DOE/ORO - 2051
Volume I of III

DWG. NO. K/GA 97-771

U. S. Department of Energy
Oak Ridge Operations

REGULATORY OVERSIGHT PROGRAM

July 1, 1993, to March 3, 1997

A Transitional Program for Regulation of the Gaseous Diffusion Plants at
Paducah, Kentucky and Portsmouth, Ohio

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of the Gaseous Diffusion Plants at
Paducah, Kentucky, and Portsmouth, Ohio**

REGULATORY OVERSIGHT PROGRAM
July 1, 1993, to March 3, 1997

Issued: September 1997

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Prepared by
Regulatory Oversight Office
for
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MASTER

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COVER: This is a picture of a
typical Gaseous Diffusion Cell.

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APPENDIX A Memorandum from Secretary of Energy to Heads of Offices, Dated: June 15, 1993, Subject: Department Oversight Responsibilities of Uranium Enrichment Activities by the United States Enrichment Corporation, in which regulatory oversight authority and responsibility for Paducah and Portsmouth Gaseous Diffusion Plants was assigned to Department of Energy/Oak Ridge Operations during transition to regulation by Nuclear Regulatory Commission..

APPENDIX B *REGULATORY OVERSIGHT AGREEMENT between UNITED STATES DEPARTMENT OF ENERGY and UNITED STATES ENRICHMENT CORPORATION (Exhibit D of Lease Agreement), July 1, 1993.*

APPENDIX C *JOINT STATEMENT OF UNDERSTANDING BETWEEN THE NUCLEAR REGULATORY COMMISSION AND THE DEPARTMENT OF ENERGY ON IMPLEMENTING THE ENERGY POLICY ACT PROVISIONS ON THE REGULATION OF GASEOUS DIFFUSION URANIUM ENRICHMENT PLANTS, Signed December 20, 1993, Ivan Selin and Hazel R. O'Leary.*

APPENDIX D Memorandum of *AGREEMENT ESTABLISHING GUIDANCE FOR NUCLEAR REGULATORY COMMISSION INSPECTION ACTIVITIES AT THE PADUCAH AND PORTSMOUTH GASEOUS DIFFUSION PLANTS BETWEEN DEPARTMENT OF ENERGY REGULATORY OVERSIGHT MANAGER AND NUCLEAR REGULATORY COMMISSION*, Signed August 11, 1994, J. Dale Jackson and Nuclear Regulatory Commission, which establishes guidance for NRC observation activities at Paducah and Portsmouth Gaseous Diffusion Plants.

APPENDIX E *MEMORANDUM OF AGREEMENT RELATING TO THE TRANSFER OF FUNCTIONS AND ACTIVITIES FROM THE UNITED STATES DEPARTMENT OF ENERGY TO THE UNITED STATES ENRICHMENT CORPORATION*, Signed December 15, 1994, Hazel R.

VOLUME II**CONTENTS (Cont.)**

O'Leary and William H. Timbers, Jr., which relates the agreement between Department of Energy and United States Enrichment Corporation in which Department of Energy retains title and control of Highly Enriched Uranium material until it is blended to less than 10% of the U₂₃₅ isotope.

APPENDIX F

MEMORANDUM OF UNDERSTANDING BETWEEN THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, AND U.S. DEPARTMENT OF ENERGY OFFICE OF ENVIRONMENTS, SAFETY AND HEALTH, Signed December 21, 1994, Joseph A. Dear and Tara O'Toole, MD., to minimize potential gaps.

APPENDIX - G

Joint Policy Statement by UNITED STATES ENRICHMENT CORPORATION AND DEPARTMENT OF ENERGY RESOLUTION OF SHARED SITE ISSUES AT THE GASEOUS DIFFUSION PLANTS, Sent by United States Enrichment Corporation Letter, Dated: January 25, 1996, in which an administrative policy statement addresses Paducah Gaseous Diffusion Plants shared site issues the surrounding Department of Energy - retained reservation as well as other issues that require formal mechanisms for interface and control.

APPENDIX - H

U. S. Department of Energy Monthly Highlights of the Regulatory Oversight Program (This is a detailed list of month-by-month activity/events summaries.)

Volume II is available
upon request from:

**US DEPARTMENT OF ENERGY
REGULATORY OVERSIGHT
ATTN RANDALL M. DEVAULT ROOM 560
POST OFFICE BOX 62
OAK RIDGE TN 37831**

VOLUME III CONTENTS

NOTE: This volume contains the detailed site inspection reports for Paducah and Portsmouth Gaseous Diffusion Plants. These reports can be useful for historical information for each site

APPENDIX - I *DOE TO NRC REGULATORY OVERSIGHT
TRANSITION - DOE:ORO:PGDP
INSPECTION SUMMARY*

(The purpose of this report was to document the Department of Energy regulatory oversight inspection and enforcement (I and E) history of Paducah Gaseous Diffusion Plant. Also the report provides a formal mechanism by which Department of Energy/Oak Ridge Operations could communicate Paducah Gaseous Diffusion Plant's I and E history to Nuclear Regulatory Commission. The scope of the report encompasses the inspection activities that occurred at the Paducah Gaseous Diffusion Plant site during July 1, 1993, through March 2, 1997.)

APPENDIX - J *DOE TO NRC REGULATORY OVERSIGHT
TRANSITION - DOE:ORO:PORTS
INSPECTION SUMMARY*

(The purpose of this report was to document the Department of Energy regulatory oversight inspection and enforcement (I and E) history of Portsmouth Gaseous Diffusion Plant. Also the report provides a formal mechanism by which Department of Energy/Oak Ridge Operations could communicate Portsmouth Gaseous Diffusion Plant's I and E history to Nuclear Regulatory Commission. The scope of the report encompasses the inspection activities that occurred at the Portsmouth Gaseous Diffusion Plant site during July 1, 1993, through March 2, 1997.)

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ACRONYMS

CFR	-	Code of Federal Regulations
DEVs	-	Deviations
DOE	-	Department of Energy
DOE/HQ	-	Department of Energy - Headquarters
DOE/HQ-EM	-	Environmental Management within DOE/HQ
DOE/HQ-NN	-	Nonproliferation and National Security within DOE/HQ
DOE/HQ-EH	-	Environmental Safety and Health within DOE/HQ
DOE/HQ-GC	-	General Counsel within DOE/HQ
DOE/HQ-NE	-	Nuclear Energy within DOE/HQ
DOE/ORO	-	Department of Energy - Oak Ridge Operations
DOE RO	-	Department of Energy - Regulatory Oversight
EOC	-	Emergency Operations Center
FSAR	-	Final Safety Analysis Report
FTEs	-	Full Time Equivalents
GDP	-	Gaseous Diffusion Plant
HEU	-	Highly Enriched Uranium
I & E	-	Inspection and Enforcement
IFIs	-	Inspection Follow-up Items
ISA	-	Independent Safety Assessment
JCO	-	Justifications for Continued Operation
LCO	-	Limiting Conditions for Operation
LEU	-	Low Enriched Uranium
LLNL	-	Lawrence Livermore National Laboratory
LMES	-	Lockheed Martin Energy Systems, Inc.
LMUS	-	Lockheed Martin Utility Services
NCSA	-	Nuclear Criticality Safety Approval
NCVs	-	Non-Cited Violations

ACRONYMS (Cont)

NOV	-	Notice of Violation
NRC	-	Nuclear Regulatory Commission
OCC	-	Office of Chief Counsel
ORE	-	Operational Readiness Evaluation
ORO	-	Oak Ridge Operations
ORO/RO	-	Oak Ridge Operations - Regulatory Oversight
ORR	-	Operational Readiness Review
OSHA	-	Occupational Safety and Health Administration
OSRs	-	Operational Safety Requirements
OSRs/ TSRs	-	Operational Safety Requirements/Technical Safety Requirements
PAAA	-	Price-Anderson Amendments Act
PGDP	-	Paducah Gaseous Diffusion Plant
PORTS	-	Portsmouth Gaseous Diffusion Plant
PSOA	-	Plant Safety Operational Analysis
PW	-	Product Withdrawal
PY	-	Program Year (July 1 through June 30)
RO	-	Regulatory Oversight
ROA	-	Regulatory Oversight Agreement
RO Manual	-	Regulatory Oversight Inspection and Enforcement Manual
SAR	-	Safety Analysis Report
SE	-	Safety Evaluation
SER	-	Safety Evaluation Report
SME	-	Subject Matter Expert
SSCs	-	Structures, Systems, and Components
SSR	-	Site Safety Representative
The Act	-	The Energy Policy Act of 1992
TR	-	Transitional Requirement

ACRONYMS (Cont)

TSRs	-	Technical Safety Requirements
UF ₆	-	Uranium Hexafluoride
URIs	-	Unresolved Items
USEC	-	United States Enrichment Corporation
USQ	-	Unreviewed Safety Question
VIOs	-	Violations

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1.0 PURPOSE

On July 1, 1993, a Regulatory Oversight (RO) organization was established within the United States Department of Energy (DOE), Oak Ridge Operations (ORO) to provide regulatory oversight of the DOE uranium enrichment facilities leased to the United States Enrichment Corporation (USEC). The purpose of the RO program was to ensure continued plant safety, safeguards and security while the Paducah and Portsmouth gaseous diffusion plants (GDPs) transitioned to regulatory oversight by the Nuclear Regulatory Commission (NRC). These activities were performed under the authority of the lease agreement between DOE and USEC until NRC issued a Certificate of Compliance or approved a Compliance Plan pursuant to Section 1701 of the Atomic Energy Act of 1954, as amended, and assumed regulatory responsibility.

This report chronicles the formal development, operation and key activities of the RO organization from its beginning in July 1993, until the turnover of the regulatory oversight responsibility to the NRC on March 3, 1997. Through its evolution to closure, the RO program was a formal, proceduralized effort designed to provide consistent regulation and to facilitate transition to NRC. The RO Program was also a first-of-a-kind program for DOE. The process, experience, and lessons learned summarized herein should be useful as a model for transition of other DOE facilities to privatization or external regulation.

2.0 EXECUTIVE SUMMARY

The Energy Policy Act of 1992 (the Act) directed the Department of Energy (DOE) to lease those portions of the Paducah Gaseous Diffusion Plant (PGDP) and Portsmouth Gaseous Diffusion Plant (PORTS) required to perform uranium enrichment activities to the United States Enrichment Corporation (USEC). A memorandum from the Secretary of Energy to the manager of DOE/ORO and others (Appendix A) directed DOE/ORO to provide regulatory oversight of USEC uranium enrichment activities to provide for assurance of nuclear safety and safeguards and security until such time as the Nuclear Regulatory Commission (NRC) could assume regulatory responsibility. Additionally, the Act required NRC to promulgate standards for regulating the operations of these facilities to protect the public health and safety from radiological hazards, and to provide for the common defense and security.

A DOE/ORO transition team, responsible for defining and establishing the formal Lease Agreement between USEC and DOE, was organized in late 1992. In April 1993, and because DOE/ORO was tasked with providing regulatory oversight of USEC uranium enrichment activities until regulated by NRC, personnel with nuclear safety and NRC licensing background were added to the transition team, with a responsibility to develop a mechanism in which DOE/ORO could provide nuclear safety and safeguards and security oversight of the GDPs enrichment process during transition to NRC. The transition team established the set of regulatory requirements, derived from DOE Orders, necessary for assurance of nuclear safety and safeguards and security oversight during the interim period. The team further established an inspection and enforcement mechanism, derived in part from the NRC practices, to provide a regulatory framework and to facilitate an effective transition to NRC regulatory jurisdiction. These regulatory requirements were included as Exhibit D, *Regulatory Oversight Agreement Between the United States Department of Energy and the United States Enrichment Corporation* (the ROA, See: Appendix B), to the *Lease Agreement Between the United States Department of Energy and the United States Enrichment Corporation* (the Lease), which was made effective July 1, 1993.

The ROA required appointment of a Regulatory Oversight Manager to administer DOE regulatory responsibilities. The Regulatory Oversight Manager was appointed, and a Regulatory Oversight organization was formed. The ROA, as written, provided for the regulatory oversight responsibilities of inspection and enforcement to be independent of DOE line organizations. Further, the ROA provided operational authority or authorization basis responsibilities for regulatory oversight to reside with the Regulatory Oversight Manager and established a cost-recoverable budget from USEC.

The Regulatory Oversight organization assumed responsibility for regulation of USEC enrichment activities at the GDPs on July 1, 1993. The ROA provided for distinct oversight functions, including:

- on-site routine inspection and audits;

- periodic inspections and audits including functional appraisals against nineteen functional areas identified by the ROA;
- enforcement actions; and
- established the need for a program to provide appropriate, consistent, and a legally sound implementation.

