Westinghouse Hanford Company FY 1995 Materials Management Plan (MMP)

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WHC FY 1995 Materials Management Plan (MMP)

Table of Contents

	<u>Page</u>
Hanford Plant Priorities	1
PFP NEPA Review	2
Hanford Site Irradiated Fuel EIS	2
Material Management Plan Assumptions and Issues	3
N Reactor	3
N-Reactir Irradiated Fuels Disposition	4
300 Area Fuel Fabrication Facilities	5
PUREX Plant	6
UO ₃ Plant	6
Plutonium Finishing Plant (PFP)	7
Plutonium Stored in PFP Vaults	8
FFTF	9
Summary Assumptions	11
Plutonium Requirements	12
Defense Programs	12
< 7% Pu-240 Product Shipments	12
Fuel Grade Product Shipments	12
Research & Development Programs	12
FFTF Driver Fuel and LMFBR Test Fuel	12
Certified Ceramic Grade Plutonium Oxide Inventory	12
Restricted Use Plutonium Allocations	13
Summary Tables (See list on page iv)	14
Explanatory Notes for Plutonium Utilization Tables	21
Table 9 - < 7% Pu-240 Grade Plutonium Utilization/Inventory Projection	22
Table 10 - FG Plutonium Utilization	25
Table 11 - Power Reactor Grade (PRG) Plutonium Utilization	31
Appendix A - Uranium Usage Tables	36
Appendix B - Other Special Nuclear Materials	41

List of Tables

<u>Table</u>	<u>Page</u>
1A. N Reactor Irradiated Fuel In K Basins	14
1B. Isotopics of Stored N Reactor Irradiated Fuels	14
2. DP Unirradiated Plutonium Summary	15
3. Plutonium Product Inventory	16
4. Unirradiated Plutonium Scrap Inventory	17
5. PFP Stabilization Summary	18
6. Forecast of Fuel-Grade and Power-Reactor-Grade Plutonium Unirradiated Returns	19
7. Forecast of Fuel-Grade and Power-Reactor-Grade Plutonium Withdrawals	19
8. Material Usage Schedules - Plutonium	20
9. <7% Pu-240 Grade Plutonium Utilization/Inventory Projection	23
10. Fuel Grade Plutonium Utilization/Inventory Projection	26
11. Power Reactor Grade Plutonium Utilization/Inventory Projection	32
12. RL Inventory Allocation of Restricted Use Plutonium	33
13. RL Receipts of NFS Plutonium Nitrate	34
14. Total Plutonium Inventory	35
A-1. Fuel Fabrication Unirradiated Uranium Inventory (DP)	37
A-2. DP/EM Enriched & Normal Uranium Inventory and Usage	38
A-3. NE Unirradiated Uranium	39
A-4. NE Irradiated Uranium	40
B-1. Other SNM in WHC Programs	42

WHC FY 1995 Materials Management Plan (MMP)

Hanford Plant Priorities

The safe and sound operation of facilities and storage of nuclear material are top priorities within Hanford's environmental management, site restoration mission. The projected materials estimates, based on the Materials Management Plan (MMP) assumptions outlined below, were prepared for Department of Energy (DOE) use in long-range planning. The Hanford MMP covers the period FY 1995 through FY 2005, as directed by DOE.

All DOE Richland Operations (RL) Office facilities are essentially funded by the Office of Transition and Facilities Management, Environmental Restoration and Waste Management (EM). These facilities include PUREX, the UO_3 plant, N-Reactor, T-Plant, K-Basins, FFTF, PFP and the 300 Area Fuel Fabrication facilities. Currently DP provides partial funding for the latter two facilities. Beginning in FY 1996 (in accordance with DOE-HQ MMP assumptions), EM will fund expenses related to the storage, monitoring, and safeguarding of all Special Nuclear Material (SNM) in the PFP. Ownership and costs related to movement and/or stabilization of that material will belong to EM programs (excluding NE material). It is also assumed that IAEA will take over inventory validation and surveillance of EM owned SNM at this time (FY 1996).

The forecasted safe storage, stabilization and/or disposition of these nuclear materials is dependent upon receipt of the necessary direction and funding from DP, NE, and EM.

Nuclear material long term storage, processing and/or disposition plans presented in this document are dependent on two National Environmental Policy Act (NEPA) reviews, the PFP Environmental Impact Statement (EIS) and resulting Record of Decision (ROD) and the Hanford Site Irradiated Fuels EIS and ROD. With the exception of the planned stabilization of 22 kg Pu at the PFP and the potential receipt of some fuel grade (FG) oxide from the Lawrence Livermore National Laboratory (LLNL), no other plutonium movements to or from Hanford are projected until these NEPA reviews are completed. This assumption may change in the future due to an Idaho court decision of June 28, 1993 which includes Hanford as a potential receiver site for spent nuclear fuel from naval, university, and foreign research reactors, and from other sites.

PFP NEPA Review

An Environmental Impact Statement (EIS) currently being prepared to address stabilization and interim storage of plutonium bearing materials at the Plutonium Finishing Plant (PFP). A series of interim actions are being implemented to resolve those items which were considered to pose significant risks; these items will be remediated during EIS preparation. Ongoing, planned, and completed interim actions include downloading and disposition of solutions stored in the Plutonium Reclamation Facility (PRF); source term reduction of holdup material in the 232-Z building; duct remediation in 234-5; thermal stabilization and cementing plutonium bearing sludges; and development laboratory testing of corrosive plutonium solutions.

Current Status and Schedule: The EA for the PFP Stabilization Run was approved by DOE-RL in August 1994. The Notice of Intent (NOI) for the PFP EIS is completed in draft form and is currently undergoing formal review; publication is targeted for October 1994. The PFP EIS and Record of Decision (ROD) is not expected until CY 1996.

Hanford Site Irradiated Fuel EIS

A site EIS is planned to ensure that environmental factors are considered in decisions regarding the interim storage of irradiated fuel located in facilities at the Hanford Site. As currently planned, this EIS will also consider and identify technologies required to prepare the fuel for interim storage. The site EIS will satisfy site-specific NEPA review requirements for implementing the Record of Decision (ROD) resulting from the complex-wide Spent Nuclear Fuel Programmatic EIS (SNF PEIS).

The inventory of irradiated fuels to be covered by the Hanford EIS includes approximately 2100 metric tons of N Reactor fuel, 16 metric tons of Shippingport Reactor (PWR Core II) fuel, 11 metric tons of FFTF fuel, 3 metric tons of single-pass reactor fuel and 2 metric tons of miscellaneous fuels.

Current Status and Schedule:

A draft Notice of Intent (NOI) to prepare the site EIS was submitted to DOE-HQ in June, 1993. An earlier draft NOI had been transmitted to DOE-HQ in January, 1992, but the activity had been placed on hold awaiting completion of the SNF PEIS and resolution of funding constraints. The current NOI will be revised to reflect recommendations in the SNF PEIS ROD.

Currently, no funding is identified to begin preparation of the EIS in FY 1994. Fiscal Year 1995 funding has been provided to develop scoping studies that will identify reasonable alternatives to be considered in the EIS.

The NOI for the site EIS would be published in June 1995 when the SNF PEIS ROD is published. A tentative completion for the site EIS and ROD would be late FY 1996 or early FY 1997 provided funding is made available in FY 1995.

Material Management Plan Assumptions and Issues

The latest set of assumptions used in developing the RL MMP were provided by the DOE-Headquarters Office of Weapons and Materials Planning (DP-22) in a July 13, 1994 teletype to RL, Subject: Assumptions for FY 1995 Materials Management Plan (MMP). Assumptions for only one case were defined and no alternate cases were requested. DOE-RL has, however, amended these assumptions and included additional assumptions of their own in RL's letter to the President, WHC; MMP for the period FY 1995 through FY 2005, dated August 4, 1994. A summary of these assumptions appears on page 11 of this document.

N Reactor

In accordance with a cease-preservation directive received from DOE on September 23, 1991, N Reactor formally began the transition from cold standby to shutdown in FY 1992. An N Reactor Shutdown program plan (Rev. 2) was submitted to DOE in September 1991 with revision 4, implementing DOE Comments, being released in December 1993. The work described in this plan is scheduled for completion in September 1997 when N Reactor turnover to the Hanford Surplus Facilities Program for Decommissioning is achieved.

Significant progress this past year (as summarized below) occurred in the three areas: regulatory permitting, building demolition, and planning activities for deactivation.

Regulatory permitting accomplishments include approval of the Radiation Protection-Air Emissions Notice of Construction for 105N Basin Stabilization by the Washington State Department of Health (WDOH), approval of the permit for National Emissions Standards

for Hazardous Air Pollutants by the Environmental Protection Agency, and submittal of the Environmental Assessment (EA) for N Reactor Deactivation to DOE-RL.

Building demolition accomplishments include demolition of the 1100N building, removal of the 1118N and 1117N trailers, and beginning the demolition process for 1101N.

Deactivation planning accomplishments include formation of the 100N Pilot Project which placed all 100N deactivation and restoration activities under one project, inclusion of the 100N Pilot Project within proposed Tri-Party Agreement (TPA) milestones, submittal of the 100N Pilot Project Management Plan to the Tri-Party Agreement members, and revision and re-submittal of the Closure Plan to DOE.

