94-0006467

The Secretary of Energy
Washington, DC 20585

December 5, 1994

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004

Dear Mr. Conway:

Enclosed is the Department of Energy Implementation Plan for Recommendation 94-1, Improved Schedule for Remediation in the Defense Nuclear Facilities Complex, of May 26, 1994. The Department shares the Board's concern about taking timely action to prevent imminent safety hazards and, as we have discussed, already has significant efforts underway.

The Implementation Plan describes the actions the Department is taking in response to each of the Board's recommendations. Your recommended integrated program plan will prove to be a valuable tool in planning and budgeting this important work.

The Board will be kept informed of the Department's implementation progress through quarterly reports and drafts of the Integrated Program Plan as committed to in the enclosure.

Sincerely,

Hazel R. O'Leary

Enclosure

94:6467

Defense Nuclear Facilities Safety Board Recommendation 94-1

IMPLEMENTATION PLAN

December 5, 1994

Monday, Dec 5, 1994, 12:20pm

IMPLEMENTATION PLAN
TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 was issued on May 26, 1994, and was accepted by the Department of Energy (DOE) on August 31, 1994. The Board noted in issuing Recommendation 94-1 that it was concerned that the halt in production of materials to be used in nuclear weapons froze the manufacturing pipeline in a state that, for safety reasons, should not be allowed to persist unremediated. The Board noted special concern about specific liquids and solids containing fissile materials and other radioactive substances in spent fuel storage pools, reactor basins, reprocessing canyons and various facilities once used for processing and weapons manufacture.

The Board recommended that the Department prepare an integrated program plan on a high priority basis to convert, within two to three years, the specific materials cited in the Recommendation to forms or conditions suitable for safe interim storage.

The Department accepted the Recommendation conditioned upon the understanding that complete conversion of all materials cited in the Recommendation might not be accomplished within the time periods described in the Recommendation.

The Department agrees with the Board that the materials addressed by the Board should be converted into a form suitable for safe interim storage on a high priority basis. The Department has broadened the scope of the requested Integrated Program Plan to include bulk liquids and solids containing fissile materials and other radioactive substances in spent fuel storage pools, reactor basins, reprocessing canyons, processing lines and various facilities which require conversion to forms or conditions suitable for safe interim storage.

The commitments contained in the Implementation Plan are summarized in the following table. In many cases, although not all, the Department meets the time periods contained in the Board's recommendation for conversion and storage of material. Actions to accelerate a number of activities have been taken and other actions are being considered which would result in further acceleration. More detail will be contained in the Integrated Program Plan to be provided by July 1995. Most of the committed actions are contingent upon Environmental Impact Statements that have not yet been completed. The completion dates noted in this Implementation Plan are based on the assumption that what have been identified as the preferred alternatives will be selected when the Records of Decision are issued.

The Department believes that the actions summarized herein are both responsible and responsive to the Board's recommendations. Methods and alternatives for further improving the schedules will continue to be explored. The Integrated Program Plan will provide the Department with a valuable management tool in this regard. Its preparation will not be permitted to interfere with near-term actions to characterize and convert materials or to delay meeting the other commitments made in the Implementation Plan.

The Board will be informed of progress toward these commitments through written quarterly progress reports and drafts of the Integrated Program Plan.

Summary of Department's Commitments in the Implementation Plan

Board Recommendation	Commitment	Section
Prepare Integrated Program Plan to convert within 2-3 years the materials addressed in specific recommendations.	Complete plan by July 1995; drafts will be available March 1995 and April 1995. Commitments for specific materials are addressed below.	1.0
Store, within a reasonable period of time (such as eight years) all plutonium metal and oxide in conformance with the draft DOE standard on plutonium storage.	Issue final DOE plutonium storage standard in December 1994. Store all plutonium metal and oxide in conformance with the final DOE standard within a reasonable period of time. Provide by March 1995 schedule for storage to the standard.	1.2.5
Establish a research program to fill any gaps in the information base for choosing among alternatives. Development of this research program should be addressed in the integrated program plan.	The research program will be included in the Integrated Program Plan. A long-term research program designed to continually examine the selected fissile material stabilization and storage options will be instituted in FY 1996.	1.2.6

Expedite preparations to process dissolved plutonium and trans-plutonium isotopes in F-Canyon at the Savannah River Site to forms safer for interim storage.	Select solution stabilization method for F-canyon plutonium solutions using Solutions EIS Record of Decision in January 1995. The Department is currently reviewing public comments on the draft EIS. Stabilize F-canyon plutonium solutions by September 1996. Select stabilization method for other covered solutions except americium-curium by May 1995. Complete conceptual design report for stabilization of americium-curium solutions by December 1995. (Preliminary estimates are that a facility will not be available before 1999 to begin stabilizing this material. A more detailed schedule for stabilization of americium-curium and other covered solutions will be available in the Integrated Program Plan.)	2.2.1

Expedite preparations to repackage plutonium metal that is in contact with, or in proximity to, plastic.	Only Rocky Flats, Savannah River, and Mound sites are believed to have plastic in direct contact with plutonium metal. Complete repackaging plutonium metal in direct contact with plastic at Rocky Flats by October 1995. Process or repackage plutonium metal turnings in contact with plastic at Savannah River by December 1995. Repackage plutonium metal in direct contact with plastic at Mound by September 1995. Monitor and repackage as necessary packages where plutonium metal is in proximity to, but not in direct contact with, plastic until the material is repackaged to conform with the DOE storage standard. Available data indicates that this is sufficient to provide reliable, safe storage while minimizing material handling and worker exposure.	2.2.2

Expedite preparations to process containers of possibly unstable residues at Rocky Flats and convert constituent plutonium to a form suitable for safe interim storage.	Remove pyrophoric material from the two drums with skulls (1 drum by December 1994; 2nd drum by March 1995). Vent remaining 2,045 drums with a potential for hydrogen gas generation due to residues packaged in plastic by October 1995. Where there is potential for generation of shock sensitive compounds on acid-contaminated gloves, water rinse the gloves. Complete action plan by January 1995. Complete action plans for all solid residues at Rocky Flats by April 1995. Complete Building 371 solution removal and processing of six tanks by August 1996. Complete about 80% of high level and about 50% of low level solution removal and processing in Buildings 371 and 771 by May 1997. Complete Building 771 solution removal and processing by December 1997. Complete the remainder of Building 371 solution removal and processing by June 1999.	2.2.3
Expedite preparations to process deteriorating irradiated reactor fuel stored in basins at Savannah River Site to a form suitable for safe interim storage until an option for ultimate disposition is selected.	Course of action to stabilize these materials is dependent on the Interim Management of Nuclear Materials (IMNM) EIS. Complete the Record of Decision by May 1995 and interim risk reduction activities for all reactor basins by July 1997.	2.2.4

Accelerate placing the deteriorating reactor fuel in the K-East Basin at Hanford in a stable configuration for interim storage until an option for ultimate disposition is chosen.	Path forward for removing and storing fuel was selected on November 2, 1994. Final decision contingent on Record of Decision for K-Basin EIS. Install cofferdam between K-East Basin and Reactor Discharge Chute by February 1995 as an interim measure to reduce consequences of leakage. Issue Notice of Intent for K-Basin EIS in December 1994. Start fuel and sludge characterization in hot cells by March 1995. Record of Decision for K-Basin EIS by December 1995. Complete fuel and sludge removal from K-Basin by November 2000.	2.2.5
Take into account in the above-recommended actions the need to meet requirements for operational readiness per DOE Order 5480.31.	Include in each Site Integrated Program Plan the time and resources required to ensure facility operational readiness in accordance with DOE Order 5480.31.	3.0

II. INTRODUCTION

Since 1943, the U. S. Government has operated a complex of defense nuclear facilities for the purpose of manufacturing, testing, stockpiling, and subsequently dismantling nuclear weapons. This complex included facilities that produced the necessary nuclear materials, fashioned the materials into weapon components, assembled the components into weapon assemblies, and conducted tests to verify weapon designs. In response to the changing political situation in the world, particularly the end of the Cold War, the President of the United States ordered a halt to production of new nuclear weapons. Also, the U.S. entered into several arms control treaties which call for dramatic reductions in the size of the nuclear weapon stockpile.

When the weapon production lines were halted, many materials were left in conditions unsuitable for long-term storage. Also, in the past when nuclear weapons were being produced and the stockpile was growing, the vast majority of high assay fissile material scrap and residues and material from retired weapons would be promptly recycled. In general, it was less costly to recover fissile materials from high assay scrap and residues and retired weapons than to produce new material. As a result very little material containing fissile materials was considered surplus. Since the normal practice was to promptly recycle these materials, they were normally packaged for short term storage.

As a result of the sudden stoppage of nuclear weapon production and the accelerated dismantlement of existing weapons, the United States now possesses large quantities of fissile nuclear materials (e.g. plutonium and enriched uranium) and other radioactive substances which are excess to defense requirements. The Board noted in issuing Recommendation 94-1 that it was concerned that the halt in production of materials to be used in nuclear weapons froze the manufacturing pipeline in a state that, for safety reasons, should not be allowed to persist unremediated. The Board noted special concern about specific liquids and solids containing fissile materials and other radioactive substances in spent fuel storage pools, reactor basins, reprocessing canyons and various facilities once used for processing and weapons manufacture.

The DNFSB correctly states, in Recommendation 94-1, that "It is not clear at this juncture how fissile materials produced for defense purposes will eventually be dealt with long term." The ultimate storage or disposition of these materials is being studied by the Department of Energy. Due to the complexity and importance of this issue, it is likely that a significant period of time (i.e. 10 or more years) may elapse before the required facilities are available to implement storage and disposition decisions that are scheduled to be made in 1996.

Storage of large quantities of excess fissile materials is a new mission for the defense nuclear complex. Many of these materials are packaged in configurations that are not suitable for long term storage. Many materials remain in the assembly lines and processing systems where they were when production stopped. This is a significant concern because, if not handled and stored properly, these materials pose a number of hazards including criticality, dispersion of materials causing radioactive contamination, and radiation exposure to workers. As noted by the DNFSB in Recommendation 94-1, "...for safety reasons, these conditions should not be allowed to persist unremediated." Accordingly, action must and will be taken,

in the interim, to assure the safety and security of these materials until the long term disposition solution is available.

This plan describes the actions the Department of Energy plans to take to assure that the risk associated with interim storage of its excess fissile materials is kept at an acceptably low level. As described in the following sections many of the proposed actions are dependet on pending decisions and documents under the National Environmental Policy Act. Further details regarding the specific materials and the specific sites and facilities involved are provided in section III.

III. TASK INITIATIVES

This section describes in detail how the implementation of Recommendation 94-1 will be achieved. Recommendation 94-1 includes nine distinct recommendations, each of which is addressed in the tasks below.

1.0 TASK 1: INTEGRATED PROGRAM PLAN

Recommendation 1 stated, "*That an integrated program plan be formulated on a high priority basis, to convert within two to three years the materials addressed in the specific recommendations below, to forms or conditions suitable for safe interim storage. This plan should recognize that remediation will require a systems engineering approach, involving integration of facilities and capabilities at a number of sites, and will require attention to limiting worker exposure and minimizing generation of additional waste and emission of effluent to the environment. The plan should include a provision that, within a reasonable period of time (such as eight years), all storage of plutonium metal and oxide should be in conformance with the draft DOE standard on storage of plutonium now being made final.*"

1.1 Purpose:

This task outlines the Integrated Program Plan (IPP) and management arrangement envisioned to address the Board's recommendation to develop an Integrated Program Plan for conversion of selected materials into safe configurations for interim storage.

1.2 Discussion:

The disposition of the large, diverse quantities of surplus nuclear materials existing in the weapons complex and expected to be returned from retired warheads, is one of the foremost challenges facing the DOE today. Effective management and stabilization of the nuclear materials discussed in Board Recommendation 94-1 is a subset of this broader nuclear materials disposition issue. These materials, which are the result of the halt of production of nuclear weapons and materials, include spent nuclear fuel, weapon materials, and process residues, are currently stored at several sites, in numerous isotopic, physical and chemical forms, and in a number of different aging facilities. In addition, the materials are managed through different DOE program offices and contractors depending on site landlord responsibility, the user program for the material, and whether the nuclear materials have been separated from reactor irradiated fuels and targets.

