REPORT TO CONGRESS

ON THE

GASEOUS DIFFUSION PLANTS

LOCATED NEAR

PADUCAH, KENTUCKY

AND PORTSMOUTH, OHIO

OCTOBER 1, 1998, TO SEPTEMBER 30, 2003

EXECUTIVE SUMMARY

This report is provided to Congress as required by Section 1701 of the Atomic Energy Act (AEA). This is the third such report on the gaseous diffusion uranium enrichment plants near Paducah, Kentucky, and Portsmouth, Ohio, to be issued. It covers the 5-year period from October 1, 1998, to September 30, 2003. The information reported here is current as of September 30, 2003, unless otherwise specified. The first and second reports were sent to the Congressional oversight committees on January 5, 1998, and January 15, 1999, respectively. The first report covered the period from March 3, 1997, to September 30, 1997, and the second covered the period from October 1, 1997, to September 30, 1998. As directed by the AEA, the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency have been consulted about this report. DOE continues to be responsible for regulatory oversight of portions of both plants and the oversight of other non-enrichment activities in non-leased portions of both sites.

The Federal Reports Elimination Act of 1998 amended Section 1701 of the AEA to change the frequency of this report to the Congress on the status of health, safety, and environmental conditions at the gaseous diffusion plants (GDPs) from annually to a report required not later than the date on which a Certificate of Compliance is issued by the U. S. Nuclear Regulatory Commission (NRC). Certificates for each of the GDPs must be applied for at least every 5 years. The current certificates were issued January 29, 1999, and expire December 31, 2003. NRC intends to issue renewed certificates, with an expiration date of December 31, 2008, after issuance of this report.

During this reporting period, the United States Enrichment Corporation (USEC), as a privatized entity, generally met NRC regulatory requirements. The Paducah and Portsmouth GDPs have continued to provide adequate protection of public health, safety, safeguards, security, and the environment. Offsite radiological doses, as well as doses to the workers, are very low and well within regulatory limits. There have been only two events requiring activation of the emergency response center at one of the sites and no events at either site involving a significant release of radioactive material.

The AEA permits NRC to authorize operation of the GDPs in cases where the plants do not fully comply with NRC regulations, provided that DOE prepares, and NRC approves, a plan (i.e., Compliance Plan) for bringing the plants into compliance. Exceptions from full compliance at the time of initial certificate in November 1996 are described in Compliance Plans for each site, which document binding commitments for actions and schedules to achieve full compliance. Significant progress has been made in completing issues in the Compliance Plans during the 5-year period covered by this report. As of September 30, 2003, USEC had completed all Compliance Plan issues associated with the operating facilities at both plants. Two autoclaves that were taken out of service were not upgraded at Portsmouth. NRC has confirmed the completion of these issues by inspection. Where violations of NRC regulations occurred, USEC took actions to reestablish compliance and developed plans to prevent recurrence.

In May 2001, USEC terminated enrichment operations at the Portsmouth GDP. USEC phased out shipment and transfer operations of enriched uranium hexafluoride (UF_6) at the Portsmouth GDP in June 2002. The shipment and transfer facility at the Portsmouth GDP

continues to be used for replacement of out-of-specification UF_6. The shipment and transfer operations of enriched UF_6, formerly conducted at the Portsmouth GDP, were transferred to the Paducah GDP, which began producing enriched uranium at an assay of up to 5.5 weight percent of uranium-235 in early 2002. The Paducah GDP shipped its first product cylinder directly to a customer in May 2002. The Paducah GDP continues to operate independently of the Portsmouth GDP. USEC is maintaining the Portsmouth GDP in a standby condition under contract to DOE.

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CHAPTER 1

BACKGROUND

ENERGY POLICY ACT:

In October 1992, Congress enacted the Energy Policy Act (EP Act) of 1992, which amended the Atomic Energy Act of 1954 (AEA), to create the United States Enrichment Corporation (USEC).[1] Provisions of the AEA direct the U.S. Department of Energy (DOE) to lease the gaseous diffusion plants (GDPs) near Paducah, Kentucky, and Portsmouth, Ohio, to USEC. These GDPs produce enriched uranium (EU). Although the AEA established USEC as a government corporation, the AEA also required that within 2 years after the transition date of July 1, 1993, USEC prepare a plan for transferring ownership of USEC to private investors. On July 28, 1998, USEC was privatized through an Initial Public Offering (IPO). In the *Lease Agreement Between The United States Department of Energy and The United States Enrichment Corporation* (Lease) dated July 1, 1993, and in other subsequent agreements, DOE and USEC established the roles and responsibilities for each organization at both GDPs. The AEA also requires the U. S. Nuclear Regulatory Commission (NRC) to report to Congress on the status of health, safety, and environmental (HS&E) conditions at the GDPs. The Federal Reports Elimination Act of 1998 (Public Law 105-363) was signed into law in November 1998. This bill amended section 1701(b)(1) of the AEA to require NRC to report to Congress "... not later than the date on which a certificate of compliance is issued" instead of "at least annually." This is the third such report. It encompasses the 5-year period from October 1, 1998, through September 30, 2003.

