operate through October 1, 1992, at which time it could deliver a final report.

4.3 PHASE I, DEVELOPING THE RECONFIGURATION PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (1990-1994)

This portion of the report outlines an overall strategy to comply with NEPA in modernizing the Complex. Under NEPA, DOE is required to prepare an environmental impact statement on major actions that may significantly affect the human environment. Reconfiguring the Complex would be such an action.

4.3.1 NEPA Compliance Strategy

The NEPA compliance strategy for reconfiguration has two phases: near-term compliance in developing a reconfiguration plan, and long-term compliance while the plan is being implemented.

The first phase will focus on preparing a Programmatic Environmental Impact Statement (PEIS) for reconfiguration of the Nuclear Weapons Complex. The PEIS will analyze the consequences of alternative configurations for the Complex in order to determine a configuration which maximizes efficiency and minimizes risks. DOE will use the PEIS process to help develop a comprehensive reconfiguration plan.

The second phase of the recommended NEPA strategy will orchestrate future DOE decisions within the programmatic decisions stemming from the PEIS. This will include tiering future project-specific or site-specific NEPA reviews on the PEIS, thus simplifying the analysis needed for future projects. Additionally, PEIS analyses or related decisions could be incorporated by reference in future NEPA documents. DOE may choose to supplement the PEIS and Reconfiguration Plan later if there is a proposed change in the implementation of Complex-21.

4.3.2 Rationale for the PEIS Approach

A PEIS on reconfiguration can serve as an effective planning and decision tool by providing DOE and the public with information on the environmental consequences of a broad range of possible reconfiguration alternatives before potential options have been foreclosed or irrevocable project-level commitments of resources have been made. DOE plans to use the PEIS process to develop a comprehensive plan to establish an overall approach for restructuring the Complex.

NEPA requires an EIS to be prepared for major federal actions. The definition of the term "major federal action" in 40 CFR 1508.18(b) includes:

- Adoption of formal plans, such as official documents prepared or approved by federal agencies which guide or prescribe alternative uses of federal resources, upon which future agency actions will be based; and

- Adoption of programs, such as a group of concerted actions to implement a specific policy or plan; systematic and connected agency decisions allocating agency resources to implement a specific statutory program or executive directive.

The reconfiguration effort falls within the scope of this definition of a major federal action; thus, DOE is required to prepare an EIS on modernization.

The President's Council on Environmental Quality (CEQ) regulations regarding implementation of NEPA also advises agencies to analyze "connected actions" in one EIS. The actions leading to reconfiguration of the Nuclear Weapons Complex meet the definition of connected actions in 40 CFR 1508.25(a)(i) because they:

- Automatically trigger other actions which may require EISs,

- Cannot or will not proceed unless other actions are taken previously or simultaneously, and

- Are interdependent parts of a larger action and depend on the larger action for their justification.

Accordingly, a PEIS is appropriate for analyzing the consequences of the connected actions involved in reconfiguring the Nuclear Weapons Complex.

4.3.3 Decisions Needed for Reconfiguration

The PEIS will be used to support DOE decisions on how to reconfigure its Nuclear Weapons Complex; specifically, how the Complex should be configured when complete (i.e., Complex-21). The PEIS may also be used to support DOE decisions regarding the mid-term configuration of its plutonium facilities, i.e., about the year 2000. After considering the analysis in the PEIS, DOE will decide how to configure the Complex and how to achieve that configuration. These decisions will be set forth in the ROD, following completion of the final PEIS; the ROD for the mid-term plutonium facilities may be split from the main ROD and issued separately. Decisions regarding Complex-21 will also be incorporated into a specific reconfiguration plan. The plan will cover such things as sites identified to carry out (or relinquish) specific functions, schedules for transferring responsibilities from one location to another or bringing new facilities online, and the extent of government-owned and private facilities to be used.

4.3.4 Scope of Programmatic Environmental Impact Statement

The PEIS will examine implications of alternative means to accomplish modernization of the Complex. Wide-ranging, it will describe the purpose and need for reconfiguration and discuss alternative ways to meet that need. A band of reasonable alternatives will be analyzed. The PEIS may also describe alternatives which are not felt to be reasonable and the rationale for their dismissal, but not in detail.

The alternatives analyzed in the PEIS will include: (1) No Action, or only the upgrades required to comply with federal, state, and local laws, regulations, and orders and to accomplish the Department's defense related mission; (2) Reconfiguration Option A, Downsizing and Modernizing in Place; and (3) Reconfiguration Option B, Maximum Consolidation. Although, theoretically, there could be a large array of possible configurations under Reconfig-uration Options A and B, the PEIS will examine a range of options felt to be representative and feasible.

In addition to the alternatives for the long-term configuration of Complex-21, the PEIS will also examine alternatives for a mid-range configuration for the plutonium supply and fabrication functions for the existing Complex in about the year 2000. This analysis is predicated on the potential need for an interim means to supply plutonium metal and manufacture plutonium pits in the event that DOE elects to stop these functions at the Rocky Flats Plant prior to their scheduled replacement by Complex-21. Alternatives include accelerating constructing, testing, and operating the first modules for Complex-21; constructing an interim facility; retrofitting an existing facility; and No Action.

As part of the larger reconfiguration effort, a Capital Asset Management Process has been implemented to support repairing or replacing aging facilities within the Complex. Until the Reconfiguration ROD, this process will support the minimum effort required to allow the current Complex to continue to perform the Department's defense related mission in compliance with applicable requirements. The results of CAMP will be incorporated into the No Action alternative in the PEIS.

DOE will identify its preferred alternative for reconfiguration as soon as it has been developed. This may be done first in the Notice of Intent (NOI), the Draft PEIS, or the Final PEIS; DOE is obligated to identify its preferred alternative in the final PEIS. Should the Secretary identify a preferred approach prior to publication of the NOI for this effort, it will be identified to the public in the NOI as the DOE's preferred alternative. The Secretary has already identified two preferences: first, to relocate the nuclear weapons functions now assigned to RFP and close the plant, and, second, to pursue maximum consolidation of the non-nuclear manufacturing element, with the goal of having only one dedicated nonnuclear manufacturing site in Complex-21. Both of these preferences will be specifically identified within the preferred alternative in the NOI. In addition, in August 1990, the Secretary identified several other principles for achieving Complex-21. Those principles will be included in the NOI, and will be used to guide DP in formulating the preferred activities.

4.3.5 Items Outside the Scope of the PEIS

DOE can expect to receive public comments on any subject pertaining to nuclear weapons or the nation's defense; however, the scope of the PEIS analysis does not need to be enlarged to include all topics raised. The purpose of the PEIS is to support DOE decisions on reconfiguration of the Nuclear Weapons Complex. The central question is how best to do the job assigned to DOE, not whether to do it. Therefore, topics which are not germane to this series of decisions would be outside the scope of the PEIS. For example, it is not within the province of DOE to determine whether or not the nation should have nuclear weapons – that decision rests with Congress and the President. Nor is it within DOE's prerogative to decide not to meet the needs for nuclear materials or weapons established by Congress and the President.

4.3.6 PEIS Scheduling

DOE will begin work on the PEIS as soon as feasible. On January 12, 1990, the Secretary announced that DOE will prepare the PEIS. Publication of the NOI in the *Federal Register* would mark the official start of the PEIS by formally announcing that the PEIS is being prepared. The publication of the NOI in the *Federal Register* would also initiate the beginning of the public scoping period and would announce the public meetings on the PEIS.

A preliminary schedule for preparing the PEIS that includes target dates for key milestones is shown in Figure 4.3. The schedule shows the process starting in February 1991 with publication of the NOI. The schedule allows a reasonable margin for development of the draft PEIS. The NOI would identify the proposed scope of the PEIS and DOE's preferred alternative if known.

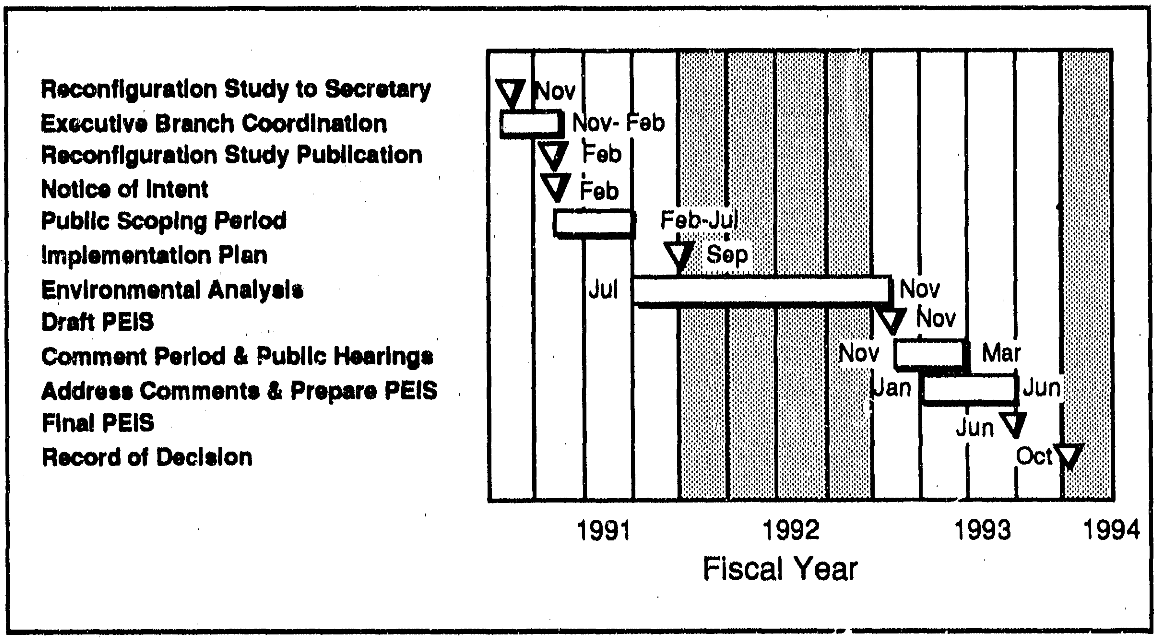


Figure 4.3.–Reconfiguration PEIS Schedule.

The NOI formally begins the PEIS process. It may be advantageous to issue the NOI at the same time that the *Reconfiguration Study* is released, in order to allow public review of the NOI in the context of the background, options, and conclusions presented in the study. Accordingly, the CRC concludes that the NOI should be published in February 1991 to coincide with the release of the study.

The Site Evaluation Panel will evaluate sites for relocating some Weapons Complex facilities (see Section 4.2.1). The PEIS scoping process may have to be extended to cover any public input process conducted as a part of the panel's evaluation. If so, the PEIS scoping period shown in Figure 4.3 would be extended, with a corresponding extension for completing the *PEIS Implementation Plan.* Other dates would not be affected.

4.3.7 Managing the PEIS Process

The PEIS effort will be managed by the RPO when this office is established. Until then, it will be the responsibility of DP's Office of Weapons Policy and Program Planning. The schedule for preparation of the PEIS is shown in Figure 4.3. In order to accomplish the PEIS review expeditiously, public scoping will be managed as a separate task from the remainder of the work for the PEIS. Key steps in the PEIS development process are described below.

4.3.7.1 The Public Scoping Process

The public scoping process allows an agency to solicit information from the general public and other governmental agencies in order to identify significant issues to be addressed through the NEPA review. The NOI initiates the public scoping process, and invites public comment on the agency's proposed scope for the EIS.

As part of this process, DOE requires that one or more public scoping meetings be held for any EIS effort. Public meetings will be scheduled at representative locations around the country to allow interested parties to present oral comments and information. All oral and written comments received in response to the NOI will be reviewed. The scope of the PEIS will be adjusted as needed, and the results of scoping reflected in the PEIS Implementation Plan.

4.3.7.2 Preparing the PEIS

The PEIS contract will be offered for bid as soon as possible. The contractor selected will be responsible for preparing the PEIS Implementation Plan, the draft PEIS, and the final PEIS. The alternatives and analysis in the draft PEIS will be based in part on the material and assumptions contained in this study. Other studies prepared as part of the reconfiguration effort, described below, will also be used to support the PEIS analysis.

The contractor will assist with managing the public review and comment process for the draft PEIS. DOE requires that one or more public hearings be held for any draft PEIS. Public hearings will be held at approximately the same locations where public scoping meetings were held. Written and oral public comments will be addressed in the final PEIS, and the document will be revised as necessary in response to concerns raised.

4.3.7.3 Preparing the ROD

After the final PEIS is issued, the reconfiguration ROD will be prepared for Secretarial action. The ROD will explain how DOE considered environmental factors in reaching its decision on Complex-21 and will identify other factors, such as cost projections or engineering data, that were used to reach the decision.

In addition to the ROD on the configuration of Complex-21, DOE may prepare separate RODs to address the mid-range configuration for plutonium fabrication functions of the Complex. Should DOE determine that there is a need to establish an interim means to manufacture plutonium pits, a ROD would establish the timing and method to meet that need. Should DOE determine that consolidation of nonnuclear manufacturing functions requires action under NEPA, a separate ROD would address such consolidation. The RODs on mid-range configuration could be issued independently from the ROD on Complex-21, or they could be issued at the same time but as a separate decision from the broader considerations regarding Complex-21.

4.3.8 Coordination with Other DOE Studies

4.3.8.1 Reconfiguration Panels

As outlined in Section 4.2, five independent reconfiguration support panels have been or are being established by the Under Secretary. These panels will support the RPO by concentrating the best talent and technical expertise available within the Complex on a limited number of issues which are critical to selecting the best configuration and design for Complex-21. Although these panels will conduct their work independently, under the oversight of the RPO, the findings and recommendations of one panel may be pertinent to the activities of another. Also, the activities of the support panels will produce data which will be needed to perform other RPO activities.

For example, the activities of the Weapons Design Standardization Panel related to minimizing the number of different types and designs of components used in weapons manufacturing will be of interest to the Privatization Planning Panel as they try to develop a Complex Privatization Plan. Similarly, the findings and recommendations of the Technology Assessment and Selection Panel and the Site Evaluation Panel (SEP) will be needed by the A&E contractor to develop increasingly more sophisticated feasibility and cost studies. The outputs of both the SEP and the feasibility and cost studies will be needed to prepare the PEIS and, ultimately, the ROD. The SEP will be particularly important because it will establish evaluation criteria and determine candidate sites for the relocation of Complex facilities under reconfiguration Options A and B.

4.3.8.2 Architecture and Engineering Study

As discussed in Section 4.2.2, the RPO will retain an A&E firm to prepare a number of analyses in support of the PEIS and the ROD processes. The primary functions of the A&E contractor will be to prepare and evaluate, in accordance with standards, criteria, and requirements specified by the RPO, preliminary designs and construction cost estimates for Complex facilities that might be relocated. This includes determination of technical factors and cost differences that are associated with each of the various sites recommended by the SEP and being evaluated through the PEIS. The A&E contractor, under the guidance of the RPO, will also maintain a close liaison with the reconfiguration panels to ensure panel recommendations are appropriately reflected in the conceptual designs.