1.2.1 Integrated Program Plan

Using all appropriate facilities and Departmental resources is essential to the prompt and cost-effective conversion of materials to a form suitable for storage over the period between conversion and ultimate disposition. To ensure that use of appropriate resources is considered in a systematic manner an Integrated Program Plan will be prepared using system engineering principles.

The Department commits to prepare an Integrated Program Plan on an expedited basis. The content and method of preparation of the Integrated Program Plan is described in this section of our Implementation Plan. Preparation of the Integrated Program Plan is underway with completion scheduled by July 30, 1995, including review and concurrence by the appropriate DOE headquarters secretarial officers. Interim milestones on the preparation schedule are as follows:

- Sites submit draft Site Integrated Program Plan - March 1995; and
- Headquarters prepare first draft of Integrated Program Plan - April 1995.

The Integrated Program Plan will:

- utilize a systems engineering approach to maximize the integration of facilities and capabilities while minimizing worker exposure and generation of additional waste;
- include detailed schedules for activities required at each site to stabilize materials. These activities include: appropriate NEPA review, other regulatory activities, points of stakeholder involvement, alternatives to be considered, requirements for new or modified facilities, interrelationships between sites, and the proposed critical path(s) to completion;
- include research programs to fill any gaps in the technological information base;
- identify those facilities that may be needed for future handling and treatment of these materials; and
- include operational readiness reviews in accordance with DOE Order 5480.31.

The Integrated Program Plan will consist of two volumes as follows:

Volume I - This volume will be in a narrative format with accompanying graphs, tables, etc., as necessary. Volume I will explain the scope of the stabilization effort, e.g., in terms of quantities and types of materials involved, the technical approach, alternatives to be considered, overall program cost and schedule and options for program acceleration.

Volume II - This volume will consist of resource-loaded Critical Path Methods networks for each site showing in detail the actions, proposed actions and the end points for safe interim storage of the covered materials and an integrated Critical Path Methods network showing the relationship of the stabilization efforts between the individual sites.

Resource-loaded Critical Path Methods (CPM) network - Detailed schedule using logic ties between activities and linking financial resources required to perform a task to the schedule for task performance.

The resource-loaded, critical path method schedule will contain:

- Activities required to stabilize materials at each site, including:
  - alternative consideration and decision points
  - NEPA documentation
  - regulatory approvals
  - stakeholder involvement
  - legal commitments
  - engineering/design/construction activities
  - safety evaluations
  - training
  - procedures
  - operational readiness
  - production activities with measurable milestones
  - decisions and other approvals.
  - DNFSB commitments
- Interrelationships between sites
- Critical path to completion
- Resources required, i.e., the costs associated with activities

The Integrated Program Plan will be utilized by contractor and Departmental management as a tool to assist in determining the appropriate course of action to convert expeditiously the material discussed in recommendations 3 - 7 and other similar material as listed in Task 2 to a form or condition more suitable for interim storage. The plan will be used to determine realistic schedules, assess practicality and costs of expediting completion, and as a management and oversight tool by contractor and Departmental management.

After the initial Integrated Program Plan is issued, the sites will be required to provide periodic reports to DOE Headquarters showing the status of their work relative to the Integrated Program Plan and listing problems and corrective actions relative to that work. The Integrated Program Plan will be covered by change control procedures to help ensure the integrity of subsequent status reporting. The change control procedures will be drafted as part of plan preparation.

Attachment A contains more details regarding the preparation of the Integrated Program Plan.

1.2.2 Covered Materials

The Department has decided to add similar materials beyond those noted by the Board to the Integrated Program Plan. The materials to be covered in the Integrated Program Plan are described by this criteria:

> Bulk liquids and solids containing fissile materials and other radioactive substances in spent fuel storage pools, reactor basins, reprocessing canyons, processing lines and various other facilities which require treatment for conversion to forms or conditions more suitable for safe interim storage. Wastes in a recognized treatment system and low level wastes, uranium and uranium compounds and weapons usable plutonium already suitable for safe interim storage are not included.

Safe interim storage is defined as safe, controlled, inspectable storage under conditions where minimum surveillance and maintenance is required for the period (potentially decades) prior to ultimate long-term storage and disposition. This is the "end state" for purposes of the Integrated Program Plan. Sample "end states" for different forms of covered materials are listed below. Analysis of viable alternatives may derive other suitable end states meeting this definition for safe interim storage.

> *Uranium or Plutonium solutions* - processed to oxide or metal (phase I end state); or processed and solidified. If plutonium oxide or metal, end state to be in accordance with requirements of the DOE plutonium storage standard. If uranium, stored in accordance with DOE requirements or National Consensus Standards, and dispositioned as, e.g., low enriched uranium.
>
> *Spent nuclear fuel* - qualified dry or wet storage; processed to oxide or metal (phase I end state); processed and solidified (e.g., cementation, vitrification. If processed to oxide or metal, final end state for plutonium storage to be in accordance with requirements of plutonium storage standard now under preparation. If uranium, stored in accordance with DOE requirements or National Consensus Standards, and dispositioned as, e.g., low enriched uranium.
>
> *Residues* - Phase I end state: characterize in descending order of identified risk potential; if an unsafe condition is determined, process to mitigate safety concern and repackage to meet existing storage or disposal criteria. Final end state: process and repackage to meet final end state disposal or storage criteria.

The materials intended to be covered in the Integrated Program Plan are described in the following tables, organized by site. As characterization of materials and other vulnerability assessments of the complex are completed, this list may change.

Savannah River Site

Material Group	Location	Quantity
Plutonium-239 Solutions	221-F	85,000 gals (320,000 liters)
Plutonium-239 Solutions	221-H	9,000 gals (34,000 liters)
Americium-Curium Solutions	221-F	3,800 gals (14,000 liters)
Plutonium-242 Solutions	221-H	3,500 gals (13,000 liters)
Neptunium-237 Solutions	221-H	1,600 gals (6,000 liters)
Highly-enriched Uranium Solutions	221-H	60,000 gals (230,000 liters)
Depleted Uranium Solutions	221-F	93,500 gals (350,000 liter)
Irradiated Aluminum-Clad Production Targets	Reactor Basins and F Canyon	16,000 slugs
Irrad. Aluminum-Clad Production Fuels	Reactor Basins and H Canyon	4,300 tubes
Miscellaneous Irradiated Fuels and Targets	Reactor Basins	900 items
Irrad. Spent Fuel Nuclear Fuel	RBOF	4,000 items
Plutonium Solids	235-F, FB Line	1,000 containers
Mixed Solids	235-F, FB Line	300 containers
Plutonium Scrap	235-F, FB Line	800 containers
Mixed Scrap	235-F, FB Line, SRTC	300 containers
Misc. Pu-238, Np-237, Pu-242, Solid (excludes Cassini Material)	H-Area, F-Area, M-Area	200 items

Rocky Flats Environmental Technology Site

Material Group	Location	Quantity
Plutonium Metal and Plutonium Oxides	371,559,707,771, 776/777,779,991	6600 kgs Mtl 3000 kgs Oxide
Plutonium Solid Residues	371,559,707,771, 776/777,779	3050 kgs in 100 metric tons bulk
Plutonium Solutions	371,559,771,776/777, 779	143 kgs in 32,000 liters
Highly-enriched Uranium Solutions	886	569 kgs in 2700 liters
Highly-enriched Uranium Solids	371,707,777,779,991	6100 kgs

Hanford Site

Material Group	Location	Quantity
Materials Production Fuels - N Reactor - Single-Pass Reactor	105-KE Basin	1,146.2 metric tons of heavy metal
Materials Production Fuels - N Reactor - Single-Pass Reactor	105-KW Basin	953.0 metric tons of heavy metal
Research Reactor Fuel - Fast Flux Test Facility	Fast Flux Test Facility	11.0 metric tons of heavy metal
Materials Production Fuels - Single-Pass Reactor - N Reactor	PUREX Plant	2.9 metric tons of heavy metal
Special Case - Shippingport Fuel	T Plant	15.8 metric tons of heavy metal
Miscellaneous Special Case and Research Reactor Fuels	324, 325, 327 Buildings	2.3 metric tons of heavy metal
Specialty Fuels - TRIGA Fuel	308 Building	0.02 metric tons of heavy metal
Solutions - Relatively Clean Nitrate - Chlorides - Organics	Plutonium Finishing Plant	15,600 Kgs. gross* (~460 Items)
Reactive Solids - Sand, Slag, & Crucible (SSC) - Unburned ash	Plutonium Finishing Plant	1,890 Kgs. gross* (~1,625 Items)
Sludges - Sludges with organics - Sludges without organics	Plutonium Finishing Plant	175 Kgs. gross* (~275 Items)
Combustibles - Polycubes - Plastic - Rags	Plutonium Finishing Plant	245 Kgs. gross* (~230 Items)
Interim Stable Solids - Oxide - Metal & Alloys - Reburned ash - Unirradiated FFTF mixed oxide fuel material	Plutonium Finishing Plant	7,900 Kgs. gross* (~5,700 Items)

* gross includes packaging weight.

Los Alamos National Laboratory

Material Group	Location	Quantity
Matrix Pu (all Isotopes)	TA-55, CMR	9,246 Items
Enriched Uranium	CMR, TA-55	3,088 Items
Uranium 233	CMR	95 Items
Depleted Uranium	Sigma, CMR	3,426 Items
Natural Uranium	CMR, TA-18	88 Items
Thorium	CMR, Sigma	168 Items
Neptunium	TA-55, CMR	432 Items
Americium	TA-55, CMR	285 Items

Idaho National Engineering Laboratory

Material Group	Location	Quantity
Navy Comm. Zirc clad Al clad Exp. SS clad	CPP-603 Underwater	950.0 Kg. (U) 251.4 Kg. (U) 222.6 Kg. (U) 1485.3 Kg. (U)
Al clad Navy Exp SS clad Exp Zirc clad	CPP-666 Underwater	905 Kg. (U) 5900 Kg. (U) 892 Kg. (U) 4521 Kg. (U)
Graphite SNF Fermi Blanket LWBR	CPP-749 Underground	202 Kg. (U) 34000 Kg. (U)
Graphite SNF Exp SS clad Unirr. Graphite	CPP-603 Dry	439 Kg. (U) 151 Kg. (U) 148 Kg. (U)
Graphite SNF	CPP-603 Fuel Element Cutting Facility	Two Peach Bottom fuel rods 0.3 kgs(ea)
UO_3 Product, unirr. fuel	CPP-651	2000 Kg. (U)
Combusted graphite SNF	CPP-640 Fluidized Bed Furnace	100 Kg. (U)
UO_3 Product	CPP-602	291 Kg. (U)
Al clad SNF	ARMF/CFRMF	231 Kg. (U)
Commercial SNF Exp Zirc clad	MTR Canal	62 Kg. (U) 68 Kg. (U)
Exp SS clad	PBF Wet Pool	560 Kg. (U)
Commercial SNF	TAN Pool	84626 Kg. (U)
Commercial SNF	TAN Dry Casks	23610 Kg. (U)
LWBR Materials in Drums (unirr)	RWMC	23 Kg. (U)
Miscellaneous Surplus Material	Various	Depleted U 1064 Kg. Enriched U 1012 Kg. Thorium 802 169g Plutonium 6g U-233 13g Np-237 17g AM-241 9g AM-243 327ug Cf-252

Oak Ridge

Material Group	Location	Quantity
Uranium-233 Spent Fuel Salt	Molten Salt Reactor Experiment	4,650 Kg Li, Be, F, Salt Material with 31 Kg U-233, 1 Kg U-235, and 1 Kg Pu
Highly-enriched Uranium (HEU)	Oak Ridge Gaseous Diffusion Plant (K-25 Bldg.)	Less than 100 items each with > 500 grams of HEU

Mound Site

Material Group	Location	Quantity
Pu-Oxides/Metals/Mixed	T&SW Buildings	~6.2Kg
U-233 Oxide	SW	~3.5Kg
Highly-enriched Uranium mixed with Plutonium	T Building	~228g
Highly-enriched Uranium	CFX Facility	~2Kg
Natural Uranium mixed with Plutonium	T Building	~2.9Kg
Am-241	T Building Building 38	~6g
Cf-252	CFX Facility	~17,000 micrograms

Lawrence Livermore National Laboratory

Material Group	Location	Quantity
Plutonium Solids	B332	500 Containers
Mixed Solids	B332	400 Containers
Plutonium Scrap/Residues	B332	250 Containers
Mixed Scrap	B332	150 Containers

1.2.3 Systems Engineering

Recognizing that a systems engineering approach to managing these diverse and geographically widespread inventories is important, the DOE will develop the Integrated Program Plan using systems engineering techniques. This will include integration of management, technical, engineering, and operational aspects. The systems engineering approach will also consider minimization of worker exposure and minimizing generation of additional waste and effluent emissions to the environment.