To assure an orderly transition to regulation by NRC, the DOE Regulatory Oversight Program was patterned from the model used by NRC to accomplish its oversight functions. An on-site inspection program was established utilizing two full-time Site Safety Representatives (SSRs) per site. The SSRs performed daily routine inspections and audits, and initiated recommendations for enforcement actions based on their findings. The Regulatory Oversight Manager was the authority to establish enforcement policy and implement enforcement actions, including the imposition of civil penalties. The Regulatory Oversight Manager was supported by nuclear safety and safeguards and security, legal counsel, administrative, and subject matter experts (SMEs) responsible for development and tracking of enforcement actions and for support and conduct of periodic inspections.

The DOE Regulatory Oversight Program as implemented included the following activities:

- DOE regulatory oversight, including SSR routine monitoring of operations, started with USEC assuming management of the gaseous diffusion plants on July 1, 1993.
- The Regulatory Oversight Inspection and Enforcement Manual (RO Manual) was developed and implemented on January 1, 1994.
- The Functional Inspection Teams were established and trained, and started conducting the functional area inspections in April 1994.
- The Regulatory Oversight Manager approved enforcement actions and imposition of civil penalties, and conducted three enforcement conferences for the purpose of regulating USEC's practices and procedures for operating the gaseous diffusion plants as well as encouraging improvements in their management controls and program commitments.
- The Regulatory Oversight Manager held two management conferences with USEC management to discuss concerns regarding the lack of responsiveness to the need for improving management controls, for implementing corrective actions and for following established plant procedures.
- The Regulatory Oversight Manager issued an Order to Take Action to address failure to ensure prompt evaluation and resolution of a number of "as found" conditions self-identified by USEC and potentially involving unreviewed safety questions (USQs) on April 5, 1996.

Concurrent with the DOE/ORO Regulatory Oversight Program activities, NRC developed regulations required for NRC to assume regulatory oversight of uranium enrichment activities. These requirements included the Code of Federal Regulations (CFR), Title 10, Part 76 (10 CFR 76), "Certification of Gaseous Diffusion Plants," which was issued with an effective date of October 24, 1994. In addition, NRC assigned on-site inspection personnel to begin observation of uranium enrichment operations during the transition period (See: Appendix D).

Several additional regulatory initiatives were conducted as a result of DOE and NRC policy issues during the transition period. The most significant of these initiatives included technical oversight and performance of safety evaluations (SEs) for the Highly Enriched Uranium (HEU) refeed activities at PORTS and for transitioning from DOE-approved Operational Safety Requirements (OSRs) to DOE- and NRC-approved Technical Safety Requirements (TSRs) at both facilities. In preparation for transition, the RO staff also assisted the NRC by providing NRC personnel with technical training for familiarization and understanding of the gaseous diffusion technology and programs.

Other regulatory activities in support of transition to NRC regulatory oversight included development of the DOE Compliance Plan as required by the Energy Policy Act and 10 CFR 76, and implementing the DOE commitments included in the DOE Compliance Plan. The most significant DOE Compliance Plan commitment involved development of the site-wide upgrade of the Safety Analysis Reports (SARs) for both facilities, and review and approval of facility design changes required as a result of SAR Upgrade activities. The requirements to increase the seismic capacity of several of the process buildings at the PGDP is an example of these facility changes.

The RO staff was effective in working with both USEC and the NRC to implement a regulatory program which has prepared USEC to operate the facilities under NRC regulatory oversight. However, there were several lessons learned which would facilitate the future transitioning of other DOE facilities to NRC regulatory oversight, including both positive and negative observations. Some of these lessons learned include RO Manager being independent from production, cost, schedule, and budget concerns; assignment of RO Manager with authority to approve regulatory issues without further DOE management approval; and it is essential that the authorization basis be accurate and up-to-date with facility configuration. Further detail and additional lessons learned follow in the next section of this report.

The DOE/ORO Regulatory Oversight Program accomplished the primary mission of maintaining safe operations throughout the period of transition to NRC regulatory oversight, with the NRC accepting regulatory authority on March 3, 1997.

3.0 LESSONS LEARNED

The lessons learned, during the DOE/ORO Regulatory Oversight of USEC operation of the GDPs while in transition to certification and regulation by NRC, may be relevant to other DOE facilities and activities being considered for external regulation. This section addresses the overall regulatory oversight lessons learned.

- It is essential for the RO Manager to be removed from the production, cost, schedule and budget concerns in order to foster an acceptable regulatory environment similar to that of the NRC. One of the greatest needs is for the RO organization not to be responsible for line management of the regulated organization.
- It is essential for senior DOE management to endorse the program and to support personnel actions in order to hold an effective team in place. This program had the endorsement of senior management, without which the program would have failed.
- It is essential that the RO Manager be "One Regulatory Voice", such that all DOE organizations with interest in the GDPs provide their input to the RO Manager. This enabled the DOE/ORO RO program to successfully and consistently focus on the protection of the health and safety of the workers and the public, on safeguards and security interests, and on environmental issues. Assignment of the RO Manager with authority to approve regulatory issues without further DOE management approvals, significantly improved the effectiveness and timeliness of the regulatory function.
- It is essential to develop regulations which are understood by both the regulator and the organization being regulated, and which contain criteria that can be verified by inspection. Development of the ROA to include clear, concise regulatory requirements based on existing DOE Orders and Standards which impact nuclear safety and safeguards and security, and focusing inspection findings and enforcement actions only on that minimum set of requirements invoked by the ROA, greatly improved the independence of the regulatory function from production concerns and decreased the amount of interpretations of regulations required.
- It is essential that the authorization basis upon which the regulations are to be based, including the SARs and OSRs/TSRs, are accurate and up-to-date with current facility configuration and current DOE-approved analysis methods. Unfortunately, both of these facilities were in the process of updating their respective SARs as part of the SAR Upgrade project. This placed a significant burden upon the RO Program and USEC, and especially the SSRs and Functional Inspection Teams, in consistently interpreting compliance with the authorization basis.
- It is essential that the SSRs be provided with sufficient training and support to allow adequate inspection time in the facility process and control areas. Significant training and qualification requirements were provided to the SSRs. In the initial phases of implementing the DOE RO Program, the SSRs were not fully prepared for regulatory

oversight responsibilities and were overloaded by the amount of administrative, follow-up actions required in response to each observation or finding, including preparation of inspection reports and tracking corrective actions by USEC. This situation was further complicated by the large numbers of findings resulting from the Functional Inspection Teams, and by the fact that USEC and their contractor were just beginning to develop their regulatory affairs programs. Eventually, the SSRs believed that they had become too reactive, rather than proactive, to regulatory concerns. To correct this situation, significant contractor support was provided for in the transition to NRC regulatory oversight to determine the status or to close open regulatory issues.

- Personnel from three key elements of the DOE/ORO organization had to be made available on a real time basis to the RO Manager. This was perhaps the most significant lesson learned. These were the specialized areas of Nuclear Safety, Safeguards and Security, and the Office of Chief Counsel (OCC). Personnel from each of the specialized areas were made available as dedicated support to the RO Manager. Likewise, Department of Energy-Headquarters (DOE/HQ) Nuclear Engineering key personnel were routinely available to provide headquarters coordination and support to the RO Manager. This dedicated support was able to continuously follow specific issues and to develop a working relationship that allowed prompt technically and legally sound positions in the specialty areas. Having the best technical and OCC legal representatives participating in significant RO meetings to provide sound legal council, perform reviews, and adjudge approval of formal RO correspondence and reports has greatly enhanced the professionalism and the success of RO Program.
- It is essential to have effective communication, with mutual professional respect, among the involved agencies. The openness and sharing of information between NRC and DOE was exceptional throughout the process and transition period. The interactions between the DOE and USEC were professional and effective, due in large part to the consistency of the RO program and personnel.

The remainder of the report, Volume I provides more information about the DOE/ORO Regulatory Oversight Program for the 44-months of regulating the GDP leased facilities. Volume II provides exhibits of implementation memoranda, Regulatory Oversight Agreement, joint statements, memorandums of agreement or understanding, and a chronological summary list of monthly activities. Volume III has two exhibits that provide the detailed inspection summary of PGDP and PORTS Inspection Activities. Volume II and III are available upon request from DOE/ORO RO office and is not included herein because of the voluminous detail. The detailed information could be useful for the site inspectors and staff, and possibly for an external regulation program staff as they begin a regulatory oversight program.

4.0 PROGRAM ORGANIZATION AND OPERATION OBJECTIVES

A temporary DOE organization, the DOE Transition Team, was created within DOE/ORO to establish and to implement the regulatory oversight requirements during the development of the Lease Agreement between DOE and USEC. When the Secretary of Energy directed (See: Appendix A) DOE/ORO to provide the regulatory oversight of USEC uranium enrichment process until regulated by NRC, personnel with nuclear safety and NRC licensing background were added to the transition team, with a responsibility to develop a mechanism in which DOE/ORO could provide nuclear safety and safeguards and security oversight of the GDPs enrichment process during transition to NRC. These requirements were incorporated into the safety basis and framework of the ROA (See: Appendix B), which described how applicable requirements were implemented at the GDPs at the time of inception of the ROA. Under the ROA, the objectives of the RO Program were:

- To base the program on a foundation of regulatory requirements and safety principles as stated in the ROA and to provide consistent interpretation,
- To determine the status of compliance with the requirements of the ROA,
- To identify conditions within inspected areas that may adversely affect public health and safety and the ability to provide for the common defense and security so that appropriate corrective action could be taken,
- To provide a basis for continuation of operations, or the modification or revocation of the lease between the DOE and USEC,
- To build the RO program with priorities based on nuclear safety and safeguards and security significance, and
- To structure the RO program to account for the impact of reactive efforts on planned, periodic, and scheduled routine inspections¹.

The RO organization made information available to the NRC regarding DOE regulatory oversight; nuclear safety and safeguards and security, and the safety bases for the GDPs which might be useful to NRC in the development of regulatory standards for the GDPs. Lastly, a

¹NOTE: Reactive Efforts pertains to the RO staff response to events and occurrences that happen at the plant. These require the RO staff to perform on-site visits and special inspections to respond to the event that occurred. Whether it is a deficiency discovered or when talking about planned, periodic, and scheduled inspections; events will impact the established program. RO reactive efforts may include enforcement activities, civil penalties, and/or shutdown.

DOE management objective was to provide regulatory oversight through inspection and enforcement activities similar to that which NRC would provide in the future. This activity supported and provided direction for NRC certification activities by enhancing the potential for a successful transition to NRC as a regulator of the leased GDPs.

5.0 OVERVIEW

5.1 BACKGROUND

On July 1, 1993, pursuant to the Energy Policy Act of 1992, the USEC and DOE entered into a six year lease agreement for the Paducah and the Portsmouth gaseous diffusion uranium enrichment facilities. The Act required that USEC's operation of the leased portion of the GDPs be subject to NRC and Occupational Safety and Health Administration (OSHA) regulations in order to protect the public and worker health and safety from hazards and to provide for the common defense and security. The legislation further required that NRC establish regulations and standards necessary to govern the operation of these facilities. This process required more than three years.

The NRC requested through the Secretary of Energy that DOE continue its regulatory oversight role until regulations could be enacted and the plants provisionally certified under the new regulations. Initially, DOE management and the DOE/ORO transition team had operated with the understanding that NRC would begin GDP regulatory oversight on July 1, 1993, but in the March-April 1993 time frame, it was mandated that DOE/ORO would provide the regulatory oversight functions until NRC could assume regulatory responsibility (Appendix A). DOE/ORO legal and technical staff formed the core of what would become the RO staff. DOE and USEC worked in a concerted effort to draft the ROA (Appendix B). This document, which provided the authority and bounded conditions within which DOE, through its RO Manager, was to provide regulatory oversight for the leased GDPs, was signed by the Secretary of Energy on July 1, 1993.

5.2 A THREE AND HALF YEAR SUMMARY

5.2.1 Program Development and Staffing

The RO program began July 1, 1993, with an acting RO Manager, four SSRs stationed at the GDP sites (two each at Paducah and Portsmouth), and two DOE staff persons detailed to the RO program. In addition, DOE legal and technical staff members provided direct support to the RO program during the planning, development and initial phases with support from Lockheed Martin Energy Systems, Inc. (LMES) and Ogden Environmental and Energy Services Corporation.