The AEA assigns safety, safeguards, and security regulatory responsibility at the USEC-operated GDPs to NRC. Further, the AEA required that within 2 years of the date of the passage of the EP Act, NRC establish, by regulation, both: (1) safety, safeguards and security standards for the GDPs; and (2) a certification process to ensure that USEC complies with these standards. This certification process is in lieu of any requirement for a license. Thus, the AEA made the NRC regulation of the GDPs conditional on the issuance of new regulations, which were to be promulgated by October 1994. In accordance with these requirements, NRC promulgated Title 10 of the *U.S. Code of Federal Regulations*, Part 76 (10 CFR Part 76), "Certification of Gaseous Diffusion Plants," in September 1994.

The EP Act changes to the AEA made provision for the possibility that USEC might not initially be able to comply with the safety, safeguards, and security standards established by NRC. To address this contingency, the AEA permitted NRC to approve continued USEC operation of the GDPs if NRC approved DOE-prepared plans for bringing the GDPs into compliance with any unsatisfied provisions of the NRC regulations. On November 26, 1996, NRC issued Certificates of Compliance certifying USEC's operation of the GDPs in accordance with Part 76 and approved a Compliance Plan for each GDP for achieving compliance with the NRC regulations for those areas not in full compliance. After an interim period allowing for USEC to transition to the NRC regulation in an orderly manner, NRC began regulatory oversight of USEC operations on March 3, 1997. NRC has continued regulatory oversight of USEC operation of the GDPs for the entire period covered by this report.

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[1] A listing of abbreviations and acronyms can be found in Appendix A.

NRC/DOE INTERFACE AND RESPONSIBILITIES:

The AEA does not require that DOE lease the entire GDP sites to USEC. For example, those areas containing legacy material from operations under DOE, and that are not required to support current enrichment activities, and those areas containing significant quantities of accessible highly enriched uranium [(HEU) i.e., uranium that is enriched to 20 percent or more in uranium-235 (U^{235})] are excluded from the Lease. Consequently, DOE retains responsibility for the environmental protection, safety, safeguards, and security for those portions of the GDP sites that are not leased to USEC and for those portions of the GDPs leased to USEC that contain HEU material. At the Portsmouth GDP, DOE regulated the HEU material activities occurring in the leased areas until: (1) all the HEU material was down-blended into the low-enriched uranium (LEU) cascade; (2) all cylinders that contained residual HEU material were cleaned; (3) all remaining HEU in those areas was transferred elsewhere; and (4) the associated areas were transitioned to NRC regulation. These activities were completed in October 2000; however, DOE retains responsibility for as-found HEU (> 10 percent assay). Since then, all that remains under DOE regulatory oversight are those areas within the GDP sites not leased to USEC or its successor organization. An exception to this is the Federal arming and arrest authority the security forces exercise at both GDPs, which DOE provides and regulates. The AEA further assigns responsibility to DOE for the payment of any costs of decontamination and decommissioning (D&D), response actions, or corrective actions that are related to conditions existing before USEC leased the GDPs. With this assignment, DOE retains responsibility for environmental restoration activities and legacy[2] waste management at the GDP sites and for the operation of facilities used for the storage of DOE-owned special nuclear and source material, such as the cylinder storage yards for depleted uranium hexafluoride (DUF_6) generated before July 1993 and surplus uranium material in interim storage at the Portsmouth GDP. In addition, DOE has been assigned responsibility for all DUF_6 generated up to the date of USEC's privatization (July 28, 1998).

In December 1993, NRC and DOE approved a "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." This joint statement established the areas of responsibility between NRC and DOE. In August 1994, NRC and DOE approved an "Agreement Establishing Guidance for the NRC Inspection Activities at the Paducah and Portsmouth Gaseous Diffusion Plants Between Department of Energy Regulatory Oversight Manager and Nuclear Regulatory Commission." This agreement supplemented the joint statement by defining in more detail the role of the NRC observers at the GDPs in the interim period during which DOE exercised public health and safety and common defense and security regulatory oversight of the leased GDPs. In March 1995, NRC and DOE established the "Agreement Defining Security Responsibilities at the Paducah and Portsmouth Gaseous Diffusion Plants Between the Department of Energy's Office of Safeguards and Security and the Nuclear Regulatory Commission." This agreement also supplements the joint statement by defining in greater detail the security roles and responsibilities of DOE and NRC after NRC assumption of regulatory oversight of USEC activities.

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[2] The term "legacy" refers to items that are a carryover from the period before DOE leased the facilities to USEC (e.g., legacy waste and legacy equipment).