In consort with the TASP and the RPO, the A&E contractor will be expected to recommend a technical baseline for new or substantially upgraded Complex-21 facilities. This technical baseline will specify the technologies, materials, processes, and equipment that will form the design basis for Complex-21 facilities. Cost-benefit analyses addressing the various technologies proposed and their degree of incorporation into the facility designs will be an important element of this task. As facility conceptual designs evolve, they will be used to help evaluate the environmental impacts of new or upgraded facilities at specific potential sites and to determine the overall cost effectiveness of particular configurations. The output of the feasibility and cost studies will be essential to the successful completion of the PEIS and the specification of a final Complex-21 configuration in the ROD. The RPO will aggressively manage the A&E contractor's activities and coordinate them with these efforts.

4.3.9 Coordination with Other NEPA Efforts

The Reconfiguration PEIS will require interface with other ongoing and future NEPA reviews. The RPO will coordinate the PEIS with other DP NEPA reviews and Complex-related programmatic NEPA reviews prepared by other offices within DOE. Currently, DOE is preparing two related programmatic EISs: the New Production Reactor EIS and the Environmental Restoration and Waste Management PEIS. Over time, to remain flexible, DOE may have to revise the *Reconfiguration Plan* and supplement the Reconfiguration PEIS to accommodate future programmatic decisions.

4.3.9.1 New Production Reactor EIS

The New Production Reactor EIS analyzes the proposal to achieve new production capacity to produce nuclear materials and to select one or more sites for locating production reactors. The schedule for this effort is to publish a draft EIS in April 1991; a final EIS in November 1991; and a ROD in December 1991. Because the decisions on new production capacity will precede the final Reconfiguration PEIS, the PEIS will not revisit the analysis in the New Production Reactor EIS or its related decisions. Material from that EIS may be incorporated by reference into the Reconfiguration PEIS, and decisions on new production capacity will be factored into the final PEIS analysis.

4.3.9.2 Environmental Restoration and Waste Management PEIS

At the same time that the Secretary directed DOE to prepare the Reconfiguration PEIS (January 12, 1990), he directed DOE to prepare an Environmental Restoration and Waste Management PEIS.

The Environmental Restoration and Waste Management PEIS will be a planning-level document which evaluates alternative approaches for managing DOE's nuclear, hazardous, mixed, and sanitary waste. DOE proposes an integrated approach to corrective actions, environmental restoration and waste management, and an applied research and development program, as outlined in the DOE *Environmental Restoration and Waste Management Five-Year Plan.*

This PEIS will evaluate the impacts of DOE's proposed environmental restoration and waste management program over the next 30 years. It will include the waste management implications of DOE's plans to modernize the nuclear waste portion of the Complex and examine transportation implications of waste disposal.

The Office of Environmental Restoration and Waste Management (EM) is developing its own modernization study as the first step in a continuing strategic planning process for EM. The study will explore strategic configuration alternatives and modernization options for the Waste Management Complex. These will be used to determine the scope of the environmental restoration and waste management PEIS. EM will continue this strategic planning process to ensure that DOE's waste management and site cleanup operations are handled efficiently.

4.3.9.3 Future Site-Wide EISs

Some DOE Nuclear Weapons Complex sites have site-wide EISs (or environmental assessments) in place. Site-wide EISs completed or updated after the Reconfiguration PEIS will incorporate appropriate aspects of the Reconfig-uration ROD.

DOE may decide to initiate some site-wide EISs (or supplement existing documents) while the Reconfiguration PEIS is underway. Any such effort must be carefully coordinated to ensure that neither review forecloses options considered in the other.

4.3.9.4 Interim Actions

In the event DOE wishes to act on a proposal covered by the scope of the PEIS analysis before the Reconfiguration ROD is issued, DOE will have to determine, on a case-by-case basis, whether the action may proceed. For a major federal action, this would be done by applying the test for interim actions found in 40 CFR 1506.1(c): (1) the action must be justified independently of the program, (2) the action must be covered by an adequate EIS, and (3) pursuing the action will not prejudice the ultimate decision on the program by determining subsequent development or limiting alternatives. For other actions, DOE would determine the level of NEPA review required. It would be the responsibility of DP and the RPO to review any interim actions to ensure that these conditions were met. For NEPA reviews related to the Complex that were initiated prior to the start of the Reconfiguration PEIS, DP and the RPO would review the proposal to recommend whether or not it constitutes an interim action within the meaning of 40 CFR 1506.1(c).

4.3.10 Conclusion

The CRC concludes that the Reconfiguration PEIS should be scheduled, developed, and coordinated as described above.

4.4 PHASE II, COMPLEX-21 ACTIVITIES (1992-2009)

The primary activities of Phase II will center on developing designs for the new or substantially upgraded Complex-21 facilities and complying with all regulatory requirements necessary to allow the construction and startup of these facilities on an expedited basis. Specific Phase II activities will include:

- Defining the technical baseline of the selected Complex-21 facilities;
- Completing the development and validation of new or less mature technologies selected for use in Complex-21 facilities;
- Completing specification of the design criteria to be used for Complex-21 facilities (particularly with regard to seismic, ES&H, S&S, and other protection criteria);
- Completing the detailed conceptual design of Complex-21, specifying the general layout and capabilities of the sites which are to constitute the Complex;
- Completing Title I and regulatory compliance requirements for the preliminary design of Complex-21 facilities, including NEPA requirements such as site-specific EISs;
- Substantially completing Title II, detailed design of Complex-21 facilities; and
- Determining the overall schedule for, and coordination of, construction, startup, testing, transition, shutdown, and decommissioning for affected facilities.

These alternatives will require extensive use of A&E and technical support, particularly environmental contractors to prepare and evaluate design alternatives and the associated EISs. The RPO will oversee these activities, with the assistance and close coordination of the national laboratories and DP line management.

4.5 PHASE III, COMPLEX-21 ACTIVITIES (1996-2015)

Phase III embodies the bulk of the Reconfiguration effort and results in the commitment and expenditure of a large amount of public funds. Phase III focuses on the construction and testing of the new or upgraded Complex-21 facilities, the checkout and operational testing of these facilities, the transfer of operations, and the shutdown and deactivation of surplus facilities. Phase III overlaps considerably with Phase II. All reasonable efforts will be made in sequencing the operational startup of Complex-21 facilities to allow early shutdown or reduction of weapons activities at existing sites; especially those such as RFP that are prime candidates for phase-out.

Phase III tasks will present formidable management challenges to DOE, such as the potentially large surge in personnel required to activate new facilities for testing and operations, while mission-essential operations continue at existing facilities. Recruiting, training, and certifying such a large work force, especially in light of the shrinking pool of skilled labor, will rival the construction and management of the Complex-21 facilities themselves in terms of complexity and management expertise required.

The actual construction and operational testing of Complex-21 facilities, once all design and regulatory hurdles have been overcome, will present their own unique challenges as highly specialized, complicated, and unique structures are built to exacting standards.

4.6 COST SUMMARY

The funding requirements to support the activities described in this chapter are summarized in Table 4.1.

Summary of Reconfiguration Funding Requirements ($M)
(Rounded to Nearest $0.1M)

FY:	1991	1992	1993	1994	1995	1996
PEIS	2.0	4.1	4.1	-	-	-
A&E	2.0	21.0	6.0	-	-	-
PPP	0.2	0.2	-	-	-	-
Post-ROD*	-	-	-	75.0	200.0	400.0
RPO	-	-	2.1	2.1	2.1	2.1
Total	4.2	25.3	12.2	77.1	202.1	402.1

* Post-ROD costs are rough estimates only.

Summary of Personnel Requirements for Reconfiguration
(Full Time Equivalents)

FY:	1991	1992	1993	1994	1995	1996
PEIS	-	-	-	-	-	-
A&E	-	-	-	-	-	-
PPP	-	-	-	-	-	-
Post-ROD	-	-	-	-	-	-
RPO	17	35	35	35	35	35
Total	17	35	35	35	35	35

Table 4.1.–Summary of Reconfiguration Resource Requirements.

Chapter 5

Improved Management of the Complex

CHAPTER 5

IMPROVED MANAGEMENT OF THE COMPLEX

This chapter addresses changes to management processes, tools, and organizations to ensure that the existing Complex Infrastructure can be safely, efficiently, and effectively sustained during and after the transition to Complex-21. The chapter begins with a discussion of the Integrated Management System Concept – the establishment of fully integrated strategic and program planning processes, flowing directly into the budgeting process. Next, one of the most important recommendations of this study is presented. A Capital Asset Management Process will be established as the primary tool for the planning, budgeting, and managing of all capital assets, maintenance projects, and activities throughout Defense Programs. It will provide, for the first time, detailed vertical and horizontal visibility of all ongoing and forecast projects related to every significant capital asset in the Complex. Much of the information in this chapter was developed by Reconfiguration Teams E and F.

5.1 THE INTEGRATED MANAGEMENT SYSTEM

Many factors have contributed to Complex deterioration over the past 40 years. The lack of an integrated approach to planning, budgeting, and managing resources to achieve long-range goals is one of the more critical shortfalls that must be corrected. To this end, a framework has been developed to examine the Complex as it currently exists, to describe the future, and to plan an orderly transition to Complex-21. This framework is based on an integrated management system that includes standards, tools, and applications.

The foundation of this concept is a strategic planning process that provides guidance for the Complex 20-25 years into the future. A shorter range Program Plan details a roadmap for the immediate five years and guides development of an implementing budget. The Capital Asset Management Process (CAMP), which is an important new tool in the integrated system, will provide the basis for managing capital assets in an orderly manner throughout DP. In order to provide the necessary structure to assemble data, develop and present alternatives for decisions, and coordinate actions across program areas, the concept also includes some reorganization within DP.

5.1.1 The Planning and Budgeting Process

Improvements in the Complex can only be realized and sustained through a systematic process that translates visions into prioritized, detailed plans and actions. This development of systematic foresight coupled with the creation of clearly articulated long-term goals and plans minimizes uncertainties, maximizes opportunities, creates consensus, and provides greater organizational stability. This process of foresight, goal setting, and planning enables one to view the future from a qualitatively different perspective, treating the future as an achievable product of today's decision – in effect, defining the future.

A sound planning and budgeting process is the mainstay of any organization. In the past, DP has not developed an effective system for identifying or achieving its long-term goals. To remedy this situation, a fundamental change is needed in the management of the Complex's operations. The traditional practice of dividing the Complex into relatively small pieces and making rather narrowly scoped, short-range plans needs to be replaced by an integrated process that begins with a sweeping, long-range, top level view of the realistic goals of the Complex and a strategy for realizing those goals. From this strategy must evolve a Complex-wide prioritization of needs, an analysis of alternative ways of meeting these needs, and decisions for budget implementation.

The DP Strategic Plan (SP) provides this broad, long-range view of the future of the Complex. It defines the missions, goals, values, objectives and key factors relating to the missions. The strategic planning process is intended to orient all line managers and staff planners to a common course of action. However, strategic planning alone is insufficient. The long-range goals can only be realized through coordinated efforts that produce a succession of near-term, well defined Program Plans.

The DP Program Plan (PP) is a five-year plan that addresses the near-term major thrusts and issues of the individual program elements that support the Strategic Plan. It delineates specific projects, key milestones and deliverables, and provides estimates for manpower and funding needs. The Program Plan provides direct linkage between the broader Strategic Plan and the budget. Budget preparation, in turn, flows directly from the Program Plan.

The existing DP budget process requires very little modification. However, substantial changes should be made in the approach to obtaining the supporting data. The most significant change in the budget process would result from the field office's assessment of needs and then headquarters' prioritization of those needs in the context of program management's strategic perspective (as outlined in the Strategic Plan) of future requirements and site interrelationships. Thus, the budget request will be supported by a five-year Program Plan reflecting both headquarters and site level analyses of near-term prioritized requirements.

5.1.2 Integration of Strategic Planning, Program Planning, and Budgeting

The flow of information during the development of the Strategic Plan, the Program Plan, and the budget submission can be seen in Figure 5.1. This section of the report discusses the information flow in the planning process. The composition and functions of the organizational entities performing the work are discussed later in this report.

As Figure 5.1 shows, inputs to the strategic plan are gathered from many sources. Overall planning guidance is then developed by the Defense Programs Management Board (DPMB), a board composed of senior executives and chaired by the ASDP. This guidance is interpreted in the context of the three primary mission-oriented programs (RD&T, Nuclear Materials Production and Nuclear Weapons Production) and the Reconfiguration project. For each of these areas, program components for the Strategic Plan are developed. The Strategic Integration Group will be charged with integrating these components with each other and with other major DOE planning efforts to create a single, integrated Strategic Plan.

After approval of the Strategic Plan, final strategic planning guidance is issued to field offices and laboratories for use as the starting point for the program planning process. After the broader program planning guidance necessary to implement the strategic plan has been derived, more specific, mission-oriented

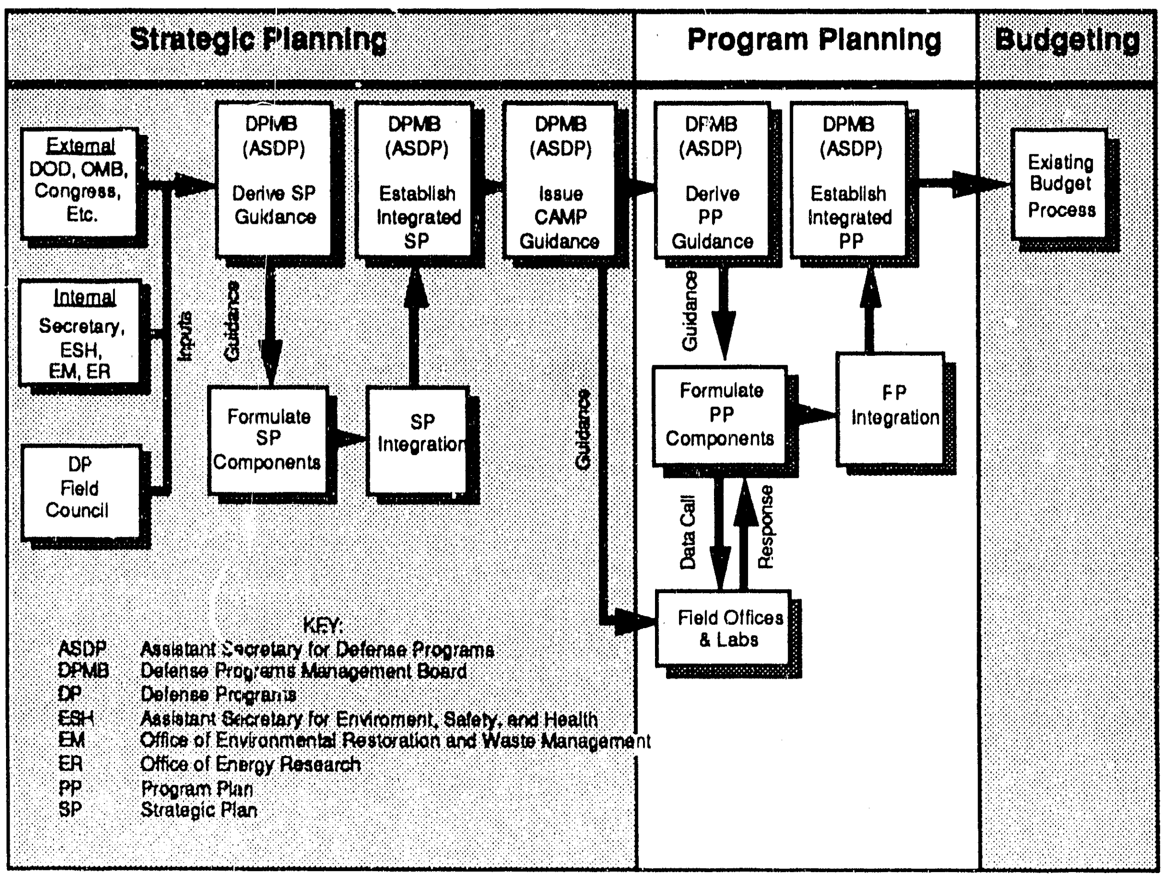


Figure 5.1.–Planning Process Information Flow.

guidance for each program area is formulated and a data call is sent to the field. Field offices and laboratories develop their responses to the data call which is used to complete development of each of the mission-oriented components of the Program Plan. The Program Plan components are then merged into an integrated Program Plan for senior management approval. Following that approval, the data flows into the formal budgeting process.