The systems engineering approach will include:

- A disciplined, common sense approach for establishing:
  - The end result to be accomplished
  - Alternatives to be considered
  - Criteria for selecting the preferred alternative
- An approval process which includes a means for reconciling differences of opinion and agendas. This is particularly important because of the involvement of the regulators, local governments and other diverse stakeholders (both internal and external).
- A means for identifying interfaces and for documenting assumptions and decisions. This will assist in reaching common solutions and sharing resources among the widely separated sites involved.
- A method for establishing communications and team work.

Each site will have a systems engineering description in the Integrated Program Plan which discuss how the above criteria is met.

1.2.4 Organization

The Office of Environmental Management (EM-60) will provide overall leadership for the DOE complex-wide Integrated Program Plan and will monitor implementation. Line management in DOE Headquarters and the responsible DOE program and field offices will have responsibility for preparing the Site Integrating Program Plan and for implementing the committed and proposed actions to in the Implementation Plan, the Integrated Program Plan and their Site Integrated Program Plan(s) (SIPP).

A dedicated group reporting to EM-60, will be responsible for the following activities:

- Completing the Integrated Program Plan by the schedule contained herein, in conjunction with cognizant program and field offices.
- Coordinating identification of and the resolution of complex-wide integration issues and associated systems engineering evaluation.

- Monitoring program adherence to the schedules in the Integrated Program Plan (which will contain all commitments in the Implementation Plan). Periodic status reports to EM-60 and the congnizant headquarters program office will be required from each site, covering status relative to scheduled progress, problems, corrective actions being taken and requested assistance from headquarters.

- Periodically updating the Integrated Program Plan based on the change control requirements developed as part of Integrated Program Plan preparation.

- Providing periodic status reports to the Cognizant Secretarial Officers and the Under Secretary for their information and appropriate action.

1.2.5 Plutonium Storage

Part of recommendation (1) stated, "*The plan should include a provision that, within a reasonable period of time (such as eight years), all storage of plutonium metal and oxide should be in conformance with the draft DOE Standard on storage of plutonium now being made final.*"

Plutonium metal reacts with moisture and air at room temperature to form various plutonium compounds. Formation of these compounds may be accompanied by a volume expansion which may bulge or breach the container leading to spread of contamination. Gases (e.g., hydrogen or helium) generated by a variety of chemical and nuclear reactions provide another source of potential container pressurization. Finely divided plutonium metal and plutonium hydrides oxidize rapidly and may release sufficient heat to cause any collocated combustibles to ignite resulting in a fire and potential spread of contamination. Another potential hazard associated with storage of plutonium is a criticality accident which could produce high radiation fields and release of fission products. More detailed discussions of the hazards associated with storage of plutonium may be found in *Assessment of Plutonium Storage Safety Issues at Department of Energy Facilities* (DOE/DP-0123T) and DNFSB staff issue paper *Plutonium Storage at Major DOE Facilities*, dated April 14, 1994. In addition to the safety and environmental concerns associated with storage of plutonium, the risk of nuclear weapons proliferation or acts of intentional sabotage must be considered.

The Department of Energy is now challenged with assuring the safety and security of large quantities of excess plutonium (potentially for several decades), pending the implemention of decisions not yet made regarding ultimate long-term storage and disposition of our excess fissile materials.

To bridge the gap between now and the time that the ultimate solution (long-term storage and disposition) is available, the Department is placing high priority on preparing a standard for storage of plutonium metal and oxides.

Preparation of the standard is nearly complete. To date, the Department has received hundreds of comments on earlier drafts of the standard. Most of the comments have been resolved. It is expected that the plutonium metal and oxide storage standard can be issued in

December 1994. The schedules for implementation of the standards will be available in March 1995 and will be included in the Integrated Program Plan. The Department desires to fully implement the standard as soon as practical, but until the content of the standard is determined and the impact has been evaluated, the Department cannot commit to specific dates for implementation. The Department does commit to store all covered plutonium metal and oxide in conformance with the issued standard within a reasonable period of time after its issuance.

1.2.6 Research Program

Recommendation 2 stated, *"That a research program be established to fill any gaps in the information base needed for choosing among the alternate processes to be used in safe conversion of various types of fissile materials to optimal forms for safe interim storage and the longer term disposition. Development of this research program should be addressed in the program plan called for by [Recommendation] (1) above."*

Sufficient information must be available to enable informed choices between technical alternatives for the safe conversion of fissile materials to a form suitable for safe interim storage and longer term storage and disposition. Where this information is not currently available, it will be obtained either through Departmental research or research by others. Waste minimization principles and discard limit criteria will be factors in making the choices for treating the various materials. We do not believe that the actions to which we are committing in this Implementation Plan are, in general, dependent on new research programs. However as more detailed planning proceeds, e.g., during development of the Integrated Program Plan, such needs may be identified. As any major research activities are identified, they will be addressed in the Integrated Program Plan.

The Department also recognizes that, over decades, unanticipated situations may develop which call into question the adequacy of the storage conditions selected for the stabilized fissile material. For this reason we intend to institute a long-term research program designed to continually examine those fissile material conversion and storage alternatives which we select in an attempt to anticipate problems which might arise from their use over decades. The research program will be instituted in FY 1996 and will be under the management of the Office of Environmental Management. Our intent is that the specific research activities be performed by those organizations most capable of performing the work as determined on the basis of peer review and as approved by the Department. This activity will also be used to integrate related existing research efforts. This research program will be included in the Integrated Program Plan.

The National Spent Nuclear Fuel program in the Office of Environmental Management also has research efforts which are supportive of Recommendation 94-1 activities. These are described in the National Spent Nuclear Fuel program technology Integration Plan, which delineates the research efforts on-going at the DOE sites and focuses future research efforts for management of spent nuclear fuel. This effort includes research efforts needed to assure safe existing storage, characterization and treatment of fuels for interim storage, and preparations for final disposal at a geologic repository.

On-going research at several sites includes efforts to characterize the as-stored condition of spent nuclear fuels, necessary treatment programs to condition fuels for interim storage and to clearly define the technical parameters for interim storage in dry storage facilities. In addition, performance assessments and preliminary waste acceptance criteria for final disposal of the spent nuclear fuels are being developed.

1.2.7 Facility Operation Prioritization

Recommendation 8 stated, *"That those facilities that may be needed for future handling and treatment of the materials in question be maintained in a usable state. Candidate facilities include, among others, the F- and H-Canyons and the FB- and HB-Lines at the Savannah River Site, some plutonium-handling glove box lines among those at the Rocky Flats Plant, the Los Alamos National Laboratory, and the Hanford Site, and certain facilities necessary to support a uranium handling capability at the Y-12 Plant at the Oak Ridge Site."*

The Department recognizes that many of the materials covered by this Recommendation will have to be in safe storage for decades before their final disposition. During this period, even with the best efforts of all concerned, some of the materials may have to be handled, treated or repackaged because of deficiencies in the stabilization process or due to other matters that cannot be determined in advance. Certain facilities throughout the complex must be retained to ensure that repackaging or other treatment can be performed when required to ensure continued safe storage.

Determination of what facilities should be retained, and for which purposes must be performed using a deliberate process, considering potential synergy between sites, practicality of transfer of materials between sites, fiscal realities, etc. We must both ensure that sufficient facilities are retained and that the resulting Departmental complex is cost-effectively prepared for its future missions, which will include maintenance of safe storage of the covered materials.

The Integrated Program Plan, along with appropriate NEPA and other documents, will be the vehicle by which the Department will ensure that the appropriate alternatives for future handling and treatment of the materials in question are evaluated, and that the appropriate facilities are retained or constructed. The Department will retain the necessary facilities available for operation until the Integrated Program Plan has been completed. Information regarding facility status will be included in the annual reports submitted by DOE to the DNFSB in response to Recommendation 92-5.

1.2.8 Stakeholder Participation

As a matter of policy the DOE is working in partnership with its stakeholders, internal and external, national and local, to achieve the goals of its environmental management programs. This partnership with the stakeholders is part of the larger public participation policy set forth for all DOE employees in Secretary O'Leary's memorandum of July 29, 1994. This policy applies to the implementation of DNFSB Recommendation 94-1. Stakeholder comments on the draft Integrated Program Plan will be requested during preparation of the Plan to ensure that public input is appropriately considered.

1.3 Commitments:

The Assistant Secretary for Environmental Management has lead responsibility for Task 1.

Commitment 1.1 - A team under the leadership of a senior DOE person will be named for the development of the Integrated Program Plan to include those nuclear materials specified by the Board in Recommendation 94-1, and those additional similar materials listed in paragraph 1.2.2.

Due Date: September 1994 (done)

Commitment 1.2 - Interim milestones for development of the Integrated Program Plan are:

Deliverable: First draft of the Site Integrated Program Plans

Due Date: March 1995

Deliverable: Draft of the Integrated Program Plan

Due Date: April 1995

Commitment 1.3 - The Integrated Program Plan

Deliverable: Integrated Program Plan

Due Date: July 1995

Commitment 1.4 - Plutonium Metal and Oxide Storage Standard

Deliverable: Issued standard

Due Date: December 1994

Commitment 1.5 - Schedule for implementation of the Plutonium Metal and Oxide Storage Standard

Deliverable: Schedule

Due Date: March 1995

Commitment 1.6 - Institute a long-term research program designed to continually examine selected fissile material conversion and storage options to anticipate problems

Deliverable: Research program begun

Due Date: March 1996

2.0 TASK 2: SPECIFIC SITE CONSIDERATIONS

2.1 Purpose:

This Task outlines the actions to implement Recommendations 3 through 7, and establishes a criteria for other similar materials to be covered in the Integrated Program Plan.

2.2 Discussion:

Recommendations 3 through 7 concern accelerating or expediting various ongoing activities at specific sites to obtain safe interim storage status for cited materials. This section of the implementation plan is organized to address each of the specific facilities and cited materials and provide a short description of ongoing activities and commit to overall milestones. The organization for management of these activities is described in section 1.2.4. More detail will be provided in the Integrated Program Plan.

The estimated schedules shown in this plan are based on our current expectations of the scope and timing of the many activities and anticipated proposed actions required for its implementation. These schedules could be significantly impacted by one or more of the following:

- discovery of a major unexpected safety issue,
- regulatory actions or increased Environmental Safety &Health or administrative requirements,
- a major unanticipated failure of key equipment utilized for stabilization,
- extensive controversy or litigation associated with anticipated proposed actions, and
- unavailability of required funding beyond the control of the Department.

2.2.1 Savannah River Solutions

Recommendation 3 stated, "*That preparations be expedited to process the dissolved plutonium and trans-plutonium isotopes in tanks in the F-Canyon at the Savannah River Site into forms safer for interim storage. The Board considers this problem to be especially urgent.*"

This response and the Department's Integrated Program Plan encompass more than the plutonium and trans-plutonium solutions in F-canyon. There are more than 150,000 gallons of plutonium, trans-plutonium, neptunium and highly-enriched uranium solutions located in F and H-Canyons at Savannah River. Long-term storage of these materials as liquids is not acceptable to the Department due primarily to the potential for inadvertent criticality caused by unanticipated chemical changes (for the fissile material) and the potential for loss of containment integrity, which could result in increased worker dose and release of radioactivity to the environment.

The approach taken for Savannah River is to stabilize the highest risk materials in a prioritized manner while taking current facility capabilities into consideration.

F-Canyon Plutonium Solutions

The Department is expediting preparations for the proposed conversion of the liquid plutonium and uranium solutions in the Savannah River canyons into forms safer for interim storage. A decision was made to expedite the EIS for processing of the plutonium solutions in F-Canyon, the highest priority at Savannah River, by dividing the originally-contemplated EIS into two documents. The first draft EIS, which covers the plutonium solutions in F-Canyon, has been issued and public comments are now being addressed. A Record of Decision is expected in January 1995. The options being considered in the EIS are as follows:

- Convert the solutions to safe, storable plutonium metal through operation of the F-Canyon and the FB Line. This option is the fastest way to stabilize those materials and use existing technology and facilities. Should this option be selected, the plutonium metal would be stored and eventually converted to a form suitable for long term storage.