The need to develop a sound basis for a RO Inspection and Enforcement program was recognized early. Therefore, a former NRC regulator was contracted to develop the RO Inspection and Enforcement Manual (RO Manual) which defined the administrative and inspection procedures that implemented the ROA requirements. The RO Manual was issued January 1, 1994. Two SSRs were placed at each site with roles and responsibilities similar to those of a NRC Resident Inspector. Each SSR had previous GDP experience, but no formal training in the NRC inspection and enforcement methods. Based on their previous experience, the SSRs began implementation of the RO Inspection Program on July 1, 1993, by performing walkthrough and surveillance assessment activities at each facility. Brief inspection reports were prepared for the RO Manager and shared informally with USEC management. Concurrently, the SSRs received formal training,

including "mentoring" by NRC- experienced contractors, formal NRC Inspector courses, and on-the-job training. In January 1994, more formal SSR site inspections began in conjunction with the issuance of the RO Manual. The SSRs completed Oral Board Certification in June 1994, with exceptional results. The SSRs demonstrated a thorough knowledge and understanding of the GDP operations, of the ROA and of the RO inspection and enforcement requirements and activities.

The RO staff developed a set of inspection procedures that included guidance for the inspection activities of the SSRs and for Functional Area Inspections. In conjunction with, and in addition to, the day-to-day on-site inspection activities of the SSRs, in-depth inspections were performed in the 19 functional areas defined in the ROA. These inspections were conducted by teams of SMEs from both the contractor (primarily AIMS and ATI) and DOE/ORO organizations. Functional Area Inspection teams were drawn from DOE personnel and contractors having broad experience in NRC or in NRC-regulated organizations.

5.2.2 Nuclear Regulatory Commission Interface

In response to the December 20, 1993, NRC and DOE Joint Statement of Understanding (Appendix C), the development of an effective interface with the NRC was a high priority for the RO staff. Significant RO staff time was devoted to familiarizing NRC personnel with the gaseous diffusion technology, and to establishing an atmosphere of cooperation to bring the GDPs under NRC regulation. An indicator of success was having most of the DOE review comments incorporated into the NRC proposed draft regulation for the GDP technology, which became 10 CFR 76 and went into effect on October 24, 1994. Additionally, a Memorandum of Agreement Establishing Guidance for NRC Inspection Activities (Appendix D) was signed on August 11, 1994, to provide for NRC inspector personnel to move on-site to familiarize themselves with the leased GDP facilities by observing day-to-day operations. The RO staff worked with the NRC personnel to foster understanding of the gaseous diffusion process and programs in order to facilitate the transition of regulation to the NRC. NRC staff representatives attended many of the regulatory oversight meetings such as the Enforcement Conferences and Management Conferences.

5.2.3 Interfaces Within Department of Energy

The degree to which regulatory policy would be applied to the GDPs and interfaces within DOE/HQ had to be established and required considerable time and effort on the part of the RO Manager and staff. DOE/HQ and DOE/ORO Environment, Safety, and Quality Offices, all assigned staff to coordinate with RO on GDP SARs upgrades, GDP configuration control, and preparation of a compliance plan acceptable to NRC and DOE. During the initial 18-months taken to establish a regulatory posture, the RO staff had to instruct and direct USEC to make several adjustments in their operational management of the GDPs in order for USEC to adapt to a changing regulatory environment. This work to develop a regulatory program created a significant amount of activity between USEC and DOE. The end result was the successful institution of a regulatory cultural change that was critical for the transition to NRC regulation.

5.3 REGULATORY OVERSIGHT PROGRAM - MILESTONES,
ACTIVITIES, AND PROJECT STAFF/COST

RO milestones, activities, and project staff/cost are presented in chronological order in Exhibit 1. The charts reflect an increase in regulatory activities as the RO effort progressed through 1996. The manpower resources to meet this increased work load are reflected in the project requirements at the bottom of the page and in the report. The following categories are listed down the left hand margin of the charts and are discussed in greater detail in the sections following Exhibit 1.

- Milestone Events: 1992 -1997 key milestones are labeled on the time line with solid triangles.
- Interagency Activities: Two categories of interagency activities are represented in this section: 1) the Regulatory Issues time line shows coordination meetings between DOE and USEC, and 2) the Technical Issues Meetings time line reflects planning, coordination, and interaction among DOE, USEC, and NRC staffs.
- Inspection and Enforcement Program: PGDP and PORTS SSR inspection activities are depicted on separate time lines. The Functional Inspection Team procedures development are shown on another time line as well as the Functional Inspections are depicted on separate time lines for each site.
- Major Regulatory and Technical Issues: These issues include Compliance Plan activities, the Uranium Hexafluoride (UF₆) false alarm reduction effort, UF₆ cylinder handling procedural problems, seismic hazards at the GDP facilities, OSR to TSR transition and the SAR Upgrade Program. These efforts required significant RO staff involvement and time in addition to the routine RO Inspection and Enforcement Program activities.
- Training and SSR Qualification Program: The SSR Qualification and Certification Training time line begins with the identification of training requirements in mid-1993 and continued through the project. RO staff training and GDP Technology training are depicted in two other time lines.

Project - Program Year (PY) Staff/Cost: The time line reflects the Program Year (July 1 through June 30) maximum DOE/Contractor support people and approximate PY Total Cost for the RO effort. This does not include the SAR Upgrade project and Compliance Plan program staff and cost as these were billable to DOE.

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REGULATORY OVERSIGHT

Activities	1992												1993											
	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J								
Milestone Events					Congress passes Energy Policy Act ▲											Lease/RO issued ▲								
Interagency Activities							Developed/Approved Lease/ROA						Regulatory Issues meetings USEC / DOE			Techn								
Inspection and Enforcement Program													SSR Inspections – Paducah											
													SSR Inspections – Portsmouth											
																PGDP C-337A E								
																Functional inspection procedures devel								
Regulatory and Technical Issues																PGDP - 2 3/4% Enrichment/Cylinder H								
																SAR Upgrade								
Training and Qualification Program																SSR Qualification training and Certification								
																RO staff training								
																GDP Technology training								
Project Staff/Cost																								

PROGRAM — Milestones, Activities, and Project Staff/Cost

REGULATORY OVERSIGHT PROGRAM

Activities	1994	1995												
		J	F	M	A	M	J	J	A	S	O	N	D	
Milestone Events		USEC Application to NRC → ▲ (Rev. 0) USEC Application to NRC												
Interagency Activities	Regulatory Issues meetings USEC / DOE Technical Issues meetings NRC / USEC / DOE	▲ DOE/USEC Enforcement												
Inspection and Enforcement Program	SSR Inspections – Paducah SSR Inspections – Portsmouth Functional Inspections – Paducah Functional Inspections – Portsmouth	▲ \$5,000 Civil Pen ▲ \$20,000 Civil Pen												
Regulatory and Technical Issues	DOE Compliance Plan (CP Rev. 0) Compliance Plan activities PGDP - 2 3/4% Cylinder Handling UF ₆ detector false alarm reduction SAR Upgrade Emergency Response Exercises	▲ OSR/TSR Transition ▲ PORTS Exercise												
Training and Qualification Program	Continuing technical and professional development SSR Qualification training and Certification SSR Qualification training / Continuing techn RO staff training GDP Technology training	CD ROM Con												
Project Staff/Cost	50P / \$9.1M													

[illegible]

6.0 DESCRIPTION OF THE REGULATORY OVERSIGHT PROGRAM ACTIVITIES

The following sections discuss the various aspects of the RO Program during the 44-month period. The initial section discusses some of the RO staff interagency activities; followed by the main section that covers: Inspection and Enforcement activities; and then, Regulatory and Technical Issues, where significant amounts of resources were expended.

6.1 INTERAGENCY ACTIVITIES

6.1.1 Implementation of Proposed Nuclear Regulatory Commission Rule

The proposed NRC rule 10 CFR 76, "Certification of Gaseous Diffusion Plants," was published in the *Federal Register* (59 FR 6792) on February 11, 1994, for public comment. Overall, there were 20 comment letters submitted on the proposed rule. The comments were provided by USEC, citizens' groups, industry representatives, other government agencies, legal firms, and DOE. With a broad spectrum of constituents responding, the comments were somewhat mixed and general; however, the more significant comments focused on:

- environmental effects from operation of the GDPs,
- location of the PGDP in a geological rift zone,
- application of the backfitting policy, and
- emergency planning.

DOE's comments were submitted on April 12, 1994, under the signature of Acting Director, Office of Nuclear Energy. The comments were extensive with the more significant ones focusing on the following issues:

- funding for the decontamination and decommissioning of the GDPs for all waste and depleted uranium generated by USEC as a result of its production activities,
- implementation of a "graded approach" in the quality assurance requirements,
- enhancement of requirements for nuclear criticality monitoring,
- enhancement of requirements for the safeguarding of classified matter, and
- DOE future commitments and involvement with the nonleased portions of the facilities, i.e., compliance plans.

The NRC commissioners affirmed the proposed rule (10 CFR 76) on September 8, 1994, with a 3 to 0 vote. The document was published in the *Federal Register* on September 23, 1994, with an effective date of October 15, 1994. This effective date met the original schedule established by the Energy Policy Act of 1992.

More than 80 percent of DOE's comments, including those concerning the funding program for decontamination and decommissioning of USEC's generated waste, were accepted and incorporated. NRC deferred the request for including emergency planning within 10 CFR 76. DOE requested that the provision of 10 CFR 76 maintain the existing emergency plan, which included an emergency operations center, an emergency planning zone, and periodic exercises and training activities. NRC concluded that the emergency planning portion of 10 CFR 70, fuel cycle facilities, would be followed, which significantly reduced requirements in this area.

6.1.2 Nuclear Regulatory Commission On-Site Observers and Protocol Agreement

A Joint Statement of Understanding (Appendix C) between NRC and the DOE on implementing the Energy Policy Act provisions with regard to the regulation of gaseous diffusion uranium enrichment plants was issued in February 1994. As part of the Joint Statement, DOE was to permit NRC to locate observers at the facilities to obtain information and knowledge that might be useful to the NRC in development or implementation of its standards. Also a Memorandum of Agreement (Appendix D) between the RO Manager and the NRC was signed on August 11, 1994, establishing guidance for NRC observation activities at PGDP and PORTS. The DOE and NRC agreed to work in concert to ensure that staffing, inspection and enforcement, communications and information exchange, and conflict resolution protocols regarding NRC Inspector activities were followed.

NRC senior resident and resident inspectors have been observing at each GDP, since in May 1994 at PGDP and in June 1994 at PORTS.

6.1.3 Independent Safety Assessment Report

An independent safety assessment (ISA) of the nuclear safety and safeguards and security programs for operations at the gaseous diffusion plants at Paducah, Kentucky, and Piketon, Ohio, was performed at the request of the Secretary of Energy. The purpose of this assessment was to evaluate (1) the overall quality, completeness, and effectiveness of the nuclear safety and the safeguards and security programs at the GDPs, (2) the functional areas and implementation requirements set forth in the ROA, and (3) the generic implications of Defense Nuclear Facility Safety Board recommendations. A 10-member ISA Team performed the major parts of the assessment during on-site reviews of PORTS (between October 25 and November 12, 1993) and PGDP (between November 30 and December 17, 1993).

The ISA final report was received early in February 1994, and reviewed by the RO staff to determine if any major deficiencies identified by the ISA Team required immediate action or the initiation of a special inspection. None were identified. The ISA concerns were evaluated and classified into one of three action classification categories:

- review the specific area during the scheduled functional inspections,
- modify RO requirements and inspection activities based on ISA concerns, or
- no action required by the RO staff.

Prior to the start of the Functional Inspection Team assessments, the ISA concerns and the necessary actions were made available to the RO staff so they could focus inspection efforts on the specific concerns identified by the ISA. Also, DOE requested USEC provide their proposed actions to address the ISA concerns. The ISA concerns served as an indicator for future areas of inspections for the SSRs, as well as for other special inspections and audit programs.

6.1.4 Occupational Safety and Health Administration and Department of Energy Agreement

Both DOE and the Department of Labor have jurisdiction over radiological safety and health at those portions of the gaseous diffusion plants leased by USEC. A coordinated inter-agency effort resulted in the signing of a Memorandum of Understanding (Exhibit F) between DOE and the Department of Labor's OSHA to minimize potential gaps in the protection of workers and, at the same time, avoid possible conflicting or duplication of requirements. This document, signed on December 21, 1994, delineated the areas of responsibility of each agency at the gaseous diffusion plants, described the efforts of the agencies to assure worker protection, and provided procedures for coordination of activities between DOE and OSHA.