5.2 CAPITAL ASSET MANAGEMENT

Much of the impetus for modernization of the Nuclear Weapons Complex has grown from a general concern that the current Complex is aged, deteriorated, and obsolete. The deterioration of the material condition of the Complex is due, in part, to inadequate maintenance and capital investment practices for its capital assets. It is widely recognized that the current Complex is absorbing a disproportionate amount of DOE's resources for remedial actions and that certain production difficulties are attributed to the age, outdated technology and poor condition of the equipment in the Complex. There is little likelihood that economical, efficient, and compliant operations can be sustained until Complex-21 is implemented, unless improvements in the management of DOE's capital assets are made. These improvements will ensure that the current Complex will remain viable until Complex-21 becomes a reality. Further, these changes will ensure the operability and longevity of Complex-21 by avoiding some of the current problems.

While CAMP will initially be applied to the existing Complex, as reconfiguration decisions are made (particularly after the Secretarial Record of Decision in FY 1994), new and modified facilities and infrastructure will be incorporated into CAMP. Thus CAMP is the capital assets management method of the future.

Private industry, in general, plans its capital investment around an analysis of the capital asset needs of its business. The business engages in a continuous effort to balance the capital assets it has with those that are needed, adding and disposing of assets as required. Industry strives to maximize the utility and functionality of capital assets by maintaining them in a manner which maximizes productivity while minimizing ownership costs. Generally, then, industry seeks to have all those assets required to do business, but only those assets required, and endeavors to maintain those assets in a manner which balances ownership costs with production costs.

The industry concept of a capital stock management plan has been adapted for use in DP. In the process the name was changed to Capital Asset Management Process (CAMP). While CAMP is supportive of the reconfiguration of the Complex, it is not solely a modernization effort and does not depend on the ultimate success of any particular reconfiguration effort. CAMP is intended to induce a permanent, fundamental change in the way DP manages its capital assets and is a long-term approach, integral to DP line management. This approach has great potential for Department-wide application.

CAMP is intended to provide consistent, defensible capital asset planning information, including comprehensive assessments of the material condition of a site's facilities as well as long-term projections of its requirements for maintenance activities, capital projects, and funding. Through CAMP, these requirements are to be derived from analyses of the operating performance and expected useful life of individual groups of the site's assets as compared to the projected duration and overall importance of the missions supported by each of the groups. CAMP is intended to address all aspects of maintenance since maintenance is inextricably linked to capital investment and is required to realize the full potential and benefit of any facility. Proper maintenance will prevent untimely deterioration of capital assets and should preclude the need to replace or upgrade the Complex because of material condition deficiencies.

Certain assumptions have been made in establishing CAMP:

- The maintenance backlog will undergo validation. Meaningful requirements will be worked-off over a reasonable period of time;
- CAMP will be a long-range, perpetual effort that will eventually become standardized within DOE;
- CAMP will be coordinated with the internal review budget (IRB) process, the requirements of the new *DOE Maintenance Order 4330.4*, and the site development plans. CAMP will complement and supplement these items; and
- CAMP will be applied equally and consistently across the Complex. Resources will be allocated for those activities having the most pressing needs as determined through CAMP.

The ultimate goal of establishing CAMP is to develop and refine a process for systematically identifying and validating DP capital investment and capital asset-related funding requirements in a manner which prioritizes needs and allocates scarce resources against the most important requirements. To this end, the annual product of CAMP is not the set of reports described below, but a DP five-year spending plan which balances requirements against resources for maximum benefit. Properly integrated, CAMP should preclude the need to perform a wholesale replacement or upgrade of the Complex in the future.

5.2.1 Description of CAMP

CAMP provides a systematic means of developing and maintaining asset planning documents and a supporting database listing groups of facilities/equipment (hereafter termed "functional units") which encompass all assets within the Complex. CAMP identifies and schedules each foreseeable major event occurring in the unit's lifetime, outlining the site's infrastructure management and maintenance plans and identifying the costs associated with each project resulting from those plans. This includes all funding of Line Items, Capital Equipment, General Plant Projects, and maintenance throughout the Complex. CAMP serves as the principal tool needed to plan comprehensively for the future as well as provide highly resolved justification for funding requests and clear identification of the impact of resource constraints or decrements. Components of CAMP include:

- Functional Unit Life Cycle Plans,
- Maintenance Plans,
- Activity Data Sheets, and
- Condition Assessment Surveys.

A draft CAMP order was originally prepared as part of this study. Since then, it has been modified for use by the entire Department and is undergoing formal Departmental review in preparation for Secretarial approval for implementation. The original draft order was developed by Team F. The coordinating draft of *DOE CAMP Order 43xx.x* is available from the DOE Office of Project and Facilities Management (AD-22).

5.2.2 Functional Units and Life Cycle Plans

Under CAMP, key operating facilities/equipment or groups of facilities within a site are identified as functional units. A functional unit is a logically related grouping, at a single site, of capital assets which are essential for accomplishing the site mission or a requirement of the Complex. Functional units may vary in size or scope within sites and from site-to-site, depending on the number and types of activities which are performed. A functional unit will usually comprise a complete facility, such as a special purpose building and its related equipment, a single production line within a larger general purpose structure, or a grouping or class of similar assets. A functional unit may be as large as a series of buildings or it may be as small as a single shop or the items of special equipment that comprise a process. The functional unit is the basic entity for justifying individual projects and must be capable of being audited in terms of mission requirements and performance standards. Thirty-one standardized functional units have been created for use by all sites, as applicable. Additional functional units may be identified by site personnel to meet their specific management and planning needs, as long as they are based upon the property codes and classification schemes contained within the Real Property Inventory System (RPIS), and the Financial Information System (FIS).

Figure 5.2 illustrates the breakdown structure used for identifying functional units. Since all DOE sites are different, there is no predefined breakdown structure below the third level. Each site develops the breakdown structure that meets its own requirements, as long as functional units below the third level tie to one of the 31 standardized functional units. The end result is a series of functional units which includes all of the site's capital assets and provides a conve-

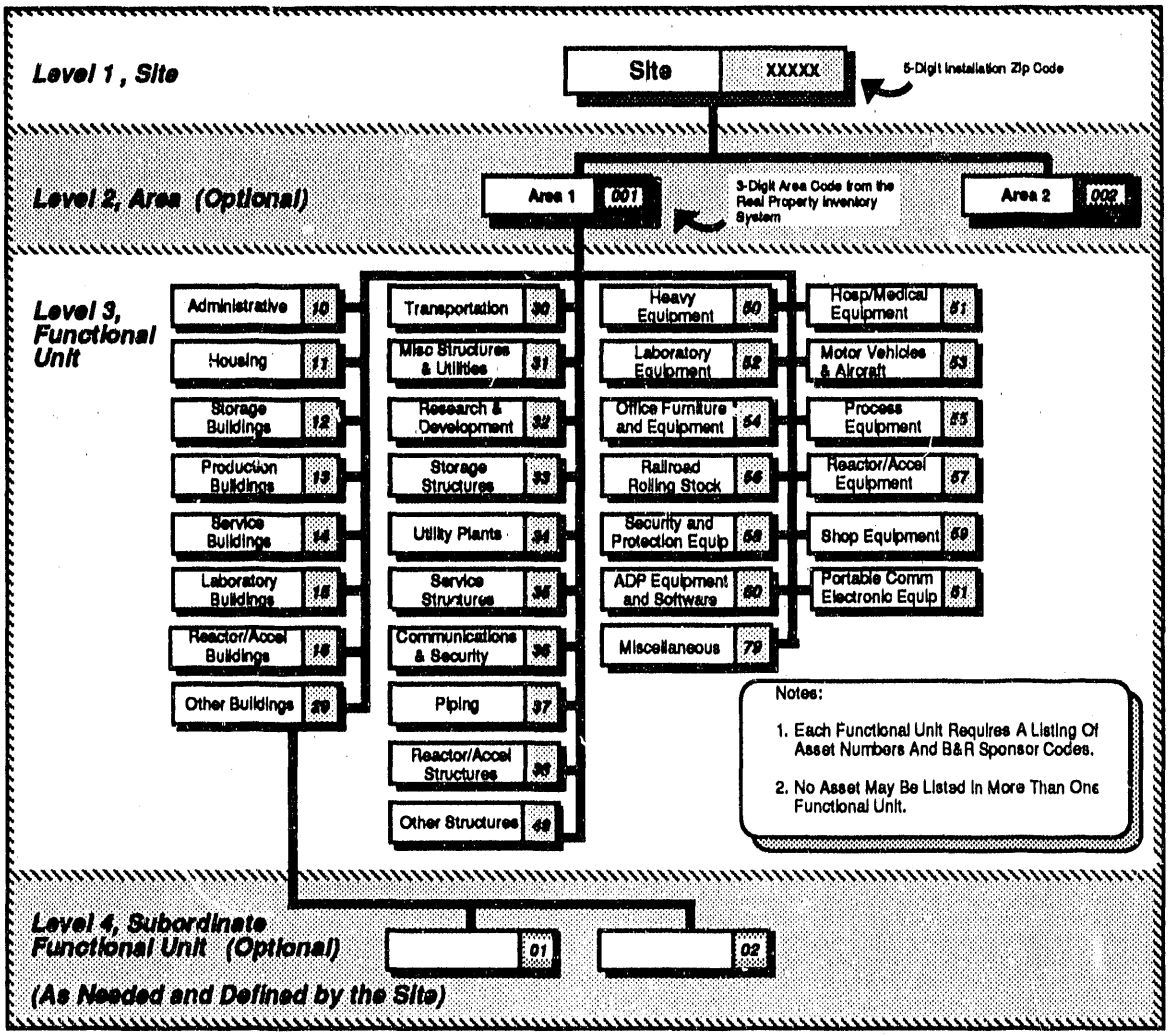


Figure 5.2.–CAMP Functional Unit Breakdown Structure.

nient means of identifying and justifying capital asset funding needs. The breakdown structure is flexible, allowing several levels, depending on the complexity of the site and its management requirements. The first two levels specify the site where the functional unit is located and, if required, the area on the site where the assets are located. The third and subsequent levels designate the major units or groupings of capital assets which are associated with a specific type of asset or their function at the site.

As each functional unit is developed, it is analyzed for events or intentional changes that are expected to occur over the next 20 years. Each event is reviewed to determine if a significant resource requirement (i.e., major expense or line item project) is needed. This information is then captured in a Life Cycle Plan (LCP) for that functional unit.

The LCP provides an overview and assessment of the activities and resources needed to perpetuate a functional unit over its mission life or a 20-year planning period, whichever is shorter. Using this information, a two-part Life Cycle Diagram is developed in a Gantt chart format. Figure 5.3 shows an example. The top portion of the diagram depicts major life cycle events for the functional unit. The bottom portion shows the major capital expenditures or projects related to each life cycle event. In addition to the Life Cycle Diagram, the LCP includes a concise, narrative discussion of the events and projects identified on the diagram as well as a discussion of significant maintenance activities affecting the subject functional unit. Also included is a discussion of the maintenance backlog and any actions planned to reduce the backlog. For the purposes of CAMP, an event is defined as any significant happening which can be expected to alter the size, condition, useful life, capability, performance, or baseline technologies of a functional unit. A project is defined as any activity resulting from an event which requires capital funding, significant non-developmental expense funding, or significant maintenance funding relative to the total amount of maintenance required for the functional unit. The maintenance requirements identified in each LCP will be incorporated by site personnel into a Mainten-

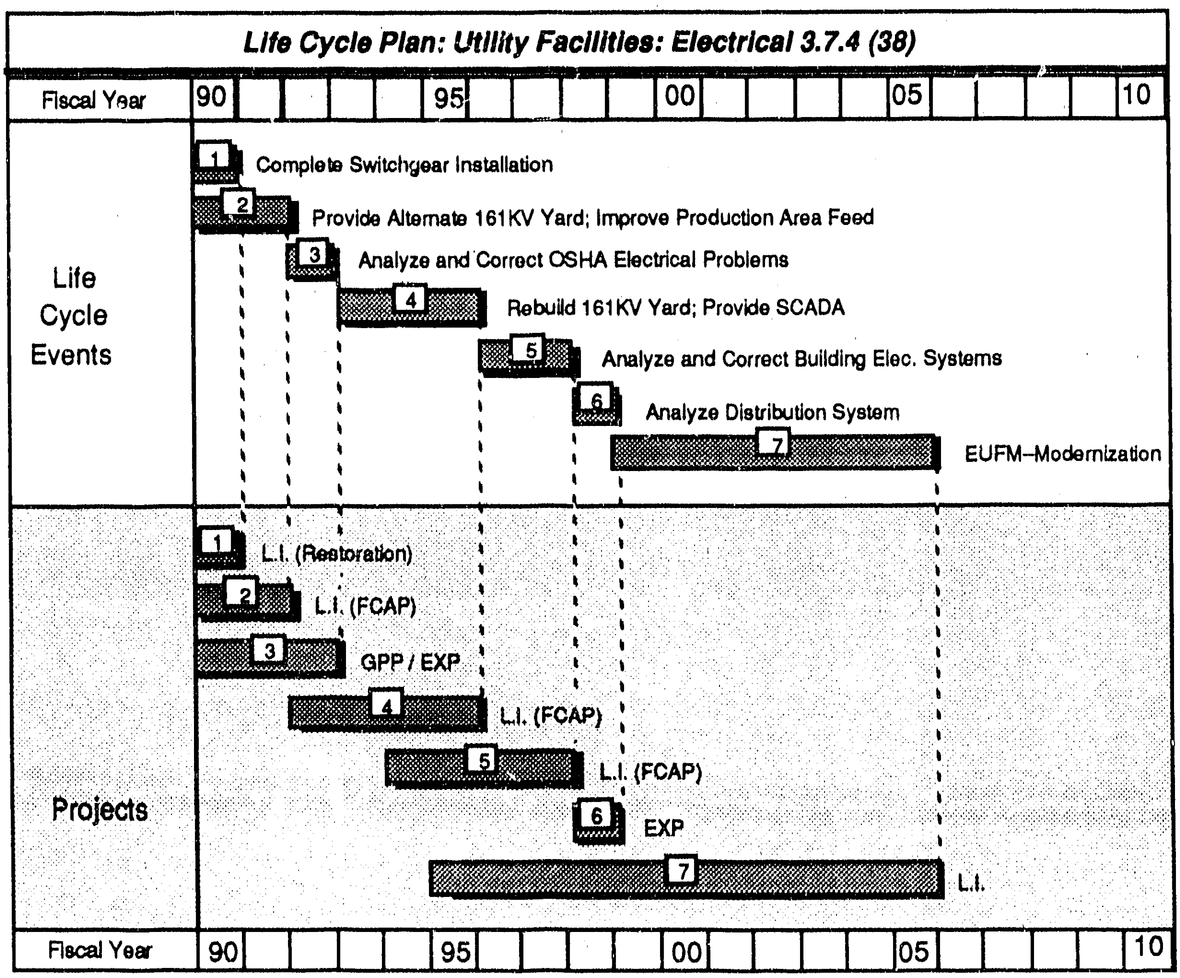


Figure 5.3.–CAMP Life Cycle Diagram.

ance Plan which complies with the new *DOE Maintenance Order 4330.4*. A summary of the Maintenance Plan and a discussion of the site's strategy for reducing the maintenance backlog will be included in each site's CAMP Report. The plan will describe the site's maintenance activities, amount of maintenance backlog, the backlog's impact on the missions, and the status of ES&H compliance at the site.