N-ReactoR Irradiated Fuels Disposition

Storage of N Reactor irradiated and miscellaneous spent fuel in water filled storage basins at Hanford will continue pending recommendations of the SNF PEIS and Hanford Site Irradiated Fuel EIS previously referenced. Material stored in K-East basin remains unencapsulated; material in K-West basin is encapsulated.

A draft EA, Characterization of Stored Defense Production Special Nuclear Fuel and Associated Materials, was forwarded to DOE-RL for review on July 25, 1994. In addition a video survey of K-East Basin canisters and fuel contents was completed, and work is planned to authorize, pull samples and/or characterize gas samples from encapsulated canisters, sludge samples from canisters in both K basins, and irradiated fuel element samples from canisters in both K basins.

Construction to install seismic qualified isolation barriers between the basin storage area and discharge chute area has begun. Project completion is scheduled in early FY 1995 and will allow removal of radionuclides from water contained in the discharge chute area; water in this area will be maintained (kept free of any significant radionuclides contamination). This project is part of the resolution of an unreviewed safety question relating to the seismic performance of a construction joint in the basin.

DOE-RL, through outside consultants and contractors, is also preparing an engineering study to determine the feasibility of dry storage of irradiated fuels on the Hanford site. Dry storage would require a benign, essentially non-corrosive and stable condition suitable for an extended period (50 years or longer) of interim storage. Since there are various types of irradiated fuels and materials at Hanford, it will be necessary to address each of

these on an individual basis. One plan being considered addresses the need for a Hanford 200 Area modular dry storage facility that can be expanded to accommodate the N Reactor irradiated fuel after it is prepared for dry storage.

K Basin clean-up proposals that employ the use of dry storage for N Reactor irradiated fuels consider a demonstration program and implementation approach. Costs and schedules are being generated.

300 Area Fuel Fabrication Facilities

Shutdown and deactivation of the 300 Area Fuel Fabrication Facilities is assumed to occur by FY 2000 provided funding becomes available to relocate and store the unirradiated uranium inventory remaining from N-Reacto fuel fabrication activities. Various options for consolidation and storage of this material were included in a WHC study completed in FY 1994; reference WHC-SD-CP-ES-163, Rev 0, Options Analysis for Uranium Consolidation, dated April 8, 1994. A recommendation for continued storage verses disposal could not be reached and is dependent on development of a national policy for the disposition of excess unirradiated depleted, normal, and low enriched uranium. Continued short term storage in the 300 Area (until a national policy is developed) is the preferred option provided costs are the primary drivers for DP and EM programs. If interim storage is required beyond FY 2000, the recommended alternative is to transfer, consolidate, and store this material in the 4732-C warehouse in the Hanford 400 Area. In this case additional funding of 2.6 million dollars would be required (one time), but yearly operating expense requirements would decline by \$190,000 (from \$950K to \$760K).

Although, Hanford did ship 326 MTU of 0.95% U-235 enriched billets to the United Kingdom Ministry of Defense (UK MOD) in FY 1993 (authorized by the United States/United Kingdom Mutual Defense Agreement), the remaining inventory of normal and low enriched uranium billets will not ship to COGEMA Inc., the approved buyer of Hanford's excess uranium inventory, as previously planned. COGEMA made a decision not to extend their bid and therefore voided the sales transaction. Reasons cited were the time lag since the original bid, the change in availability of French processing facilities, and the changing world market for fuels that could be produced from this material. This uranium billet material will remain indefinitely (as discussed in the above paragraph) in the Hanford 300 Area along with unirradiated finished and unfinished fuel elements.

PUREX Plant

In accordance with DOE-HQ direction, the Plutonium Uranium Extraction Plant (PUREX) is currently being deactivated. The objective of deactivation is to place the PUREX facility in a passively safe, environmentally secure configuration, and ensure that this configuration is retained until decontamination and decommissioning (D&D) take place. The PUREX/ UO_3 Deactivation Project Management Plan outlines the deactivation approach and the supporting technical, cost, and schedule baselines. Deactivation activities concentrate on removal, reduction, and stabilization of the radioactive and chemical materials remaining in the plant as well as the shutdown of utilities and effluents.

Currently, the majority of the PUREX chemical inventory has been redeployed to offsite users. Remaining actions are to neutralize approximately 19,814 liters of solution in tanks D5/E6 containing 9 kgs plutonium and 5.3 metric tons uranium (MTU) and to transfer this material to tank farms' double shell waste tanks by June of 1995. In addition, details are being finalized to support the sale of 689,030 liters of the PUREX low specific activity nitric acid containing 7.3 MTU to British Nuclear Fuels, Ltd. in England (based on an unapproved change request). When the deactivation project is completed in September 1997 (based on change request), the PUREX facility will be unoccupied and locked pending eventual D&D.

UO_3 Plant

Phase II deactivation activities are currently underway at the Uranium Trioxide (UO_3) Plant. These activities consist of deactivating and/or decontaminating instruments and equipment, permanently shutting down and sealing off the utilities, and documenting existing conditions. Materials and equipment, as made available, are being redeployed to other facilities on the Hanford site. End state criteria was developed and is in the approval cycle. The UO_3 deactivation project is scheduled for completion in May 1995. However, at the current rate of progress, the project will be completed six months ahead of schedule in December 1994. Currently 662 metric tones of uranium oxide powder are stored at the UO_3 Plant in T-hopper containers. This material was scheduled for shipment to COGEMA, however, due to cancellation of the sales transaction will remain at Hanford indefinitely.

Plutonium Finishing Plant (PFP)

The PFP planned stabilization run previously reported in the FY 1993 and FY 1994 MMP documents has changed in the scope of material to be stabilized and in the method of stabilization to be used (see table 5).

The current stabilization plan schedules for treatment only plutonium bearing sludges (reactive scrap solids) stored in polyjars within the process gloveboxes in the PFP. These sludges contain 21 kg plutonium along with other chemical impurities; this amounts to 10% of the total plutonium contained in reactive materials at the PFP. The remaining 90% of reactive material plutonium is primarily contained in residual process solutions which are not now included in the stabilization plan. In addition the product plutonium nitrate solutions (containing 235 kg Pu) previously scheduled for stabilization are no longer included in the interim action stabilization plan.

Neither the Plutonium Reclamation Facility (PRF) nor the Remote Mechanical C (RMC) line will be used to complete the current stabilization plan. Instead, muffle furnaces will heat the chemically reactive sludges to approximately 500 to 1000°C (900 to 1800°F). The resulting stable powder will be stored in PFP vaults as impure scrap oxide inventory.

It is estimated that the planned stabilization will require 400 to 600 batches of material resulting in approximately 150 containers (after packaging) for vault storage. There is sufficient storage capacity to accept this material.

An Environmental Assessment (EA), Sludge Stabilization at the PFP, was completed in June 1994 and submitted to DOE-RL for approval. Publishing of this document is expected in October 1994 (reference DOE-00978).

In addition to stabilizing the reactive scrap sludges outlined above, a small amount of high chloride solutions containing 1.3 kg Pu are to be transloaded to the PFP Plutonium Process Support Laboratory for process testing. These tests are designed to demonstrate a process for converting this type solution to a stable, storable solid. Resulting data will provide input to the PFP EIS.

The reason for down-scoping the stabilization run stems from a DOE-RL and WHC management decision to require a PFP Environmental Impact Statement that expands the scope of review to include all alternatives for stabilization, clean out of the facility, and activities to support future environmental missions. Public involvement meetings held in

the last half of CY 1993 prompted a DOE-RL decision not to restart PRF and RMC prior to obtaining a Record of Decision (ROD) on the EIS. At this time, it appears unlikely that the ROD will support either a PRF or RMC restart for stabilization.

Plutonium Stored in PFP Vaults

In order to reduce the number of project accounts containing plutonium inventory, some inventory realignment was initiated this past year; essentially all scrap material was consolidated into one project (H-GE-0221-06S); standards and samples were also realigned into fewer accounts. Consolidation of material in holdup and in-process accounts along with further consolidation of the standards and samples material is planned in FY 1995. Other inventory reorganization proposals designed to improve efficiency of reporting and clarity and visibility of inventories and will also be assessed.

Fuel grade plutonium metal and oxide from the existing product inventory will continue to be supplied to the Office of Nuclear Energy (NE) projects as requested and as availability allows. The product inventory does, however, contain americium above product specification levels and may require some processing at another site before beneficial use.

It is assumed that EM programs will assume ownership of all plutonium at the PFP (excluding NE material) beginning in FY 1996. It is also assumed that in FY 1996, IAEA will take over inventory validation and surveillance of EM owned plutonium.

The May 24, 1994 Withdrawals and Returns Summary received from DOE-HQ in June 1994 schedules returns from LLNL only, and no withdrawals are projected for NE programs throughout the forecast period. Only material that meets Hanford acceptance criteria may be schedule for returns as storable SNM inventory at Hanford. Therefore, it is assumed that only 10 kg Pu of the 51 kg Pu scheduled will be received as stored inventory.

Interim storage of unirradiated plutonium extends through the reporting period of this document and will remain at the PFP. A Hanford unirradiated Plutonium disposition plan is dependent upon the previously addressed NEPA documentation (PFP EIS and ROD) due out in FY 1996.