Following the unplanned release of UF₆ from the C-337-A Feed Facility to the atmosphere on December 13, 1994, a special, announced inspection was conducted at PGDP from January 9 through 12, 1995. The purpose of the inspection was to investigate the circumstances surrounding this event. Pursuant to the DOE inspection team charter, information and evidence was collected, analyzed, and assessed to determine the safety significance of the event.

In accordance with the terms of the Memorandum of Understanding, DOE inspectors worked in concert with OSHA inspectors. Each group of inspectors worked within the scope and charter of its organization. The DOE issued their inspection report on July 17, 1995. A separate report was issued by the Department of Labor.

6.1.5 Price-Anderson Amendments Act

The Energy Policy Act of 1992 directed the lease of the GDPs and did not require that the nuclear safety regulations of the Price-Anderson Amendments Act (PAAA) of 1988 were applicable to the GDPs' lease. However, during the transition period these regulations were applicable until such time as the NRC assumed regulatory authority. Numerous meetings were conducted among representatives of the Office of Uranium Programs, the DOE/ORO, the OCC,

the Office of Environmental Safety and Health, and the USEC. The decision was made for USEC to request an exemption from all existing and future PAAA nuclear safety rules.

DOE approved USEC's exemption request for Part 830 (Quality Assurance) on October 31, 1995, and Part 835 (Occupational Radiation Protection) on February 23, 1995. The exemption was authorized by law and based on the contention that it posed no risk to the public health and safety, to the environment or to plant workers; was entirely consistent with safe operation of the GDPs; and was supported by numerous "special circumstances" as defined in 10 CFR Part 820, Subpart E.

6.2 INSPECTION AND ENFORCEMENT

The RO Manager was responsible for management of DOE inspections of the GDPs to verify compliance with the requirements of the ROA. The cornerstone of the inspection program involved an on-site inspection presence and activities similar to those of NRC resident inspectors. Two SSRs were assigned to each GDP to report directly to the RO Manager. The ROA and the RO Inspection and Enforcement Manual provided the framework within which the SSRs performed inspections, prepared inspection reports, and reported to the RO staff. Appraisal elements were included in all aspects of the RO Program.

In conjunction with, and in addition to, the day-to-day on-site inspection activities, in-depth inspections were performed for 19 functional areas defined in the ROA. These inspections were conducted by teams of subject matter specialists from both the contractor and DOE/ ORO organizations.

USEC was responsible for development of a corrective action plan for each violation of ROA requirements. The RO staff reviewed USEC's corrective actions to verify that they were consistent with USEC's commitments, implemented, and that these actions were adequate to correct the violation and prevent recurrence.

The approach of the RO inspection program was straight-forward.

- The DOE RO function existed to assure that the public and worker health and safety were protected and the common defense and security of the United States were provided for, with respect to the operation of the gaseous diffusion plants located in Paducah, Kentucky, and Piketon, Ohio. If this protection could not be reasonably assured by USEC's actions, then USEC would not be permitted to operate.
- USEC was ultimately responsible for the safety of its activities and the safeguarding of nuclear facilities and materials used in its operation. The DOE RO function ensured that USEC adequately discharged this ultimate responsibility.
- The DOE RO staff developed and used a formal inspection program with requirements which emphasized nuclear safety and safeguards and security considerations.

the adequacy and effectiveness of USEC's performance. This program was accomplished through the sanction of independent inspection efforts by SSRs and the authority of the RO Manager to direct the performance and scope of special inspections.

- Enforcement actions were taken as a logical consequence of USEC's failure to comply with the Nuclear Safety and Safeguards and Security Requirements of the ROA.
- The DOE Inspection and Enforcement activities were performed in a manner consistent with future NRC regulation of the gaseous diffusion plants so as to facilitate the transition of the regulatory function from DOE to NRC.

6.2.1 Inspection Program Structure

The program included two types of inspection efforts: routine and special. Routine inspections were performed on a planned, scheduled, and periodic basis and made up the core of the program. These included the normal cycle of inspections carried out by SSRs, functional area inspections coordinated by the RO office, and evaluations of GDP performance during major emergency exercises at each site. In contrast, special inspections were performed in response to non-routine events or circumstances. The table below (Exhibit 2) provides a summary of these inspections.

Exhibit 2				
<u>Inspections Performed Between July 1, 1993 and March 2, 1997</u>				
	<u>SSR</u>	<u>Functional Area</u>	<u>Special</u>	<u>Total</u>
Paducah	37	6	4	47
Portsmouth	33	6	7	46
TOTAL	70	12	11	93

6.2.1.1 Routine Inspections

The purpose of routine inspections was to maintain ongoing assurance of USEC's compliance with the requirements of the ROA. This effort was systematic and scheduled. The core of the routine inspection program was implemented by the SSRs stationed at each facility. The technically diverse SSRs were "generalists" who performed ongoing regulatory oversight activities. These activities were characterized in large part by repetitive, cyclic inspections of the USEC's operations in all 19 of the functional areas described in Chapter 3 of the ROA Appendix A, the Safety Basis Document. These inspections included facility walkthroughs for the purpose of making general observations relative to operations, equipment, and facilities to detect any unsafe or potentially unsafe conditions or activities. The inspections also included observation of process cycles, document reviews, interviews with personnel; and follow-up on open and unresolved items, items of noncompliance, and deviations. Direct inspection efforts were accomplished during each shift. Some inspections

regulatory oversight activities. These activities were characterized in large part by repetitive, cyclic inspections of the USEC's operations in all 19 of the functional areas described in Chapter 3 of the ROA Appendix A, the Safety Basis Document. These inspections included facility walkthroughs for the purpose of making general observations relative to operations, equipment, and facilities to detect any unsafe or potentially unsafe conditions or activities. The inspections also included observation of process cycles, document reviews, interviews with personnel; and follow-up on open and unresolved items, items of noncompliance, and deviations. Direct inspection efforts were accomplished during each shift. Some inspections were done during normal business hours and other inspections were conducted during evening shifts and on weekends. A goal was set to allocate the equivalent of 60% of the SSR's time onsite to direct inspection activity.

The SSRs' collective knowledge base included engineering, operations, quality, maintenance, occupational safety and health, radiation protection, nuclear criticality safety, and environmental protection. The SSRs received additional training in areas such as fire protection, nuclear materials safeguards, emergency preparedness, waste management, security, and others related GDP activities. The SSRs were also required to demonstrate adequate knowledge of the GDP technology and the ROA's 19 functional areas against which the inspections were performed. The SSRs completed an oral board and were certified on June 14, 1994.

The SSRs began conducting routine inspections on July 1, 1993, and continued through March 2, 1997. The purpose was to ensure plant operations were in compliance with the implementation requirements set forth in the ROA. Findings resulting from the inspections were orally discussed with the GDP management and operators at the conclusion of each inspection period and were documented in periodic inspection reports issued by the RO Manager.

Additional duties of the SSRs included preparation of daily and weekly reports to the RO Manager, initial notifications of significant operational events, emergency response, liaison with DOE regulatory staff, interface with DOE site office, and liaison with NRC regulatory staff and with NRC on-site resident observers.

The duties of the SSRs evolved considerably between 1993 and 1997. Therefore, additional contract engineering support was added to support the demands of site regulatory oversight activities.

6.2.1.2 Functional Area Inspections

The site-based activity of the SSRs was supplemented by inspections conducted and coordinated out of the Oak Ridge office. These inspection activities were at a greater technical depth than those performed by the SSRs and focused on the 19 functional areas in Chapter 3 of the ROA. The frequency for the inspections of this type is delineated in Table 4.2 of the ROA.

This aspect of the RO program was performed by personnel matrixed and contracted to the RO staff. This provided a cost-effective approach for obtaining the services of functional area specialists familiar with the programs and the GDP facilities. The RO staff prepared a series of 19 inspection procedures covering the requirements articulated in the 19 functional areas of the ROA. These procedures were used by the DOE/ORO matrix organization and supplementary staff to assure that the effort, at a minimum, addressed the requirements applicable to the ROA.

The Functional Area Inspection effort included evaluating responses to inspection findings, conducting follow-up inspections, and resolving open items. Inspection Teams were staffed with a combination of DOE senior staff and contract staff with an average of 20 years experience in different disciplines. DOE staff were drawn from Oak Ridge and other DOE locations.

The collective experience of the teams was weighted heavily in NRC compliance inspection practices, DOE orders implementation, and Institute of Nuclear Power Operations performance-based assessments. Most team members had held senior positions in one or more of these organizations. This experience was augmented by the RO staff internal training program, which included detailed familiarization with the ROA and information of gaseous diffusion process, operations, and authorization bases.

6.2.1.3 Special Inspections

The purpose of special inspections was to sharply focus the examination and evaluation of lessee controls on a particular aspect of operation in response to a specific event or condition. The guidance for a special inspection was developed on a case-by-case basis, and was in the form of a general inspection plan or concept of action.

The level and extent of effort expended on a special inspection was determined by the RO Manager based on the degree of potential threat or risk to public health and safety presented by the situation or the nature and source of the event resulting in the special inspection.

Special inspections were conducted as a result of the following types of situations or conditions:

- allegations and concerns,
- incidents and unusual events,
- special follow-up inspections of corrective actions not covered by the routine inspection program,
- response to requests, or

- a situation outside the defined written program of routine inspections necessitating a special inspection.

6.2.2 Inspection Findings - Enforcement Actions

A key part of DOE's RO Program function was the monitoring of daily operations at the GDPs. This function was accomplished by the on-site presence of the RO SSRs, who performed daily inspections by interviewing personnel, observing operations and performing other fact gathering activities in response to USEC's reported events. The SSRs focused on the safety requirements as defined in the ROA and conducted inspections using a planned "sampling" approach. The findings of the planned and selective sampling served as indicators of the USEC's overall performance with appropriate independent verification.

Appendix B of the ROA Chapter 3, Enforcement Process, provided the enforcement actions for DOE to take when dealing with USEC noncompliance to applicable requirements of Chapter 3. The Enforcement Process provided three Enforcement Actions: (a) Shutdown Authority, (b) Notice of Violation, and (c) Civil Penalties.

Enforcement actions were the consequence of the USEC's failure to comply with the nuclear safety and safeguards and security requirements of the ROA. DOE inspection and enforcement activities were performed in a manner consistent with NRC regulatory practices to facilitate the smooth transition of regulatory functions from DOE to NRC. During the three and one half year period of regulation by DOE, USEC was assessed a total of \$85,000 in civil penalties, \$15,000 of which were mitigated.

6.2.2.1 Inspection and Enforcement Management Meetings

Management meetings were key mechanisms to executing DOE RO responsibilities and in supporting both the inspection and enforcement activities with regard to the GDPs. Two types of management meetings are discussed below.

6.2.2.1.1 Enforcement Conferences

Three Enforcement Conferences were held to deal with the more serious violations of the nuclear safety and safeguards and security requirements of the ROA. These Enforcement Conferences constituted significant events in the RO program history.

April 28, 1994, Enforcement Conference

Repetitive violations, failure to follow procedures, continued incidents involving personnel exposure, inattention to detail in performing work, lack of commitment to corrective actions and/or unacceptable implementation precipitated the RO Manager holding an Enforcement Conference with USEC senior management. The RO Manager communicated three areas of concern to USEC: (1) adherence to and/or adequacy of

procedures, (2) management controls by USEC, and (3) timely characterization and reporting of events. This meeting concluded by the RO staff requesting USEC to document an action plan, to provide the level of implementation that will be monitored, and to provide a method to be used in determining the effectiveness of the plan. USEC made specific commitments in 13 topical areas in a letter to DOE, dated: May 16, 1994. Also DOE issued a PGDP Imposition of Civil Penalty, EA-70-7001/93-10-01 (Level II Violation), dated: June 7, 1994, and subsequently USEC paid the \$20,000 civil penalty.

April 26, 1995, Enforcement Conference

The conference was held with USEC to determine appropriate enforcement actions to be taken on violations which was still indicative of continued lack of adherence to procedures. The RO position at this conference was that USEC's previous identification and implementation of corrective actions to address root cause of these issues had been inadequate to prevent their recurrence. DOE issued a PGDP Imposition of Civil Penalty of \$5,000, EA-94-12-01 (Level II Violation), dated: May 15, 1995, which was mitigated as a result of USEC taking prompt corrective action in addressing root causes of the violation. DOE issued a PORTS Imposition of Civil Penalty of \$20,000, EA-94-12-03 (Level II Violation), dated: May 24, 1995, and \$10,000 was mitigated as well as USEC paid the \$10,000 civil penalty.