A draft Maintenance Order was originally prepared as part of this study. It was subsequently modified by the Office of the Assistant Secretary for Nuclear Energy and the Office of Administration and Human Resource Management, has been coordinated throughout the Department, and is now pending formal issue. The original draft order was developed by Team F. The new *DOE Maintenance Order 4330.4* may be obtained from the Office of Project and Facilities Management (AD-22).

5.2.3 Condition Assessment Surveys

The Condition Assessment Survey (CAS) will be an adjunct to CAMP that will facilitate and standardize the physical inspection of many DOE facilities and their installed equipment. The CAS program will define facility inspection methods and deficiency standards in a *CAS Handbook of Standards and Criteria* and develop a computerized database to automate both the field collection of the information and the recording/analysis/reporting of identified deficiencies. Additionally, the CAS program will provide standardized training and certification of field inspectors as well as a quality assurance program to ensure that field inspections are valid and are performed in a consistent manner at all sites.

Ultimately CAS will provide CAMP with documentation of the material condition and requirements for such items as architectural and structural features; mechanical, electrical, heating, cooling, ventilation, water, and waste processing equipment and facilities; communications, safety, and security systems; as well as virtually all aspects of facility interiors, exteriors, and grounds. For optimum utilization, the CAMP and CAS electronic data base systems will be fully compatible.

CAMP is still under development, and it will be some time before it is fully implemented within the Department. CAS, however, was an ongoing program within the Office of Administration and Human Resource Management (AD) when it was incorporated into CAMP. The implementation of CAS is proceeding independently of CAMP, and a procurement to select a CAS support contractor is underway.

AD expects the CAS support contractor to commence work in February, 1991. The first task for the support contractor will be to develop the *CAS Handbook of Standards and Criteria* which will be used to identify and document capital asset material condition deficiencies on a common basis throughout DOE.

As soon as the *CAS Handbook of Standards and Criteria* is complete (currently planned for September 1991) site managers will be able to begin the implementation of CAS on an individual basis at their respective facilities. Simultaneously, AD will undertake the training and certification of CAS inspectors and the implementation of the CAS data base and computer support system at all DOE sites with facilities management responsibilities. Figure 5.8 shows key milestones for the implementation of CAS. The CAS is expected to be fully operational by March 1, 1993.

5.2.4 CAMP Electronic Data Base and Activity Data Sheets

The CAMP electronic data base contains the information needed to determine the types and amount of funding and the number and kinds of projects needed to support the Complex's capital assets. The electronic data base was designed to be compatible with and supported by the CAS data base. The CAS data base will contain data on the material condition of the Complex's assets compiled through a series of periodic physical inspections and analyses. As CAS data is input, it will automatically be consolidated into reports at various management levels and processed by a number of analysis routines. Similarly, field activities will use the CAMP data base to compile their annual CAMP Reports, and the resulting information will be accessible to all levels of management in a variety of formats.

The data base contains identifying information for every project planned, as well as summaries of the various categories of funding required to support the Complex. For each project or funding requirement, the data base contains specific descriptions of what the item will accomplish, the proposed schedule and estimated cost for its completion, specific justification for the item, and an analysis of the impact of not completing or rescheduling the item. The hierarchical data base will ultimately be structured such that lower levels of management can input or review data, but once inputs are approved by successively senior management levels, they cannot be modified without the permission of the most senior level to approve the entry. In this way, the data and analysis tools contained therein will be available to all users, but the integrity of the data base will be preserved.

The information contained in the data base is entered through and manipulated within a record format known as an Activity Data Sheet (ADS). The ADS contains all of the information relevant to a particular project or funding category summary. The ADS format is built into the data base software. Users are permitted to add, modify, or delete information in the data base by making entries to fields in the ADSs. The ADSs may be printed individually for analysis or collectively for publication in documents. In the course of preparing their CAMP reports, site personnel will develop ADSs for each line-item or major expense-funded project identified in the LCP and occurring during the first five years (FY+2 to FY+6) of the 20-year planning window. Often ADSs will be prepared which summarize all funding requirements at various levels of detail. An example of an ADS is shown in Figures 5.5 and 5.6. A legend of entries for the ADS is shown in Figure 5.4.

5.2.5 Prioritization Methodology

Reflecting the Secretary's guidance, the CRC decided that, in general, projects adversely affecting the health and safety of workers and the public were of highest priority and would be addressed first. Items concerning environmental protection laws or regulations would be addressed second, followed in third by projects affecting safeguards and security of Complex facilities and materials. The fourth general category of items which would be addressed last includes all other efforts to address programmatic and production issues.

These general priorities do not mean that all deficiencies of a higher category will be corrected before any of a lower category. For example, all safety and health deficiencies would not be corrected before starting to correct any of the environmental or safeguards and security problems. Rather, these priorities state that when the relative cost-effectiveness and benefits of projects are found to be of similar merit, preference will be given to the project of the higher general priority.

Consistency in preparation and prioritization of the ADSs is key to the validity of the DP budget plan and the corresponding justification of the budget to OMB and Congress. A detailed instruction set and a prioritization methodology for new initiatives have been devised to guide site personnel in building the ADS. In order to provide the means of assessing the rank order of all projects, a "Rating Score" field is used to quantify the seriousness of the particular deficiency addressed by the project. A scored matrix of conditions and consequences is used to assign rating scores. Finally, after applying the general prioritization categories to break ties in the rating score, line management provides a site-wide relative ranking for each new start.

The rating score and site-wide relative ranking are useful in focusing efforts at particular sites and allowing a degree of comparison across the Complex as a whole. However, it is conceivable that there may be overriding considerations that could make a particular project at one site more critical to the Complex as a whole than a higher-scored project at another site. Consequently, in developing a DP Program Plan, a Line Management Panel will convene to create an integrated, Complex-wide ranking of all projects. This panel will be led by a senior person from DP headquarters and contains members from each program office as well as field offices and national laboratories.

Funding requirements in the CAMP database will be updated prior to the start of the next CAMP data call to reflect the actual expenditures and the current year's budget in each area. Thus, requirements that are not funded in a particular budget year will be able to compete for funding in future budget submissions or reprogramming actions.

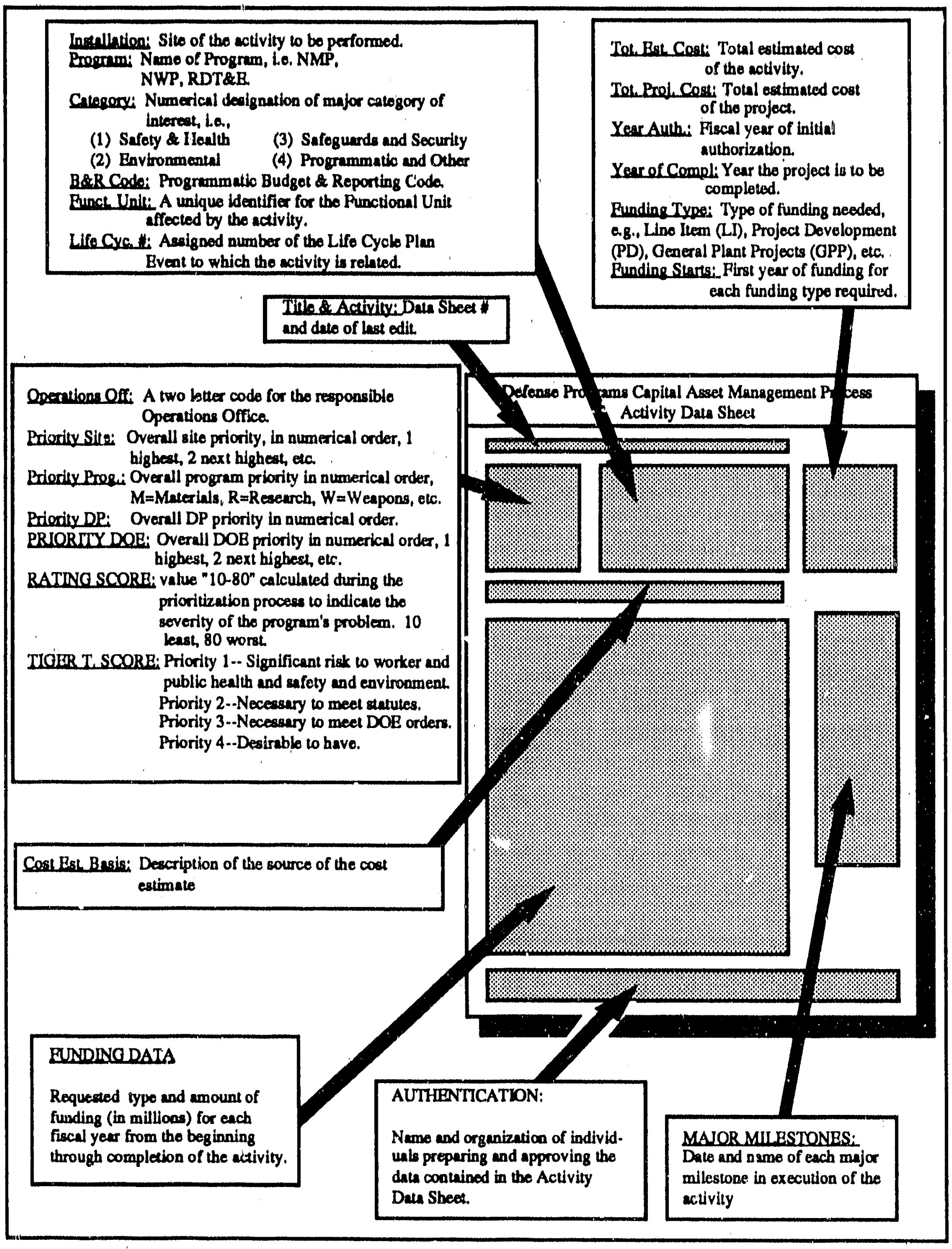


Figure 5.4.–Legend for Activity Data Sheet (ADS).

DEFENSE PROGRAMS CAPITAL ASSET MANAGEMENT PROGRAM
ACTIVITY DATA SHEET

Operations Off:	OR			Tot. Est. Cost:	NWP
Zipcode:	37831	Installation:	Y-12	Tot. Proj. Cost:	39GB03
Priority Site:	09	Program:	P&S	Year Auth.:	1991
Priority Prog:	P-30	Category:	4	Year of Compl.:	1994
Priority DP:	43	B&R Code:	39GB03	Funding Type:	LI
Priority DOE:	-----	Funct. Unit:	38		
Priority Tiger:		Life Cycle #:	4	FUNDING STARTS:	
Rating Score:	45			MT	GP
				BL	CE
				PD 1990	LI 1991

Cost Est. Basis: Based on completed conceptual design. Project TEC: $40.0M.

ADS93-V1 ED: 05/29/90

FY	OPERATING Maint	Backlog	Proj Dev	Subtotal	CAPITAL GPP (millions)	CapEq	LineItem	Subtotal	Year Total
1991	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	1.9
1992	0.0	0.0	0.0	0.0	0.0	0.0	8.8	8.8	8.8
FY91, 92 not in totals below									
1993	0.0	0.0	0.0	0.0	0.0	0.0	17.9	17.9	17.9
1994	0.0	0.0	0.0	0.0	0.0	0.0	11.4	11.4	11.4
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93–97	0.0	0.0	0.0	0.0	0.0	0.0	29.3	29.3	29.3
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98–02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03–07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
08–12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	29.3	29.3	29.3

MAJOR MILESTONES

1. 10/01/90 Initiate Design
2. 11/01/91 Initiate Procurement
3. 10/01/91 Initiate Construction
4. 9/30/95 Complete Construction
5. / /
6. / /
7. / /
8. / /
9. / /
10. / /
11. / /
12. / /
13. / /
14. / /
15. / /

CONTRACTOR: MMES	PREPARED BY: G. P. Patterson	DATE: 01/05/90
DOE ORG: ORO	APPROVED BY: R. J. Spence	DATE: 01/10/90

Figure 5.5.–CAMP Activity Data Sheet (Page 1).

DEFENSE PROGRAMS CAPITAL ASSET MANAGEMENT PROGRAM
REFURBISH POWER SUPPLY/DIST SYSTEM

****************************** ACTIVITY DESCRIPTION ******************************

The power supply/distribution system at Y–12 must be refurbished to provide a reliable and maintainable source of electricity to meet weapons production requirements.

This project will refurbish the Y–12 electrical power supply/distribution system by: (1) restoring Elza I switchyard (primary 161-kV switchyard for the Y–12 Plant); (2) refurbishing electrical power control system (161- and 13.8-kV); and (3) refurbishing the secondary distribution system.

The 40-year-old Elza I switchyard, which brings 161-kV power into the Y–12 Plant from TVA generating stations, will be refurbished by installing new equipment such as bus bars, breakers, disconnect switches, and control systems in a double-bus double-breaker configuration, and providing required fire protection. The new configuration will accept power from Bull Run, Wolf Creek, and Fort Loudon generating stations and distribute it through the double-bus arrangement to the Y–12 feeders. Foundations will be repaired or replaced as appropriate, and switchyard gates, fences, and the access road will be modified for the new configuration. A new substation control building of approximately 2,400 square feet will be constructed to facilitate the conversion of the substation controls to the current industry standard (250-volt d.c. system), which will include new instrument transformers, control wiring, relays, and control panels. The existing, inadequate control building (1501-1) will be demolished after the new system is operational.

The Y–12 electrical power control system will be refurbished by providing a supervisory control and data acquisition system (SCADA system). The new SCADA system will include centrally located control and data equipment with an electrical system graphic display board; remote control interface panels; control cable, equipment status and data acquisition system; and electrical power system status sensors, reducers, and control devices. Approximately 1,200 square feet of new space attached to the plant shift superintendents' operating center will be built for installation of the new SCADA central control equipment.

A portion of the electric distribution systems will be refurbished by replacing obsolete 480-volt switchgear, motor-control centers and starters, 13.8-kV/480-volt transformers, and associated cabling. New 480-volt breakers will be installed to cross-tie power supplies to critical equipment and will be sized to meet existing loads and fault current requirements.

****************************** JUSTIFICATION ******************************

The Elza I switchyard is the only source of electrical power for the Oak Ridge Y–12 Plant. The switchyard is functionally inadequate to provide the flexibility and increased availability of electrical service required for weapons production and must be refurbished to meet current national electrical codes. The Elza I switchyard, which was built during the World War II Manhattan Project, has been modified several times to accomodate transmission system and load characteristic changes. Most of the original equipment is still in use, but has reached the end of its useful life and must receive a major upgrade. Most of the control and panel wiring is old and deteriorated, and several attempts to rewire existing 125-volt d.c. control panels have resulted in unplanned Y–12 Plant power outages. Most of the equipment is outdated and no longer being manufactured, which makes it difficult to obtain repair parts.