In April 1994, DOE-HQ, Defense Programs (DP-22) directed operations offices to cancel the established Economic Discard Limit (EDL) methodology for unirradiated plutonium-

bearing materials. DOE-RL directed WHC in August 1994 to develop a Plutonium Disposition Plan by October 94 that would serve as the technical basis for RL discard decisions. WHC management is organizing a team of experts to prepare a practical EDL methodology for Hanford plutonium and is assessing the cost of meeting this request. A WHC assessment of this request and a proposed plan of action will be prepared and forwarded to DOE-RL.

FFTF

In a December 15, 1993 memorandum, DOE-HQ directed its Richland Operations Office (RL) to place the FFTF in a radiologically and industrially safe shutdown condition. The memorandum set a target date of 5 years to accomplish the shutdown. The reactor had previously been placed in a hot standby mode with the capability of restart.

The permanent shutdown directive is based on a decision made at DOE-HQ that no combination of missions for the FFTF has a reasonable probability of financial viability over the next 10 years.

WHC management published an FFTF Shutdown Program Plan (WHC-SD-FF-SSP-004) on March 4, 1994. An aggressive Master FFTF Shutdown Schedule has been prepared, and WHC is actively working to complete program plan activities in accordance with this schedule. In addition, a revised EA (Shutdown of the FFTF, Hanford Site, Richland, WA) was submitted to DOE-RL on July 29, 1994 for review.

Currently at the FFTF Reactor, all control rod drive mechanisms have been disabled, all fuel assemblies are being removed from the reactor vessel, appropriate systems have been placed in lay-up status.

Included in the steps necessary to complete FFTF shutdown requirements are the following primary activities:

- o Defueling of the reactor vessel assemblies to existing sodium storage; replace with non-fuel components to ensure core configuration; wash irradiated fuel and transfer to above ground dry cask interim storage in the Hanford 400 Area pending final disposition.
- o Wash 32 unirradiated assemblies (currently stored in sodium), load into shipping containers, and transfer to the PFP for interim storage.

- o Wash, load into shipping casks, and ship 7 sodium-bonded metal fuel assemblies plus sodium bonded metal and carbide pins to Idaho National Engineering Laboratory for storage.
- o Transfer molten metallic sodium (after core defueling) to a new sodium facility yet to be constructed. In order to accommodate residuals, an inert gas atmosphere would be maintained to prevent any chemical reactions during long-term surveillance and maintenance.
- o Convert stored sodium to a stable form at a future reaction facility still to be designed and constructed.

During the first four years of the transition to shutdown, approximately 90 percent of the plant systems are required to support hot sodium circulation. After that time period as systems become available for deactivation, the need for general maintenance and plant support will be reduced. Essentially all of the plant systems would be deactivated at final shutdown (January 2001) placing the FFTF in a long term monitoring phase. The total shutdown project completion date is scheduled for April 2002 on the FFTF Shutdown Master Schedule. No substantial increase in environmental impacts at Hanford are expected from the shutdown activities.

DOE-HQ Recommended Assumptions	DOE-RL Amended Assumptions and Comments
Deactivate 300 Area Fuel Fabrication facilities by FY 2000	Agree, provided funding available to relocate and store material.
Deactivate and shutdown FFTF over a 5-7 year period	Agree
Deactivate PUREX by FY 1997	Agree
Deactivate UO ₃ Plant by FY 2000	WHC schedule is to deactivate by May 1995 (plant ready for D&D at that time).
Begin encapsulation of N-Reactor irradiated fuel in FY 1995	Encapsulation pilot run to occur in FY 1995; pilot run will provide information to support the containerization of irradiated fuel.
MMP should reflect results of PFP EIS	A Hanford unirradiated Pu disposition plan is dependent upon the PFP EIS and ROD scheduled for completion in FY 1996. Interim storage of unirradiated Pu extends through the reporting period of this document and will remain at the PFP.
Irradiated fuel disposition plans will be based on guidance from the Office of Spent Nuclear Fuel Management, Environmental Management (EM-37)	Agree
Other EM managed nuclear material disposition plans will be based on guidance from the Northwestern Office, Environmental Management (EM-65)	Agree
Hanford depleted, normal, and low enriched uranium will be sold, bartered, and/or transferred to EM	Defense Programs depleted, normal, and low enriched unirradiated uranium located at Hanford is sold, bartered, or transferred to EM.
Beginning in FY 1996 EM will fund storage, monitoring and safeguarding of all nuclear material in PFP	Beginning in FY 1996, EM will fund expenses related to the storage, monitoring, and safeguarding of all SNM in the PFP. Ownership, and costs related to movement and/or stabilization of that material will belong to EM programs (excluding NE material). It is also assumed that IAEA will take over surveillance and inventory validation at this time (FY 1996).
PFP material will continue to be available for transfer to user programs as requested and subsequently approved by the Office of Nuclear Weapons Management	Agree
Excess Pu-238 at Hanford will either be shipped to SRS for recovery or transferred to EM for disposition	Agree
Returns and withdrawals will be scheduled in accordance with the schedule received from DOE-HQ in June 1994	The June 94 Returns/Withdrawals forecast only schedules returns from LLNL to Hanford; no other Pu movements are forecasted for Hanford. Only material that meets Hanford acceptance criteria may be scheduled for returns as storable material at Hanford. Therefore, it is assumed that only 6 kg Pu (FY 95) and 4 kg Pu (FY 96) will be received as stored inventory.
	Pu stabilization will occur for reactive scrap solids and a small amount of chloride solution (as a process test). Disposition of nitrates and liquids will be determined in the PFP EIS and Record of Decision.

Plutonium Requirements

Defense Programs

<7% Pu-240 Product Shipments

All <7% Pu-240 plutonium product in stable form (does not include nitrate) has been shipped off-site. There are no plans to produce any weapon grade plutonium metal. No requirements for weapon grade plutonium oxide or metal from the Hanford Site were identified in the DOE-HQ assumptions for the RL MMP.

Fuel Grade Product Shipments

No Defense Programs requirements for fuel grade (FG) plutonium from the Hanford Site were identified in the DOE-HQ assumptions for the RL MMP.

Research & Development Programs

In accordance with the returns and withdrawals schedule received from DOE-HQ in June 1994, no withdrawals are projected throughout the MMP reporting period for Nuclear Energy programs (NE) or any other programs.

FFTF Driver Fuel and LMFBR Test Fuel

Due to the FFTF shutdown directive, dated December 15, 1993, no SNM requirements are projected for NE Hanford programs.

Certified Ceramic Grade Plutonium Oxide Inventory

A total of 357 kg Pu (not decayed) of 16-16.75% Pu-240 ceramic grade oxide, prepared by Los Alamos National Laboratory (LANL) during FY 1982-1983 for the Breeder Program, is in storage at WHC. No requirements for this material are currently forecasted. The oxide is held in an excess but usable "M" account (project M-GE-0221-OCX, Ceramic Grade Pu Oxide-RL).

Restricted Use Plutonium Allocations

Plutonium restricted to non-explosive use is assumed to be available to NE programs upon DP supply authorization. The current identity of the allocated* material is as follows:

<u>kg Pu</u>	
179	FG Oxide and metal product at RL in existing inventories**
195	Scrap at RL in existing inventories**
152	Previously forecasted R&D program scrap returns
<u>393</u>	FFTF irradiated fuel in existing inventories
919	
<u>(9)</u>	LMR Scrap shipped to NBL in FY 1991
910	

Disposition or recovery of the restricted use plutonium contained in Hanford DP existing inventories is dependent upon the PFP NEPA review.

At this time there are no processing plans to recover restricted use plutonium contained in projected Liquid Metal Reactor (LMR) scrap returns (mainly Pu-U) or FFTF irradiated fuel which remains in the NE inventory (no returns projected).

* Reference: Memorandum dated April 14, 1989, Revised Draft Allocation of Non-weapon Grade Plutonium, from Materials Planning Division (DP-131) to RL, CH, AL, and SR. (SRD) [RL document control number RL-HQ-405]

** The original allocations per the above reference were 199 kg Pu of product and 175 kg Pu of scrap. In the RL MMP the quantities have been adjusted to reflect that 20 kg Pu of scrap, previously forecasted as recovered to product form, will remain in scrap form indefinitely.

Table 1A. N Reactor Irradiated Fuel in K Basins

kg Pu

All Cases

Fiscal Year Ending Inventory											
<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>
4028	4025	4022	4019	4017	4014	4012	4010	4008	4006	4004	4002

Table 1B. Isotopics of Stored N Reactor Irradiated Fuels

(At fiscal year end)

All Cases

<u>FY</u>	<u>Grade</u>	<u>MTU</u>	<u>kg U-235</u>	<u>kg Pu</u>	<u>%U-235</u>	<u>%Pu-239</u>	<u>%Pu-240</u>	<u>%Pu-241</u>	<u>kg Np</u>
1994	<7%	332	2966	223	0.890	94.49	5.12	0.389	2.51
	FG	<u>1764</u>	<u>13166</u>	<u>3805</u>	<u>0.750</u>	<u>84.93</u>	<u>13.44</u>	<u>1.630</u>	<u>57.21</u>
		2096	16132	4028	0.772	85.46	12.98	1.561	59.72
2005	<7%	332	2966	222	0.890	94.65	5.13	0.229	2.51
	FG	<u>1764</u>	<u>13166</u>	<u>3778</u>	<u>0.750</u>	<u>85.50</u>	<u>13.53</u>	<u>0.966</u>	<u>57.21</u>
		2096	16132	4000	0.772	86.01	13.06	0.925	59.72

Notes: 1. Plutonium quantities reflect decay of Pu-241.