January 15, 1997, Enforcement Conference

The conference was held with USEC regarding the apparent violations identified in recent inspection reports, involving the improper handling of UF₆ cylinders at PORTS. This action was prompted by the recent improper movement of a UF₆ cylinder using a straddle carrier at PORTS before it had completed the required cooldown period. USEC admitted to these violations and provided a comprehensive corrective action plan for resolution of these issues. Two Severity Level II violations were cited with civil penalties of \$20,000 each imposed and one Severity Level III violation was cited without civil penalty assessment.

6.2.2.1.2 Management Conferences

DOE also convened two management conferences during the period of its regulatory oversight responsibility.

May 9, 1996, Management Conference

This management conference addressed DOE's concerns regarding USEC failures to improve both its operational management controls at the GDPs and to meet its commitments to improve specific programs within its management control. DOE's regulatory inspections, USEC's internal problem reports and self-assessments, and NRC observation reports all supported concerns in the areas of procedures, corrective

action issues, and adherence to the authorization basis. During the management conference, USEC provided an action plan for increasing its management involvement in the operational aspects of the GDPs.

December 19, 1996, Management Conference

This management conference addressed USEC's report on improper movement of a liquid UF₆ cylinder. This event caused grave concern to DOE because of the potential impact on nuclear safety, the continued apparent weaknesses in the adherence of contractor plant staff to activities important to safety, and the repetitive nature of the event. DOE promptly limited UF₆ handling at the site and convened a management conference. The purpose of the conference was for USEC to describe the immediate corrective actions taken to restore and to demonstrate that there was reasonable assurance that liquid UF₆ handling operations could be performed in a manner consistent with the authorization basis and that such operations would not increase the probability of the occurrence of the worst-case accident beyond that analyzed in the Final Safety Analysis Report (FSAR). Additionally, the conference gave DOE an evaluation basis for determining whether the restriction on cylinder movement imposed by letter dated December 19, 1996, should continue, be modified, or lifted.

6.2.2.2 Inspections Findings Summary Table

The following table (Exhibit 3) provides a tabulated summary of the inspection findings from July 1, 1993, through March 2, 1997, which includes the categories of Violations (VIOs), Non-Cited Violations (NCVs), Deviations (DEVs), Unresolved Items (URIs), and Inspection Follow-up Items (IFIs).

Exhibit 3**Inspections Findings Summary—July 1, 1993 through March 2, 1997****Inspection Findings****Summary**

	VIOs	NCVs	DEVs	URIs	IFIs	Total
Paducah	73(77) ¹	36	5	41	50(90) ³	205
Portsmouth	59(65) ²	57	4	50	37(78) ⁴	207
TOTAL	132(142)	93	9	91	87(168)	412

Closed Items

	VIOs	NCVs	DEVs	URIs	IFIs	Total
Paducah	65	36	3	39	50(90)	193
Portsmouth	51	55	2	50	37(78)	195
TOTAL	116	91	5	89	87(168)	388

Open Items⁵

	VIOs	NCVs	DEVs	URIs	IFIs	Total
Paducah	8	0	2	2	0	12
Portsmouth	8	2	2	0	0	12
TOTAL	16	2	4	2	0	24

DEVs - Deviations

URIs - Unresolved Items

IFIs - Inspection Follow-up Items

VIOs - Violations

NCVs - Non-Cited Violations

^xNOTES (Exhibit 3):

- 1) Four (4) cited inspection violations were later withdrawn after the original reports were issued based upon updated information provided by USEC. This brought the number of cited inspection violations requiring corrective action to a total of 73. (PGDP)
- 2) Six (6) cited inspection violations were later withdrawn after the original reports were issued based upon updated information provided by USEC. This brought the number of cited inspection violations requiring corrective action to a total of 59. (PORTS)
- 3) There were 40 additional inspection items identified from outside of the direct PGDP RO inspection program. These were derived from enforcement and management conference commitments, or as a result of DOE/HQ appraisal findings requiring SSR follow-up inspections for closure. This caused the total number of IFIs for closure to be 90.
- 4) There were 41 additional inspection items identified from outside of the direct PORTS RO inspection program. These were derived from enforcement and management conference commitments, or as a result of DOE/HQ appraisal findings requiring SSR follow-up inspections for closure. This caused the total number of IFIs for closure to be 78.
- 5) Transferred to NRC on March 3, 1997 for follow-up and closure.

6.2.3 Violations and Civil Penalty History

6.2.3 Violations and Civil Penalty History

The following sections provide background on the civil penalty history and illustrate the use of enforcement conferences to address the violations which occurred.

6.2.3.1 Paducah - Uranium Hexafluoride Release

On September 7, 1993, an unplanned release of UF_6 occurred at the PGDP in Building C-337-A. An inspection and subsequent event review was conducted indicating that USEC had not conducted its activities in compliance with the requirements of the ROA. A Notice of Violation (NOV) and Proposed Imposition of Civil Penalty was transmitted to USEC for failure to implement engineering and administrative controls and failure to properly use personal protective equipment during this event to control internal radiation exposures of employees.

Following USEC's appeal, a revised NOV (reduced severity level), and Proposed Imposition of Civil Penalty in the amount of \$20,000 was transmitted to USEC due to the total failure of management to respond properly and to protect employees from UF_6 . A request for mitigation of the escalation of the base civil penalty was made by USEC on the basis that it had no record of past poor performance, it had a short operating history prior to the event, it had taken prompt corrective actions, and it had no prior notice of the violation. However, DOE determined that the violations occurred as stated and responded by issuing an order imposing a civil monetary penalty, EA-70-7001/93-001, dated June 7, 1994. USEC subsequently paid the \$20,000 civil penalty.

6.2.3.2 Paducah - Failure to Adhere to Operational Safety Requirements

The violation involved two cases where USEC failed to adhere to OSRs as related to observing the Limiting Conditions for Operation (LCO) for passive fire watches on out-of-service fire protection systems in the cascade. An enforcement conference concerning this violation was held on April 26, 1995, in Oak Ridge, Tennessee.

DOE was particularly concerned because of the apparent lack of USEC management's success in motivating its contractor employees to prevent recurrence of such events. With respect to fire watches, two similar violations had previously been identified to USEC.

The implication of this lack of management success was intensified in light of a previous enforcement conference held on April 28, 1994. During that enforcement conference DOE was concerned by the USEC contractor's repeated failure to adhere to procedures in the area of radiation protection and facility operations..

During the enforcement conference of April 26, 1995, USEC admitted the violation and described their root cause determinations and their planned and implemented corrective actions. DOE determined that a civil penalty in the amount of \$5,000 was in order. The full amount of the proposed penalty, however, was mitigated based on USEC's

representations during the enforcement conference.

6.2.3.3 Portsmouth - Movement of Uranium Hexafluoride Cylinder With Straddle Carrier

On December 28, 1994, USEC moved a 10-ton cylinder filled with liquid UF_6 using a straddle carrier in violation of the OSRs and several Uranium Material Handling procedures. An enforcement conference concerning this violation was held on April 26, 1995, in Oak Ridge, Tennessee.

DOE considered this violation to be particularly serious because of the fact that the potential for occurrence of the worst-case accident at the PORTS facility was increased. During the enforcement conference of April 26, 1995, USEC admitted the violation and described their root cause determinations and their planned and implemented corrective actions to date. DOE determined that a base civil penalty in the amount of \$20,000 was justified due to the seriousness of the event. A portion of the amount of the proposed penalty (\$10,000), however, was mitigated and USEC subsequently paid \$10,000.

6.2.3.4 Portsmouth - Movement of Uranium Hexafluoride Cylinder With Straddle Carrier

The apparent violations involved: (1) the December 16, 1996, movement of a 14-ton UF_6 cylinder in violation of the OSRs, using a straddle carrier before the cylinder had completed a required 5-day cooldown period; and (2) the failure to follow several Uranium Material Handling procedures incident and contributory to the improper movement.

An enforcement conference concerning these violations was held on January 15, 1997, in Oak Ridge, Tennessee. DOE considered the violation involving the movement of the UF_6 cylinder to be particularly serious in light of the fact that potential for the occurrence of the worst-case accident at the PORTS facility was increased.

During the enforcement conference, USEC admitted the violations and described their root cause determinations and planned and implemented corrective actions. DOE imposed a civil penalty in the amount of \$20,000 for the violation.

6.2.3.5 Portsmouth - Failure to Perform Safety Evaluation

This violation involved the rerouting of vehicular traffic to the vicinity of cylinders containing liquid UF_6 , in violation of safety evaluation procedures and section 3.3.2.6 of the ROA. An enforcement conference concerning this violation and the improper cylinder movement discussed above was held on January 15, 1997, in Oak Ridge, Tennessee. DOE considered this violation to be particularly serious in light of the fact that the potential for occurrence of the worst-case accident at the PORTS facility was increased. During the enforcement conference, USEC admitted the violation and described their root cause determinations and planned and implemented corrective actions. DOE determined that a

base civil penalty in the amount of \$20,000 was justified due to the seriousness of the event and USEC paid the \$20,000 civil penalty.

6.2.4 Order To Take Action

Follow-up inspection activities for a number of self-identified "as found" conditions and formally identified in a September 1995 Problem Report (PR-PTS-95-2862) indicated that a majority of these items had not been reviewed for their potential as USQs in the nine-months following their identification. During the inspectors' discussions, the staff indicated no intention or willingness to accelerate this schedule. This was of particular concern, considering the fact that certain of these "as-found" conditions involved safety-related systems and components and the conduct of operations outside of the authorization basis. USEC's actions regarding these issues were viewed to be clearly outside the intent of Sections 3.3.2.6 and 3.3.2.7. of the ROA. Therefore, DOE issued an "Order To Take Action" on April 5, 1996, to ensure prompt attention to the evaluation and resolution of the self-identified "as found" conditions.

6.2.5 Open Item(s) Transition to Nuclear Regulatory Commission

By May 21, 1997, DOE sent remaining open inspection items (violations, unresolved items, inspection follow-up items) to NRC for their disposition. DOE issued a final inspection report for each facility (70-7001/97-02 for Paducah and 70-7002/97-03 for Portsmouth) which provided a status of each remaining item at each facility. In addition, DOE provided NRC with:

- A copy of the final inspection report summarizing the status of any remaining open items;
- A printout of the Inspection Follow-up System database contents; and
- Copies of USEC's responses to any open violations.

Throughout the RO Program, DOE sent NRC copies of all inspection reports and any related correspondence. This gave NRC a historical source of information in support of any open items.

6.3 REGULATORY AND TECHNICAL ISSUES

Initially, neither the ROA nor the RO organization had planned for certain technical and administrative activities, such as safety evaluations (SEs) and reviews of JCOs. In the absence of a formal proceduralized administrative program, which continued to evolve on a monthly basis over the life of the project, the RO staff convened management meetings to address and resolve the regulatory and technical issues.

6.3.1 Regulatory Issues Meetings

Throughout the program history, DOE's RO staff and USEC's Nuclear Regulatory Affairs staff held periodic meetings to discuss various issues regarding regulatory oversight of the GDPs. Over 25 meetings were chaired by the RO Manager, providing a forum to discuss technical and administrative issues that affected the operation of the GDPs from a regulatory perspective. Some of the substantial issues discussed included:

- PGDP Seismic Upgrade
- PORTS and PGDP Certification Status
- PORTS Autoclave Operational Problems
- PGDP C-337A Event
- PORTS HEU Refeed Program
- PGDP Assay Upgrade to 2 ¾ Percent
- OSR Revisions
- PORTS and PGDP Inspection Reports
- PORTS and PGDP UF₆ Detectors
- PAAA Exemption Request
- Transition of OSRs to TSRs
- NRC and DOE Regulatory Oversight Boundaries at PORTS

6.3.2 Gaseous Diffusion Plant Safety Analysis Report Upgrade Program

A program was begun in 1990 to update the safety basis of the GDPs. This program, known as the GDP SAR Upgrade Program, was intended to be sufficiently systematic, comprehensive, and rigorous to withstand the criticisms raised in the review of the existing SARs issued in 1985. The creation of USEC in 1993 resulted in DOE continuing the SAR Upgrade but focused on a site-wide SAR analyzing facilities leased to USEC, facilities retained by DOE (non-leased facilities), and interactions resulting from a shared site. In response to DOE's commitment to support GDP certification by NRC, the analysis of the leased facility segments of the SAR upgrade program was accelerated and re-prioritized to provide maximum technical input for USEC's certification application submitted in August 1995.