- Continue to store the solutions in the existing tanks. (No Action option)

- Continue to store the solutions in the existing tanks while a process is developed and new facilities installed in F-Canyon to vitrify the plutonium.

- Transfer the solutions to high level waste tanks for eventual vitrification in the Defense Waste Processing Facility.

- Convert the solutions to plutonium oxide through operation of F-Canyon and FB-Line modified to produce oxide instead of metal.

If the first option is selected, the plutonium solutions in F-Canyon can be stabilized as quickly as practicable. The applicable facilities continue to be brought into or maintained in useable condition. Processing of existing solutions would begin in FY 1995 and is expected to be completed in FY 1996. No funding beyond that currently planned is necessary to process the material in accordance with the first option.

SRS has taken mitigating actions, including the addition of boron and increased sampling and surveillance, to reduce the potential for criticality while awaiting stabilization of these solutions.

F-Canyon Americium-Curium Solutions

The americium-curium solutions cannot be stabilized within the 3-year period recommended by the Board because of the lack of capability. The radiation levels associated with the americium-curium make it necessary that this material be stabilized to a solid form within the heavily shielded F-Canyon building. Solidification of the Am-Cm solutions is more complicated than processing of the plutonium solutions since no current capability exists to achieve stabilization. A process in F-Canyon was utilized previously (in the early 80's) to convert small quantities of americium-241 to an oxide; however, this process equipment has

not been maintained and would require extensive modification to produce either a borosilicate glass or oxide. Specialized process equipment for solidification and packaging must be developed and installed.

The Interim Management of Nuclear Materials (IMNM) EIS will contain an evaluation of the options under consideration for stabilization of the F-Canyon americium-curium solutions to a storage form suitable for use in the DOE's National Heavy Element and Advanced Neutron Source Programs. These options will include:

- Continue to store the solution under active management while a process is developed and new facilities installed in F-Canyon to vitrify the americium-curium for future programmatic use.

- Continue to store the solution under active management while a process is developed and new facilities installed in F-Canyon to solidify the americium-curium as an oxide for programmatic use.

- No action.

As noted above, the Department does not consider the present condition of this material suitable for long-term storage.

Costs and schedules are being developed at an accelerated pace for solidification of the americium-curium, but they are not yet complete. The IMNM EIS Record of Decision is expected by May 1995. The significant design, construction and start-up testing activities required will determine the critical path. The limiting, near-term goal is to complete necessary development work to support design and a Conceptual Design Report of the system by December 1995. Several years will be required to design, construct, and start-up the required modification to enable stabilization of these materials. Preliminary estimates indicate the facility could be ready to begin stabilization in early 1999. Stabilization should be completed within a year after start-up. This effort is being given high priority within DOE and a more detailed schedule with emphasis on acceleration will be developed as part of the Integrated Program Plan.

To reduce the potential for release of material to the environment while awaiting stabilization, SRS has taken mitigating actions, such as the isolation of cooling water from the vessel and increased sampling and surveillance frequencies.

H-Canyon Plutonium-239 Solution

The Department agrees that this material must be stabilized and is considering the following options for stabilization:

- Process the solution in H-Canyon to remove fission products and other material that would interfere with subsequent stabilization steps and transfer the separated plutonium to HB-Line Phase II for conversion to a low-fired oxide. Should this alternative be selected, the plutonium oxide would be stored and

eventually converted to a form suitable for long term storage. This alternative is the fastest way to stabilize the material and has the least technical uncertainty.

- Continue to store the material in H-Canyon until it can be discharged to the H-Area high-level waste tanks. Then vitrify the material at the Defense Waste Processing Facility.

- Vitrify the solutions in a proposed process in F-Canyon. The material would be converted to a low-fired oxide in HB-Line and when the vitrification facility was available, it would be transferred to F-Canyon or FB-Line, processed to meet the vitrification process feed specifications, and vitrified.

- Continue storage under active management. (No action).

The vehicle for deciding the course of action on this matter is the IMNM EIS. The Record of Decision is expected May 1995. Converting to oxide (first alternative) would put the material into a stable form most quickly with the least technical development risk since it would rely on proven technology and facilities. Assuming the first alternative is selected, the subsequent schedule is dependent primarily on the start-up schedule for HB-Line Phase II, which was constructed in the mid-1980's but never operated. It will take several years to prepare this facility for start-up in accordance with current requirements (e.g., DOE Order compliance, Safety documentation, training, etc.). The preliminary schedule for stabilization is to start processing the solutions in Phase II of HB-Line in early 1999, with completion scheduled in 2001. The Department is exploring ways to improve the schedule and will reflect the schedule in the Integrated Program Plan.

Current activities to reduce the potential for release to the environment include (1) the use of a neutron poison to reduce the potential for criticality, (2) an enhanced sampling and monitoring program, and (3) continued pressurization and monitoring of the cooling water supplied to the solution storage vessels.

H-Canyon Plutonium-242 Solution

Plutonium-242 has a programmatic customer and thus the goal for this material is to convert it to a form suitable for shipment to that customer and for interim storage until it is used. This material was also identified as a vulnerability in the recent DOE Plutonium Vulnerability Assessment. The options for converting this material are:

- Process the solution in H-Canyon to remove fission products and concentrate the solution for products and transfer to HB-Line Phase III for conversion to an oxide. (This option would meet the programmatic need.)

- Continuing storage under active management (No action).

The vehicle for deciding the course of action on this matter is the IMNM EIS. The Record of Decision is expected May 1995. Converting this solution to an oxide (first alternative) would

be the quickest way to stabilize this material and meet the programmatic need. Assuming the first alternative is selected, processing of the Pu-242 solution in HB-Line Phase III could begin in mid-1995, after completing the activities supporting the NASA Cassini Mission, and should be completed within six months. A resource-loaded schedule will be part of the Integrated Program Plan.

H-Canyon Neptunium Solution

As with the plutonium-242, neptunium-237 has a potential programmatic need, in this case as a target material for production of plutonium-238 for use as a fuel for radioisotope thermoelectric generators for spacecraft. The options for material stabilization are as discussed above for plutonium-242 except Phase II HB-Line would be used rather than Phase III. The vehicle for deciding the course of action on this matter is the IMNM EIS. Phase II of HB-Line will not be available for processing the neptunium solution until late 2001, since Phase II must undergo extensive start-up preparations and first be used to process H-Canyon plutonium-239 solutions. Special provisions for storage of the resultant neptunium oxide, including new storage containers and additional storage space, are also required due to radiation levels associated with the ingrowth of protactinium. Feasibility studies are underway to determine the most cost effective method to provide storage capability. These studies involve a number of options which include accelerating HB-Line Phase II restart and new facilities and/or upgrade of existing facilities for storage beyond the year 2000. More definitive plans will be described in the Integrated Program Plan.

While awaiting disposition, activities to reduce the potential for release to the environment include: (1) a sampling and monitoring program and (2) pressurization and monitoring of the cooling water supplied to the solution storage vessels.

H-Canyon Highly-Enriched Uranium (HEU) Solution

There are enriched uranium nitrate solutions in stainless-steel tanks both inside and outside the H-Canyon facility. The following alternatives are being considered for stabilizing these solutions:

- Process the solutions through H-Canyon to separate the enriched uranium from the other material in solution, e.g., fission products and small amounts of other isotopes normally present in irradiated fuel. Transfer the fission products and other material to the H-Area high-level waste tanks. Stabilize the enriched uranium solution by blending it with depleted uranium solution (utilizing existing quantities of depleted uranium solutions or produced by dissolving depleted uranium oxide in FA-Line) to below 2% U-235 enrichment, and then transporting the solution to FA-Line for conversion to uranium oxide. Store the low-enriched uranium oxide in a new storage facility in F-Area.

- Process the solution as above but dilute to below 20% U-235 enrichment and ship offsite for use in commercial fuel fabrication.

- Process as above to a pure highly-enriched uranium oxide in the Uranium Solidification Facility in H-Canyon, following its completion, and store the containers in a vault.

- Store the liquid solution until it could be transferred to the H-Area high-level waste tanks and then vitrify the material at Defense Waste Processing Facility.

- Continued storage under active management. (No action).

The first two options above would have low technical risk and could be accomplished earlier than the other alternatives. The IMNM EIS is the vehicle for selection among the alternatives; the Record of Decision is expected in May 1995. Assuming selection of the first alternative, stabilization could be completed by 1997. A detailed schedule will be provided as part of the Integrated Program Plan.

While awaiting disposition, activities to reduce the potential for criticality and release to the environment include (1) an enhanced sampling and monitoring program and (2) pressurization and monitoring of the cooling water supplied to the solution storage vessels.

2.2.1.1 Commitments

Commitment 2.1 - Decision on method for stabilizing the F-Canyon plutonium solutions through the Record of Decision on the EIS for F-Canyon plutonium solutions.

Deliverable: Decision Reached Record of Decision

Due Date: January 1995

Commitment 2.2 - Stabilize F-Canyon plutonium solutions

Deliverable: Complete Stabilization

Due Date: September 1996

Commitment 2.3 - Decision on method for stabilization of other F- and H-Canyon solutions through the Record of Decision on the Interim Management of Nuclear Materials (IMNM) EIS

Deliverable: Complete Record of Decision

Due Date: May 1995

Commitment 2.4 - Conceptual design report for stabilization of americium - curium solutions

Deliverable: Design Report

Due Date: December 1995

2.2.2 Plutonium Metals in Proximity to Plastics

Recommendation 4 stated, "*That preparations be expedited to repackage the plutonium metal that is in contact with, or in proximity to, plastic or to eliminate the associated existing hazard in any other way that is feasible or reliable. Storage of plutonium materials generated through this remediation process should be such that containers need not be opened again for additional treatment for a reasonably long time.*"

To achieve contamination-free exterior surfaces on items removed from glovebox lines, the normal practice has been to place the item in a metal container which then was placed in a plastic bag prior to removing it from the glovebox line. Items included plutonium metal with and without outer containment. If the plutonium metal was not first placed into a metal container prior to being placed into the plastic bag, the plutonium metal remained in direct contact with plastic.

Over time, heat and radiation cause the plastics (polyethylene and polyvinyl chloride) to deteriorate forming unwanted gases, including hydrogen. Plutonium metal that is not isolated from the gases generated by deteriorating plastic reacts to form a mixture of potentially pyrophoric plutonium compounds on the surface of the metal. The existence of these potentially pyrophoric compounds can lead to uncontrolled reactions during storage and handling.

Plutonium metal packaged in proximity to plastic exists at several DOE sites. The Department's first priority will be to repackage to eliminate all instances where plutonium metal is packaged in direct contact with plastic. Packages where plutonium metal is not in direct contact with plastic will be monitored to assure container integrity. Individual packages may be repackaged, on a case-by case-basis, when monitoring or other information reveals a need to do so. To avoid the risk and to minimize the radiation exposure of workers associated with handling of plutonium, wholesale repackaging of containers that do not have plutonium in direct contact with plastic will be deferred until the capability exists to repackage the material in conformance with the DOE standard. This approach is supported by historical data and recent repackaging efforts at Rocky Flats and Los Alamos National Laboratory. Several hundred plutonium storage containers with slip fit type lids stored in plastic have been inspected within the past year. Results indicated that plastic surrounding the contaminated containers does not accelerate oxide growth or create unreacted hydrides for several years (at least five). Inspection programs are implemented to verify package integrity and material conditions on a periodic basis. The Department feels this approach provides reliable, safe storage while minimizing material handling and worker exposure. The removal

of plastic in direct contact with plutonium represents only an interim step to address a particular hazard. Additional repackaging steps may be needed to meet the criteria of the plutonium metal and oxide storage standard as discussed in section 1.2.5.

Plutonium metal in direct contact with plastic will be eliminated as follows:

2.2.2.1 Rocky Flats

Plutonium metal in direct contact with plastic will be brushed, repackaged and returned to storage per site storage requirements by October 1995. There were 252 metal items packaged with metal in direct contact with plastic. Thirteen of these items have been repackaged as part of a statistical sampling plan to determine oxide generation rates.