2. The percent Pu-240 includes Pu-238 and Pu-242.

3. Total basin plutonium as of March 31, 1994 in project H-EW-3135-OBP is 4029 Kg.

Table 2. DP Unirradiated Plutonium Summary
for WHC Programs and M Projects
by
NMMSS Project and Material Category

(as of March 31, 1994)
kg Pu

Project	Scrap	Taiwan Rx Substitution Scrap	Standards & Samples	Holdup & In Process	Lab. Matl.	Product			Total
						Oxide	Nitrate	Metal	
H-GE-0221-000	0.4		1.9	4.6	22.2				29.1
H-GE-0221-01Z				12.7					12.7
H-GE-0221-03C				5.8					5.8
H-GE-0221-04R				51.6					51.6
H-GE-0221-06N							234.8		234.8
H-GE-0221-06S	1357.4	88.1		0.7					1,446.2
H-GE-0221-06X						351.2			351.2
H-GE-0221-OSP				13.4					13.4
H-GE-0221-OZM				1.3					1.3
H-GE-0347-030			0.2	1.0					1.2
H-GE-0348-060	0.1								0.1
M-GE-0221-00X			15.0			183.5			198.5
M-GE-0221-0CX						356.5			356.5
M-GE-0221-03M								732.0	732.0
Total	1,357.9	88.1	17.1	91.1	22.2	891.2	234.8	732.0	3,434.4

Notes:

1. Above values are not decayed
2. Does not include 10.9 kg Pu of metal and archive samples in Hanford project H-GE-0221-03C located at LANL.
3. Does not include: Table 1A plutonium from N Reactor Irradiated Fuel (EM project H-EW-3135-OBP); other EM irradiated material; nor SNM in NE projects.
4. Does not include 0.8 kg Pu of waste material stored in waste drums at PFP designated for burial.
5. With the exception of 13.4 kg Pu of PUREX holdup (H-GE-0221-OSP), all unirradiated plutonium stored in WHC facilities is located at the PFP.

Table 3. Plutonium Product Inventory

FY 1994 Year End kg Pu				
<u>% Pu-240</u>	<u>Metal</u>	<u>Oxide</u>	<u>Total Metal & Oxide</u>	<u>Nitrate</u>
<7%	--	--	--	208 ^a
FG: 7-10	--	1	1	
10-13	1	106 ^b	107	27
13-16	1	97	98	
16-19	713	512 ^c	1225 ^b	
Total FG	715	716	1431	27
PRG	<u>1</u>	<u>139</u>	<u>140</u>	<u> </u>
Total all grades	716	855	1571	235

Notes: 1. Plutonium values decayed through March 1994 result in a 16 kg Pu metal loss and a 12 kg Pu oxide loss not reflected in NMMSS project totals.

2. The product inventory contains americium buildup; removal prior to future use (if identified) may be required.

a. Consists of PUREX N Reactor nitrate (196 kg Pu) plus PRF Nitrate (12 kg Pu).

b. Oxide total reflects shipment of 23.6 kg Pu to LANL in July 1994.

c. Includes 357 kg Pu (not decayed) of certified ceramic grade oxide previously prepared for the LMR Program and held on M-GE-0221-OCX.

Table 4. Unirradiated Plutonium Scrap Inventory
in WHC Programs
 (1994 Fiscal Year Ending)
 kg Pu

DP Scrap (H-GE-0221-06S) Stored at PFP^{a,b,c}

<u>FY</u>	<u>RF^d</u>	<u><7</u>	<u>7-10</u>	<u>10-13</u>	<u>13-16</u>	<u>16-19</u>	<u>>19</u>	<u>Total</u>
1994	834	341	47	92	8	56	69	1446

Nuclear Energy (NE) Program Unirradiated Scrap^{c,e}
 H-AF-8010 Stored at PFP

<u>FY</u>	<u>7-10</u>	<u>10-13</u>	<u>13-16</u>	<u>16-19</u>	<u>PRG</u>	<u>Total</u>
1994	1	192	3	6	15	217

Nuclear Energy (NE) Program LMR Fuel Pins^{c,e}
 H-AF-8010 Stored at PFP (A) and FFTF (B)

<u>FY</u>	<u>7-10</u>	<u>10-13</u>	<u>13-16</u>	<u>16-19</u>	<u>PRG</u>	<u>Total</u>
(A) 1994	0	384	0	0	12	396
(B) 1994	0	289	0	0	0	289

- Scrap stabilization scheduled to occur in FY 1995 (22 kg Pu) will not affect inventory values; scrap removals from inventory for stabilization will return to inventory as oxide scrap in FY 1995.
- Inventories include the following: 39 kg Pu inventory in sources, samples, and standards in vaults and laboratories, and 91 kg Pu in-process material and hold-up material in lines, tanks, and hoods.
- No changes in scrap inventories are projected beyond dates shown.
- Rocky Flats <7% Pu-240 material includes 10 kg anode heels and 88 kg Pu of material substituted for restricted use Taiwan Research Reactor fuel.
- These inventories consist of LMR program (H-AF-8010) scrap fuel pins and/or driver fuel assemblies. The LMR Program (NE) continues to be programmatically responsible for this material. No shipments to SRS for Central Scrap Management Office (CSMO) recovery are forecasted.

Note: Not included in this table are approximately 47 kg Pu in scrap material located at PFP but belonging to Hanford's Pacific Northwest Laboratory (PNL), Argonne National Laboratory (ANL)-West, and Los Alamos National Laboratory (LANL).

Table 5. PFP Stabilization Summary
FY 1995

Material for Stabilization	Items	kg Pu	Comments
Reactive Scrap Solids			
< 7% Pu-240	203	20.2	Heat Treating
	30	0.1	Cementing
8-12% Pu-240	33	0.8	Heat Treating
Total Solids	266 ^a	21.1	
Scrap Chloride Solution			
< 7% Pu-240	27 ^b	1.3	Laboratory Process Testing
Grand Total	293	22.4	

- a. Solid items consist of either plutonium oxide (including RMC floor sweep material), plutonium oxalate, or sludges and is scheduled for processing through the muffle furnaces in HC-21C glovebox.
- b. High chloride solutions stored in 10-L containers are to be transloaded to the PFP Pu Process Support Laboratory for process testing designed to demonstrate a process for converting this type solution to a stable, storable, solid. Resulting data will provide input to the PFP EIS.

**Table 6. Forecast of Fuel-Grade and Power-Reactor-Grade Plutonium
Unirradiated Returns**

Fiscal Year - kg Pu

<u>Project</u>	<u>Wt. % Pu-240</u>	<u>1995</u>	<u>1996-2005</u>	<u>ANSI Code</u>
L-GB-0103-010	7.0-99.0	15	0	C01
L-GE-0231-010	7.0-19.0	27	0	C01
L-GE-0231-010	19.0-99.0	9	0	C01

Note:

No returns were forecasted from Hanford NE programs due in part to the lack of requirements for plutonium in Defense programs.

Returns schedule is based on the May 24, 1994 Withdrawal and Returns Summary received from DP-22 in June 1994.

As stated in DOE-RL's amended assumptions, only material receipts that meet Hanford's acceptance criteria are acceptable; therefore, only 10 kg Pu (7-19% Pu-240) of the above forecasted material is projected as SNM inventory receipts at Hanford in the FY 95 MMP.

**Table 7. Forecast of Fuel-Grade and Power-Reactor-Grade Plutonium
Withdrawals**

In accordance with the schedule received in June 1994 from DP-22, no withdrawals from WHC projects were scheduled throughout the MMP reporting period.

Table 8. Material Usage Schedules - Plutonium

NE Inventories in WHC Programs
as of March 31, 1994 - kg Pu

<u>Project</u>	<u>Location</u>	<u>Unirradiated</u>			<u>Unirrad. Total</u>	<u>Irrad Fuel^c</u>	<u>Project Total</u>
		<u>PuO₂</u>	<u>MOX</u>	<u>MOX Fuel</u>			
H-AF-8010-OFF ^a	WHC	0.4	11.7	644.7	656.8	2253.9	2910.7
FFTF Fuel	PNL	0.1		0.2	0.3	0.8	1.1
	ANL					4.8	4.8
	Total	0.5	11.7	644.9	657.1	2259.5	2916.6
H-AF-8010-OOL ^{a,b}	WHC	1.3	201.1	18.9	221.3	179.1	400.4
LMFBR Test	PNL			0.0	0.0	1.0	1.0
Fuel	ANL		0.9	5.8	6.7	27.6	34.3
	LANL	2.9	0.6		3.5		3.5
	Total	4.2	202.6	24.7	231.5	207.7	439.2
H-AF-8010-OFR	ANL			5.2	5.2	0.3	5.5
Fast Rctr Safety Dev							
H-AF-8010-OUK	WHC			23.4	23.4		23.4
Fast Rctr Safety Dev - UK Return							
Total		4.7	214.3	698.2	917.2	2467.5	3384.7

- a. Due to the FFTF shutdown directive, no Plutonium requirements are projected for NE FFTF programs. Note that 393 kg Pu of irradiated fuel (see table 12) is designated as restricted use plutonium.
- b. Unirradiated scrap with about 75 kg Pu as MOX and 4 kg Pu as PuO₂ has been declared/re-declared to the Central Scrap Management Office (CSMO) during the years 1978-1985 with no disposition resulting. In accordance with MMP assumptions, unirradiated plutonium material will continue to be stored at Hanford throughout the forecast period awaiting the PFP EIS and Record of Decision (ROD) targeted for completion in CY 1996. Total does not include approximately 0.2 kg Pu at Babcock & Wilcox, Leechburg (YKH) and 0.6 kg Pu at Cimmaron Corporation (YEC).
- c. FFTF spent fuel will continue to be stored indefinitely at the Hanford Site by the Office of Nuclear Energy (NE) awaiting a final decision on disposition.