The primitive controls for the Y–12 Plant electrical power supply and distribution system pose potential safety hazards, require excessive response times in dealing with outages, and yield inadequate information and control capability for emergency or load management. Correction of the inadequate control capability is especially important considering the current critical mission of the Y–12 Plant produciton facilities.

The refurbishment of the distribution system involves the replacement of equipment which is functionally inadequate and, in many cases, in poor physical condition, reaching the end of its useful life. Portions of the present system are overloaded, contain obsolete equipment (spare parts are difficult to obtain), and are configured so that no back-up of critical components is available. Thus the system has marginal availability and preventative maintenance is very time-consuming and prohibitively expensive.

Figure 5.6.–CAMP Activity Data Sheet (Page 2).

5.2.6 The Annual CAMP Cycle

Figure 5.7 depicts the annual cycle of CAMP events in the development of the annual budget request. The cycle begins with the issuance of a CAMP data call. At each site, condition assessment reports are generated and CASs conducted or updated to evaluate the status of functional units and identify present or impending problems that must be addressed through either the Life Cycle Plan for capital investment or the Maintenance Plan. The data collected is then analyzed and a preliminary CAMP Report (including ADSs) is prepared for each site. Following Operations Office and DOE Headquarters Program Office review and analysis, revision instructions are provided to the sites. These instructions reflect the impacts of the Office of Management and Budget (OMB) input, completed and approved conceptual design reports, and reconciliations of the prior year's budget.

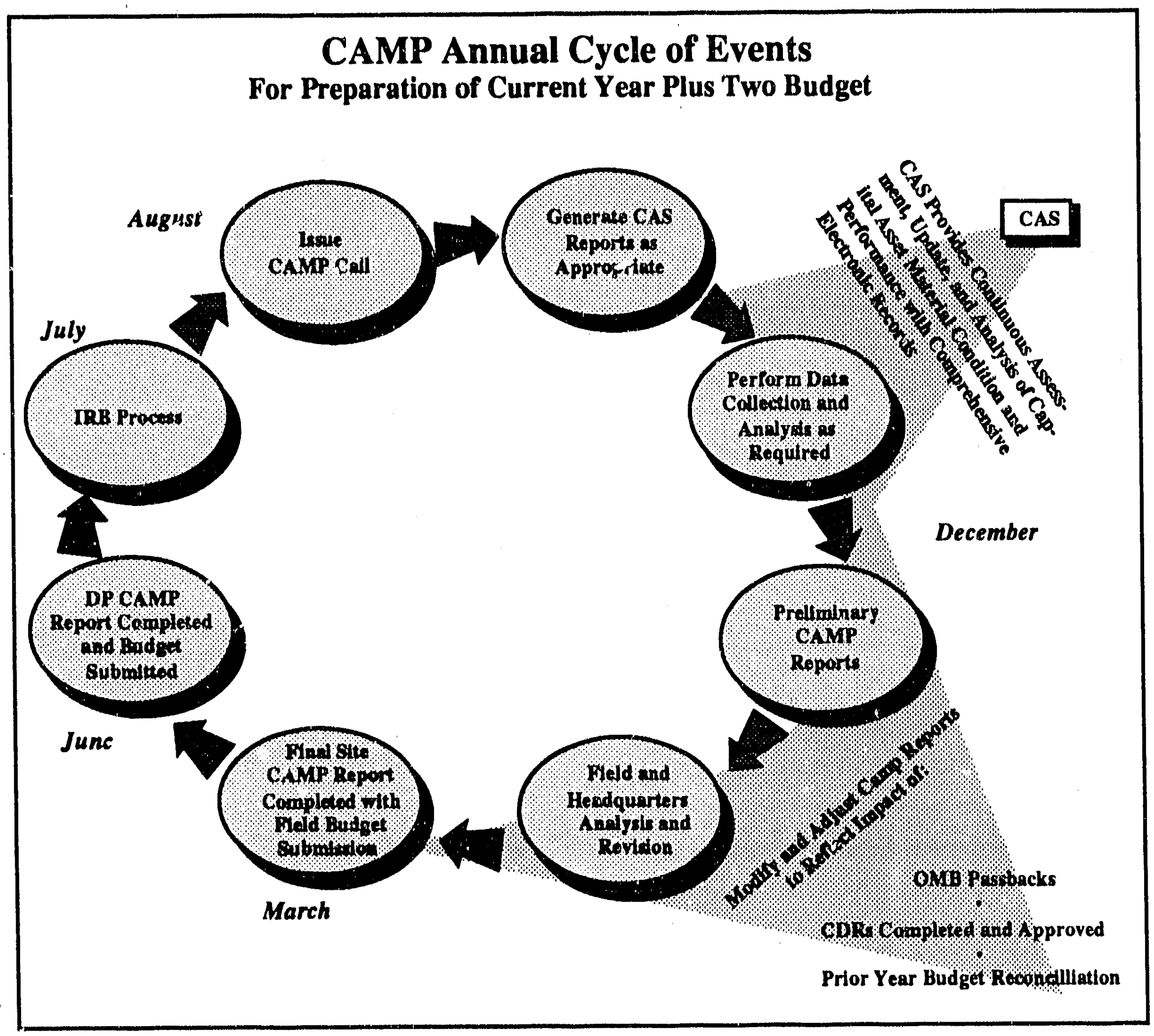


Figure 5.7.–The CAMP Annual Cycle.

Site personnel apply the changes to the Life Cycle Plan, Maintenance Plan, and ADSs and resubmit the final site CAMP report along with the field budget submission through line management to DOE Headquarters. A DP CAMP Report is then developed to provide a Complex-wide view of all projects competing for funds. During the Internal Review Budget (IRB) Process, the projects are validated and then assigned a DP funding priority. Following the IRB process, funding decisions are announced to the field so that appropriate adjustments in plans and data bases may be made in preparation for execution. Any projects not funded may be reevaluated and submitted in future CAMP calls.

5.2.7 Personnel Required to Implement CAMP and CAS

As described earlier, CAMP and CAS will be active at all DP sites. Table 5.1 shows the number of federal and contractor personnel required by site to implement and manage these programs. Since most of the sites are not currently performing functions related to CAMP or CAS, new personnel will be needed.

The DOE role in CAMP and CAS is primarily administrative and a single organization at these sites can effectively manage both activities. Therefore, in Table 5.1, the combined needs for CAMP and CAS personnel at DOE Headquarters and field offices are shown in the "CAMP" column. At DOE Headquarters, it is estimated that 12 people will be shifted to CAMP/CAS positions in DP-10, DP-20, and DP-50 through reassignments and only six new people will be needed.

With the exception of those at Albuquerque, Savannah River, and Y-12, each of the DP field offices, which are variously identified as Site Offices, Site Representatives, Area Offices, or Operations Offices, will require only one additional person to support CAMP and CAS (a total of 10 additional people). The Albuquerque and Savannah River Operations Offices have a broader range of responsibilities and will each require two additional people (four additional people total). Since the Y-12 Site Representative is collocated with Oak Ridge Operations Office, that office will be used for support. Table 5.1 shows that 14 additional federal employees will be required to support CAMP and CAS at the field office level.

At the DP sites operated by M&O contractors, the personnel needed to support CAMP and CAS are primarily technical, but require different disciplines. CAMP is largely a planning and management function which requires coordinating long-range DP mission-related goals and objectives with data on serviceability and adequacy of capital items. CAS is an engineering-based inspection and reporting function requiring detailed knowledge of equipment.

The CAMP management team for an average DP contractor site will consist of a manager, project engineer, maintenance engineer, budget analyst, planning specialist, and an administrative support person. This basic unit has been scaled up or down as appropriate for larger or smaller sites. The requirements

Location	CAMP	CAS
DP Headquarters *	6	-
Field Offices *	14	-
Idaho National Engineering Laboratory	4	3
Kansas City Plant	6	12
Los Alamos National Laboratory	6	19
Lawrence Livermore National Laboratory	6	17
Mound Plant	4	3
Nevada Test Site	6	7
Pantex Plant	6	5
Pinellas Plant	4	3
Rocky Flats Plant	6	12
Sandia National Laboratories **	6	14
Savannah River Site	12	21
Y-12 Plant	6	19
Total	88	135

* Federal employees. All other requirements are for M&O contractor personnel
** Includes Sandia , Livermore, and Tonapah Test Range

Table 5.1.–Additional (New-Hire) Personnel Requirements to Implement CAMP.

shown in Table 5.1 are estimates of the additional personnel needed for each site and represent generic, "full-time equivalent" (FTE) personnel rather than specific disciplines or specialties.

The site CAS requirements were derived from Naval Facilities Engineering Command data for FY 1989. This data showed that, on average, one person can inspect nonspecialized real property with a replacement value of about $37.5M. Using this yardstick against the recently updated Real Property Inventory System database, and assuming that half of the nonspecialized real property would be inspected each year produced the CAS personnel requirements in Table 5.1. Specialized real property, such as reactors, linear accelerators, contaminated facilities, etc., is already being inspected by existing site personnel, who could be redirected to support CAS functions for specialized real property. Should that not be the case at specific sites, the values in Table 5.1 will have to be correspondingly increased.

The total contractor and government personnel requirement for implementing CAMP and CAS is estimated to be 223 FTEs. Assuming a mean cost of $70K per person, the total annual funding requirement is about $16M.

5.2.8 Status of CAMP Implementation

Initial elements of CAMP have been implemented on an interim basis. On November 14, 1989, a data call was issued with instructions to the operators of 14 DP sites for the preparation of interim FY 1992 CAMP reports (ADSs, LCP, and Maintenance Plan). Final reports for the FY 1992 interim CAMP were returned in March 1990. The interim reports have provided a basis for improvement and refinement of CAMP, as will all future CAMP reports. The full schedule for transition from the interim CAMP to the final CAMP is shown in Figure 5.8. It is an iterative process that will incorporate lessons learned from each cycle and may require two to three iterations before its products are fully developed and of maximum value. In the meantime, the Under Secretary authorized DP to implement an interim version of CAMP on September 27, 1990, based upon the draft DOE CAMP Order 43xx.x.

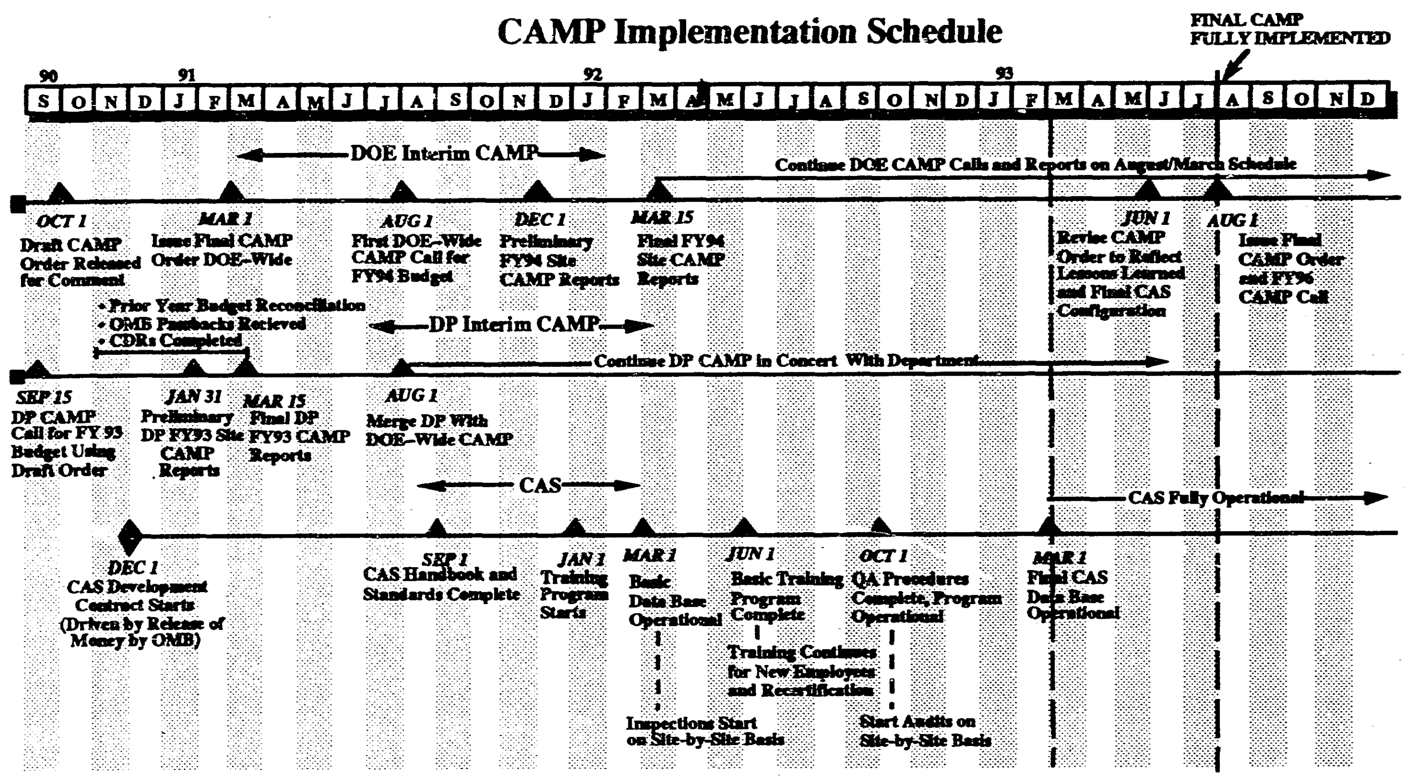
As mentioned previously, the draft DOE CAMP Order is pending intra-Departmental coordination, while the draft DOE Maintenance Order has been coordinated and is awaiting formal issue. Both orders have been modified from the original CRC versions to reflect use by the entire department. Implementation of CAS has not yet started. It is expected that, eventually, following implementation of the necessary orders, all DOE activities will incorporate CAMP.

5.2.9 Remaining Actions for CAMP

Although initial implementation of CAMP has taken place, additional actions are necessary for it to become a formal, fully institutionalized process for the entire DOE. The following actions should be taken:

- Issue the DOE Maintenance Order and DOE CAMP Order;
- Use the DP CAMP to prepare the FY 1993 Budget Request and, based upon the results, refine DOE CAMP guidance, procedures, and processes;
- Continue implementation of the CAS program by AD with the ultimate goal of having it become a part of CAMP throughout the Department; and
- Support personnel (223 FTE) and funding ($16M/year) requirements as discussed in Section 5.2.7.

CAMP Implementation Schedule



CAS HANDBOOK AND STANDARDS

- Material Condition Standards by Class of Property (COP)–May 91
- Methods for Inspection by COP–July 91
- Frequency of Inspection by COP–Aug 91
- Training and Certification Procedure for Inspectors by COP–Sep 91

ROUTINE CAS OPERATIONS

- Maintenance and Update of Standards and Procedures
- Training and Certification for New Methods, Equipment, and Personnel
- Recertification of Inspectors
- Data Base Maintenance and Enhancement
- QA Audits and Surveillance

Figure 5.8.–CAMP Implementation Schedule.