Beginning in 1994, the SAR Upgrade Program changed to new DOE orders and followed the methodology and reporting requirements specified in DOE Order 5480.23, Nuclear Safety Analysis Report, as guided by DOE STD 3009-94. This also caused some refocusing of analysis to emphasize deterministic methods. The SAR Upgrade Program used the following methods to perform the analysis, to achieve results and to reach conclusions.

- Data collection
- Natural Phenomena Hazard Analysis
- Preliminary Hazards Screening
- Hazards Analysis
- Plant Safety Operational Analysis (PSOA)
- Limiting Event Analysis based on the PSOA
- Accident analysis based on Limiting Event Analysis
 - * Source Term Development based on Limiting Accident
 - * Off-site release dispersion based on Heavy Gas Dispersion Code HG Systems with UF_6 heavy gas thermodynamics developed by the SAR Upgrade Program.
- Consequence Analysis based on the results of the accident dispersion analysis.
- Identification of Safety and Safety Related Structures Systems and Components (SSCs) from PSOA and accident analysis.
- Development of TSRs based on the SSCs, PSOAs and accident analysis.

The results of the GDP SAR Upgrade Program analysis were expected to impact the operation basis of the GDPs by identifying new safety and safety significant systems, by providing a basis for declassifying such systems, or by identifying changes necessary to control consequences. Therefore, to ensure the plant was certified to an accurate technical basis, a deficiency in the safety analysis basis was included in the DOE Compliance Plan for compliance with 10 CFR Part 76 requirements. To achieve compliance, USEC must compare the SAR produced by the GDP SAR Upgrade Program with the current application requirements and differences and should be addressed in the next annual update of the USEC application.

The RO staff attended numerous technical meetings, performed many review and support

tasks, and issued 48 formal memoranda in support of the SAR Upgrade Program. The draft SAR for each GDP site was completed in September 1996, and a final version January 1997. The RO staff provided comments and facilitated a SE review of the SAR in order to fulfill a February 15, 1997, DOE Compliance Plan commitment for delivery of the final SAR to USEC and NRC so that the review process could begin. The DOE commitment on this support item for transition to NRC regulation was fulfilled on February 14, 1997, with the issue of two volumes for each PGDP and PORTS.

6.3.3 Operational Safety Requirements/Technical Safety Requirements Transition Program - Safety Evaluation Reports

6.3.3.1 Background

DOE Orders require the existence of a SAR and OSRs in a traditional DOE operating facility possessing a nuclear hazard. The SAR analyzes the hazards for that facility and the respective operations and describes the programs, components, systems and structures necessary to contain hazardous materials, prevent their release or mitigate the consequences to on-site and off-site personnel in the event the first two barriers fail. The OSRs establish the necessary limits to keep the probability of consequences to on-site and off-site personnel to an acceptable level.

The ROA established and adopted the OSR and SAR requirements for the interim operation of the PORTS and PGDP with DOE approval authority by the RO Manager. Requested changes to the OSRs were reviewed and approved by the RO Manager. The review was documented in a Safety Evaluation Report (SER), which described the review and its conclusion, as well as any conditions placed on the change to make it acceptable for approval.

In preparation for regulation under NRC, USEC submitted and gained approval of the Application for Certification (Application). The Application included a SAR and corresponding TSRs, which are similar to the OSRs although in a slightly different format. In supporting the transition to NRC regulation, ORO/RO staff took steps to facilitate review and approval of nine new TSRs for implementation during the transition period between the NRC's decision to certify and the date on which NRC regulation commenced. Fourteen SERs and/or revisions were prepared in support of the OSR to TSR transition.

6.3.3.2 Preparation

USEC submitted the PGDP and PORTS Application for Certification, Revision 1, on September 15, 1995. About the same time, DOE started organizing the necessary staff to prepare for the eventual review of NRC-based TSRs which were to be implemented during the transition phase of the change-over from DOE to NRC regulation. This TSR review group was tasked with reviewing the USEC Applications for Certification to ensure consistency with the existing DOE authorization basis which consisted of DOE OSRs and were supported by the 1985 SAR, as revised. The initial reviews consisted of two parts:

- 1) review of the disposition of OSR elements to TSRs by using the USEC provided mapping documents; and,
- 2) review of the SAR accident analysis chapters of the Application to ensure the necessary controls for nuclear safety had been captured by the proposed TSRs.

During the preparation effort for the OSR to TSR transition, each site produced documents which mapped the disposition of each OSR element: transfer of the OSR to the new TSRs, classification as a "procedure" or "program," or deletion of the requirement as not needed. This mapping document allowed DOE review to commence by capturing the necessary elements that were expected to be in the TSRs. To facilitate this review, a review comment database was developed into which each reviewer's comments were entered and sorted for later disposition.

Prior to commencing the formal review of TSR submittals for implementation, several meetings were held between DOE and USEC to define the process for requesting approval, review, approval and implementation. DOE participation was aided by the comments captured in the database. One of the most significant benefits that resulted from DOE/USEC working level meetings was the coordination of expectations regarding the documents that would be submitted for DOE review and what DOE would send back as part of the authorization to use the TSRs. It was decided that the TSRs would be approved based on their equivalency to the existing OSRs. For instances where limits or controls did not address existing OSR elements, these requirements would be captured in Transitional Requirements (TRs) which would be included as part of the authorization for implementation.

Review of the TSRs for implementation was documented in an SER. A flowchart of the review process is shown in Exhibit 4, OSR/TSR Transition. The evaluation (as acceptable or unacceptable) of each TSR element as compared to the corresponding and existing OSR element was documented in the SER. The TRs necessary to maintain a similar level of nuclear safety were also listed in an attachment to the SER. The SER was transmitted to USEC by cover letter which granted the authorization for implementation.

Parallel with the DOE review, NRC also reviewed the Applications and generated a multitude of questions on both the SARs and the TSRs. In support of NRC review, DOE forwarded their comments for consideration and incorporation into the listing of questions that NRC sent to USEC for resolution. DOE staff also participated in the working level meetings that were held in Washington, DC., to discuss and resolve NRC and DOE questions.

During these meetings a number of different issues surfaced which required further review and resolution by USEC. These included:

- Commitment to industry codes and standards
- Control of nuclear criticality safety
- Chemical safety
- Worker safety
- UF₆ release detection
- Administrative control of procedures

Several hundred review comments and questions were raised by both DOE and NRC. Many were resolved during the working level meetings, while others required further evaluation. Of the DOE questions that were not resolved at the meetings, most were tied to the resolution of an NRC question/issue. Subsequent review of the USEC response to the NRC question either closed the DOE questions or resulted in the need for further discussion.

OSR/TSR TRANSITION

**OPERATIONANAL SAFETY REQUIREMENTS / TECHNICAL SAFETY
REQUIREMENTS PROCESS FLOW CHART**

Exhibit 4

6.3.3.3 Lessons Learned

Several specific lessons were learned from the OSR to TSR transition process, particularly at PORTS X-705 Decontamination Facility, that would facilitate other regulatory transition efforts. The following is a listing of those items:

- The use of a matrix format for mapping requirements from OSR to TSR format was critical to ensure that all existing regulatory basis requirements were dispositioned properly. This served as a vehicle for resolving comments during the review process. It helped to link NRC and DOE comments and to maintain an "open items list."
- Development of a comment tracking database to internally track the disposition of review comments was equally critical. This allowed the responsible reviewer to track the disposition of the comments to closure. Several times a proposed disposition was discussed during the working level meetings and the resulting change to the applicable TSR(s) did not adequately address the DOE comment. By using the database, the reviewer was able to resurface the comment/question for further resolution. The database contained the OSR element reference number, the mapping document number, the TSR/TR reference (if applicable), applicable reviewer comments, the USEC disposition, and the SER disposition.
- Dialog with USEC's site technical staff was helpful in resolving final review comments. A working level meeting at the site and frequent telephone calls resolved many questions without having to submit formal requests. It is recommended that more frequent meetings be held during the SER preparation process.
- Site working level involvement (i.e., facility managers, etc.) should have occurred earlier in the TSR review process. Comments from the users groups were essential to ensure that the TSR would "work".
- During the USEC-NRC-DOE working level meetings in Washington, DC., many of the DOE comments were combined and linked to other NRC comments or issues. This combining/linking process was done very rapidly in order to get through the multitude of comments. However, this rapid determination and linking process did not allow for the in-depth and/or under-lying concerns discussion necessary to fully understand the significance of many of the comment/issue items. As a result, the several comment/issue items had to be revisited when DOE conducted the final review for approval and implementation of the TSRs.
- Receipt by DOE of USEC responses to NRC comments helped resolve DOE comments.

- Willingness of NRC reviewers to discuss DOE questions on an informal basis was helpful in resolving comments. It is recommended that more frequent working-level between NRC and DOE.
- Use of the Westinghouse Standard Technical Specifications format as a basis for the review helped in converting the OSRs to TSRs.
- The standard format developed for the X-705 DOE SER package required additional work on the front-end and proved to be effective and could be effective in saving time for other facilities.
- Most DOE comments were not addressed by USEC until the end of the process which delayed the SER preparation. Although most of the NRC/DOE review process was conducted on an informal basis, a more formal method could have resolved DOE comments earlier.
- Coordination between the PORTS and PGDP plant sites was not adequate to develop standard TSRs for similar processes (i.e., Fire Protection, UF₆ detectors, Allowable Values for Limiting Condition Setting/LCO setpoints, etc.).
- It was difficult to determine the basis for some TSRs. The existing 1985 SAR, as revised, in some cases did not contain sufficient detail to determine which equipment was required to mitigate an accident scenario. Earlier access to analysis results from the SAR Upgrade program might have helped establish a basis for the TSRs.
- The TSRs should have been revised as comments were resolved. Delaying the revision until all first and second round NRC questions were resolved (Rev. 1 on 9/15/95 to Rev. 3 on 5/31/96) made it more difficult to review the corrected version which contained major changes in format and technical content.

6.3.4 Paducah Gaseous Diffusion Plant 2 ¾ Percent Enrichment and Changes to Withdrawal Facility Cylinder Handling

A request was submitted dated September 13, 1993, for approval of a change to the PGDP Authorization Basis to allow enrichment operations to be increased from 2 percent enrichment production to 2 ¾ percent. The request was limited to portions of the plant involved only with the production of material (i.e., the portion of the cascade that could exceed 2 percent) and temporary waste staging areas within these buildings and the C-710 laboratory needed for confirming assay in production samples and waste. The request was intended to allow PGDP to conduct operations at 2 ¾ percent on an interim basis while work was completed for operation at 5 percent and a further request was submitted to RO staff for approval on a site-wide basis. Changes to the cylinder handling operation in the withdrawal facility were also included in the request package. These changes, however, were not directly related to the request for permission to increase assay.

These requests involved a number of safety concerns primarily focused on nuclear criticality, configuration control, and waste control issues. The RO staff prepared a SER concerning the impact on safety of the proposed operation. The SER identified 18 open items on the request for operation at higher assay and several on the request for changes to the cylinder handling operation. The SER was submitted to USEC on December 7, 1993. An Operational Readiness Review (ORR) was required to be performed with a subsequent Operational Readiness Evaluation (ORE) by DOE/RO staff prior to full approval for startup.

On January 31, 1994, USEC submitted responses to the open items. This information was used to resolve many of the open items. A revised SER was submitted to USEC on April 7, 1994, which approved the operation in principal, pending the closure of several unresolved open items, the performance of an ORE, and USEC's testament of the plant's readiness to operate.

RO staff conducted an ORE at the PGDP during the week of May 23, 1994, following USEC's affidavit of readiness. The RO staff found that much of the safety configuration, procedures, and training were not complete and, in some cases, inadequate. Operation at the higher enrichment limit was denied. Observations from the ORE were formally submitted to USEC on August 1, 1994.

USEC submitted new responses to RO staff on November 18, 1994, that addressed the observations made during the May 23, 1994, ORE. These were found acceptable with the exception of a few open items that were considered resolvable during the ORE process (See: DOE SER, Rev. 4, dated: January 31, 1995). USEC completed an ORR and submitted a request for an ORE on May 9, 1995. The RO staff conducted an ORE during the week of May 27, 1995, and approved the interim operation at the higher assay. The RO Manager transmitted approval on June 21, 1995.

During this same period, the RO staff informally received the criticality safety analyses needed to support a request for extending the approval to site-wide facilities necessary to support continuing operations at the higher assay and to increase the assay overall to 5 ½ percent. USEC's management decided against submitting the request for raising the enrichment level at Paducah to 5 ½ percent, but did request that the approval for 2 ¾ percent be extended site-wide. This permitted operations at the plant to be self-sustaining at the 2 ¾ percent enrichment level.