Note: This table does not include NE material located at WHC facilities but belonging to PNL and other off-site projects.

Explanatory Notes for Plutonium Utilization Tables

Separate tables are provided for < 7% Pu-240 grade, fuel grade (FG), and power reactor grade (PRG) plutonium material balances. The superscript numbers in the tables refer to the correspondingly numbered notes listed on pages preceding each table.

In the FY 1994 column, only the projected ending inventories as of September 30, 1994, are shown. The ending inventory for each year is the beginning inventory for the following year.

The letter in parentheses after the material identity shows the activity to which the material is removed or from which it is received and corresponds to the following project numbers.

<u>Code Letter</u>			<u>NMMSS</u>	
<u><7% FG</u>	<u>PRG</u>		<u>Project No.</u>	<u>Title</u>
A	A	-	H-EW-3135-OBP	N Reactor Irradiated Fuel in Basin - Pu & Np/EM
			H-AF-8010-00L	LMFBR Test Fuel
			H-AF-8010-OFF	FFTF Fuel
-	-	A	H-EW-3135-01S	High Exposure Irradiated Fuel - Stored - RL/EM
			H-EW-3135-00A	PWR Cores - PNR
			H-AF-8010-00L	LMFBR Test Fuel
			H-AF-8010-OFF	FFTF Fuel
B	B	-	H-GE-0221-OSP	Reactor Products Separation - Pu
C	C	-	H-GE-0221-03C	Pu Conversion in Process
			H-GE-0347-03O	Process Development
D	D	-	H-GE-0221-04R	Pu Reclamation - Dissolver/Solvent Extraction
			H-GE-0221-0ZM	Z Plant Misc. Processes
			H-GE-0221-03C	Pu Conversion in Process
			H-GE-0221-01Z	Z Plant Services
E	E	B	H-GE-0221-06S	Pu Scrap Inventory
-	F	C	H-AF-8010-	LMR Program projects (Nuclear Energy/NE)
F	G	D	H-GE-0221-06N	Pu Nitrate Awaiting Conversion
			H-GE-0221-06X	Pu Product - Oxide
			M-GE-0221-00X	Inactive Pu Product - Oxide - RL
			M-GE-0221-03M	Inactive Pu Product - Metal - RL
-	H	-	M-GE-0221-0CX	Ceramic Grade Pu Oxide
G	I	E	H-GE-0221-000	Sample Analysis
			M-GE-0221-00X	Inactive Pu Product Oxide
			H-GE-0347-03O	Process Development

Note: Code letter A above refers to plutonium contained in irradiated fuels. All other code letters (B through I) refer to plutonium contained in unirradiated material.

In accordance with MMP assumptions, beginning in FY 1996 ownership of all plutonium in defense programs and M accounts will transfer to EM; transfer of material to new EM project numbers will occur at or before this time.

Table 9 - < 7% Pu-240 Grade Plutonium Utilization/Inventory Projection**Explanations for Table 9 Footnote References**

1. See page 21, "Explanatory Notes for Plutonium Utilization Tables," for <7% code letters for NMMSS project numbers.
2. The planned stabilization of PFP reactive materials requires operation of muffle furnaces in glove box HC-21C. Included in the campaign are 20 kg Pu of reactive materials from the PFP scrap inventory; also included is 1 kg Pu of chloride solutions from the scrap inventory as a process test.
3. In addition to the material being stabilized, the PFP scrap inventory of <7% Pu-240 material consists mainly of stabilized scrap oxide, ash, slag and crucible, and small quantities of other scrap material (including some chloride solutions) from various sources.
4. The inventory of RF origin scrap remaining from RF shipments to the Hanford Site during FY 1984-1986 is shown separately and is not included elsewhere in Table 9. Completion of processing in PFP was delayed by plant shutdowns. Due to changes in Defense Programs plans, PFP recovery of the remaining inventory is no longer planned.
5. The plutonium was substituted for the restricted use (non-weapon use) plutonium contained in Taiwan Research Reactor (TRR) fuel processed at SRS. The RF scrap was the only material with the required Pu-240 assay, that was available in sufficient quantity and suitable form for the substitution.

Table 9. <7% Pu-240 Grade Plutonium Utilization/Inventory Projection¹

kg Pu - Fiscal Year Ending

Base Case

		Fiscal Year				
		1994	1995	1996	1997	1998*
A	Irradiated Fuel					
	Ending Inventory: K Basins(N-Rx Fuel)	223	223	223	223	223
	FFTF	11	11	11	11	11
B	PUREX					
	Removal to Tank Farm Waste		9	0	0	0
	Ending Inventory: PUREX in process/holdup (solution in D5/E6 tanks)	9	0	0	0	0
C	PFP Stabilization²					
	Glovebox HC-21C					
	Receipts: Reactive Scrap (E)		20	0	0	0
	Process Dev. Lab. Test			0	0	0
	Receipts: Chloride Solution (E)		1	0	0	0
	Total		21	0	0	0
	Removals: Scrap oxide (E)		21	0	0	0
	Removals: Loss (1%)		0	0	0	0
	Total		21	0	0	0
	Ending Inventory	0	0	0	0	0
D	PFP In-Process/Holdup					
	Ending Inventory: PRF	51	51	51	51	51
	RMC	6	6	6	6	6
	PFP Building Holdup	4	4	4	4	4
	Ending Inventory Total	61	61	61	61	61
E	PFP Scrap Inventory					
	Receipts: Oxide (C)		21	0	0	0
	Removals: Reactive Scrap (C)		20	0	0	0
	Removals: Chloride Solution (C)		1	0	0	0
	Ending Inventory: PFP scrap ³	341	341	341	341	341
F	Product Inventory					
	Ending Inventory: Product nitrate	208	208	208	208	208

Table 9. <7% Pu-240 Grade Plutonium Utilization (Continued)

kg Pu - Fiscal Year Ending

	Fiscal Year				
	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998*</u>
G Samples and Standards					
Ending Inventory: In Vaults & Labs	11	11	11	11	11
Lab in-process/holdup	5	5	5	5	5
Total	16	16	16	16	16
<hr/>					
<7% Pu-240 Inventory					
Irradiated Fuel: K Basins (A)	223	223	223	223	223
FFTF (A)	11	11	11	11	11
PUREX Tank Holdup (B)	9	0	0	0	0
PFP Stabilization In-process (C)	0	0	0	0	0
PFP In-process/Holdup (D)	61	61	61	61	61
PFP Scrap Inventory (E)	341	341	341	341	341
Product Inventory (F)	208	208	208	208	208
Samples and Standards (G)	16	16	16	16	16
Subtotal	869	869	869	869	869
Scrap from Rocky Flats <7% Pu-240 Inventory⁴					
Oxide (85%)	736	736	736	736	736
Oxide - TRR substitute ⁵	47	47	47	47	47
Ash/stabilized - TRR substitute ⁵	37	37	37	37	37
Ash/unstabilized - TRR substitute ⁵	4	4	4	4	4
Anode heel	10	10	10	10	10
Subtotal	834	834	834	834	834
Total Pu Inventory (<7% Pu-240) in WHC Programs at WHC Facilities	1703	1703	1703	1703	1703

* In the Base Case, the FY 1998 ending inventories continue without change through the MMP period ending FY 2005.

Table 10 - FG Plutonium Utilization**Explanations for Table 10 Footnote References**

1. See page 21, "Explanatory Notes for Plutonium Utilization Tables," for FG code letters for NMMSS project numbers.
2. The FY 1994 Basin ending irradiated inventory does not reflect measured values from the KE Basin fuel segregation program. Instead, the FY 1995 MMP inventory values are derived from the official Safeguards PRE data base used for NMMSS reporting. The plutonium quantities and weighted average Pu-240 percentages are based on decayed values.
3. In order to reduce security, safeguards and storage costs, a program was initiated in FY 1988 to move Nuclear Energy (NE) program scrap, fuel pins, and assemblies out of Hanford 300 area NE facilities and into the PFP for storage; this program was completed in FY 1992.

With the exception of plant hold-up and thirty two driver fuel assemblies containing 289 kg Pu in mixed oxide (located at the FFTF), all unirradiated plutonium material stored by WHC is located at the PFP. The NE unirradiated fuel pins currently located at the FFTF will be moved to the PFP once storage space is made available.