2.2.2.2 Hanford

The Hanford Site does not have plutonium metal in direct contact with plastic. This conclusion is based upon an extensive repackaging program completed in the early 1980's and the review of all packaging records for material in inventory. Packaging standards in place since 1979 have assured all receipts since 1979 met those standards.

2.2.2.3 Savannah River Site

Based on available material and packaging information, there are twelve containers of metal turnings where plutonium metal is known to be in direct contact with plastic. Additional items may be identified as SRS proceeds with ongoing and planned characterization activities. An Option in the draft Interim Management of Nuclear Materials at SRS EIS is to stabilize these turnings by dissolving in the FB-Line dissolver and processing through F-Canyon/FB-Line to produce plutonium metal suitable for safe interim storage until it can be repackaged to meet the long-term storage standard as outlined in Section 1.2.5.

Total processing time for metal scrap that is stored in direct contact with plastic is less than 3 months and could be dissolved by December 1995. Goal dates depend on the EIS Record of Decision (May 1995), the completion of processing of existing F-Canyon plutonium solutions, and the restart of the Recovery Dissolver. The preliminary schedule would involve beginning to operate the FB-Line Dissolver in August 1995 for these turnings and other similar FB-Line process residues (sweeping and turnings). Firm schedules will be provided as part of the Integrated Program Plan.

If significant delays occur in the EIS or in preparations to process this material, it will be repackaged utilizing existing packaging technology to remove plutonium metal from direct contact with plastic. This material will either be processed or repackaged by December 1995.

2.2.2.4 Los Alamos National Laboratory

The Laboratory's standard plutonium handling practices should have precluded direct contact between plastic and plutonium metal and oxide. The laboratory's practice for packaging plutonium has always been to store material in a stainless steel dressing jar or aluminum or

tin can prior to bagging the can out of the glove box and placing it into a secondary container. However, in the past the Laboratory has found some isolated instances where plastic and some actinides were in direct contact, which have been corrected.

The current plutonium repackaging project at Los Alamos will examine and repackage the approximate 7,700 existing containers that currently do not meet the long-term storage criteria. In response to the 94-1 recommendation, Los Alamos has reviewed item descriptions for all plutonium items in inventory. As a result of this review, which incorporated process knowledge and historical knowledge of packaging procedures, the Department concludes that the Los Alamos inventory does not currently contain packages with plutonium in direct contact with plastic.

2.2.2.5 Mound

Approximately 290 containers of Pu and Pu mixtures are in interim storage. The majority of packages have incomplete composition or containment descriptions. All materials will be unpackaged, evaluated, stabilized, and repackaged as necessary to meet shipping and storage requirements. Repackaging operations are expected to be complete by September 1996.

2.2.2.6 Lawrence Livermore National Laboratory

An LLNL project is currently operating to identify, characterize and non-destructively assay all plutonium items in the Livermore inventory and is expected to be completed by January 1997. LLNL does not believe there is any metal in direct contact with plastic; however, any found during this process will be immediately repackaged.

The LLNL standard metal packaging technique is to envelope metal tightly in aluminum foil packaging prior to bag-out and canning; effectively protecting the plastic from direct alpha particles. LLNL historical experience collected over the last 30 years of using this method suggest little oxidation of plutonium metal and minimal plastic degradation. The recent Plutonium ES&H Vulnerability Assessment working group assessment team viewed two eight-year old samples during their May 1994 site visit and agreed with this observation.

There are approximately 250 containers of plutonium metal in the LLNL inventory. In the past six months approximately 30 cans of plutonium metal have been opened and virtually no oxidation has been observed.

LLNL will continue to monitor these items to assure container integrity. Repackaging of this material will be deferred until the DOE Standard is final and the capability exists to repackage the material in conformance with the standard.

2.2.2.7 Commitments

Commitment 2.5 - Repackage plutonium metal in direct contact with plastic at Rocky Flats

Deliverable: Complete repackaging

Due Date: October 1995

Commitment 2.6 - Process or repackage plutonium metal turnings in direct contact with plastics at Savannah River

Deliverable: Processing or repackaging complete

Due Date: December 1995

Commitment 2.7 - Repackage plutonium metal in direct contact with plastic at Mound

Deliverable: Repackaging complete

Due Date: September 1996

2.2.3 Rocky Flats Site Possibly Unstable Residues

Recommendation 5 stated "*That preparations be expedited to process the containers of possibly unstable residues at the Rocky Flats Plant and to convert constituent plutonium to a form suitable for safe interim storage*".

The Department agrees that mitigation of the hazards presented by possibly unstable residues should be expedited and that the plutonium should be placed in a form suitable for safe interim storage. DOE is examining reprogramming of funds to further accelerate the stabilization of Rocky Flats residues.

The response is divided into two parts, solid residues and liquid residues.

Solid Residues

Solid residues are by-products of past plutonium production operations and are categorized into 100 different types by Item Description Code (IDC). Typical residues are metal, glass, graphite, crucibles, salts, combustibles, filters, gloves, ion exchange resins, incinerator ash, and sludge. They range from a minimum of about 0.1% to as high as 80% plutonium, although the average plutonium concentration is less than 5%. There are approximately 100 metric tons of residues containing 3,050 Kgs. of plutonium which are stored in 55-gallon drums, 10-gallon drums, and one and two liter stainless steel cans. There are about 20,000 packages nested in about 8,000 outer containers. The volume of these containers is approximately 4,000 drum (55 gallon) equivalents.

Over the past year and a half the solid residue program has shifted focus to accelerate the safe management and final disposal of residues. In May 1993, the emphasis was on building a new residue Line Item processing facility which would have been available in 2005. In February 1994, an approach was developed to further identify and mitigate safety issues and to accelerate final disposal of residues utilizing existing facilities.

This accelerated program emphasizes characterization, repackaging, development of safe residue storage criteria and a residue management strategy. The solid residue budget has been increased by approximately $3.5M in FY 1995. Two drums of residues have already been repackaged and 70 drums will be repackaged in FY 1995.

The headspace sampling has identified a potential safety issue of hydrogen gas build-up for 50 residue IDCs which Rocky Flats is aggressively investigating and mitigating. Actions to be completed before the end of 1994 include venting and headspace sampling 42 additional drums of residues and detailed hydrogen mapping and repackaging of the electro-refining salt drum which had the highest concentration of hydrogen gas. By October 1995 the Department will have vented 2000 more drums with the potential for hydrogen gas generation. Further mitigation of safety issues will be identified and action plans developed based on the results of the ongoing characterization program.

In summary, DOE is aggressively identifying and mitigating safety issues while at the same time developing and implementing a strategy for logical, timely and cost effective final disposal of residues utilizing existing facilities.

The program to manage solid residues at Rocky Flats has both near-term and long-term components. Near-term activities are concerned with the characterization of residues and the mitigation of identified safety issues. Long-term activities include processing and treatment for shipment to an offsite repository.

Near-term activities are complete when all residues have been characterized, ranked in order of potential risk, and any unsafe conditions corrected. Correction of safety issues includes all activities to stabilize the possibly unstable residues to mitigate the issue and ensure safe interim storage. Long-term activities will continue until all solid residues are treated and packaged to meet transportation and disposal criteria. If such treatment includes actinide separation, then the separated actinides will be in a form that meets the Department's storage standards.

Characterization of residues will result in information about the possible instabilities of Rocky Flats residues. Characterization activities include:

- Review of material documentation
- Non-intrusive container inspection (visual and x-ray)
- Sample and analysis of gases inside drums
- Sample and analysis of residue material inside drums

Near-term characterization results are used to identify safe storage issues and to develop storage criteria. Near-term characterization activities include the head gas sampling and venting of 42 drums by December 1994. These issues are prioritized and action plans developed to describe the problem and associated mitigation. The overall characterization program is scheduled to continue through April 1997 and will be used to develop processing requirements to meet disposal, transportation, and regulatory requirements. This effort may also identify additional safety issues that require mitigation to ensure continued safe storage. Currently-identified issues and associated mitigation efforts are described below.

Issue	Mitigation	Status
Potential hydrogen gas generation in hydrogenous residue drums (material is hydrogenous and may also be packaged in plastic).	Vent Drums	All drums vented (940)
Potential drum fire due to pyrophoric reaction in 2 skull drums	Remove pyrophoric material	- First drum complete by December 1994 - Second drum complete by March 1995
Potential hydrogen gas generation in residues packaged in plastic (2,045 drums)	Vent drums	Drums vented by October 1995
Potential for generation of shock sensitive compounds on acid-contaminated gloves (11 drums)	Water rinse gloves and repackage	Action plan to be completed by January 1995

The above mitigation activities address the known issues concerning safe residue drum storage. Characterization will continue until the entire backlog has been evaluated and necessary actions to ensure safe storage are complete. The above table addresses 52 of the 100 IDC's and represents about 3,000 out of 4,000 drum equivalents.

The characterization program also includes the remaining risk potential IDCs identified in the "Evaluation of Residue Drum Storage Safety Risks" report. The risk factors for these IDCs include loss of contamination containment, drum and packaging corrosion, and reactive metals and compounds. The residues (about 500 drum equivalents) represented by these IDCs are being inspected for integrity and further actions will be specified in the action plan for implementing the storage criteria. The remaining residues (about 500 drum equivalents) are lower risk drums which are stable and issues requiring mitigation do not exist.

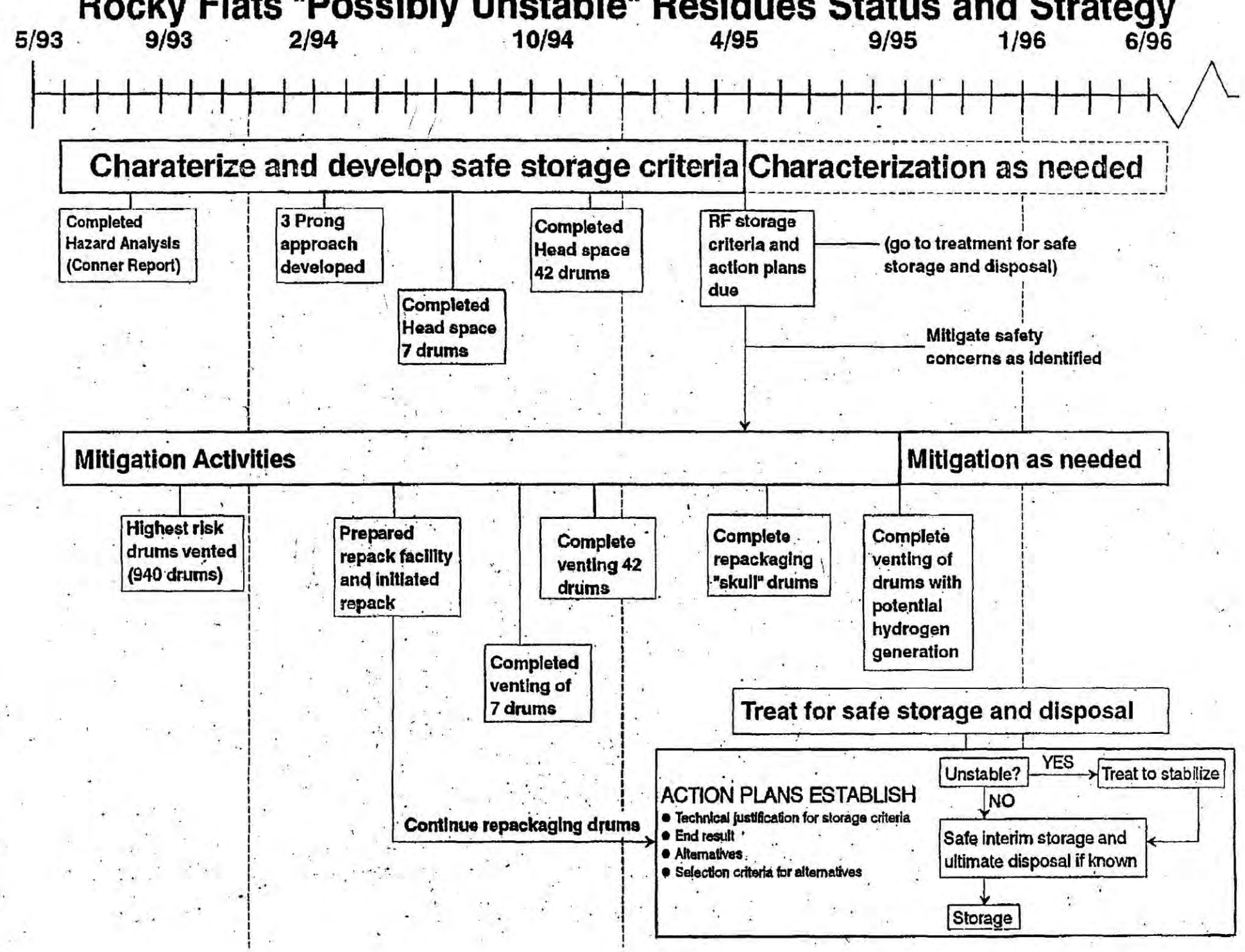
Action plans for all residues will be completed by April 1995 and will contain technical justification for the safe storage criteria. Detailed schedules will be provided in the Integrated Program Plan. DOE will consider whether separation of actinides is needed as action plans are developed.