In October 1997, NRC and DOE signed a Memorandum of Understanding (MOU) entitled “Memorandum of Understanding Between the Department of Energy and the Nuclear Regulatory Commission - Cooperation Regarding the Gaseous Diffusion Plants.” This MOU defines the responsibilities of DOE and NRC regarding continuing cooperation at the GDPs after the NRC assumption of regulatory oversight for USEC activities. The MOU also clarifies the framework for coordination regarding issues that may involve DOE and NRC areas of responsibility. According to this MOU, DOE not only remained responsible for regulatory oversight of the HEU-related activities at the Portsmouth GDP that took place in designated leased areas until October 2000, but also will continue to review and, where appropriate, approve, USEC-proposed modifications to the Paducah and Portsmouth GDP Compliance Plans before their submittal to NRC for final review and approval. In addition to the recognition of these continuing DOE responsibilities, DOE and NRC: (1) agreed to exchange information and technical support; (2) defined responsibilities for emergency response; (3) described the manner in which issues identified during an inspection by either agency would be the August 1994 “Agreement Establishing Guidance for NRC Inspection Activities at the Paducah and Portsmouth Gaseous Diffusion Plants Between Department of Energy Regulatory Oversight Manager and Nuclear Regulatory Commission.”

In January 2001, NRC and DOE signed a Joint Procedure (JP) entitled “Response to Emergencies in the Leased Areas at the Gaseous Diffusion Plants.” The JP provides that NRC would be the Lead Federal Agency (LFA) for responding to emergencies in areas leased to USEC, unless it was later determined that DOE or another agency should be the LFA. The JP also provides for continuous exchange of information between DOE and NRC concerning emergencies, and for coordination of any response actions.

Through these aforementioned agreements, statements, formal MOU, and other cooperative NRC/DOE efforts, the agencies have continued to coordinate activities of interest to both DOE and NRC.

CHAPTER 2

GASEOUS DIFFUSION PLANT OPERATIONS

The principal process NRC regulates at the GDPs is the production of EU for reactor fuel. The GDPs receive uranium hexafluoride (UF_6); enrich it (i.e., process the material to increase the concentration of fissionable U^{235}); and then ship the enriched UF_6 to other fuel cycle facilities, where it is processed into fuel assemblies for use in nuclear power reactors. In the gaseous diffusion separation process, UF_6 gas passes through a material (barrier) with small pores that are large enough to permit the escape of single molecules but are too small to permit bulk flow of the gas. The gas that emerges from the pores has a slightly higher concentration of U^{235} atoms than the gas that does not pass through the barrier. This process creates two streams of gas, one with a higher U^{235} concentration (enriched) and one with a lower concentration (depleted). Because the degree of enrichment achieved by the use of a single barrier (i.e., a single diffusion stage) is very small, the process must be repeated many times, employing a cascade of many stages to achieve the required enrichment levels. The outputs of the cascade are EU product and depleted uranium (DU). The DU is stored at the GDPs, awaiting ultimate disposition. As of the writing of this report, the Paducah GDP continues to enrich uranium. The Portsmouth GDP has been placed in a standby condition.

The main components of a GDP are: (1) large cylindrical vessels called diffusers that contain the barrier; (2) compressors used to compress the gas to the pressures needed to flow through the barrier tubes and from one stage to another; (3) electric motors to drive the compressors, heat exchangers and cooling systems for removing the heat of compression from the UF_6; (4) piping for the stage and interstage connections; and (5) block and control valves to adjust the gas flow. In addition to this process stage equipment, GDPs require: (1) auxiliary systems such as the UF_6 feed and withdrawal systems; (2) an extensive electrical power distribution system; and (3) cooling towers to dissipate the waste process heat.

The major areas of the NRC oversight at the GDPs include: (1) plant operations; (2) nuclear criticality safety: (3) physical protection; (4) security of classified information; (5) material control and accounting (MC&A); (6) radiological controls for onsite and offsite personnel; (7) waste management; (8) transportation of radiological materials; (9) maintenance and surveillance; (10) training, and (11) emergency preparedness. NRC is responsible for: (1) regulatory oversight of the design, operation, and maintenance of hardware (i.e., structures, systems, and components) relied on for safe operation; (2) operational aspects involving the human element, such as training, staffing, and adherence to procedures; and (3) management organization and controls necessary to assure effective management oversight of facility operations. Management organization and controls include: (1) policies and procedures; (2) internal reviews and audits; (3) safety review committees; (4) configuration management; (5) records management; (6) event investigation and reporting; and (7) quality assurance programs. NRC also reviews and approves accident analyses and technical safety requirements (TSRs) developed by USEC. The accident analyses describe potential credible accidents and the facility response to those accidents, to demonstrate that the facility is capable of responding in a fashion that will not jeopardize public health and safety. The TSRs define the safety envelope and operating parameters within which the facility is required to operate for safe operation.

NRC assures safe operational readiness through issuance of a certificate of compliance, after a thorough review of design and operational information, and by field inspections conducted by specialists from both the NRC Headquarters and the regional office having responsibility for the sites. In addition, two NRC resident inspectors are located at the Paducah GDP. Because of decreased activity at the Portsmouth GDP, NRC reduced the number of resident inspectors at the Portsmouth site from two to one in July 2002. After September 30, 2003, NRC will no longer maintain a resident inspector at the Portsmouth site. The resident inspectors perform daily inspections covering a broad range of site activities.