Table 4 includes a summary of the amount of NE plutonium that is contained in materials stored at PFP. These materials will continue to be held on NE NMMSS project numbers awaiting DOE-HQ decisions as to responsibility for management and/or disposition. An additional note appears on Table 6 which does not project any NE returns during the MMP reporting period. Movement of the NE materials to PFP for storage is not a "return" in the context of DOE Order 5660.1B, Management of Nuclear Materials.

4. Projected receipts from LLNL are designated as fuel grade material only; no other receipts from off-site locations are projected in this document.
5. Table 3 shows the PFP FY 1994 ending product inventory breakdown by form and Pu-240 assay range. This inventory reflects approximately 16 kg Pu metal decay and 12 kg Pu oxide decay; NMMSS report project totals do not deduct this decay loss.
6. The 16% Pu-240 certified ceramic grade plutonium oxide was originally prepared by LANL for the LMR Program. The forecasts used for the MMP do not show any program requirements for the oxide.
7. Table 12 summarizes restricted use plutonium allocations for FG and PRG material.

Table 10. Fuel Grade Plutonium Utilization/Inventory Projection¹

		kg Pu - Fiscal Year Ending					
		%Pu-240	1994	Fiscal Year			
				1995	1996	1997	1998*
A	Irradiated Fuel						
	Removals: Decay N-Rx Fuel	10-13		1	1	1	0
		13-16		2	2	2	2
	End Inventory: K Basins ²	7-10	56	56	56	56	56
		10-13	904	903	902	901	901
		13-16	2781	2779	2777	2775	2773
		> 16	64	64	64	64	64
		Total	3805	3802	3799	3796	3794
	Removals: Decay FFTF Fuel	10-13		1			1
		> 16		1			1
	Ending Inventory: FFTF	7-10	8	8	8	8	8
		10-13	753	752	752	752	751
		13-16	199	199	199	199	199
		> 16	1220	1219	1219	1219	1218
		Total	2180	2178	2178	2178	2176
	Restricted Use (FFTF)	> 16	270	270	270	270	270
	Unrestricted Use (FFTF)	7-10	8	8	8	8	8
		10-13	753	752	752	752	751
		13-16	199	199	199	199	199
		> 16	950	949	949	949	948
		Total	1910	1908	1908	1908	1906
B	PUREX						
	Removal to waste	10-13		4	0	0	0
	Ending inventory in process	10-13	4	0	0	0	0
C	PFP Stabilization						
	Glovebox H-21C						
	Receipts: Reactive Scrap (E)	10-13		1	0	0	0
	Removals: Scrap Oxide (E)	10-13		1	0	0	0
	Removals: Loss (1%)	10-13		0	0	0	0
	Total	10-13		1	0	0	0
	Ending Inventory in process	10-13	0	0	0	0	0
D	PFP In-Process/Holdup						
	Ending Inventory: PRF	10-13	2	2	2	2	2
	PFP Building Holdup	10-13	9	9	9	9	9
	End Inventory: Total in process/holdup	10-13	11	11	11	11	11

Table 10. Fuel Grade Plutonium Utilization (Continued)

kg Pu - Fiscal Year Ending

		Fiscal Year				
	<u>%Pu-240</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998*</u>
E PFP Scrap Inventory						
Receipts: Oxide (C)	10-13		1	0	0	0
Removals: Reactive Scrap (D)	10-13		1	0	0	0
End Inv: PFP Scrap	7-10	47	47	47	47	47
	10-13	92	92	92	92	92
	13-16	8	8	8	8	8
	> 16	56	56	56	56	56
	Total	203	203	203	203	203
Restricted Use	7-10	35	35	35	35	35
	10-13	71	71	71	71	71
	13-16	6	6	6	6	6
	> 16	51	51	51	51	51
	Total	163	163	163	163	163
Unrestricted Use	7-10	12	12	12	12	12
	10-13	21	21	21	21	21
	13-16	2	2	2	2	2
	> 16	5	5	5	5	5
	Total	40	40	40	40	40
F NE Program Material³						
Fuel Pins at the FFTF	10-13	289	289	289	289	289
Fuel Pins at the PFP	10-13	384	384	384	384	384
Ending Inventory: NE Fuel Pins	Total	673	673	673	673	673
Ending Inventory: NE Scrap Storage	7-10	1	1	1	1	1
	10-13	192	192	192	192	192
	13-16	3	3	3	3	3
	> 16	6	6	6	6	6
	Total	202	202	202	202	202
Restricted Use	10-13	137	137	137	137	137
Unrestricted Use	7-10	1	1	1	1	1
	10-13	55	55	55	55	55
	13-16	3	3	3	3	3
	> 16	6	6	6	6	6
	Total	65	65	65	65	65

Table 10. Fuel Grade Plutonium Utilization (Continued)

kg Pu - Fiscal Year Ending

		Fiscal Year				
	<u>%Pu-240</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998*</u>
G Product Inventory						
Receipts: LLNL Oxide ⁴ (table 6)	13-16		6	4	0	0
Ending Inv: Nitrate	10-13	27	27	27	27	27
End Inv: Oxide and Metals	7-10	1	1	1	1	1
	10-13	107	107	107	107	107
	13-16	98	104	108	108	108
	> 16	868	868	868	868	868
	Total	1074	1080	1084	1084	1084
Total Product Inventory ⁵	7-10	1	1	1	1	1
	10-13	134	134	134	134	134
	13-16	98	104	108	108	108
	> 16	868	868	868	868	868
	Total	1101	1107	1111	1111	1111
Restricted Use: Available	> 16	179	179	179	179	179
Restricted Use: Used	> 16	0	0	0	0	0
Unrestricted Use	7-10	1	1	1	1	1
	10-13	134	134	134	134	134
	13-16	98	104	108	108	108
	> 16	689	689	689	689	689
	Total	922	928	932	932	932
H Ceramic Grade Oxide⁶						
Ending Inventory	> 16	357	357	357	357	357
I Samples and Standards						
Ending Inventory: In Vaults/Labs	7-10	6	6	6	6	6
	10-13	19	19	19	19	19
	13-16	1	1	1	1	1
	> 16	1	1	1	1	1
	Total	27	27	27	27	27
Lab in-process/holdup	7-10	1	1	1	1	1
Total Ending Inventory		28	28	28	28	28

Table 10. Fuel Grade Plutonium Utilization (Continued)

kg Pu - Fiscal Year Ending						
		Fiscal Year				
	<u>%Pu-240</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998*</u>
Total Fuel Grade Plutonium Inventory						
Inventory						
Basins Irradiated (A)		3805	3802	3799	3796	3794
FFTF Irradiated (A)		2180	2178	2178	2178	2176
PUREX Holdup (B)		4	0	0	0	0
PFP Stabilization (C)		0	0	0	0	0
PFP In-Process/Holdup (D)		11	11	11	11	11
PFP Scrap (E)		203	203	203	203	203
LMR Scrap (F)		202	202	202	202	202
LMR Fuel Pins (F)		673	673	673	673	673
Product (G)		1101	1107	1111	1111	1111
Ceramic Grade Oxide (H)		357	357	357	357	357
Samples and Standards (I)		28	28	28	28	28
Total		8564	8561	8562	8559	8555
Unrestricted Use						
Basins Irradiated (A)		3805	3802	3799	3796	3794
FFTF Irradiated (A)		1910	1908	1908	1908	1906
PUREX Holdup (B)		4	0	0	0	0
PFP Stabilization (C)		0	0	0	0	0
PFP In-Process/Holdup (D)		11	11	11	11	11
PFP Scrap (E)		40	40	40	40	40
LMR Scrap (F)		65	65	65	65	65
LMR Fuel Pins (F)		673	673	673	673	673
Product (G)		922	928	932	932	932
Ceramic Grade Oxide (H)		357	357	357	357	357
Samples and Standards (I)		28	28	28	28	28
Subtotal		7815	7812	7813	7810	7806
Restricted Use⁷						
Basins Irradiated (A)						
FFTF Irradiated (A)		270	270	270	270	270
PUREX Holdup (B)						
PFP Stabilization (C)						
PFP In-Process/Holdup (D)						
PFP Scrap (E)		163	163	163	163	163
LMR Scrap (F)		137	137	137	137	137
LMR Fuel Pins (F)						
Product (G)		179	179	179	179	179
Ceramic Grade Oxide (H)						
Samples and Standards (I)						
Subtotal		749	749	749	749	749
Total		8564	8561	8562	8559	8555

Table 10. Fuel Grade Plutonium Utilization (Continued)

kg Pu - Fiscal Year Ending

			Fiscal Year			
	<u>%Pu-240</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998*</u>
Total Fuel Grade Plutonium Inventory by Pu-240 percent						
Inventory	7-10	120	120	120	120	120
	10-13	2782	2776	2775	2774	2773
	13-16	3090	3094	3096	3094	3092
	> 16	2572	2571	2571	2571	2570
	Total	8564	8561	8562	8559	8555
Unrestricted Use	7-10	85	85	85	85	85
	10-13	2574	2568	2567	2566	2565
	13-16	3084	3088	3090	3088	3086
	> 16	2072	2071	2071	2071	2070
	Subtotal	7815	7812	7813	7810	7806
Restricted Use ⁷	7-10	35	35	35	35	35
	10-13	208	208	208	208	208
	13-16	6	6	6	6	6
	> 16	500	500	500	500	500
	Subtotal	749	749	749	749	749
Total		8564	8561	8562	8559	8555

* FY 1998 inventories continue without change through the MMP period ending FY 2005.