Additional activities center around repackaging solid residues. Certain residues, e.g., crucibles, metal, glass, etc., are currently in a physical and chemical form that would be acceptable to a repository, but they are not packaged in a manner that would meet transportation requirements or are not packaged to be transported efficiently and cost-effectively. These residues are part of the lower-risk drums described above. Simple repackaging of these residues will provide safe storage, transportation and disposal.

This repackaging effort, which has already been initiated, is being accomplished using existing glove boxes in Building 707 at Rocky Flats. Two drums of crucibles have been repackaged. This effort has prepared facilities, procedures and personnel for future handling of residues to mitigate safety issues using low-risk residues to prove the process. The process will now be utilized to repackage higher risk materials to mitigate identified safety issues such as the hydrogen gas generation in electrorefining salts packaged in plastic bottles.

The following diagram outlines the current strategy and progress towards achieving safe storage of solid residues. The strategy is consistent with the systems engineering approach described previously in this plan.

Rocky Flats "Possibly Unstable" Residues Status and Strategy



Liquid Residues

There are approximately 32,000 liters of actinide bearing solutions at Rocky Flats. These solutions are stored in tanks, pipes, or 4-liter plastic bottles. The majority of these solutions are stored in Buildings 371, 771, and 886. The solutions in Building 559, 776/777 and 779 will be transferred to Building 771 for disposition. Building 886 contains only highly-enriched uranium solutions. All other buildings contain plutonium solutions. The plutonium solutions are planned to be solidified through precipitation, calcination and/or cementation. The separated actinides will be in a form that meets the site's storage criteria and eventually the DOE standard for plutonium storage. The highly-enriched uranium solutions are being considered for off-site shipment in a liquid form.

Plutonium Liquid Residues

The target schedules presented to the DNFSB on May 17, 1994 included draining liquids from 24 actinide solution tanks in Building 771 and 6 tanks in Building 371. The target schedules did not include liquids in pipes and 67 operationally empty tanks (tanks drained below the sight glass). These materials were being quantified at the time of the DNFSB briefing. It is important to note that these projected volumes are a calculated estimate, using low point studies and non-destructive analysis. These estimates may increase as lines are emptied. The target schedules for the original scope of work have not changed. Approximately 10 months are required to drain and stabilize the additional solutions in Building 771 and approximately 25 months are required to drain and stabilize the additional solutions in Building 371.

The milestones presented in this section represent a two-year acceleration compared to the Liquid Stabilization Program Plan of January 1994. The current accelerated schedule provides timely stabilization commensurate with risk. Further acceleration is possible with additional resources applied in FY 1995, FY 1996 and FY 1997. DOE is examining reprogramming of funds to further accelerate the program. A decision on whether to reprogram funds will be made by January 1995.

The following plans are subject to change depending on the outcome of the Liquid Stabilization Program Environmental Assessment.

In Building 771, liquids from pipes, tanks, and bottles will be processed or cemented depending upon the level of actinide in the solution.

- Liquids greater than 6.0 grams per liter total actinide will be processed in Building 771 using a hydroxide (for chloride solutions) or oxalic acid (for nitric solutions) precipitation method. The precipitate will be calcined and placed in safe interim storage. The effluent will be transferred to 774 for cementation.

- Liquids currently stored in pipes, tanks, or bottles that are less than 6.0 grams per liter total actinide and up to 70 grams per batch will be cemented in the Building 774 bottle box cementation operation. Approximately 34% of the Building 771 liquids to be processed in this manner have been cemented.

The objective for FY 1995 is to complete all preparations and blend and ship two tankers to the subcontractor. Once the second tanker is filled and shipped in September, all work would halt and the facility would be placed in a secure status since shipment of this material when the ambient outside temperature is below 32°F is prohibited. Work would begin again in May 1996 with the blending of the remaining material (approximately 4 Tankers), shipping, conversion and final delivery to Y-12. Completion of shipments in the second year would occur prior to September 30, 1996.

Milestone	Date
• Complete HEU solutions NEPA Documentation	December 1994
• Complete Integrated Safety Assessment	March 1995
• Complete First HEU Solution Shipment	September 1995
• Complete Last HEU Solution Shipment	September 1996

2.2.3.1 Commitments

Commitment 2.8 - Remove pyrophoric material from skull drums at Rocky Flats

Deliverable: Remove material

Due Date: First drum - December 1994, Second drum - March 1995

Commitment 2.9 - Vent drums with potential hydrogen gas generation in residues packaged in plastic a Rocky Flats

Deliverable: Venting completed

Due Date: October 1995

Commitment 2.10 - Action plan to water rinse acid contamination from gloves and repackage at Rocky Flats

Deliverable: Action Plan Completed

Due Date: January 1995

Commitment 2.11 - Complete Action Plans for all solid residues at Rocky Flats

Deliverable: Action Plans

Due Date: April 1995

Commitment 2.12 - Complete Building 371 solution removal and processing of six tanks

Deliverable: Complete removal and processing

Due Date: August 1996

Commitment 2.13 - Complete about 80 percent of high level and about 50 percent of low level solution removal and processing in Buildings 371 and 771

Deliverable: Complete removal and processing

Due Date: May 1997

Commitment 2.14 - Complete Building 371 solution removal and processing

Deliverable: Complete Removal and Processing

Due Date: June 1999

Commitment 2.15 - Complete Building 771 solution and removal and processing

Deliverable: Complete removal and processing

Due Date: December 1997

Commitment 2.16 - Complete HEU solution NEPA documentation

Deliverable: Approved NEPA documentation

Due Date: December 1994

Commitment 2.17 - Complete first HEU solution shipment

Deliverable: Deliver two tankers of low-enriched uranyl nitrate solution to subcontractor facility

Due Date: September 1995

Commitment 2.18 - Complete second HEU solution shipment

Deliverable: Deliver four tankers of low-enriched uranyl nitrate solution to subcontractor facility

Due Date: September 1996

2.2.4 Savannah River Site Irradiated Reactor Fuels

Recommendation 6 stated, *"That preparations be expedited to process the deteriorating irradiated reactor fuel stored in basins at the Savannah River Site into a form suitable for safe interim storage until an option for ultimate disposition is selected."*

As indicated below, the selection of the method for stabilization of the SRS irradiated reactor fuels considered to be at risk (including reactor targets and other irradiated material) will be documented in the Record of Decision for the IMNM EIS currently scheduled for May 1995. The irradiated spent fuel considered in this EIS is limited to the fuel and targets that are currently located at the SRS. The Department is also developing a programmatic spent fuel EIS which in addition to processing spent fuel is considering options which could result in movement of additional spent fuel to the SRS or removal of the SRS spent fuel to another DOE site. The Record of Decision for this EIS is scheduled for June 1995, and if an alternative is selected which changes the spent fuel situation at the SRS, the strategy for stabilization may need to be revised at that time.

Pending completion of the EISs, Records of Decision and associated proposed actions, SRS is taking near term actions to reduce the risk from corrosion of targets and fuels in the Reactor Basins. These actions include a number of activities including completion of an emergency line item project to provide a new deionizer system and new horizontal storage racks to reduce galvanic corrosion. The completion dates for these activities are as follows:

Vacuum sludge from all reactor basin floors	December 1996
Deionize all reactor basin water to improve chemistry	December 1996
Place Mark 31 targets in containment boxes	complete
Install new horizontal racks	July 1997

Mark 31 Aluminum-Clad Target Slugs

There are 16,000 Mark 31 Target slugs currently stored in reactor basins, and F-Canyon. The slugs are in a location that is unacceptable for the long term storage due to aluminum cladding and uranium target material corrosion, which allows irradiated uranium target material and fission products to leak into the reactor basins, potentially increasing radiation levels for workers and posing the risk of leakage and subsequent contamination of the ground water.

The Department is proposing to expeditiously convert the deteriorating irradiated reactor targets stored at the Savannah River Site into a solid form suitable for safe interim storage until an option for ultimate disposition is selected.

Options which are being considered in the IMNM SRS EIS for stabilizing the Mark 31 aluminum-clad target slugs are:

- Dissolve and process targets through F Canyon and FB Line to produce plutonium metal suitable for safe interim storage until it can be repackaged to meet long-term storage standards. The depleted uranium from the targets would be converted to oxide in FA Line, packaged in drums, and stored onsite (fastest option to stabilize materials in the EIS).

- Dissolve the targets, with stabilization of the plutonium as an oxide in FB Line.

- Dissolve the targets, with direct disposal of the liquids to the high-level waste system for eventual vitrification in the Defense Waste Processing Facility.

- Dissolve the targets, with stabilization to either an oxide or vitrified form through processing in F-Canyon;

- Continue active management of targets in improved wet storage until dry storage facilities are available.

- No action.

The first option would convert the corroding targets into a solid form suitable for safe interim storage in a vault. It builds on the facilities and procedures utilized for stabilization of the plutonium solutions in F-Canyon and is expected to be faster and have lower technical risk than the other options. The limiting activities include the EIS Record of Decision, expected May 1995, and, if the first option is selected, completion of the second phase of the F-Canyon start-up Operational Readiness Review (ORR) and related activities, expected in July 1995. Start-up activities are addressing order compliance, DNFSB issues, safety documentation, training, DOE Order 5480.31 compliance, and conduct of operations issues. Success in meeting these requirements has been demonstrated in the recently completed, successful F-Canyon ORR.

The Department can begin stabilizing these corroding targets by August 1995 if the first option is chosen in the IMNM Record of Decision. A definitive date for completing stabilization will be provided in the Integrated Program Plan. This should be in the range of one year to complete dissolution and processing. Preparation activities for target stabilization are proceeding in parallel with the EIS, insofar as is practical and in accordance with NEPA.

Mark 16 and Mark 22 Aluminum-Clad Fuel Assemblies

More than 4,300 aluminum-clad production reactor fuel tubes are also stored underwater in basins at SRS. This material is in a storage location that is unacceptable for the long term due to corrosion and loss of strength of the cladding material which allows fuel material and fission products to leak into the reactor basins,

and which could result in structural failure of the fuel, increasing radiation levels for workers. Leakage from the basin could cause contamination of the ground water.

The Department will expedite preparations to either convert the deteriorating irradiated reactor fuel stored in basins at the Savannah River Site into a form suitable for safe nterim storage or move the fuel into safe interim dry storage until an option for ultimate disposition is selected.

Options which are being considered in the Interim Management of Nuclear Materials (IMNM) SRS EIS for stabilizing the Mark 16 and Mark 22 aluminum-clad fuel assemblies are:

- Dissolve and process through H Canyon, separating the highly-enriched uranium (HEU) for blend-down with depleted uranium to produce either low-enriched uranium (LEU) oxide for storage or LEU solutions for transfer to commercial vendors.

- Dissolve the fuels, with direct disposal of the HEU to the high-level waste system for eventual vitrification in the Defense Waste Processing Facility.

- Dissolve the fuels, with stabilization of the uranium as an oxide in the Uranium Solidification Facility following completion of the project.

- Continue active management of targets in improved wet storage until dry storage facilities are available.

- No action.

As with the Mark 31 targets discussed above, the Department cannot commit to selection of an option until the IMNM EIS Record of Decision, which is expected in May 1995. The site's ability to prepare the facilities for operation has been demonstrated by the recent successful completion of the Operational Readiness Review for F-Canyon.