RO staff reviewed the supporting Nuclear Criticality Safety Approvals (NCSAs) for extension of the increase to the higher enrichment approval to other buildings on-site. Following issuance of an SER for site-wide approval in late 1995 that identified several remaining open issues with the NCSA / Nuclear Criticality Safety Evaluations, the RO staff met with the PGDP staff to informally review the state of readiness. This discussion resulted in the internal review of the NCSAs and the revision of several controls on certain identified equipment.

The formal ORE request for the site-wide assay increase was initiated in January 1997. The ORE was conducted January 14 through January 17, 1997, with tentative approval given with

the exception of certain buildings not currently in operation. Formal approval was given to USEC for site-wide operation at an enrichment level of 2 ¾ percent in February 1997.

6.3.5 Uranium Hexafluoride Detector False Alarms

Ionization-chamber-type leak detectors were used extensively in the process buildings at PORTS and PGDP to detect UF₆ releases in the operating cells. Although this equipment had been proven by years of service to be reliable and durable, a large number of false alarms began to occur at the GDPs, PORTS in particular. Response to the alarms was costly and difficult when the number of false alarms was inordinately high.

The NRC Transition Support Group assigned to the RO Program from LMES' K-25 Technical Division was asked by the RO Manager to assist the GDPs in determining the cause and in recommending a solution to this problem. The team visited both sites to gather data and to meet with key personnel working on the problem. A database was developed to track the false alarms, and a market survey to determine the feasibility of replacement technology was completed.

Equipment modifications were implemented at PORTS, and maintenance procedures were reviewed at both sites. The number of false alarms was significantly reduced due largely to increased maintenance and equipment modifications at both GDPs.

6.3.6 Gaseous Diffusion Plant Seismic Hazard

DOE RO assumed regulation of the GDPs under requirements that established the 1985 GDP SARs as the authorization basis for each plant. In these documents the requirements for natural phenomena and in particular, seismic hazards were established on the basis of probability of exceeding a given earthquake magnitude within a given time period. This resulted in an evaluation basis earthquake loading or peak ground acceleration of 0.18g and an approximate earthquake return period of 237 years.

An upgrade of the FSARs for the GDPs was underway at the time that USEC took possession of the GDPs under the Lease Agreement. During the upgrade of the GDP SARs, DOE orders established requirements for seismic evaluations of new and old facilities that imposed a 1000-year and a 500-year return period earthquake respectively. Since this greatly exceeded the known capability of these facilities, which were anticipated to have limited remaining life, DOE RO staff evaluated the risk of operation and prepared a position paper and evaluated Justifications for Continued Operation (JCO) of the facilities on the basis of a 250-year return period earthquake.

Structural evaluations of PGDP buildings C-331 and C-335 on the basis of a 250-year earthquake found that these buildings did not meet the authorization basis earthquake loading by a substantial margin and with no uncertainty. When these results were reported to DOE RO in September of 1995, the RO staff issued an information request to USEC concerning an "as found condition".

After exchanges of information with USEC, DOE determined that the issue represented an USQ and issued directions to USEC to take action. In January 1996, USEC submitted a schedule to implement modifications to the two structures and action was begun to design the modifications. The issue was included in the DOE Compliance Plan with a July 31, 1997, scheduled completion date. However, USEC subsequently requested relief from this schedule and NRC gave permission to extend the relief until December 7, 1997. Since the actions are to occur on NRC watch, NRC will be responsible for the oversight of these activities.

6.3.7 Highly Enriched Uranium Refeed Program

On December 15, 1994, USEC entered into an agreement with DOE to refeed HEU into the low enriched uranium (LEU) cascade at PORTS. USEC has started this process and plans to refeed approximately thirteen (13) metric tons of HEU, in the form of UF_6 , blend it with LEU, and allow USEC to sell the resulting LEU product. The HEU material is contained in numerous 5-inch, 8-inch, and 12-inch (nominal diameter) cylinders stored at PORTS facility.

In accordance with the Memorandum of Agreement (Appendix E) between DOE and USEC, DOE retains title and control of HEU material until it is blended to less than ten percent (10%) of the Uranium-235 (U-235) isotope. All transportation of HEU is to be in accordance with DOE safeguards and security requirements, including material control and accountability.

HEU Refeed activities occur in both leased and non-leased facilities at PORTS. A Joint Policy Statement by USEC and DOE (Appendix G) provides a resolution of shared site issues. The activities performed in non-leased facilities were under the purview of DOE Orders and Rules. The activities performed in the leased facilities were under the oversight of the ROA until the transition to NRC regulation was complete.

The HEU Refeed process is as follows:

- Removal of the cylinder(s) from Building X-345 and transport to the Product Withdrawal (PW) area in Building X-326,
- Cylinder receipt and storage in the PW vault,
- Cylinder connection to the Feed and Topping Station(s),
- Feed of HEU into the LEU cascade,
- Return of the cylinder to the PW vault and/or return to Building X-345,
- Transfer of the cylinder to Building X-705 for removal of heel material, and
- Transfer of the empty cylinder to the cylinder disposal area.

The initial phase of HEU Refeed involved the blending of UF_6 material from 5-inch cylinders from three (3) existing feed stations and was authorized by letter dated May 11, 1995, from DOE to USEC. The first report revision addressed the refeeding of material from 8-inch and 12-inch cylinders and was approved by letter dated March 28, 1996, from DOE to USEC. Removal and blending of heel material from the refeed cylinders and the disposal of cleaned cylinders will be addressed in a subsequent evaluation and documented in a separate report.

Current plans call for this HEU material to be refed in the cascade by August 1998. Cylinder cleaning activities are to be completed by December 1998. Until the time that USEC completes the handling of HEU material and NRC certifies the facilities involved in HEU processing, the RO Manager will continue to regulate these activities under the auspices of the ROA.

6.3.8 Compliance Plan Project

Prior to the transfer of regulatory responsibility from DOE to NRC, USEC was required to submit to NRC an application for an initial certificate of compliance (hereafter referred to as the Application) in accordance with Section 1701(c) of the Energy Policy Act which amended the Atomic Energy Act of 1954, and Part 76, "Certification of Gaseous Diffusion Plants," of Title 10 of the *Code of Federal Regulations* (10 CFR 76). 10 CFR 76.35(b) requires that the Application include the following:

A plan prepared and approved by DOE for achieving compliance with respect to any areas of noncompliance with NRC's regulations that are identified by the Corporation as of the date of application that includes:

- 1) A description of the areas of noncompliance;
- 2) A plan of actions and schedules for achieving compliance; and
- 3) A JCO with adequate safety and safeguards.

Separate Compliance Plans were developed for PGDP and PORTS GDPs. DOE formed and led a joint DOE-LMES team to review and provide comments on the initial Compliance Plans drafted by USEC in August 1994. When USEC could not meet DOE's November 1, 1994, deadline to provide high quality, detailed drafts, DOE initiated its own development of Compliance Plans. The DOE Compliance Plans were prepared by SMEs knowledgeable in the technical areas addressed, employing a structured, traceable process designed to ensure that all relevant information was collected and appropriately incorporated in the plans. The plans were reviewed by a management team composed of individuals with extensive NRC regulatory experience and by technical experts representing DOE/HQ [the Offices of Environmental Management (DOE/HQ-EM), Nonproliferation and National Security (DOE/HQ-NN), Environmental Safety and Health (DOE/HQ-EH), Office of General Counsel (DOE/HQ-OGC) and Nuclear Energy (DOE/HQ-NE)]. The plans which were approved by DOE/HQ-NE incorporated USEC comments and contained compliance issue discussions that had been coordinated informally with cognizant USEC SMEs at PGDP and PORTS.

In preparing the Compliance Plans, DOE reviewed the past operating history of the GDPs as evidenced by assessments, audits, reviews, event reports, and RO Program inspections. Also

DOE incorporated plans of action and schedules into the Compliance Plans which would address the deficiencies identified from past operations and areas in which USEC was not in full conformance. The USEC Applications described aspects of the operations at the GDPs as they will be when the GDPs are in full compliance. In those cases where some aspect of an operation was not in full compliance with applicable NRC regulations, the noncompliance was described in the Applications and in the Compliance Plans, as required by 10 CFR 76.35(b)(1).

In March 1995, the initial PGDP and PORTS Compliance Plans were submitted to DOE/HQ for review and approval. These Compliance Plans were subsequently submitted to NRC as a part of USEC's initial Applications for Certification. NRC rejected the initial USEC Applications for Certification based upon a determination that they did "... not meet the requirements of 10 CFR §76.31 and §76.35 for the content of an initial application." NRC did not formally comment on the Compliance Plans.

USEC prepared revised Applications for Certification and submitted them to NRC. Concurrently, the RO staff worked directly with NRC to incorporate the changes to the USEC Applications into the Compliance Plans and to resolve technical issues. Revisions to the two Compliance Plans were made in conjunction with, and reviewed by, DOE/HQ-NE. In addition, DOE/HQ-NE convened a DOE/HQ technical review panel with members from DOE/HQ-EM, -NN, -EH, and -GC. After the advance copies of the revisions to the Compliance Plans had been reviewed by DOE/HQ technical review panel and the review panel comments had been addressed, the revised sections were provided to NRC for informal review. Based upon their review of the advance copies of the revised sections of the two Compliance Plans, NRC concluded that all of the sections that they reviewed were acceptable for submittal. Revision 1 of the Compliance Plans, approved by DOE, were transmitted to USEC which then included them, with comments, in Revision 1 of the Applications resubmitted to NRC.

With the acceptance of the Revision 2 Applications, NRC commenced a formal review of the Applications and their associated Compliance Plans. NRC requested further clarification on a number of statements and, in some instances, a commitment from USEC to perform a certain activity or meet a schedule. This question and answer process resulted in further revisions to the USEC Applications and to the Compliance Plans.

The DOE-approved Revision 3, Change A, Compliance Plans formed the formal basis for certification. The Compliance Plans addressed those aspects of the operations at the GDPs that were identified by USEC in its Applications as not currently being in full compliance with either the applicable NRC requirements or the commitments set forth in the USEC Applications and they included commitments made to modify the Compliance Plans in response to NRC questions. DOE prepared and approved revisions to the Compliance Plans to address PORTS and PGDP noncompliances identified by USEC through the Revision 6 Applications and USEC responses to NRC questions through August 1, 1996. This included any new Compliance Plan issues not identified in the USEC Revision 6 Applications, and all commitments made to modify the Compliance Plans in the responses to NRC questions regarding Revisions 1 and 2 of the Compliance Plans. Revision 3, Change A was issued as Revision 4 to provide a record revision of the certification Compliance Plans. Because many

parts of 10 CFR 76 and sections of 10 CFR cited therein are performance based, only NRC can determine whether the commitments made by USEC are adequate to meet the requirements. However, DOE has independently considered whether PORTS and PGDP personnel have implemented the programs and procedures and installed the required equipment to fulfill the commitments stated in the revised Applications. The Compliance Plans addressed nonconformances, whether or not these nonconformances constituted deviations from applicable NRC regulations.

The existence of the noncompliances described in the plans did not indicate a difference in the overall level of health, nuclear safety, and safeguards protection provided to workers and the public under DOE and NRC oversight. Rather, these noncompliances reflected areas where compliance had not yet been achieved to existing DOE requirements or areas in which NRC and DOE differed in their regulatory approaches to assure adequate health, safety and security.

DOE approval of the Compliance Plans was based, in part, upon its conclusion that

- The JCOs presented in the Compliance Plans were considered by DOE to be acceptable for assuring adequate safety and safeguards.
- For the noncompliances identified by USEC, the upgrades proposed in the plans of action would, when completed, bring the GDPs into compliance with the commitments in the Applications.
- The plans of actions and schedules for the identified noncompliances represented an appropriate means of bringing the GDPs into compliance with the commitments in the revised Applications as rapidly as could be safely and effectively managed. Furthermore, the priority assigned to individual upgrade actions was, to the maximum extent practicable, commensurate with the safety or safeguards risk associated with the noncompliance.

In compliance with 10 CFR 76.33(e), those portions of the Compliance Plans that contained withholdable information were placed in an Appendix. Withholdable information includes Restricted Data, National Security Information, Safeguards Information, Unclassified Controlled Nuclear Information, proprietary data, and other such information. Where withholdable information was required to describe a noncompliance, justify continued operation or planned actions and schedules that would otherwise be in the body of the Compliance Plan, the compliance issue was discussed in the Appendix.