Table 11 - Power Reactor Grade (PRG) Plutonium Utilization**Explanations for Table 11 Footnote References**

1. See page 21, "Explanatory Notes for Plutonium Utilization Tables," for PRG code letters for NMMSS project numbers.
2. In the Base Case, the FY 1998 ending inventories continue without change through the MMP period ending FY 2005.
3. FFTF PRG irradiated fuel inventory declines FY 1996 (by 1 kg Pu) due to decay.
4. No PFP stabilization operations are scheduled for PRG material.
5. PRG plutonium scrap will continue to be stored at the Hanford site.
6. See note 3 on page 25.
7. Table 12 summarizes restricted use plutonium allocations for FG and PRG material.

Table 11. Power Reactor Grade Plutonium Utilization/Inventory Projection^{1,2}
kg Pu - Fiscal Year Ending

		Fiscal Year				
	<u>%Pu-240</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>
A Irradiated Fuel at Hanford						
End Inv: PWR Core 2 Blanket	26-30	120	120	120	120	120
End Inv: High Exposure K Reactor	26	9	9	9	9	9
End Inv: FFTF ³	20-23	242	242	241	241	241
Total		371	371	370	370	370
Unrestricted Use	26-30	248	248	247	247	247
Restricted Use (FFTF)	20-23	123	123	123	123	123
B PFP Scrap Inventory						
End Inventory: Storage ^{4,5}	23	69	69	69	69	69
Restricted Use	23	32	32	32	32	32
Unrestricted Use	23	37	37	37	37	37
C LMR Program Scrap⁶						
Ending Inventory Scrap	20-24	15	15	15	15	15
Ending Inventory LMR Fuel Pins	22	12	12	12	12	12
Restricted Use	20-24	15	15	15	15	15
Unrestricted Use	22	12	12	12	12	12
D Product Inventory						
Ending Inventory: Oxide	19-43	139	139	139	139	139
Ending Inventory: Metal	44	1	1	1	1	1
Unrestricted Use	19-44	140	140	140	140	140
E Samples and Standards	21	1	1	1	1	1
Total Power Reactor Grade Plutonium Inventory						
Unrestricted Use						
Irradiated Fuel-PWR,K-Rx,FFTF (A)		248	248	247	247	247
PFP Scrap (B)		37	37	37	37	37
LMR Fuel Pins (C)		12	12	12	12	12
Product Inventory (D)		140	140	140	140	140
Samples and Standards (E)		<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Subtotal		438	438	437	437	437
Restricted Use ⁷						
Irradiated Fuel-FFTF (A)		123	123	123	123	123
PFP Scrap (B)		32	32	32	32	32
LMR Scrap (C)		<u>15</u>	<u>15</u>	<u>15</u>	<u>15</u>	<u>15</u>
Subtotal		170	170	170	170	170
Total		608	608	607	607	607

Table 12. RL Inventory Allocation of Restricted Use Plutonium

kg Pu			
<u>Restricted Use Account</u>	<u>FG</u>	<u>PRG</u>	<u>Total</u>
<u>UK Barter:</u>			
FFTF & Test Fuel ^a	270	123	393
<u>NFS/Licensed Facility:</u>			
Product Inventory (G)	179	--	179
Scrap Inventory (E,B)	163	32 ^d	195
LMR Program Scrap (F,C)	<u>137^e</u>	<u>15^e</u>	<u>152</u>
NFS Totals ^b	479	47	526
Shipped for NBL ^c	<u>(6)</u>	<u>(3)</u>	<u>(9)</u>
Unused Allocation	<u>473</u>	<u>44</u>	<u>517</u>
 Total RL Restricted Use	 743	 167	 910

Notes: 1. Capital letters in parentheses indicate project account in Plutonium Utilization Tables 10 and 11.

2. Allocations are based on the DOE-HQ/DP-131 memorandum dated April 14 1989, "Revised Draft Allocation of Non-weapon-grade Plutonium", to Operations Offices. (RL document control number RL-HQ-405)

3. Does not include material substituted for the Taiwan Research Reactor restricted use fuel processed at the SRS (see table 9).

a. Restricted use allocation is assigned to NE irradiated inventory. Original plutonium before irradiation was mainly 12% Pu-240.

b. See Table 13 for NFS-West Valley nitrate shipments received at RL.

c. Supplied in FY 1991 for New Brunswick Laboratory (NBL) standards.

d. 20 kg of restricted use Critical Mass Laboratory (CML) nitrate identified as PRG product in 1991 MMP will remain as scrap nitrate.

e. Based on the inventory of LMR Program scrap stored at PFP (Table 4).

Table 13. RL Receipts of NFS Plutonium Nitrate

<u>Transfer No.</u>	<u>Month/Year</u>	<u>Pu Origin/Reactor</u>	<u>Pu-240 Wt%</u>	<u>kg Pu Element</u>
DAA-HWA 1-5	N/A	N Reactor	N/A	N/A
DAA-HWA 6	7/67	Dresden	No Data	1.869
DAA-HWA 7	7/67	Yankee	15 est. ^a	36.925
DAA-HWA 8	7/67	Yankee	15 est. ^a	52.937
DAA-HWA 9	8/67	Yankee	13.2 non-fiss.	77.145
DAA-HWA 10	9/67	Yankee	14.5 non-fiss.	27.864
DAA-HVA 1	10/67	Yankee	14.9 non-fiss.	64.390
DAA-HVA 2	10/67	Yankee	16.1 non-fiss.	20.148
DAA-HVA 3-33	N/A	N Reactor	N/A	N/A
DAX-HVA 1-2	N/A	SEFOR	N/A	N/A
YDE-HVA 1	9/70	Yankee	14.795	34.359
YDE-HVA 2	9/70	Commonw. Edison	23.349	29.795
YDE-HVA 3	9/70	Consolid. Edison	15.630	23.232
YDE-HVA 4	10/70	Yankee	15.014	34.138
YDE-HVA 5	10/70	Commonw. Edison	22.584	18.795
YDE-HVA 6	10/70	Consolid. Edison	16.009	37.474
YDE-HVA 7	10/70	No. States Power	7.921	7.036
YDE-HVA 8	10/70	Yankee	14.902	37.775
YDE-HVA 9	10/70	Commonw. Edison	23.456	22.844
YDE-HVA 10	10/70	Consolid. Edison	16.850	21.050
YDE-HVA 11	12/70	Yankee	14.505, 15.652	38.625
YDE-HVA 12	12/70	Commonw. Edison	23.300	20.391
YDE-HVA 13	12/70	Consolid. Edison	16.975	22.210
YDE-HVA 14	12/70	Consumers Power	13.233, 15.390	42.117
YDE-HVA 15	12/70	Consumers Power	13.844	21.315
YDE-HVA 16	3/73	Consumers Power	21.264 - 7 bot. 19.512 - 1 bot.	12.093
YMU-HVA 1	5/73	Vermont Yankee ^b	9.18	9.075
DAA-HVA 34-46	N/A	N Reactor Fuel Retn.	N/A	N/A
Commercial Origin Total				713.602

By Pu-240 Wt%:	<u>8 - 9</u>	<u>13 - 15</u>	<u>15 - 17</u>	<u>FG Total</u>	<u>PRG Total</u>
kg Pu:	16.111	469.459	124.114	609.684	103.918

a. Based on Yankee Pu-240 assays listed below.

b. Involved trade between Vermont Yankee and Commonwealth Edison.

Table 14. Total Plutonium InventoryMMP Beginning Inventory
kg Pu

WHC Programs: DP Projects, M Accounts, & EM Projects (irradiated fuel)					
Inventory Type	At WHC Hanford Facilities				Offsite
	Table 9 <7%	Table 10 FG	Table 11 PRG	Total	Total
Irradiated (EM)	223	3805	129	4157	
In-process/Holdup (DP)	70	15	0	85	
Scrap (DP)	341	203	69	613	
Scrap from Rocky Flats (DP)	834	0	0	834	
Product: Nitrate (DP)	208	27	0	235	
Metal & Oxide (DP & M)	0	1074	140	1214	
Ceramic Grade Oxide (M)	0	357	0	357	
Standards & Samples (DP)	11	27	1	39	11
Laboratory In-process/Holdup (DP)	5	1		6	
MMP 9/30/94 Projected Inventory	1692	5509	339	7540	
Add:					
Material not in tables					
Product Oxide to LANL, 7/94 (DP)		+ 24		+ 24	
Irradiated Fuel Decay, 4/1-9/30/94 (EM)		+ 1		+ 1	
Prod Decay in tables/not in NMMSS DP,M		+ 28		+ 28	
MMP Beginning Inventory (3/31/94)	1692	5562	339	7593	11

WHC Programs: NE Projects					
Inventory Type	At WHC Hanford Facilities				Offsite
	Table 9	Table 10 FG	Table 11 PRG	Total	Total
Irradiated (NE)	11	2180	242	2433	35
Unirradiated Fuel Pins & Assemblies (NE)		673	12	685	0
Scrap (NE)		202	15	217	16
MMP Beginning Inventory (3/31/94)	11	3055	269	3335	51

Total MMP Beginning Inventory (3/31/94) in WHC Programs, and M Accounts	At WHC	Offsite
	10928	62

Note: 1. This table does not include 67 kg Pu of offsite program material located at WHC facilities (PNL 45 kg Pu, LANL 17 kg Pu, and ANL 5 kg Pu).