Currently, the Department does not believe that it is feasible to complete stabilization within three years, even if the fastest option (first alternative) were selected. Based on F-Canyon experience and current standards for facility start-up, H-Canyon start-up and dissolution could not be expected to begin until November 1996, with full operation not expected until May 1997. Dissolution would then be completed in 3-4 years.

The Department has evaluated this issue and will attempt to accelerate stabilization of these materials. An evaluation of the ability to accelerate this schedule will be completed by February 28, 1995.

In addition to the improvements in water chemistry outlined above, actions are underway to develop dry storage technology, in the event that fuels are not processed. These actions should define the dry storage criteria for these fuels by mid-1995.

Miscellaneous Aluminum-Clad Fuels and Targets

Approximately 900 tubes, targets, and sources containing various isotopes such as thorium, U-233, cobalt and low concentrations of transuranics are stored underwater in SRS reactor basins. Some of these items show signs of corrosion and others will also be subject to corrosion. Long-term storage in the basins is not suitable.

The IMNM EIS is evaluating alternatives regarding the miscellaneous fuels and targets. The draft EIS considers the following alternatives:

- Dissolve the fuel/targets in H-Canyon, neutralize and transfer to the waste tank, and vitrify in Defense Waste Processing Facility.

- Improved wet or dry storage.

- No Action.

The first option in the IMNM Draft EIS is to stabilize most of these targets by dissolution in H-Canyon and then send the radioactive isotopes in high-level waste systems, where they would eventually be vitrified in the Defense Waste Processing Facility. Some of the miscellaneous materials will be evaluated for transfer to potential offsite users or treatment for disposal as low-level waste.

If the first option is selected, it is unlikely that these materials will be stabilized by May 1997, because of the predicted H-Canyon start-up in November 1996 (see above), and because assessed risks in these miscellaneous materials are less than the risks inherent in the materials described earlier in this section. A more specific date will be developed as part of the Integrated Program Plan.

Other Irradiated Materials of Receiving Basin of Offsite Fuels (RBOF)

The Receiving Basin for Offsite Fuels (RBOF) contains a variety of irradiated fuel and targets which are clad in aluminum, stainless steel, and zirconium. The IMNM EIS has identified these materials as "stable within the near term (decade)" based on control of corrosion through water chemistry. Disposition of these materials for eventual interim storage (next several decades) will be addressed in the Integrated Program Plan, including plans to prepare either to stabilize these fuels by processing or to develop technology and conceptual design for interim dry storage of these fuels. Some additional NEPA documents may be required.

- Liquids less than 0.0245 grams per liter total actinide will be directly transferred by pipeline to Building 774 for treatment through carrier precipitation.

In Building 371:

- Liquids from pipes and tanks will be blended in the Caustic Waste Treatment System holding tanks to a level of less than 1 gram per liter total actinide. These liquids will then be treated in the Caustic Waste Treatment System.

- Filtrates less than 1 x 10-3 grams per liter total actinide will be transferred to Building 374 carrier precipitation.

- If there are liquids that are greater than 6.0 grams per liter remaining after batching is complete having used all of the low-level liquids, the greater-than-6.0- grams-per-liter liquids will be sent to Building 771 for processing.

Accelerated tank draining planning was initiated in May 1994 and the draining of the first tank performed in June. Plans include draining of 12 tanks in FY 1995.

Milestone	Date
• Complete Environmental Assessment for liquid stabilization program	April 1995
• Complete Building 371 solution removal and processing of six tanks	August 1996
• Complete about 80 percent of high level and about 50 percent of the low level solution removal and processing in Buildings 371 and 771	May 1997
• Complete Building 771 solution removal and processing	December 1997
• Complete Building 371 solution removal and processing	June 1999

Highly-Enriched Uranium (HEU) Solutions

The highly-enriched uranium solutions are located in Building 886 and include 569 kg of 93.2% U235 in solution form of approximately 2,700 liters in eight Raschig ring tanks.

Current plans are to utilize the commercial services and experience of a private company to assist in the preparations and removal of HEU solutions from Building 886 and ultimate delivery to Y-12 at Oak Ridge as an oxide. This company would set up portable skid mounted blending equipment for blending of HEU solutions down to a low enriched uranyl nitrate (<20% U235).

2.2.4.1 Commitments

Commitment 2.19 - Record of Decision for Interim Management of Nuclear Materials (IMNM) EIS

Deliverable: Complete Record of Decision

Due Date: May 1995

Commitment 2.20 - Complete risk reduction activities for all reactor basins

Deliverable: Completed action

Due Date: July 1997

2.2.5 Hanford Site K-East Basin Deteriorating Reactor Fuel

Recommendation 7 stated, *"That the program be accelerated to place the deteriorating reactor fuel in the K-East Basin at the Hanford Site in a stable configuration for interim storage until an option for ultimate disposition is chosen. This program needs to be directed toward storage methods that will minimize further deterioration."*

The K-East Basin fuels consist of 1146.2 metric tons of heavy metal of materials production fuels primarily from the N Reactor with some single pass reactor fuel. The fuel is stored in an aging facility which has seismic vulnerability and is located near the Columbia River. The facility may currently be leaking small quantities of water and has leaked large quantities in the past. The fuel is corroding and sludge is forming in the basin.

The Department agrees with the Board's recommendation and is placing a high priority on removing the fuel and sludge from the K-East Basin. It is important that the deteriorating fuel and sludge be removed from the basin on an expedited basis and placed in a stable configuration for interim storage. Until this can be done, actions are being taken to reduce the risk of basin leakage. By February, a cofferdam will be installed between the basin and the reactor discharge chute (the point most likely to leak).

The method of removing and storing the fuel is subject to the NEPA and requires tribal, regulator and stakeholder input. Alternatives and related NEPA review strategies were developed and evaluated to identify a path forward for removing the fuel and sludge from the K-East (and K-West) Basin. The alternatives considered were:

- Containerize the fuel and continue to store in the K-East Basin.
- Transfer the fuel to a wet pre-interim storage facility and then into dry interim storage, after stabilization.

- Transfer the fuel directly to a stabilization and interim dry storage facility from K-East Basin, utilizing a common fuel container for transport, stabilization , and interim dry storage.

- Processing in a foreign facility to stable materials. The materials would be returned to Hanford for interim storage.

- Variations within and among the above alternatives.

Alternative descriptions, important assumptions, and comparative evaluations for the path forward decision are identified in Westinghouse Hanford Company report WHC-EP-0830 of October 1994.

The DOE path forward for proposed actions was approved on November 2, 1994, and is based on the best features of several of the alternatives, which enables the previous schedule to be accelerated. The path forward for proposed actions is to be performed in two steps, as follows:

- The first proposed step would place fuel in Multi-Canister Overpacks and transfer the overpacked fuel (in a wet or damp inerted condition) to a Staging and Storage Facility prior to fuel drying and passivation. This step would remove fuel from the deteriorating safety condition at the K-East Basin at the earliest possible date.

  The storage configuration at the Staging and Storage Facility would isolate fuel and sludge from the worker and the environment. The facility would include features to minimize personnel exposure and additional fuel corrosion. The facility design would comply with current requirements, including natural phenomena hazards criteria.

- The second proposed step would transfer the fuel in the Multi-Canister Overpacks to a Stabilization Facility, dry and passivate the fuel at the Stabilization Facility, and return the fuel to the Staging and Storage Facility in dry Multi-Canister Overpacks. This would achieve a storage condition that satisfies criteria for interim storage and stages the fuel for final disposition activities. The dry storage configuration would result in a passive system that should arrest further fuel corrosion.

  Activities necessary to implement the second step are proposed to be initiated and performed in parallel with the first step. This will enable expeditious implementation of dry interim storage.

The first proposed step will be based on analysis in a separate K-Basins EIS concerning proposed acceleration of the fuel removal schedule. It is expected that the Record of Decision on the K-Basins EIS will be reached in December 1995. The second step will be based on the planned Hanford Spent Nuclear Fuel Management EIS. The scope and alternatives for the Hanford Spent Nuclear Fuel Management EIS are contingent on the Record of Decision from the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS. Steps are being taken to expedite each of the NEPA reviews.

Near term actions such as cofferdam installation, and fuel and sludge characterization will be expedited; preliminary design of the necessary facilities and design of multi-canister overpack fuel containers will proceed.

A detailed schedule is in preparation and will be included in the Integrated Program Plan. Depending on the alternative selected in the K-Basin Record of Decision, schedule limiting items include the design and construction of a new facility and the design and manufacture of Multi-Canister Overpacks. The preliminary schedule indicates that fuel and sludge removal can begin in late 1998 and be completed in November 2000, an acceleration of two years over the previous schedule. Efforts are underway to further accelerate this schedule.

Key schedule dates for work planned between now and September 30, 1995 are as follows:

- Identify necessary actions and the cost and schedule to improve the date for start of fuel removal by December 1994.
- Determine acquisition strategy by December 1994.
- Issue Notice of Intent for K-Basins Environmental Impact Statement by December 1994.
- Start fuel and sludge characterization in hot cells by March 1995.
- Initiate proposed sludge retrieval/packaging demonstration by July 1995.

Additional schedule dates will be included in the Integrated Program Plan based on the K-Basins integrated schedule that will be issued by March 1995. The following key near-term milestones will be included:

- Submit project validation package.
- Initiate process development for N Reactor SNF stabilization.
- Finalize site identification and initiate site characterization for facilities.
- Place contract(s) for necessary equipment and facilities.

Other fuel at Hanford (e.g. K-West Basin and PUREX) also requires action. The other Hanford fuels will be addressed in the Integrated Program Plan as stated in section 1.2.2.

2.2.5.1 Commitments

Commitment 2.21 - Install Cofferdam Between K-East Basin and Reactor Discharge Chute

Deliverable: Installation Complete

Due Date: February 1995

Commitment 2.22 - Identify Necessary Actions and the Cost and Schedule to Improve the Date for Start of Fuel Removal

Deliverable: Report

Due Date: December 1994

Commitment 2.23 - Issue Notice of Intent for K-Basins Environmental Impact Statement

Deliverable: Notice Issued

Due Date: December 1994

Commitment 2.24 - Start Fuel and Sludge Characterization in Hot Cells

Deliverable: Work Started

Due Date: March 1995

Commitment 2.25 - Record of Decision for K-Basin EIS

Deliverable: Record of Decision

Due Date: December 1995

Commitment 2.26 - Complete Fuel and Sludge Removal from K-Basin

Deliverable: Removal Complete

Due Date: November 2000

2.2.6 INEL Spent Fuel

There is a variety of spent nuclear fuel stored at INEL. Some of the storage facilities are over 40 years old and are not suitable for long term storage of spent nuclear fuel. The interim disposition for the spent nuclear fuel at INEL is included under the Programmatic Spent Fuel EIS. The Record of Decision is scheduled for June 1995. The planned overall

approach for dealing with the spent fuels at INEL involves consolidating the storage of spent nuclear fuel and associated fissile materials and making use of dry storage. This will involve retiring older storage facilities, upgrading newer facilities and acquiring new storage facilities.

The CPP-603 underwater storage facility was mentioned by the Board as a concern. It contains deteriorating reactor fuel from a number of sources and sludge from corrosion of the fuel. It began fuel storage service in 1951. The basins do not meet current design requirements for storage pools. There are approximately 1141 units of spent fuel stored in the facility. A Federal Court Order specifies a schedule for fuel movement from CPP-603. This includes 189 fuel units moved by September 1994, an additional 189 units by December 1995, all fuel moved from the North and Middle basins by December 1996, and all remaining fuel removed by December 2000. The proposed plan calls for fuel whose cladding is intact to be moved to the CPP-666 wet storage facility in currently available transport casks. Fuel with suspect cladding integrity may be stabilized, most likely by canning in an appopriate facility (e.g., the CPP-603 IFSF fuel handling cave). Following canning, this fuel may be stored in either the CPP-666 underwater fuel storage area or in appropriate dry storage areas. To date, the first 189 fuel units were expedited to complete movement by July 1994 and 10 additional units were completed by September 1994. Means to expedite removal of the spent nuclear fuel from the CPP-603 basin in advance of the December 2000 date in the Court Order will be considered in the Integrated Program Plan.

Other spent nuclear fuel listed in paragraph 1.2.2 is stored in a number of other locations at INEL and is included as material to be covered in the Integrated Program Plan. The alternatives being considered and the schedule for safe interim storage of this spent nuclear fuel will be included in the Integrated Program Plan.