In May 2001, USEC terminated enrichment operations at the Portsmouth GDP. USEC phased out shipment and transfer operations of enriched UF_6 at the Portsmouth GDP in June 2002. The shipment and transfer facility at the Portsmouth GDP continues to be used for replacement of out-of-specification UF_6. The shipment and transfer operations for enriched UF_6 formerly conducted at the Portsmouth GDP were transferred to the Paducah GDP, which began producing EU at an assay of up to 5.5 weight percent (wt %) U^{235} in early 2002 and shipped its first product cylinder directly to a customer in May 2002. At this time, the Paducah GDP continues to operate independently of the Portsmouth GDP, which USEC is maintaining in a standby condition under contract to DOE.

CHAPTER 3

STATUS OF COMPLIANCE PLAN ACTIVITIES

The AEA permits NRC to authorize operation of the GDPs in cases where the plants do not fully comply with NRC regulations, provided that DOE prepares, and NRC approves, a plan (i.e., Compliance Plan) for bringing the plants into compliance. 10 CFR 76.35 states that the application for an initial certificate of compliance must include, among other things, a DOE-prepared and -approved plan, for achieving compliance regarding any areas of noncompliance with NRC's regulations. Section 76.35 further states the plan must include a description of the areas of noncompliance, a plan of actions and schedules for achieving compliance, and a justification for continued operation with adequate safety, safeguards, and security.

DOE prepared separate Compliance Plans for Paducah and Portsmouth, which NRC approved on November 26, 1996, as part of the initial certification activities. The Compliance Plans contain 53 and 46 issues, respectively, for Paducah and Portsmouth. USEC has now completed all Compliance Plan issues for both plants, and NRC has confirmed completion by inspection as needed.

Of the original Compliance Plan issues, 36 issues are substantially common to both Paducah and Portsmouth. The issues contained in the Plans, along with their status as of June 30, 2003, are listed in Appendix B. Each issue in the Plan, which may consist of several subissues, contains: (1) a description of the applicable requirements; (2) USEC's commitment to achieve compliance; (3) a description of the noncompliance; (4) a justification for continued operation while the issue is being resolved: and (5) a plan of action to resolve the issue and bring the GDP into compliance, along with completion schedules.

Several types of noncompliances are discussed in the Compliance Plans. These noncompliances can be generally grouped into three types. The first type, minor issues, consists of minor noncompliances that were associated with established programs. Eight minor issues were identified at Paducah, and 10 at Portsmouth. The second type of noncompliance, equipment issues, involved the need for upgrades of safety-related equipment to meet NRC requirements. Equipment issues identified in the Compliance Plans total 18 for Paducah and eight for Portsmouth. The third type of noncompliance, programmatic issues, involved situations in which USEC had not yet fully implemented a program necessary to meet NRC requirements. Programmatic issues identified in the Compliance Plans total 27 for Paducah and 28 for Portsmouth.

Equipment noncompliances for both Paducah and Portsmouth included the need to upgrade the autoclaves, discussed below, to provide an additional safety margin. These noncompliances also address structural upgrades to the process buildings at Paducah to provide an appropriate margin of safety against earthquakes. Programmatic noncompliances for both Paducah and Portsmouth include upgrading the GDPs' safety analysis reports (SARs) and procedures to meet the NRC requirements and assuring that programs are in place to maintain the procedures consistent with current GDP operations and the authorization basis.

Two significant issues, addressed in the Compliance Plans, which are common to both Paducah and Portsmouth, are discussed in detail below:

- SARs - Part 76 requires that the application for a certificate of compliance include: (1) a SAR that presents an assessment of potential accidents and describes the plant site and principal structures, systems, and components of the plant; (2) the equipment and facilities that will be used to protect health and minimize danger to life; and (3) the management controls and oversight program employed to protect the public and worker health and safety. DOE was in the process of updating the SARs for the GDPs when the EP Act was passed. These SAR updates were necessary to reflect new information and understanding about initiating events; plant configuration; expected response of structures, systems, and components; and accident analyses. However, DOE was not able to complete the revised SARs in time to include them in the applications for NRC certification. Thus, the SARs that were submitted with the original certificate applications were based, in part, on the 1985 Final Safety Analysis Reports (FSARs) for the two plants and on DOE-approved safety evaluations performed after those FSARs were issued. DOE completed the update of the SARs and transmitted the revised SARs to USEC and NRC on February 14, 1997. On August 18, 1997, USEC submitted some SAR-related information to NRC, but was unable to fulfill its SAR commitments as stated in the Compliance Plans. On October 31, 1997, USEC submitted the bulk of the updated accident analysis. During this reporting period, USEC completed walk-downs of both plants to confirm that the actual plant configurations match the documentation. For Paducah, USEC submitted a series of additional revisions as the need was identified. On April 3, 2000, as a separate amendment request, USEC submitted an update of SAR Chapter 3, "Facility and Process Description." On February 11, 2002, NRC approved the Paducah SAR updates, including the Chapter 3 revisions. Similarly, NRC approved the Portsmouth SAR updates and the Chapter 3 changes on July 24, 2002. Therefore this Compliance Plan item is closed for both plants.