2. No E accounts remain in WHC facilities; all former E account material was transferred into to EM projects.

Appendix A - Uranium Usage Tables

Table A-1. Fuel Fabrication Unirradiated Uranium Inventory (DP)

Inventory as of March 31, 1994

H-GE-0112-00F

	<u>COEI</u>	<u>MTU</u>	<u>% U-235</u>	<u>kg U-235</u>
Enriched Uranium				
Billets	254	626 ^a	0.95	5947
	254	234	1.25	2920
Finished Fuel	257	622 ^b	0.95	5915
	257	134 ^c	1.15	1538
Unfinished Fuel	256	113	0.95	1077
	256	<u>15</u>	1.25	<u>183</u>
Total		1744		17580
Natural Uranium				
Billets	254	80	0.71	
Finished Fuel	257	66	0.71	
Unfinished Fuel	256	<u>9</u>	0.71	
Total		155		
Total Inventory		1899 ^d		

-
- a. Reflects shipment of 326 MTU to the United Kingdom in 1st quarter FY 1993.
- b. Inventory does not include 2 MTU (21 kg U-235) of unirradiated contaminated finished fuel elements contained in Hanford's K-East irradiated fuel storage basin.
- c. "Spike" finished fuel elements (1.15% U-235) consist of 0.95% U-235 inner fuel pieces combined with 1.25% U-235 outer fuel pieces.
- d. Does not include approximately 0.5 MTU (4 kg U-235) of scrap metal or 34 kg U (0.3 kg U-235) in unirradiated scrap solutions.

Table A-2. DP/EM Enriched & Normal Uranium Inventory and Usage
MTU - Fiscal Year Ending

	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998-2005</u>
Irradiated Fuel in Basins					
EM Ending Inventory: K-Basins ¹	1421	1421	1421	1421	1421
Unirradiated U (Fuel Fab)					
Removals: Transfer to EM ²		1901	0	0	0
DP Ending Inventory ³	1901	0	0	0	0
EM Ending Inventory	0	1901	1901	1901	1901
PUREX/PFP Facilities					
Removals: Transfer to tank farm waste ⁴		16	0	0	0
Transfer PUREX acid waste to BNFL		7	0	0	0
Transfer to EM		0	1	0	0
DP Ending Inventory: PUREX In process	16	0	0	0	0
PUREX Acid Waste	7	0	0	0	0
PFP Scrap ⁵	1	1	0	0	0
EM Ending Inventory: PFP Scrap	0	0	1	1	1
UO₃ Plant					
Removals: Transfer to EM ²		622	0	0	0
DP Ending Inventory: UO ₃ Product ⁶	662	0	0	0	0
EM Ending Inventory: UO ₃ Product	0	662	662	662	662
Ending Inventory					
DP total	2587	1	0	0	0
EM total	1421	3984	3985	3985	3985
Total	4008	3985	3985	3985	3985

1. 675 MTU of N-Reactor counterpart irradiated fuel in K-basins is DU and therefore not reported. Other EM owned irradiated fuel (PWR Core II and Single pass reactor fuel) contains virtually no EU or NU and were also not reported on this table.

2. Assumes EM is willing to accept material transfers in FY 1995.

3. Includes 2 MTU of unirradiated contaminated finished fuel elements in KE Basin.

4. EM tank farm waste is not carried as SNM stored inventory.

5. EU and NU counterpart of Pu/U scrap stored at PFP.

6. 0.85% U-235

Note: Does not include 103 MTU of depleted UO₃ in storage remaining after shipment of approximately 3 MTU to Oak Ridge Y-12 plant in June 1993.

Table A-3. NE Unirradiated Uranium
in WHC programs as of March 31, 1994 (all weights in kilograms)

Project	Location RIS	Element Weight			U-235 by % U-235							Total U-235
		DU	NU	EU	<20	20-<35	35-<45	45-<80	80-<92	92-<94	>94	
H-AF-6540-MMW	FCW			4.5	0.0	0.0	0.0	0.0	0.0	4.2	0.0	4.2
H-AF-8010-00L ^a	AUA	3										
	CZC	13	1	18.0	0.2	0.2	1.1	4.5	1.6	1.2	0.0	8.8
	HYA		2	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
	HUD	<u>23200</u>	<u>1387</u>	<u>335.0</u>	<u>7.4</u>	<u>28.7</u>	<u>4.6</u>	<u>43.0</u>	<u>19.5</u>	<u>19.5</u>	<u>9.1</u>	<u>131.8</u>
		23216	1390	353.2	7.6	28.9	5.7	47.5	21.1	20.8	9.1	140.7
H-AF-8010-00T	HUD			0.2								0.0
H-AF-8010-0FF ^b	CZC	1										
	HUD	1951	589	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	HYA		1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	YEC		10									
	YKH		20									
H-AF-8010-0FR ^b	CZC	5	4	10.7	0.5	0.2	0.2	1.0	0.6	0.0	0.0	2.5
	YUD	276										
H-AF-8010-0UK ^b	HUD	26	15	33.9	2.5	0.0	0.0	0.0	0.0	0.0	0.0	2.5
Totals		25475	2029	404.4	10.6	29.1	5.9	48.5	21.7	25.0	9.1	149.9

a Due to the FFTF shutdown directive, no future uranium requirement usage are projected for Hanford NE Programs.

b Storage at WHC will continue indefinitely until a decision on final disposition is reached.

Definition of location RIS codes:

FCW	Babcock and Wilcox
AUA	Los Alamos National Laboratory
CZA	Argonne National Laboratory
CZC	Argonne National Laboratory - West
HYA	Pacific Northwest Laboratory (PNL)
HUD	Westinghouse Hanford Company (WHC)
XJZ	GPU Nuclear Corp. Three Mile Island 2
YEC	Cimarron Corporation
YKH	Babcock and Wilcox, Plutonium Laboratory, Leechburg
YUD	SNPC, Richland discard to ground and lagoon.

Table A-4 NE Irradiated Uranium
in WHC programs as of March 31, 1994 (all weights in kilograms)

Project	Location	Element Weight			U-235 by % U-235							Total U-235
		DU	NU	EU	<20	20-<35	35-<45	45-<80	80-<92	92-<94	>94	
H-AF-8010-00L ^a	CZA	3		4.4	0.0	0.2	0.3	1.9	0.1	0.0	0.1	2.6
	CZC	18	20	84.1	0.8	4.9	2.4	21.2	7.9	1.8	1.4	40.4
	HYA	1		7.7	0.2	0.0	0.0	0.6	0.3	0.3	0.0	1.4
	HUD	<u>959</u>	<u>16</u>	<u>232.4</u>	<u>0.5</u>	<u>63.0</u>	<u>0.4</u>	<u>11.9</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>75.8</u>
		981	36	328.6	1.5	68.1	3.1	35.6	8.3	2.1	1.5	120.2
H-AF-8010-00T	HUD			19.4	2.8	1.0	0.0	0.0	0.0	0.0	0.0	3.8
H-AF-8010-OFF ^b	CZC	23										
	HYA	2		0.1								
	HUD	6469	981									
H-AF-8010-OFR	CZC			0.1								
	CZA	1										
Totals		7476	1017	348.2	4.3	69.1	3.1	35.6	8.3	2.1	1.5	124.0

a Due to the FFTF shutdown directive, no future uranium requirements, production, or usage is projected for Hanford NE programs.

b Storage at WHC will continue indefinitely until a decision on final disposition is reached.

Definition of location RIS codes:

CZA	Argonne National Laboratory
CZC	Argonne National Laboratory - West
HYA	Pacific Northwest Laboratory (PNL)
HUD	Westinghouse Hanford Company (WHC)

Appendix B - Other Special Nuclear Materials

Table B-1. Other SNM in WHC Programs**Pu-238 (MT 83)**

Location RIS	Location	Project	COEI	%Pu-238	Grams	
					Pu	Pu-238
AVB	Mound, EG&G	H-AF-8010-00L	781	78	5.9	4.6
HYA	PNL	H-GE-0347-030	409 746 771	85 85 85	2.4	2.1
HUD	WHC	H-AF-8010-00L	781	80	24.8	19.5
		H-GE-0221-000	771	78	84.7	67.7
		H-GE-0221-000	781	80	3.3	2.1
		H-GE-0347-030	771	80	2.1	1.7

Heat standards and samples; material at Mound is for calibration

Tritium (MT 87)

Location RIS	Location	Project	COEI	Grams Tritium
HUD	WHC	H-AF-8010-00L	746	0.5

Getter beds at FFTF resulting from Japanese MOTA experiments.

U-233 (MT 71)

Location RIS	Location	Project	COEI	kg U	kg U-233
HUD	WHC	H-AF-8010-00L	771	0.08	0.07
		H-GE-0221-000	771	0.04	0.04
		H-GE-0221-06S	728	0.04	0.04

Standards and Samples.

Np-237 (MT 82)

Location RIS	Location	Project	COEI	kg Np-237
HUD	WHC	H-AF-8010-OFF	360, 375	2
		H-EW-3135-OBP	376	60

Np-237 contained in irradiated fuel.