5.3 ORGANIZING FOR SYSTEM-WIDE COORDINATION

The implementation of integrated strategic and program planning processes requires strong top management support and creation of an organizational structure committed to the achievement of broad, long-range DP objectives. The proposed organization to implement the planning process and budget coordination within DP is shown in Figure 5.9. The purpose, major activities, and membership of each organizational element is discussed in the following text.

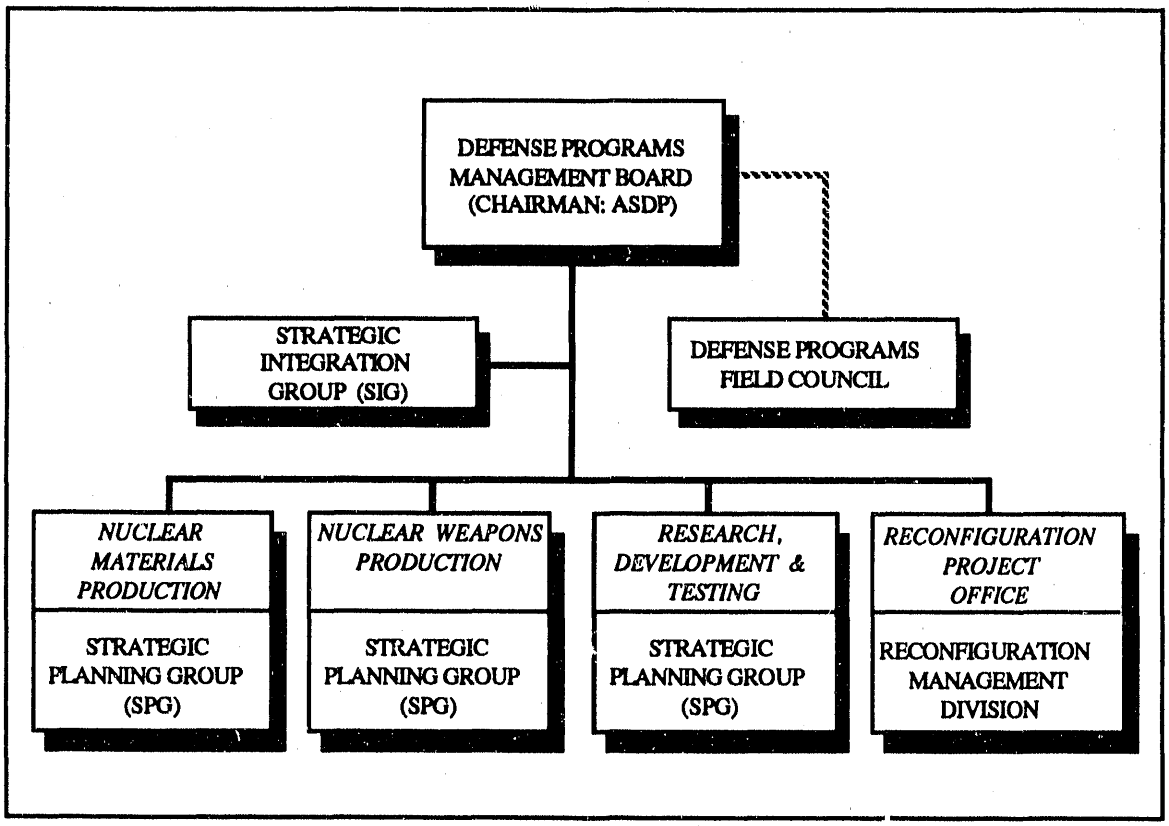


Figure 5.9.–Organization For Strategic Planning.

5.3.1 The Defense Programs Management Board (DPMB)

The DPMB, under the direction of the ASDP, will be responsible for development and implementation of both the Strategic and Program Plans for DP. This responsibility includes commitment to and accountability for:

- Establishing the strategic planning process,
- Establishing and staffing the Strategic Integration Group (SIG),
- Assigning personnel to Strategic Planning Groups (SPG),

- Soliciting and coordinating input from key sources external to DP,
- Developing and annually revising strategic and program guidance,
- Providing resources for strategic and program planning and implementation,
- Managing the development of the DP Strategic and Program Plans,
- Approving the Strategic and Program Plans, and
- Ensuring implementation of the plans.

The members of the DPMB should include the ASDP (Chairman); the Assistant Secretary for Environment, Safety and Health; the Directors of the Office of Environmental Restoration and Waste Management and the Office of New Production Reactors; the Principal Deputy Assistant Secretary for Defense Programs; the Deputy Assistant Secretaries for Nuclear Materials (DP-10); Military Application (DP-20); and Planning and Resource Management (DP-50); and the Director, Reconfiguration Project Office.

5.3.2 The Defense Programs Field Council

The Defense Programs Field Council will be responsible for advising on the status and needs of field organizations and evaluating the effects of Headquarters' policy and action on field organizations. The Council will work directly with the DPMB in:

- Reviewing the strategic planning process,
- Recommending guidance for the Strategic and Program Plans,
- Reviewing the Strategic and Program Plans and recommending revisions,
- Monitoring field implementation of both plans and providing feedback to the Board, and
- Participating in the DPMB meetings as directed by the ASDP.

The members of the Field Council should include the Principal Deputy Assistant Secretary for Defense Programs (Chairman), the Defense Programs Field Office Managers, and the Defense Programs Laboratory Directors.

5.3.3 The Strategic Integration Group (SIG)

The SIG will consist of a full-time support staff residing with DP-50. It assists the DPMB in executing the Board's responsibilities in the following:

- Development and implementation of the strategic planning process as directed by the ASDP;
- Development of the Strategic Planning Charter;
- Development of Charters for the DPMB, Defense Programs Field Council, and the SPGs;
- Development of draft strategic and program planning guidance for consideration by the DPMB;
- Integration of Strategic and Program Plans based on DPMB and SPG inputs;
- Integration of DP planning efforts;
- Monitoring and coordinating of SPG activities;
- Provision of strategic planning education and training as needed;
- Oversight of strategic initiative studies; and
- Organization of strategic planning retreats.

The members of the SIG should include a Director and four full-time staff members experienced in the offices of the Defense Programs, and the Deputy Assistant Secretaries for Nuclear Materials (DP-10), Military Application (DP-20), and Planning and Resource Management (DP-50). Two of these positions can be filled with existing personnel. The remaining three will require new personnel.

SIG operation requires about five personnel. These resources are not included in those previously shown for implementation of CAS and CAMP.

5.3.4 The Strategic Planning Groups

A separate SPG is needed for each of the principal program areas: Nuclear Materials Production; Nuclear Weapons Production; and Research, Development and Testing; as well as for Reconfiguration. Each SPG is responsible for providing the bottom-up input to the strategic planning process. Responsibilities include:

- Preparing Strategic Plans for their respective functional areas based on strategic guidance from the DPMB,
- Preparing Program Plans for their respective functional areas based on program guidance from the DPMB,
- Defining and securing resources required for implementation,
- Implementing Strategic and Program Plans and tracking their progress,
- Identifying and implementing strategic planning studies after DPMB approval,
- Periodically briefing the DPMB on plan implementation progress, and
- Recommending changes and course corrections to the DPMB.

The members of each of the SPGs should include the respective Deputy Assistant Secretary as Chairman (or the Director, Reconfiguration Project Office for the Reconfiguration SPG) and staff assistants, as well as members from the offices of the Deputy Assistant Secretaries for Security Affairs (DP-30) and Planning and Resource Management (DP-50), the SIG, the Office of Environmental Restoration and Waste Management, and field offices and site contractor representatives as appropriate.

SPG operation requires a staff of nine. Three of these positions may be filled with existing personnel while the remaining six will require new personnel. These resources are not included in those previously shown for implementation of CAS, CAMP, and SIG.

5.3.5 Group Interaction in the Planning Process

Sections 5.3.1 through 5.3.4 described the composition and functions of the major groups involved in strategic and program planning. Previously Section 5.1.3 described the integration of planning and budgeting and illustrated the planning process information flow (Figure 5.1). Using that same information flow diagram, Figure 5.10 annotates the roles of the DPMB and its SIG, the Defense Programs Field Council, and the Strategic Planning Groups in each step of the planning process.

5.3.6 Reorganization of Defense Programs

In order to realize this planning process, several organizational revisions are necessary at the Assistant Secretary level to facilitate overall policy coordination and at the Deputy Assistant Secretary level to implement the planning func-

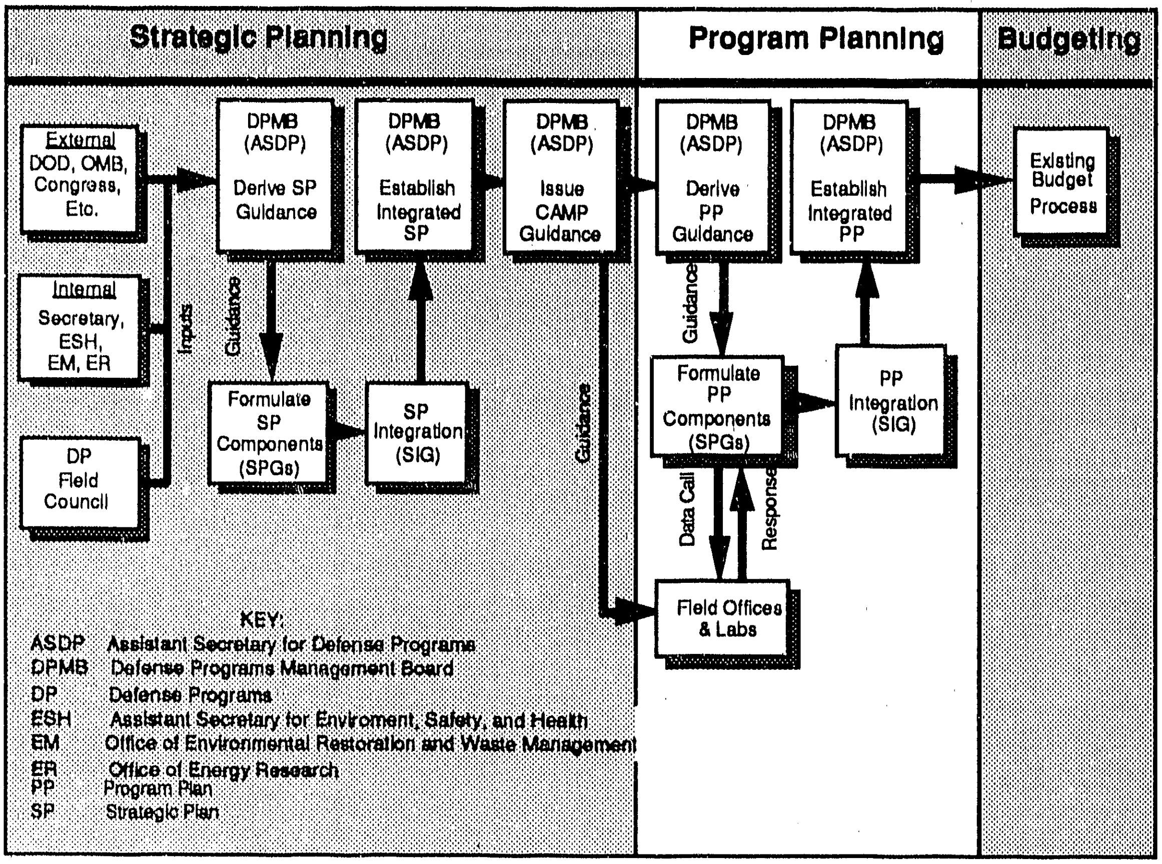


Figure 5.10.–Group Interaction in the Planning Process.

tions. Figure 5.11 shows the structure needed to effectively mesh these new management functions with the existing Complex.

DP should introduce, institutionalize, and integrate the strategies and program planning process with the budget process. Furthermore, DP should reorganize to establish the Defense Programs Management Board (DPMB) and its Strategic Integration Group (SIG), the Defense Programs Field Council, and the Strategic Planning Groups (SPG), and should staff DP-10, -20, and -50 to accomplish the Strategic Planning, CAMP, and CAS functions as discussed in this section.

5.3.7 The Planning Cycle

Figure 5.12 shows the cycle for integration of program planning and budgeting with the strategic planning process.