- Design Modifications to the Autoclaves - Feed material is received at the GDPs in cylinders that contain 9.1 to 12.7 metric tons [MT (10 to 14 tons)] of UF_6 in the solid state. To transfer this material to the diffusion cascade or for sampling, the cylinder must be heated to transform the UF_6 from a solid to a gas. When in a gaseous state, the UF_6 flows from the cylinders to feed headers, which deliver the gaseous feed material to the appropriate assay points in the diffusion cascade. Heating of the cylinders and removal of the UF_6 are performed in an autoclave. An autoclave is essentially a cylindrical vessel with an internal diameter of approximately 1.83 meters (6 feet) in which the entire UF_6 cylinder is placed and heated. The autoclave vessels and all penetrations out to the isolation valves provide containment for the remote possibility of a UF_6 release, while the UF_6 is being heated and transferred. During the original certification review, NRC determined that autoclave design improvements were needed. These improvements include the ability to test the containment valves, replacing all containment valves that are not fail-safe, and providing adequate operator alarms. Although these design improvements enhance the assurance of safety, the current autoclave design, in conjunction with compensatory measures imposed by NRC, provided adequate assurance of safe operation until the autoclave upgrades were completed. USEC completed all required actions under this issue for the Paducah plant, and NRC has verified completion. For the Portsmouth plant, however, this issue remains open. USEC has completed all the required upgrades to the autoclaves, except for autoclaves 3 and 4 in Building X-343, which USEC no longer operates, because of the termination of commercial operations at Portsmouth. Because the Justification for Continued Operation of these autoclaves without being upgraded has

expired, USEC may not operate these autoclaves until the upgrades are completed. On August 11, 2000, USEC submitted an amendment request to DOE to exclude these two autoclaves from the scope of the Compliance Plan issue. On February 20, 2001, DOE, in response to USEC's request, agreed to suspend the autoclave upgrades from the Compliance Plan, but declined to approve deletion, in order that USEC be responsible for the upgrades if the autoclaves are, in the future, determined to be needed. Therefore this issue remains open pending DOE and a subsequent NRC approval of the amendment request.

STATUS OF PADUCAH COMPLIANCE PLAN

As of September 30, 2003, all 53 issues listed in the Paducah Compliance Plan have been completed (i.e., USEC has informed NRC that it has fulfilled all the individual actions described in a Compliance Plan issue), confirmed by NRC by inspection as needed, and closed. Of the total of 53 issues that USEC has completed, four issues were completed during the reporting period that spans from October 1, 1998, to September 30, 2003. These four issues, along with a description of the corrective actions USEC took, are discussed below:

- Procedures Program - USEC completed a comprehensive process to update existing plant procedures, develop new procedures, and implement these changes. This process included the creation or update of procedures required to comply with TSRs and to properly implement other Compliance Plan items like the Quality Assurance Program. Procedures designated as In-Hand and those involving liquid UF_6-handling activities were also reviewed and updated.

- Seismic Capability of Buildings C-331 and C-335 - During DOE's review and update of the SAR for Paducah, it was found that a significant number of piping attachments and two of the main process buildings could suffer significant damage from an earthquake of lower intensity than the evaluation basis earthquake. USEC submitted an updated seismic risk analysis to quantify these risks and determine the structural upgrades needed to improve the seismic resistance of these components. Based on these results, USEC completed significant modifications that included seismically supporting process equipment such as pumps, condensers, accumulators, and connecting piping. The process buildings were also upgraded by adding structural reinforcements to columns and column junctions.

- Criticality Accident Alarm System (CAAS) - Horn Audibility - USEC completed plant modifications to ensure that the CAAS horns are capable of being heard throughout the affected areas of the process buildings. These modifications included installation of air/electrical operated horns, functional testing of these systems, and implementation of maintenance and surveillance programs.

- Criticality Accident Alarms for Nearby Buildings - Criticality alarms must annunciate in nearby buildings. Several buildings did not have evacuation horns and lights that activated when the alarm in a nearby building was activated. USEC installed evacuation horns and/or lights in the unalarmed buildings that were within the evacuation zone of alarmed buildings.

STATUS OF PORTSMOUTH COMPLIANCE PLAN

Of the 46 issues listed in the Portsmouth Compliance Plan, 45 have been completed (i.e., USEC has informed NRC that it has fulfilled all the individual actions described in a Compliance Plan issue), confirmed by NRC by inspection as needed, and closed. The incomplete issue, as discussed above, involves upgrading two autoclaves at the Portsmouth GDP that are no longer in use. Of the 45 issues that have been completed, eight issues were completed during the reporting period that spans from October 1, 1998, to September 30, 2003. These eight issues, along with a description of the corrective actions USEC took, are discussed below:

- Nuclear Criticality Safety Approval (NCSA) and Evaluation (NCSE) Documents - The nuclear criticality safety (NCS) program at the Portsmouth GDP was significantly upgraded and improved by completing formal NCSAs and NCSEs for all plant operations involving uranium enriched to 1 wt% or higher in U^{235} and 15 grams (0.53 oz) or more of U^{235}. In addition, all administrative aspects of the NCS program have been improved by establishing a documentation and procedures program.