2.2.6.1 Commitments

Commitment 2.27 - Move 2nd 189 Fuel Units from CPP-603 North and Middle Basins to CPP-666.

Deliverable: Fuel Moved

Due Date: December 1995

Commitment 2.28 - Move all Remaining Fuel from North and Middle Basins to Interim Storage (244 units)

Deliverable: Fuel Moved

Due Date: December 1996

Commitment 2.29 - Complete Fuel Removal from the CPP-603 Underwater Storage Facility

Deliverable: Removal Complete

Due Date: December 2000

2.3 Commitments:

The Assistant Manager for Environmental Management has the lead responsibility for Task 2.

Commitments are listed in paragraphs 2.2.1.1, 2.2.2.7, 2.2.3.1, 2.2.4.1, 2.2.5.1 and 2.2.6.1 above.

3.0 TASK 3: OPERATIONAL READINESS

Recommendation 9 stated, *"Expedited preparations to accomplish actions in items (3) through (7) above should take into account the need to meet the requirements for operational readiness in accordance with DOE Order 5480.31."*

3.1 Purpose:

To ensure all specific activities cited by the Board in Recommendation 94-1, and those identified in the development of the integrated program plan define the process for ensuring operational readiness. Criteria defined in DOE Order 5480.31 will be used for this review.

3.2 Discussion:

It is the Department's policy that the start-up of new or existing facilities will be in accordance with the requirements of DOE Order 5480.31. This order defines the requirements for the scope and depth of readiness reviews prior to start-up and the appropriate approval levels for the start-up activities. It also defines the prerequisites required before the readiness review is conducted and the appropriate level of independence of the readiness review team and the role of the Department's independent oversight of the readiness review activity.

For each facility/operation outlined in Task 2 of this Implementation Plan and detailed in the Integrated Program Plan, the resources and schedule for implementation of the appropriate requirements of DOE Order 5480.31 will be specified.

3.3 Commitment:

The Assistant Secretary for Environmental Management is primarily responsible for Task 3.

Commitment 3.1 - Each Integrated Program Plan detailed schedule shall include the time and resource planning required to ensure facility/operational readiness in accordance with DOE Order 5480.31.

Due Date: July 1995

4.0 TASK 4: REPORTING REQUIREMENTS

The Department will prepare quarterly reports to the DNFSB updating the progress and significant accomplishments made in implementing the 94-1 Implementation Plan initiatives.

4.1 Purpose:

To keep the appropriate DOE staff and Board aware of progress and activities. The report will also keep the various sites, Field Offices, departments and other stakeholders apprised on significant developments across the complex.

4.2 Discussion:

The quarterly reports will highlight ongoing efforts, review completion dates and upcoming milestones, discuss the upcoming quarter's activities, and note any concerns.

4.3 Commitment:

The Assistant Secretary for Environmental Management is primarily responsible for Task 4 with assistance from Cognizant Secretarial Officers, Field Office managers and the Associate Deputy Secretary for Field Management.

Commitment 4.1 - Quarterly progress reports will be issued within 30 days of the end of every calendar quarter. The first quarterly report will be issued by April 1995.

Deliverable: Quarterly Report issued to DNFSB from the Assistant Secretary for Environmental Management

Due Date: First report due by April 1995

5.0 TASK 5: CHANGE CONTROL

The Recommendation 94-1 Implementation Plan is a complex long-range plan. Flexibility is needed to address changes in commitments, proposed actions or completion dates where modifications are necessary due to additional information, project refinements, or changes in DOE's baseline assumptions.

5.1 Purpose:

To provide a change control process

5.2 Discussion:

The 94-1 Implementation Plan is based on certain assumptions. These assumptions were used to develop dates. If significant outyear funding, FTE levels, or mission changes occur, the original date for commitments may require modification. Any anticipated significant changes in department commitments will be promptly brought to the attention of the DNFSB, formally discussed in the quarterly progress reports including appropriate corrective actions, and where appropriate submitted to the DNFSB as a revision to the Implementation Plan.

5.3 Commitments:

The Assistant Secretary for Environmental Management has the primary responsibility for Task 5.

Commitment 5.1 - Substantive changes in a Department commitment will be formally submitted. The Implementation Plan will be revised and resubmitted as appropriate.

Deliverable: Revised Implementation Plan

Due Date: As required

Commitment 5.2 - Changes to interim milestones and schedules will be formally addressed and assessed in the quarterly reports.

Deliverable: Discussion in quarterly report

Due Date: As required in conjunction with quarterly report schedule

ATTACHMENT A

Preparation of Integrated Program Plan

Introduction

The Integrated Program Plan (IPP) will consist of a resource-loaded critical path method (CPM) schedule and accompanying written material which will define the Department's commitments regarding conversion of covered materials, as defined in the draft 94-1 Implementation Plan, to forms suitable for safe interim storage.

The Integrated Program Plan will consist of two volumes as follows:

Volume I - This volume will be in a narrative format with accompanying graphs, tables, etc., as necessary. Volume I will explain the scope of the stabilization effort, e.g., in terms of quantities and types of materials involved, the technical approach, alternatives to be considered, overall program cost and schedule and options for program acceleration.

Volume II - This volume will consist of resource-loaded Critical Path Methods networks for each site showing in detail the actions, proposed actions and the end points for safe interim storage of the covered materials and an integrated Critical Path Methods network showing the relationship of the stabilization efforts between the individual sites.

Definitions

Covered materials - Bulk liquids and solids containing fissile materials and other radioactive substances in spent fuel storage pools, reactor basins, reprocessing canyons, processing lines and various other facilities which require treatment for conversion to forms or conditions more suitable for safe interim storage. Wastes in a recognized treatment system and low level wastes, uranium and uranium compounds and weapons usable plutonium already suitable for safe interim storage are not included.

Safe interim storage - Safe interim storage is defined as safe, controlled, inspectable storage under conditions where minimum surveillance and maintenance is required for the period (potentially decades) prior to ultimate long-term storage and/or disposition. This is the "end state" for purposes of the Integrated Program Plan. Sample "end states" for different forms of covered materials are listed below. Analysis of viable alternatives may derive other suitable end states meeting this definition for safe interim storage.

Uranium or Plutonium solutions - processed to oxide or metal (phase I end state); or processed and solidified. If plutonium oxide or metal, end state to be in accordance with requirements of the DOE plutonium storage standard. If uranium, stored in accordance with DOE requirements or National Consensus Standards, and dispositioned as, e.g., low enriched uranium.

Spent nuclear fuel - qualified dry or wet storage; processed to oxide or metal (phase I end state); processed and solidified (e.g., cementation, vitrification). If processed to oxide or metal, final end state for plutonium storage to be in accordance with requirements of plutonium storage standard now under preparation. If uranium, stored in accordance with DOE requirements or National Consensus Standards, and dispositioned as, e.g., low enriched uranium.

Residues - Phase I end state: characterize in descending order of identified risk potential; if an unsafe condition is determined, process to mitigate safety concern and repackage to meet existing storage or disposal criteria. Final end state: process and repackage to meet final end state disposal or storage criteria.

Resource-loaded Critical Path Methods (CPM) network - Detailed schedule using logic ties between activities and linking financial resources required to perform a task to the schedule for task performance.

Preparation Method

General

Each site will be expected to prepare a Site Integrated Program Plan (SIPP). Although primarily devoted to the activities on the home site, the SIPPs will also consider interfaces with other sites to the maximum degree practical, in particular with respect to use of facilities from other sites to complement activities at the home site.

The SIPPs will be resource-loaded.

An initial goal of 8 years from May 1994 for repackaging materials to the plutonium storage standard will be assumed. For other covered materials a goal of 2-3 years for conversion or, if that is considered unobtainable, an aggressive target should be used for the initial SIPP.

Communication with headquarters and between sites is essential during the preparation period so as to take advantage of "best practices" all around.

The SIPPs will be integrated by headquarters, working with the sites, into an overall Integrated Program Plan.

The Integrated Program Plan will be used to status the conversion activities and

as a tool to help determine how to allocate resources and conversion tasks among the sites.

Specific

Volume I of the SIPP

For each class of covered materials[1] on the home site the following areas should be addressed:

Scope - materials involved, quantity and location

Assumptions - Include a clear description of assumptions used.

Conversion objective - safe interim storage form for each of the class of covered materials, i.e., the "end point"

Schedule objective - consider milestones established by statutes, regulations, hazard posed by the material, Departmental commitments to states, Defense Board, etc.

Alternatives to be considered - consider preferred alternative plus other reasonable alternatives; provide cost, schedule and technical evaluations of each as part of the SIPP.

Organizational responsibility and interfaces - Name the organization and individual responsible for the activity, describe interfaces both within the contractor organizations and with others, including DOE. Include chart showing location of the responsible organization and reporting relationships to the top level at the site.

Staffing plans - Include discussion of impact of alternatives on staffing needs; include method to be used to obtain increased staffing levels if need for higher staffing levels is significant.

Problems and Issues - Include problems and issues of a nature that must be addressed for the program to move forward successfully.

[1]For example, spent fuel clad with aluminum, spent fuel clad with zirconium, plutonium solutions, uranium solutions, residues, plutonium in storage containers, etc.

Work plan - Describe in narrative form:

What will be done
Who will do it
When it will be done
What alternatives will be considered[2]
Why other sites are (are not) appropriate for assisting in the task
Availability of resources (financial/staffing)
Resource requirements
Method of interfacing with stakeholders
Research and development required
Other?

For completeness, Volume I should also list, or reference, materials not covered.

Volume II of the SIPP

This volume will include the *schedule and logic diagrams, or resource-loaded Critical Path Methods networks*, which show the work plan in graphical form. All significant activities required to stabilize materials at each site should be shown, including:

- alternative consideration and decision points
- NEPA documentation
- regulatory approvals
- stakeholder involvement
- legal commitments
- engineering/design/construction activities
- safety evaluations
- training
- procedures
- operational readiness
- production activities with measurable milestones
- decisions and other approvals.
- DNFSB commitments

[2]Ensure that description of alternatives and preferences is consistent with NEPA documentation.

The suggested mechanics of Critical Path Methods preparation are as follows:

- Use roll-up/roll-down technique, i.e., activities roll-up and down between detail schedules, summary schedules and master schedule.

- Detail schedules will be prepared at the site, one for each class of covered materials (may be many sheets).

- At the lowest level of *site* computerized scheduling the schedules should have at least one measurable milestone per month per line of activities.

- Near-term (1-2 years) activities will have more detail than longer-term activities.

- Iteration between master schedule and detail schedules will result in one agreed-upon set of milestone dates.

- Summary schedule will reflect consolidation ("hammocking") of detailed schedule activities.

- Different level schedules (level 0,1,2) will be used for management oversight, depending on level of management.

Suggested schedule development steps:

- Obtain major items noted above for Volume I

- Gather existing schedules and plans for the site; use directly as input for the Critical Path Methods networks where applicable

- Kickoff schedule preparation with management support

- Develop schedules utilizing site technical/operations personnel assisted by trained schedulers; consider "boiler room" approach for first draft of schedules

- Identify limiting critical path items, e.g., new facility, funding authorization, etc. and iterate to optimize schedule, e.g., by use of other facilities in the DOE complex

LIST OF ACRONYMS AND ABBREVIATIONS

ARMF	Advanced Reactivity Measurement Facility
CFRMF	Coupled Fast Reactivity Measurement Facility
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DP	Defense Programs
DWPF	Defense Waste Processing Facility
EIS	Environmental Impact Statement
EM	Office of Environmental Management
EM-60	Office of Facility Transition and Management
ER	Electrorefining
FY	Fiscal Year
HEU	Highly-enriched Uranium
IDC	Item Description Code
IMNM	Integrated Management of Nuclear Materials
IPP	Integrated Program Plan
kgs.	Kilograms
LANL	Los Alamos National Laboratory
Li	Lithium
LWBR	Light Water Breeder Reactor
MOA	Memorandum of Agreement
MPPF	Multi-Purpose Processing Facility
MTR	Materials Test Reactor
NEPA	National Environmental Protection Act
Np	Neptunium
PBF	Power Burst Facility
PFP	Plutonium Finishing Plant
RFETS	Rocky Flats Environmental Technical Site
RWMC	Radioactive Waste Management Complex
SNF	Spent Nuclear Fuel
SRS	Savannah River Site
UO_3	Uranium Tri-Oxide