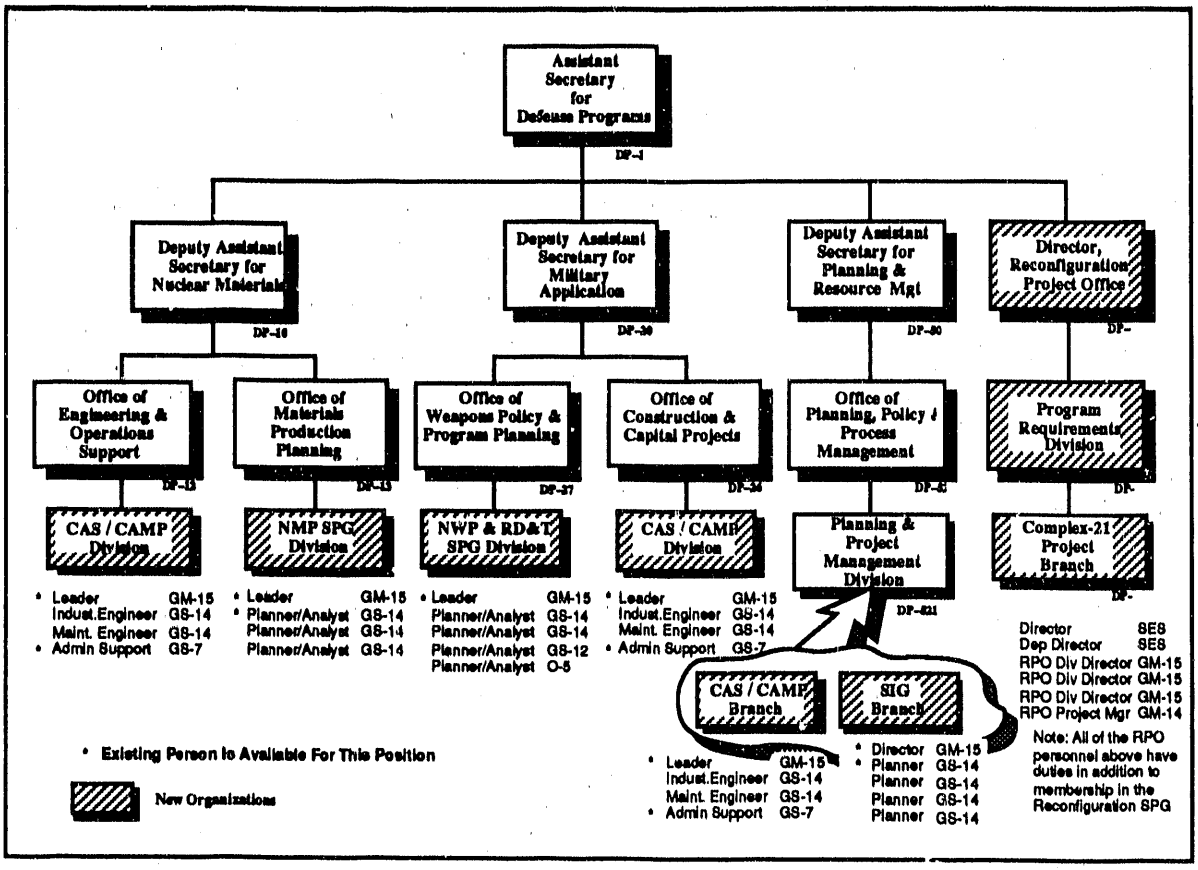
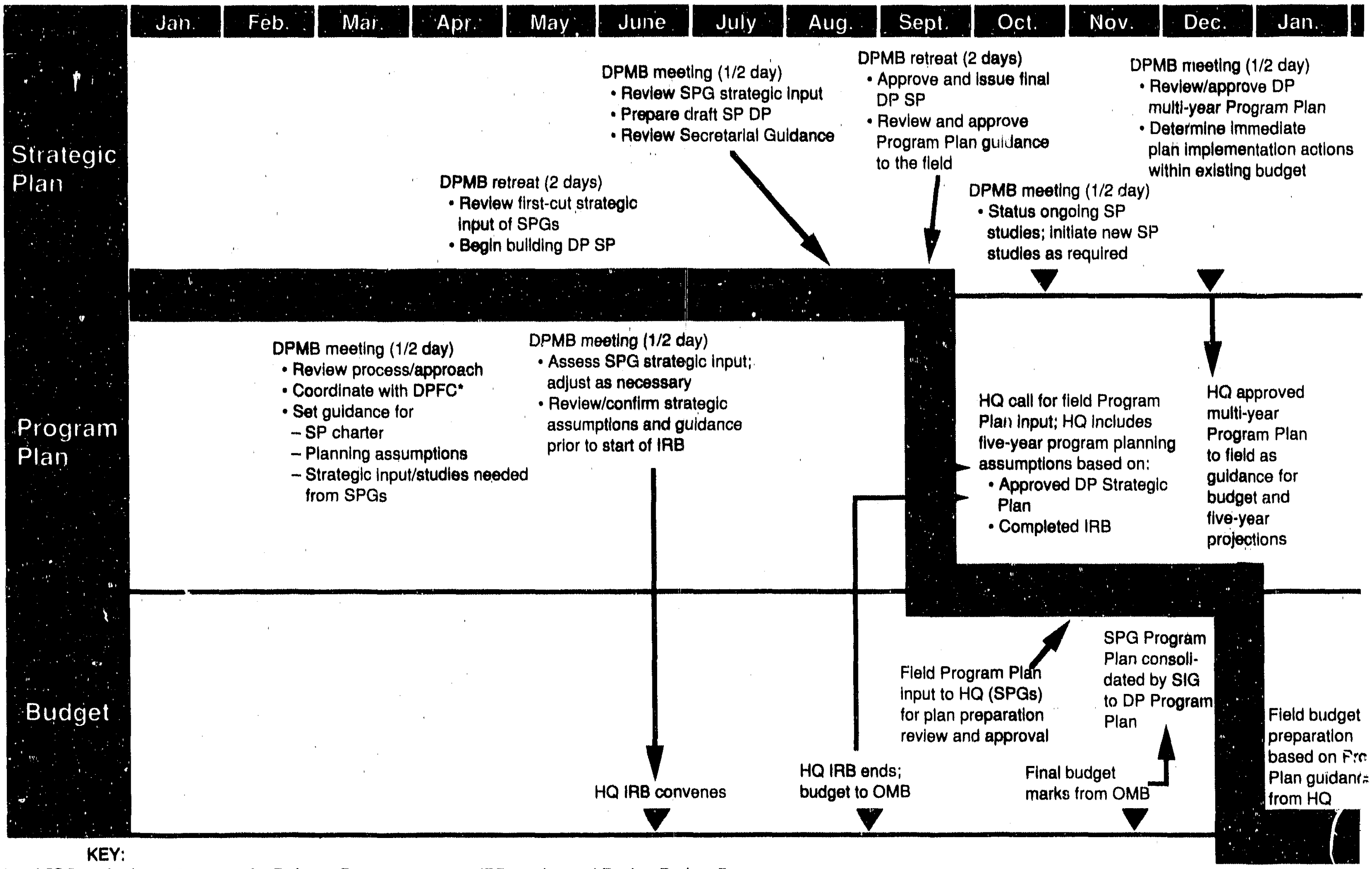


Figure 5.11.–Revised Defense Programs Organizational Structure.

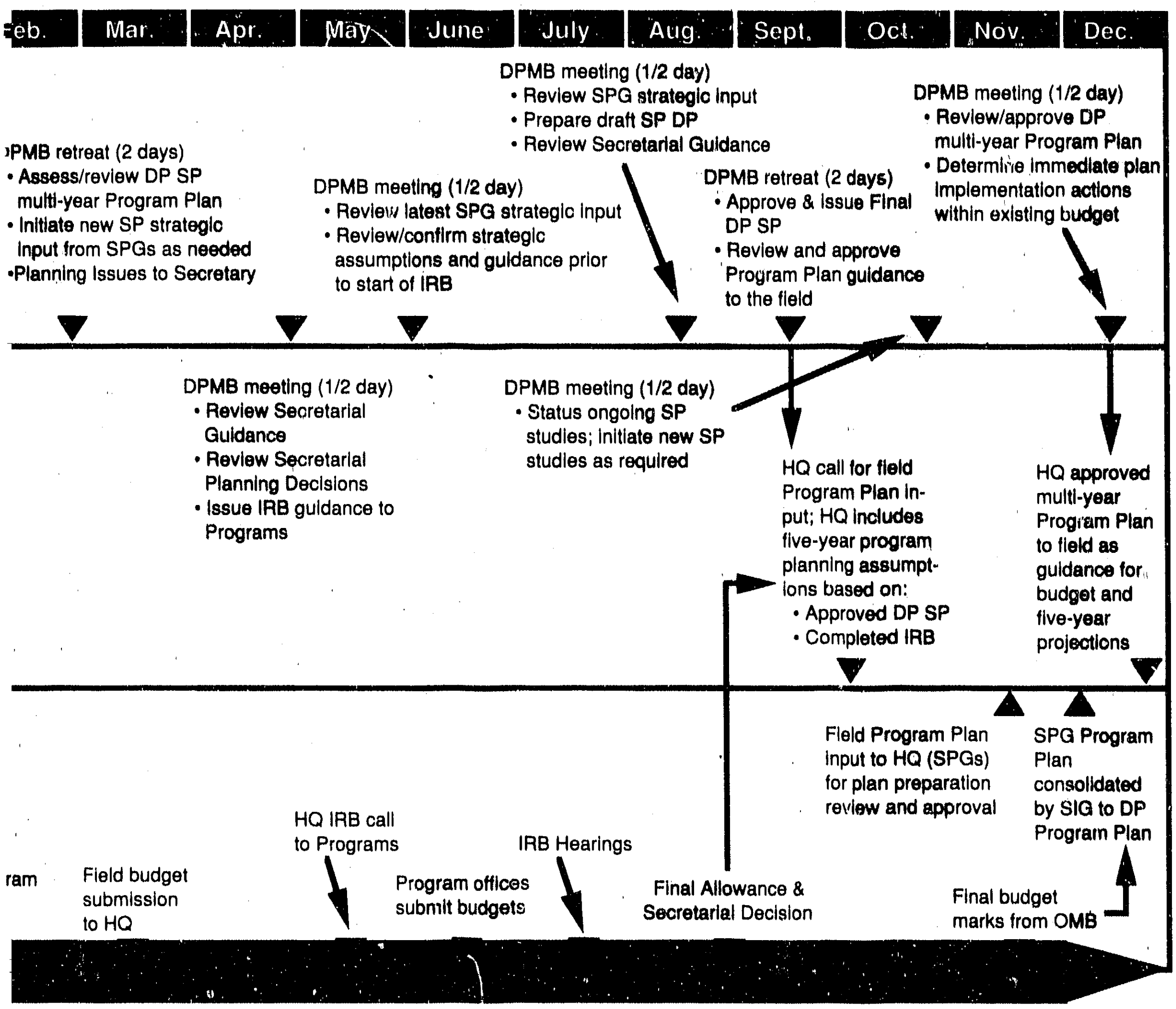


KEY:

ASDP	= Assistant Secretary for Defense Programs	IRB	= Internal Review Budget Process
DP	= Defense Programs	OMB	= Office of Management and Budget
DPFC	= Defense Programs Field Council	SIG	= Strategic Integration Group
DPMB	= Defense Programs Management Board	SP	= Strategic Plan
HQ	= Headquarters	SPG	= Strategic Planning Group(s)

* Field Council would participate in each DPMB meeting and retreat as determined by ASDP

Figure 5.12.– Defense Programs Strategic



Note: Shaded line reflects one complete planning cycle from Strategic Plan to Program Plan to Budget.

lanning Calendar (Two–Year Cycle).

Chapter 6

Transition Activities: Maintaining and Sustaining Required Facilities Until Complex-21 is Operational

CHAPTER 6

TRANSITION ACTIVITIES: MAINTAINING AND SUSTAINING REQUIRED FACILITIES UNTIL COMPLEX-21 IS OPERATIONAL

This chapter summarizes the transition activities needed to keep required facilities operating until Complex-21 is complete. These activities include maintenance of general support and mission related facilities. The chapter begins with a description of the actions necessary to upgrade Complex facilities, extend their economical life, and improve their efficiency. These actions include regulatory compliance, restoration of disrupted operations, and improved maintenance procedures. The chapter next describes consolidations and relocations which are independent of Complex-21 decisions. Finally, the roles of the DP planning process and the Reconfiguration Five-Year Plan during the transition period are described.

6.1 MAINTAINING THE EXISTING COMPLEX

Maintaining the existing Complex consists of all activities or projects necessary to maintain existing facilities and capabilities during the transition to Complex-21. The primary objectives are to ensure compliance with applicable federal, state, and local laws, regulations, and orders, at minimum resource expenditures; to sustain operations in support of the Department's defense related mission; and to minimize the cost of building and operating Complex-21. This approach is consistent with the No Action alternative of the PEIS. Seven major areas, with examples of needed activities or projects, are addressed:

- Improving safety and health performance, including full compliance with all laws and regulations;
- Restoring disrupted operations and assuring their future continuity;
- Addressing environmental corrective actions, restoration, and waste management problems;
- Accommodating increased weapons retirement as the stockpile is downsized;
- Improving safeguards and security for facilities and nuclear material;
- Upgrading infrastructure and facilities which must last until Complex-21 is operational or which might transition into Complex-21; and

- Raising the importance and visibility of maintenance.

Much work has been done in all of these areas since March 1989. However, while substantial progress has been made, considerable work remains to be accomplished before total compliance is achieved. Some of these further efforts are being met with currently authorized funds and others are included in the *Nuclear Weapons Complex Reconfiguration 5-Year Plan.* These efforts are discussed in the following sections.

In addition to the major areas set forth above, several major projects are already planned or underway that will considerably improve the Complex's capabilities. These projects include the design and construction of a Special Nuclear Materials Laboratory at the Los Alamos National Laboratory and New Production Reactor capacity at as yet undetermined locations. They are being pursued based on their own merits and with their own NEPA compliance measures. These projects and others respond to well-documented, immediate needs for the continued reliable and safe operation of the Complex, regardless of any decisions made concerning Complex-21.

6.1.1 Improving Safety and Health Performance

Maintaining the existing Complex requires essential upgrades and improvements to achieve or maintain conformity with ES&H requirements. This includes replacement of those facilities for which upgrades are not cost-effective means of achieving ES&H standards. In some cases, resources must be expended to achieve or maintain compliance at sites which may ultimately be consolidated, relocated, replaced, or eliminated as a part of a long-range reconfiguration plan. However, even these facilities will be likely to provide at least 15-20 years of operational payback before their replacements could be constructed and placed into service. Examples of safety and health projects include:

- Fire, safety, and protection upgrades at the Savannah River Site, Pantex, Kansas City, and Rocky Flats Plants, and the Idaho National Engineering Laboratory;

- Ventilation and vacuum system improvements at Hanford and SRS, the Y-12 and Rocky Flats Plants, and Lawrence Livermore National Laboratory;

- Emergency generator rewinding, electrical control system rewiring, and flood control pump replacement in the three reactors at SRS;

- Emergency Control Center, emergency notification systems, and local alarm system upgrades at the Y-12, Kansas City, and Rocky Flats Plants, INEL, and LLNL; and

- Seismic upgrades at the Rocky Flats Plant, SRS, INEL, and LLNL.

6.1.2 Restoring Disrupted Operations and Ensuring Their Future Continuity

Tritium operations and plutonium reprocessing, currently shut down, must be restored to perform the Department's defense related mission. Furthermore, once they are restored, efforts must be undertaken to ensure their operational reliability throughout the transition period.

6.1.2.1 Tritium Operations

Tritium production must be restored in time to satisfy stockpile requirements. There are currently no tritium production facilities in operation within the Complex. Tritium production operations at the last of the SRS production reactors were suspended in 1988 for safety-related modifications and upgrades.

Tritium is essential to the performance of certain types of nuclear weapons. Due to its short half-life (12.3 years), tritium decays quickly in storage and must be replaced regularly during the stockpile life of nuclear weapons. Failing to replace tritium on schedule could lead to a reduction in weapons capabilities, thus impacting the effectiveness of our nuclear deterrent. A supply of tritium that is adequate, but less than the optimum level, complicates logistics operations and increases both the cost and difficulty of maintaining the nuclear weapons stockpile.

DOE's preferred approach for meeting the long-term tritium requirements of the Complex is the construction of New Production Reactor capacity. This project is currently underway and is being managed by the New Production Reactor (NPR) Office separate from the Complex reconfiguration effort. Analyses of the stockpile scenarios developed for this study suggest that significantly less tritium will be needed than formerly anticipated.

In any event, NPR capacity will not be available before the year 2000. In the meantime, the Complex must continuously replace tritium in nuclear weapons. Expected stockpile levels will permit, in the short term, at least some of this demand to be satisfied by tritium from retired weapons. However, this source will not bridge the gap to the earliest expected operational date of the first NPR. For these reasons, tritium production must be restored at one or more of DOE 's currently shutdown reactors. Promptly restarting two of the SRS production reactors would significantly mitigate tritium supply management problems and allow DOE to better evaluate future needs in light of rapidly changing world events.

6.1.2.2 Transition Planning for Plutonium Operations

Production of plutonium components is a critical element of the Complex that must be restored and maintained throughout the transition to Complex-21. Restoration of plutonium operations will initially occur when the Rocky Flats Plant (RFP) resumes operations expected in FY 1991. Following resumption of RFP operations, transition options will be examined and appropriately implemented to reduce the reliance on RFP.

6.1.2.2.1 Components of Plutonium Operations

Plutonium operations can be split into three essential areas. Operations in each of these areas must be restored and maintained throughout the transition period.

- Plutonium reprocessing takes plutonium bearing wastes and residuals resulting from previous plutonium operations and processes them to make pure plutonium oxide. This process also generates transuranic (TRU) and low-level radioactive and mixed waste.
- Weapons specification plutonium metal (called "pure plutonium") supply operations process retired plutonium primaries (called "pits") and/or pure plutonium oxide to produce plutonium metal of the purity required for new pit production. These processes also produce plutonium-bearing wastes.
- Plutonium primary manufacturing uses pure plutonium to manufacture new pits. This process also produces plutonium oxide and plutonium-bearing wastes.