- NCSA Implementation - USEC completed a comprehensive corrective actions program to review all NCSAs, to identify conditions, specifications and controls needed, and to verify their full implementation. The program focused on developing procedures for all fissile material operations and verifying their consistency with the appropriate NCSA. USEC also established procedures for the Plant Operations Review Committee (PORC) to review and approve all NCS-related changes to plant activities or plant configuration. The PORC will verify that these plant modifications can be performed safely.

- Plant Changes and Configuration Management - In the years preceding the 5-year period covered by this report, USEC stated that all actions related to this issue had been completed. However, USEC subsequently discovered deficiencies in the implementation of this issue and needed to reopen this issue. USEC requested, and was granted, an extension of the due date for this issue to November 15, 2002. During the extension, USEC completed identification of all augmented quality-nuclear criticality safety (AQ-NCS) items under the Configuration Management Program and completed the flow-down of commitments from TSR Section 3.0 for plant procedures and training.

- Posting of Radioactive Materials - USEC made a complete characterization of all leased areas within the site boundary. All areas have been characterized and posted according to the type, extent, and amount of radioactive material present.

- Records Management and Document Control Program - USEC performed significant upgrades to this program at Portsmouth. All the site's records and documents are now maintained in retrievable form, including documents that support the plant safety basis. Records are protected against damage, deterioration, or loss. A comprehensive, centralized records management program is now in place, which identifies, captures and maintains necessary documents.

- Procedures Program - USEC completed a comprehensive process to update existing plant procedures, develop new procedures, and implement these changes. This process included the creation or update of procedures required to comply with TSRs

- and to properly implement other Compliance Plan items like the Quality Assurance Program. Procedures designated as In-Hand and those involving liquid UF_6- handling activities were also reviewed and updated.

- Receipts Based on Measured Values - USEC successfully completed all pending items for this proprietary issue of its MC&A program. NRC has verified completion and has closed this item.

- Possession of Uranium Enriched Greater than 10 wt % U^{235} - USEC completed all pending items for this proprietary issue of its MC&A program. NRC has verified completion and has closed this item.

CHAPTER 4

HEALTH, SAFETY, AND ENVIRONMENTAL STATUS

NRC has responsibility for assuring that the health and safety of the public and the workers at the GDPs are protected from hazards involving radioactive material. NRC regulation 10 CFR 76.60 requires USEC to comply with applicable sections of 10 CFR Part 20, "Standards for Protection Against Radiation." HS&E conditions are reflected in radiation doses received by workers and radioactive effluents. This chapter contains information relating to the HS&E conditions for the leased areas of the GDPs under NRC regulatory oversight. For a discussion of the HS&E conditions in the non-leased areas under DOE regulatory oversight, see the DOE report entitled “Department of Energy Annual Report on the Status of Environmental, Safety, and Health Conditions at the Paducah and Portsmouth Gaseous Diffusion Plants for Fiscal Year 2002,” DOE/ORO-2142, July 2003. DOE has also issued similar reports for the previous 4 fiscal years (FYs) covered by this report.

Both the Paducah and Portsmouth GDPs monitor air and water emissions to the environment and maintain environmental dosimeters to monitor gamma radiation levels both onsite and offsite. The most recent data from the environmental dosimeters show that ambient gamma exposure levels at the site boundaries for both Paducah and Portsmouth are very small and well within regulatory limits. Maximum annual doses to the nearest offsite individuals from exposure to radioactive effluents, for calendar years (CYs) 1999 through 2002, are calculated to be no more than 0.0017 milliSievert (mSv) [0.17 millirem (mrem)] at Paducah, and 0.0028 mSv (0.28 mrem) at Portsmouth. These values are far below the NRC regulatory limit of 1 mSv/year (100 mrem/year), for members of the public, specified in Part 20. The following table provides the maximum offsite individual doses for CYs 1999 - 2002 for Paducah and Portsmouth:

Table 1. Maximum Offsite Individual Doses, Paducah and Portsmouth, 1999 - 2002

Calendar Year	**Paducah Maximum Offsite Doses, mSv (mrem)**	**Portsmouth Maximum Offsite Doses, mSv (mrem)**
1999	0.00011 (0.011)	0.0028 (0.28)
2000	0.000039 (0.0039)	0.00039 (0.039)
2001	0.0017 (0.17)	0.00052 (0.052)
2002	0.00040 (0.040)	0.00026 (0.026)

The maximum cumulative doses from plant effluents, to the population within a 80-kilometer [km (50-mile)] radius, for Paducah and Portsmouth, for CYs 1999 - 2002 have also been very low and are given in the following table:

Table 2. Cumulative 80-km (50-mile) Population Doses, Paducah and Portsmouth, 1999 - 2002

Calendar Year	Paducah Cumulative 80-km (50-mile) Population Doses, person-Sv (person-rem)	Portsmouth Cumulative 80-km (50-mile) Population Doses, person-Sv (person-rem)
1999	0.00065 (0.065)	0.010 (1.0)
2000	0.00033 (0.033)	0.0015 (0.15)
2001	0.011 (1.1)	0.0018 (0.18)
2002	0.0020 (0.20)	0.00095 (0.095)

Although the maximum individual and cumulative population doses have been very low, they have varied significantly. This is attributable to the dominating effect of non-routine releases, and the conservative manner in which these releases are estimated.

Cumulative occupational and maximum individual occupational radiation exposure doses for both plants, for CYs 1999 - 2002, are provided in the following table:

Table 3. Cumulative and Maximum Individual Occupational Doses, Paducah and Portsmouth, 1999 - 2002

Calendar Year	Paducah		Portsmouth	
	Cumulative Occupational Doses, person-Sv (person-rem)	Maximum Individual Occupational Doses, mSv (mrem)	Cumulative Occupational Doses, person-Sv (person-rem)	Maximum Individual Occupational Doses mSv (mrem)
1999	0.136 (13.6)	3.59 (359)	0.065 (6.5)	1.83 (183)
2000	0.125 (12.5)	2.45 (245)	0.159 (15.9)	1.73 (173)
2001	0.061 (6.1)	2.26 (226)	0.042 (4.2)	1.76 (176)
2002	0.134 (13.4)	3.58 (358)	0.072 (7.2)	3.16 (316)

The maximum occupational dose received by a worker at either plant, for calendar years 1999 - 2000, was 3.59 mSv (359 mrem) for an individual at Paducah in 1999. Average occupational radiation exposure per person per year for personnel in the USEC radiation protection program at Paducah was 0.0457 mSv (4.57 mrem) in CY 1999; 0.0472 mSv (4.72 mrem) in CY 2000; 0.0295 mSv (2.95 mrem) in CY 2001; and 0.0614 mSv (6.14 mrem) in CY 2002. The slight increase in 2002 was probably because of the additional work involved in

upgrading the plant to produce higher enrichments. For personnel in the USEC radiation protection program at the Portsmouth GDP, average occupational radiation exposure per person per year was 0.0252 mSv (2.52 mrem) in CY 1999; 0.0669 mSv (6.69 mrem) in CY 2000; 0.0216 mSv (2.16 mrem) in CY 2001; and 0.0480 mSv (4.80 mrem) in CY 2002. The slight increase in 2002 may be related to additional work performed to remove uranium deposits from the cascade. The data indicate that, for these years, individual worker exposure has not exceeded 5 mSv (500 mrem), which is the administrative control level the plants use. These values are within the historical ranges for the sites and well within the NRC regulatory limit of 50 mSv/year (5000 mrem/year) specified in Part 20 for individuals. There were no instances where Part 20 individual limits for workers, including the 10 milligram (0.000353 oz) per week intake of soluble uranium, were exceeded.

There are a number of HS&E improvements that USEC has completed. Some of these improvements are included in the Compliance Plans and some of the HS&E improvements were initiated by USEC and are neither required by NRC nor included in the Compliance Plans. Improvements made by USEC include the following:

Nuclear Safety

- USEC completed the seismic upgrade project at Paducah GDP. This upgrade modified two main process buildings to eliminate the potential for failure at earthquake levels below the Evaluation Basis Earthquake.

- USEC implemented the compensatory security measures ordered by NRC at both the Paducah and Portsmouth GDPs. USEC increased security staffing, modified security procedures and training requirements, and installed physical security improvements, in response to the NRC's June 17, 2002, orders.

- USEC implemented updated SARs at both the Paducah and Portsmouth GDPs. This completed the Compliance Plan issues that required USEC to update the Application SARs based upon the 1997 DOE site-wide Final Safety Analysis Report upgrade.

- USEC completed the rewrite of the Application facility and process descriptions for both the Paducah and Portsmouth GDPs. This rewrite systematically reviewed, updated, and confirmed the information contained in Chapter 3 of the Application SARs.

- USEC upgraded NCS analyses and installed additional quality related components to support the increase in the Paducah GDP's NRC-authorized assay level from 2.75 wt% to 5.5 wt% U^{235}.

- USEC completed all remaining open Compliance Plan Issues at both the Paducah and Portsmouth GDPs (with the exception of upgrades for 2 autoclaves at the Portsmouth GDP which are no longer used).

Industrial Safety

- USEC enhanced chlorine leak detection capability at the Paducah GDP.

- USEC expanded its asbestos abatement efforts in the Paducah steam plant.

- USEC worked with DOE to investigate the extent of beryllium contamination at both the Paducah and Portsmouth GDPs.