Where USEC reported that the plans of actions to eliminate an identified noncompliance had been completed, the commitments made in their JCOs were superseded by the actual implementation of the corresponding Application commitments. Issues, including the JCOs, that had been completed but not verified either by DOE or NRC prior to NRC assuming regulatory authority, were retained in the Compliance Plans and denoted as "complete."

Following the NRC Commissioners' decision on the USEC Applications, NRC staff requested that DOE review those actions in the Compliance Plans reported as complete by USEC prior to the March 3, 1997, regulatory transition date. The purpose of the closure review was to reduce, as much as possible, the GDPs' reliance on the Compliance Plan exceptions to the 10 CFR 76 requirements and to validate progress of the GDPs towards a compliant facility. Reviews were conducted at each GDP on a monthly basis. The results of the reviews were forwarded to USEC and NRC.

6.3.8.1 Compliance Plan Lessons Learned

The DOE/ORO Compliance Plan Project Team was effective in working both with USEC and the NRC in developing and issuing a DOE Compliance Plan document that USEC and NRC can work with in order for the GDPs to operate under the NRC regulatory environment. However, there are several lessons learned which would facilitate the future transitioning of other DOE facilities to NRC regulatory oversight, including both positive and negative observations. These lessons learned include the following:

- It is essential that all principal parties associated with or who will be affected by the Compliance Plan to initially meet and discuss the purpose, scope, content, and structure of the Compliance Plan document. This discussion should also render a decision on the responsibilities of the SME selected to generate the Compliance Plan issue, the amount of detail to be included in each issue, and to establish up-front the process work flow methodology in developing, reviewing, approving, and issuing the finalized Compliance Plan document. Sufficient pre-planning will greatly reduce the number of iterations that the Compliance Plan will have to be submitted for review and comment, if all participants are involved up-front.
- It is essential that all currently "open" nonconforming issues be initially identified by all participants in order to cull out those issues that directly affect the material that is to be presented in the application for a Certificate of Conformance or License to Operate the facility. For those issues that do not directly affect the application content, but come under the purview of the regulations elsewhere, these should be formally tracked as "potential regulatory issues." The remaining items should be considered improvement initiatives, having lesser priority for resource allocation and completion mandates.
- It is essential that a varied mix of technical personnel be selected as SMEs, with direct past work experience from the facility that is coming under NRC regulation, with direct NRC work experience, with direct DOE work experience, and with direct NRC-regulated industry experience, so that management's expectations can be conditioned to meet NRCs expectations. Further, a multivariate mix of personnel can also help DOE, plant management, and corporate management better understand NRC's regulatory positions and purpose, in order to avoid possible regulatory ratcheting of corrective action requirements because of an oversight or misunderstanding by the Applicant or Compliance Plan submitting organizations.

- It is essential that personnel who work on the Compliance Plan and Application work together to complement each other's understanding as to what is expected to be submitted to the NRC, and that the documents are consistent.
- It is essential that the draft Compliance Plan issues be discussed directly with Plant Management, in addition to Corporate Management. A bottom-up/top-down review improves communication and will help to more rapidly reach a mutually agreeable corrective action plan without the culture shock that usually accompanies a high priority corrective action plan mandate coming down from corporate without the knowledge of what the issues are that the corrective actions are trying to resolve.
- It is essential that the corrective actions decided to be accomplished can be achieved by the dates identified. All corrective actions need to be "resource-loaded" to take into account all expected multiple-use personnel, and developing programs, plans, and procedures.
- It is essential that intermediate milestones be established for long-term corrective action plans in order to gage the amount of workoff that has been achieved, and the amount of new work that is being identified as a result of the corrective actions that were completed. For example, development of Alarm Response Procedures, may identify that a set of Abnormal Operating Procedures may also need to be developed.
- It is essential to verify and validate the completion of corrective actions as soon as they are identified as having been completed. "Complete" may mean something entirely different to all affected parties. For example, a report that the installation of the Autoclave Shutdown switches has been completed, may only mean that the field work was completed. The testing, operating, and maintenance procedures may still be required to be developed, as well as the training of these personnel.

Overall, the DOE Compliance Plan Project accomplished its primary mission of identifying the safety basis and corrective action plans for why the facility can continue to operate, even though NRC requirements have not yet been fully implemented.

6.3.9 Emergency Exercise Inspections

Emergency Exercises were conducted at PGDP and PORTS to help ensure that adequate protective measures could be taken in the event of an actual emergency. The emergency exercises were performed to meet a requirement in the Emergency Preparedness functional area of the ROA that requires each plant's emergency plan to be exercised annually, including opportunities for off-site agencies to participate.

A total of five full scale exercises were evaluated by members of the RO Inspection Team. Team members observed the performance of the emergency exercises from numerous locations in order to evaluate the integration of the exercise. These locations included the exercise incident scene, the USEC Emergency Operations Facility, DOE/ORO Emergency Operations

Center (EOC), GDP EOCs, GDP Control Rooms, Incident Command Posts, and the Joint Public Information Center. Additionally, the exercise planning documents, pre-exercise controller/evaluator training, and post-exercise critique activities were reviewed. In the case of each exercise, inspectors focused on the demonstration of performance objectives that were listed in the respective exercise manuals, establishment of effective emergency communications during exercise conduct, and the post-exercise critique process. Observation of the post-exercise critique process enabled each RO Inspection Team to determine whether the lessee had self-identified areas of weakness or nonconformance, as well as appropriate corrective actions.

6.4 TRAINING AND QUALIFICATION PROGRAMS

6.4.1 Site Safety Representative Training and Qualification

In August 1993, a formal training procedure (ROP-AP-002) was developed to ensure that the SSRs developed and maintained the necessary skills to accomplish their mission at the GDPs and to ensure that the SSRs stayed abreast of current industry practices and technical standards. Formal training of the SSRs began in September 1993; the major training and qualification requirements were completed in January 1994.

The requirements for SSR qualification included approximately 390 hours of classroom instruction with additional required reading and self-study assignments. The candidates were required to be certified by an oral board examination. A significant portion of the course work consisted of the Facility Representatives Advanced Nuclear Course, NRC inspection courses, Gaseous Diffusion Technology training, and site-required training, such as Radiation Worker training, 40-Hour Hazardous Waste Operations, and nuclear criticality safety courses.

On June 14, 1994, an oral board examination to certify the SSR candidates was conducted at Oak Ridge, Tennessee. The board was staffed by qualified professionals chosen for their expertise in safeguards and security, health physics, gaseous diffusion plant technology, and RO policy and procedures. The board was chaired by the DOE/ORO Assistant Manager for Enrichment Facilities. Members of the board included a DOE/ORO RO Staff Engineer, DOE/ORO Division Director, Safety and Health, and DOE/ORO Branch Chief, Nuclear Safety Branch. The RO Manager, was present to observe and assist with the proceedings, but in accordance with procedure, did not participate as an examiner. The RO Training Coordinator, facilitated and provided documentation for the proceedings. (Documentation included candidate training records, examination materials, and the SSR *Oral Board Examination Guidance Manual*, which was provided to the board members in advance.)

The SSR candidates performed exceptionally well during the examination, demonstrating good depth of knowledge and understanding of the subjects in question. A major emphasis was directed toward situations requiring the candidates to demonstrate a knowledge of policy and philosophy as it related to USEC and the RO Program. The board recommended all four candidates for certification.

The training for the SSRs was a continuing process and additional professional and personal development courses were identified and scheduled. The SSRs successfully completed a rigorous training program modeled after the DOE Facilities Representative Certification Program.

6.4.2 Fundamentals of Gaseous Diffusion Plant Operations Training

The RO Manager facilitated the provisions for GDP operations training to various individuals and organizations that were involved with the regulatory oversight of the GDPs and the transition to NRC regulation.

The objective of the operations training was to impart to the trainee a basic understanding of the fundamental aspects of the gaseous diffusion process and the operation of the specialized equipment associated with it.

The curriculum included the following components:

- information on the safe handling and heating of uranium hexafluoride cylinders as they are fed into the process,
- the major components that comprise a gaseous diffusion stage,
- the connection of stages to form a cell,
- the grouping of cells into a building with the necessary auxiliary equipment required to service the cells,
- the arrangement of buildings to form an enrichment cascade,
- the operation of the special equipment used to withdraw product and depleted streams from the cascade, and
- historical depictions of some of the more notable incidents that have occurred during the past.

The teaching material included many overhead slides, videos, posters, models, demonstrations, and plant tours. The GDP operations training was conducted for nearly 500 individuals involved with the transition to regulation by NRC. Class rosters included people from NRC Headquarters and Region III, OSHA, DOE/HQ and DOE/ORO, Defense Nuclear Facility Safety Board, RO staff and functional inspection team members, USEC, LMES, and Argonne and Lawrence Livermore National Laboratories (LLNL).

6.5 PLANT CONFIGURATION AND DOCUMENTATION MANAGEMENT VIA COMPUTER CD ROM RECORDS

In April 1996, the RO Manager established a computer documentation program task as part of the PORTS Assistance Program. The purpose was to improve communications between plant personnel, USEC, NRC, and RO staff by providing an easy reference to key information. Site plans, equipment photographs, layout drawings, schematic flow diagrams, and equipment details were captured on CD ROM computer discs for distribution to essential personnel. This computer CD ROM program allowed users to navigate throughout the site facilities via electronic links between the equipment drawings, photos, and process flow diagrams. These links also allowed users to quickly address key issues related to plant operations and equipment. Electronic links to the Process Description in the FSAR and appropriate sections of the TSRs were included. The program was designed for adaptation to a computer network for access by all site personnel, or location on a secure server for Internet simultaneous access by site personnel and other USEC, DOE, Lockheed Martin Utility Services (LMUS), and NRC personnel when necessary. The completed task allowed users quick reference to specific information about all major buildings and process systems. This approach could be used by other facilities.

6.6 REGULATORY OVERSIGHT PROGRAM STAFFING AND COST

A temporary DOE organization, DOE Transition Team, was created within DOE/ORO to establish and to implement the regulatory oversight requirements during the development of the ROA. This team started in March 1993, with an initial staff of five DOE and three subcontractor full time equivalents (FTEs). After the transition from DOE to USEC operation of PGDP and PORTS, and DOE's assumption of the formal regulatory oversight authority on July 1, 1993, the RO Program was expanded to establish the DOE SSRs at the GDP sites and to staff the ROA inspection program. The Program Year (PY) runs from July 1 through June 30. During PY 1994 and PY 1995, the staffing and associated costs required to perform the ongoing program activities closely approximated estimates made prior to the beginning of the program. Typical ongoing program efforts during the period included regulatory, inspection, technical and safety analysis developments, and administrative activities.

In PY 1995 and PY 1996, in addition to performing the ongoing activities, review and resolution of regulatory issues became important activities which required additional staff. In particular, the review of changes to OSRs, the performance of ORRs for HEU refuel operations at PORTS and reviews in support of the 2 3/4 percent upgrade at PGDP were important ongoing activities during this period.

In PY 1996, one of the main objectives of the RO Program was to work closely with USEC and NRC to facilitate the transition to NRC regulatory oversight and resolve key certification and regulatory issues. During this period, a decision was made to expand DOE's role, particularly in the area of nuclear safety analysis, through the RO Program to enhance the transition to NRC. As a result, the program staff was increased to address numerous issues, such as:

- support for frequent NRC technical meetings on certification and technical issues
- inspections of the Integrated Resource Management System
- preparation of a DOE and USEC agreement on DOE material stored in the process buildings
- development of a DOE and USEC shared-site agreement (Appendix G)
- preparation of a JCO related to the PGDP seismic condition
- preparation of SEs for the upgraded SARs
- support of the OSR to TSR transition

These activities were performed in addition to the ongoing program activities. As a result, the program staffing reached a maximum of approximately 6 (on-the-project) DOE and 55 subcontractor FTEs in PY 1996. The program costs also reached a maximum of approximately \$13.7 million in PY 1996.

During the late PY 1996, in response to the acceptance of the USEC applications for certification by the NRC and the beginning of the final transition from DOE to NRC regulation of USEC, the DOE RO Manager began to reduce the size of the RO Program. By early PY 1997, with the issuance of the certificates of compliance by the NRC, the program staff had been reduced to about one-half the level in PY 1996 at an estimated cost of \$10 million. During the final phase of the transition, which concluded with the transfer of regulatory authority to NRC on March 3, 1997, the program staff was further reduced to the level required for DOE regulation of the HEU Refeed operations at PORTS.