6.1.2.2.2 Coordination of Plutonium Operations Transition Planning With Complex-21

The ultimate plutonium operations portion of the Complex will be defined by Complex-21. As discussed previously, Complex-21 is expected to be fully operational early in the next century. However, some components of Complex-21 could be brought online earlier than others. Since the Secretary's preferred option is to relocate production activities from Rocky Flats, reconfiguration of those activities will be given priority in Complex-21 construction. Because of expected reductions in nuclear weapon production requirements, a modular approach to construction of plutonium facilities could result in at least some Complex-21 plutonium operations being ready by about 2005. The time at which Complex-21 will have sufficient capacity to allow cessation of all production oriented operations at the Rocky Flats Plant will depend on Presidentially directed production rates. The Savannah River Site currently has the capability to produce weapons specification plutonium metal and to be the principal supplier of specification metal during the transition period.

6.1.2.2.3 The Transition Plan for Plutonium Operations

The dramatic easing of tensions between the United States and the Soviet Union has resulted in changes in military requirements. This, in turn, has led to declining nuclear weapon stockpile levels and has permitted an expansion of the options available to deal with plutonium operations during the transition period. If production requirements for new nuclear weapons are significantly reduced, it may be possible to produce new pits using only plutonium recovered from pits of retired weapons. Plutonium contained in existing oxide, wastes or residues would not be required and the scale of plutonium operations could be reduced. It is important to note that this reduction relies on processing only those retired pits necessary for new pit production. This approach would help in fulfilling the Secretary's preferred alternative of relocating the plutonium operations now being conducted at the Rocky Flats Plant. There may be technical and schedule risk resulting from relocation of some production operations on an accelerated schedule.

DOE is currently preparing a related EIS on the Plutonium Recovery Modification Project (PRMP) at the Rocky Flats Plant. This EIS will analyze an alternative configuration of PRMP, the Residue Elimination Project (REP), which will be capable of reprocessing plutonium residues but not capable of producing new plutonium metal. It will consist of already designed PRMP process modules required to reduce high plutonium content residues to plutonium oxide (in a storable form), transuranic waste, and low-level waste.

The description of the approach for each of the essential plutonium operation areas follows:

- Plutonium reprocessing is not required to support production operations in any of the stockpile cases examined. The expected reduction in stockpile requirements permits plutonium recovered from retired pits to be the only source for new pit production. Consequently, all residues, wastes, and plutonium oxide currently existing, or produced from future operations, do not need to be reprocessed for weapons production. As a result, it may be possible to transfer current RFP reprocessing capabilities (Building 771) and the PRMP project to the Office of Environmental Restoration and Waste Management for use in cleaning up the Rocky Flats site. The PRMP (REP) design would not include the ability to process retired pits or to produce plutonium metal. During the transition, one operation in Building 771, which is capable of removing uranium contamination in the plutonium portion of composite pits[6]

[6] Composite pits contain both plutonium and uranium shells.

and which is unique in the Complex, would have to retain its production oriented mission.

- Weapons specification plutonium metal supply would be obtained primarily from SRS, as noted above. The current Rocky Flats capability (Building 776) would be used to make up any shortfalls in plutonium metal production. For the lower stockpile cases, as a higher risk variation of this approach, Building 776 could be shut down. The higher risk results from the uncertainty that SRS could supply the amount of pure plutonium required to meet the production mission.

- Plutonium primary manufacturing would be conducted in Building 707. However, as a higher risk and cost option, an interim pit production facility could be constructed. The PEIS will be structured such that it could support a ROD selecting an interim plutonium manufacturing facility; the ROD and interim pit production site-specific EIS will be independent of the ROD on Complex-21. Initial investigation has examined an interim production facility sized between the requirements of Stockpile Cases II and III at several sites.

6.1.2.2.4 Management of Wastes and Residues During Transition

Management of wastes and residues from plutonium operations is an area of major importance. Plutonium-bearing residues would be handled by Rocky Flats Plant Building 771 and then by PRMP (REP). During the transition, these plutonium-bearing materials would be turned into storable plutonium oxide with radioactive mixed and unmixed waste as by-products. The plutonium oxide would be placed in retrievable storage at a facility yet to be determined. Retrievable storage is suggested to support the country's investment in plutonium, which could conceivably be required in the future for weapons or power generation. Relatively pure plutonium oxide is required for a storable form since the chemical reactions with organic or inorganic substances that could be present in impure plutonium oxide are not completely predictable. Transuranic (TRU) waste would be packaged and shipped to the Waste Isolation Pilot Plant for disposal. Low level radioactive waste would be packaged and shipped to the Nevada Test Site (NTS) for final disposal. Initial calculations indicate that, with the expected reduced production requirements, the Rocky Flats Plant can remain within the current state-imposed limit of 1,601 cubic yards of transuranic mixed waste and within currently permitted storage for other waste forms. This assumes that the Waste Isolation Pilot Plant opens in a reasonable time for TRU and TRU-mixed wastes, and that the Nevada Waste Repository will open for low-level and low-level mixed wastes. Waste resulting from an interim pit production facility would have to be handled by the waste processing facilities at the site chosen for the interim facility.

6.1.3 Addressing Environmental Corrective Actions, Restoration, and Waste Management Problems

While the great majority of the Department's environmental and waste management projects are consolidated in the *Environmental Restoration and Waste Management Five-Year Plan*, some needed projects are so closely related to current production operations that DP line managers must retain responsibility for their execution. Most of these are concentrated in aging facilities of the Savannah River Site. Examples of the projects included in this category are:

- Installation of automatic, online, isotopic release monitoring systems; effluent monitoring systems; and purge treatment systems in reactors at SRS;
- Construction of a RCRA certified storage facility for 40,000 drums of uranium trioxide;
- Construction of a waste characterization facility at SRS;
- Upgrade of exhaust ventilation system at SRS to prevent radioactive releases to the atmosphere;
- Replacement of leaking and corroded high- and low-level radioactive liquid waste drain headers at SRS; and
- Upgrades of storm drains, sanitary sewer lines, and facilities at the Pantex and Kansas City Plants.

6.1.4 Accommodating Increased Weapons Retirement as the Stockpile is Downsized

Several proposed arms control agreements mandate reductions in the number of nuclear weapons deployed by the United States. Weapons retirements that result from some arms control agreements may be significant when compared with DOE's current throughput. DOE plans to recover the special nuclear materials from retired warheads for use in new weapons. Tritium recovered from these weapons would also be recycled for use in current and future warheads.

Retirement schedules for warheads may be influenced by force structure and programmatic considerations as well as by arms control agreements. These schedules may not coincide with DOE requirements and capabilities for weapons retirement processing.

The primary DOE facility for dismantling nuclear warheads is the Pantex Plant. Once disassembly begins, warheads can be quickly reduced to parts, and the fissionable components are forwarded to nuclear materials processing centers for final disassembly and recovery of plutonium and uranium. As previously discussed, final recovery, particularly of plutonium, may not be warranted.

Storage of retired pits not needed for new pit manufacture is probably the most cost-effective course of action.

If the processing centers are unable to receive all of the components available at a particular time, the components would have to be secured in a DOE storage facility until they could be further processed. Since the nuclear components are small and do not have any explosive parts, storage requirements and restrictions are small in comparison with those for storing complete warheads. A single DOE storage facility, preferably located at the weapon disassembly site, should be sufficient to serve all DOE interim requirements for fissile components. A DOE study is currently underway to address requirements related to increased warhead retirements resulting from either arms control initiatives or other force structure considerations.

6.1.5 Improving Safeguards and Security for Facilities and Nuclear Material

Most DOE facilities were originally constructed with Safeguards & Security systems that are not capable of protecting against currently understood threats. DOE has undertaken an extensive program to incorporate effective protection systems. Projects supporting this program must continue. The long-term focus is on development of technology and systems to meet future requirements, with emphasis on potential insider-threat protection measures and measures to ensure that facilities will be able to cope with vastly more sophisticated terrorists in pursuit of nuclear materials or weapons.

Examples of Safeguards and Security projects include:

- Access control and intrusion detection, security doors, and security alarms for reactors at SRS;
- Intrusion detection, assessment zones, and entry controls for chemical separation facilities at SRS;
- New personnel and access security systems for the Kansas City Plant; and
- Safeguards & Security Phase II upgrades at LANL and LLNL.

6.1.6 Upgrading Infrastructure and Facilities Which Must Last Until Complex-21 Is Operational or Which May Transition Into Complex-21

In addition to the facilities themselves, it is necessary to upgrade the infrastructure and support facilities at some of the sites. Projects such as replacement or upgrading of heating, ventilation, and air conditioning systems, water systems, sewers, electrical distribution systems, and roads must be completed in order to restore or maintain transition capability at some facilities.

When such projects are authorized, their scope will be dictated by the expected employment of the facility. If the facility is required in Complex-21, and not subject to the reconfiguration PEIS, then major upgrades or improvements will be considered to allow that facility to economically transition into Complex-21. If the facility is scheduled to be shut down, or if future requirements for its capabilities are to be determined through the PEIS process, then that facility would receive only the minimum investment needed to ensure that continued operations are in compliance with applicable federal, state, and local laws, regulations, and orders. When the PEIS ROD is made in early FY 1994, those facilities that are to be included in Complex-21 would be upgraded accordingly. Those that would not be part of Complex-21 would continue to receive the minimum investment to assure compliant operations.

Examples of projects to restore/extend operational capabilities include:

- Cooling water system improvements for reactors at SRS;
- Reestablishing roads and bridges, upgrading power substations and telephone systems, and replacing H- and F-Canyon hot cranes at SRS;
- Replacement of mechanical utilities; the condensate system; heating, ventilating, and air conditioning system; production plating shop; and machine exhaust systems; as well as refurbishment of the electric power system and production facilities at Y-12 plant;
- Replacement of temperature and humidity control facilities and electrical system components; upgrade of processed air facilities; modernization of the printed wiring assembly, communication support services, and information distribution systems; and replacement of boilers at the Kansas City Plant;
- Improvements to roads and parking areas, replacement of compressed air system, installation of a lightning protection system, and modification of the high explosives formulation and weapons staging areas at the Pantex Plant;
- Electrical power rehabilitation, fissile-material handler and residue drum storage facility improvements, central steam plant renovation, and utilities refurbishment at the Rocky Flats Plant;
- Fuel processing improvements and a new analytical chemistry laboratory at INEL; and
- Construction of power and water distribution systems and personnel support facilities, and relocation of a drilling mud plant at Nevada Test Site.

6.1.7 Raising the Importance and Visibility of Maintenance

6.1.7.1 Improving Maintenance

The maintenance programs at individual sites vary in quality of application. This may result as much from the need for improved management oversight and guidance as it does from funding shortfalls. Indications are that existing maintenance guidance is inadequate, has technical shortcomings, and is not being rigorously implemented. As one example, *DOE Order 4330.4* decentralizes maintenance management to take advantage of the technical and managerial expertise of the various M&O contractors. Unfortunately, the effect has been to create a maintenance system in which each contractor has a uniquely designed and administered set of requirements and procedures. This inhibits effective DOE-wide planning and oversight. Added to this situation is the fact that the Department financial management system cannot currently track maintenance funds by project, program, or use. Since maintenance is a hidden cost within the overall category of "operating funds," systematic study of and management of DOE's maintenance problems is essentially precluded.

A revised Maintenance Order was developed as part of this study. The Assistant Secretary for Nuclear Energy has modified the order for department-wide implementation and distributed it in draft for field review. It is currently being used in draft form for planning purposes. The revised order incorporates comprehensive, rigorous maintenance requirements, many of which are similar to those imposed by the Institute of Nuclear Power Operations. The draft order:

- Establishes a standardized maintenance program across the entire Complex;
- Institutes a risk-based approach to maintenance, as well as formal training and certification requirements for managers and maintenance technicians;
- Requires aggressive preventive and predictive maintenance efforts; and
- Installs a formal work order system that incorporates feedback from a comprehensive fault analysis program.

Corresponding changes to the Department's financial management system to support the allocation, budgeting, and tracking of maintenance dollars against specific programs and activities should be initiated.

6.1.7.2 Reducing the Backlog of Overdue Maintenance

A dedicated maintenance backlog reduction program should also be implemented to eliminate all deferred maintenance as soon as practical. The actual period required to eliminate the maintenance backlog varies by site and the total amount of time and resources required is a function of funding and availability of skilled personnel to accomplish the additional level of effort. Judgment must be applied, however, to avoid expenditures on specific deferred maintenance activities that are no longer cost-effective to accomplish.

A disproportionate amount of backlog maintenance is related to general purpose infrastructure, such as utilities, roads, and bridges. This is indicative of an apparent practice of "mortgaging" general purpose infrastructure to compensate for funding shortfalls in specialized process or production facilities with more immediate impact on mission goals. Numerous interviews with site maintenance personnel indicate that sites typically begin a fiscal year with sufficient funds to accomplish the level of maintenance planned for that year. As the year progresses, however, a sizable portion of the maintenance funds usually have to be reprogrammed to accommodate unforeseen contingencies, disrupting and severely curtailing maintenance activities later in the year.

6.2 TRANSITIONAL CHANGES TO COMPLEX CONFIGURATION: CONSOLIDATIONS AND RELOCATIONS THAT ARE INDEPENDENT OF COMPLEX-21 DECISIONS

As noted in the preceding chapters, one of the main uncertainties driving Complex-21 is its ultimate configuration. However, it is understood that it is to the Department's and the Nation's advantage to minimize the number of facilities and functions that ultimately constitute Complex-21. Effectively consolidating duplicate activities and eliminating redundant activities improves the efficiency of the Complex and lowers reconfiguration and operating costs. This section addresses some transition activities which will reduce the infrastructure of the Complex.

6.2.1 NMP&M Transitional Configura n Changes

As discussed in Section 3.6.4, several NMP&M configuration changes will occur during the transition period and are not dependent on the outcome of decisions concerning Complex-21. Phaseouts include:

- Nuclear materials operations at Mound,
- Plutonium production at Hanford, and
- Feed materials production at Fernald.

6.2.2 Nonnuclear Manufacturing Transitional Configuration Changes

The CRC has determined that the privatization of nonnuclear manufacturing and support services should be emphasized as a way of reducing the Complex's infrastructure and controlling the cost of Complex-21. As noted earlier, a Privatization Planning Panel (PPP) has been established to fully evaluate the potential for using the private sector to supplant some of the Complex's manufacturing and service operations. The PPP will develop options to close as many nonnuclear plants as possible, with the goal of having only one dedicated nonnuclear manufacturing site in Complex-21. Several activities have already been identified as suitable for privatization or consolidation, and investigation of additional possibilities will continue. Privatization will be vigorously pursued throughout the transition period to the extent permitted by NEPA requirements and by economic, operational, security, and other considerations.

6.3 MANAGING TRANSITION ACTIVITIES

Previous sections have briefly discussed the type of transition activities required to sustain the existing Complex until Complex-21 is online. Specific transition activities will be developed through the DP strategic and program planning process, described in Chapter 5. The Program Plan, or *Reconfiguration Five-Year Plan*, will include the details of the projects to be undertaken together with cost and schedule information. Once the budget process is complete, the *Reconfiguration Five-Year Plan* will be the approved document outlining transition activities. Management of these activities will be accomplished through the program offices. The first *Reconfiguration Five-Year Plan* will be submitted with the FY 1992 Budget.

END

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