Radiation Protection

- USEC decontaminated additional areas at both the Paducah and Portsmouth GDPs.
- USEC continued to reduce the generation of radioactive and mixed waste at both the Paducah and Portsmouth GDPs.
- Under a contract with DOE, USEC characterized, packaged, and disposed of 7110 cubic meters (251,000 cubic feet) of crushed UF_4 drums at the Paducah GDP.

CHAPTER 5

CERTIFICATION ACTIVITIES

AMENDMENTS TO THE CERTIFICATES OF COMPLIANCE

10 CFR 76.45 describes the process for amending the certificates to cover new or modified activities or to change commitments in the Compliance Plan. During this reporting period, NRC completed a rulemaking process that modified 10 CFR 76.45 to simplify the process for issuing certificate amendments. Under the new amendment process, which became effective on September 16, 1999, NRC is no longer required to first determine whether the amendment is significant (e.g., margin of safety is reduced), and, if so, issue a notice of consideration in the **Federal Register**. Instead, NRC conducts its review of the amendment request without delay. If NRC approves the amendment request, it is made effective on a date specified by the NRC staff. If the amendment request is not approved, USEC is informed in writing. NRC may, at its discretion, publish notice of its decision to either grant or deny an amendment in the **Federal Register**. USEC, or any person whose interest may be affected by NRC's decision on the amendment, may file a petition requesting the Director of the Office of Nuclear Material Safety and Safeguards to review the staff's decision. USEC, or any person who filed a petition for a Director's review, may also file a petition requesting the Commission's review of a Director's decision regarding an amendment request.

Since renewed certificates were last issued on January 29, 1999, through September 30, 2003, NRC approved 37 certificate amendment requests for Paducah and 25 for Portsmouth. Some of the requests were submitted in conjunction with the resolution of issues contained in the Compliance Plans, such as the updated SARs for both plants. DOE reviews and approves those amendment applications that request revision to the Compliance Plans, before they are submitted to NRC by USEC, to assure that the Compliance Plans remain DOE-prepared plans, as required by the statute.

HIGHER ASSAY UPGRADE PROJECT

One significant certificate amendment approved during this reporting period was the approval of the Higher Assay Upgrade Project at the Paducah GDP. Before approval of this amendment on March 19, 2001, the Paducah GDP enriched uranium up to a maximum assay of 2.75 wt% U^{235} and shipped this material to the Portsmouth GDP to be further enriched up to as much as 5.0 wt%. Because of economic reasons, USEC decided to stop enrichment operations at the Portsmouth facility and increase the enrichment capabilities of the Paducah facility. USEC submitted, to NRC, a certification amendment request dated October 20, 2000, asking to increase Paducah's assay limit from 2.75 wt% to 5.5 wt%.

The staff: (1) reviewed 48 pairs of NCSAs and NCSEs; (2) performed onsite reviews; (3) developed Requests for Additional Information (RAIs); (4) reviewed the RAI responses; (5) requested changes to NCSAs and NCSEs; and (6) reviewed the revised NCSAs and NCSEs. In the process of conducting its review, the staff noted some deficiencies in USEC's NCS documentation for the increased assay. USEC resolved these deficiencies by modifying the documentation. The staff found the revised documentation adequate to support assay at up to 5.5 wt%.

In addition to the licensing review, NRC conducted an operational readiness review inspection from February 20 through March 2, 2001. The results of the inspection were that USEC had met all the inspection objectives and that the facility was prepared to safely operate at enrichments up to 5.5 wt% of U^{235}.

INTERIM COMPENSATORY MEASURES ORDERS

In response to the terrorist attacks of September 11, 2001 and the intelligence information subsequently obtained, NRC issued a number of safeguards and threat advisories to its certificate holders and licensees, to strengthen their capabilities and readiness to respond to a potential attack on a nuclear facility. In addition, NRC began a comprehensive review of its safeguards and security programs and requirements. As a result of these efforts and an evaluation of current security requirements in place at the Paducah and Portsmouth GDPs, NRC determined that USEC needed to put into place certain compensatory measures to address the current threat environment. On June 17, 2002, NRC issued orders to USEC that modified its current certificates of compliance to impose certain interim safeguards and security measures. USEC has implemented all these compensatory measures for both GDPs, and NRC has confirmed their implementation by inspection.

RECERTIFICATION

USEC submitted its applications for renewal to NRC on April 11, 2003. The renewal applications did not contain any changes to the existing documentation, other than updates to the Depleted Uranium Management Plan and Decommissioning Funding Program. The application was based on USEC's initial applications, as revised to reflect authorized USEC self-approved changes and NRC-approved amendments. USEC incorporated by reference previous applications, statements, and reports into the renewal application. The NRC staff has completed its review of USEC's applications, considered public comments received, and consulted with the U. S. Environmental Protection Agency (EPA) as required. The NRC staff has prepared Compliance Evaluation Reports (CERs) for both Paducah and Portsmouth, that conclude that the applications, including the Compliance Plans, fulfill the requirements of Part 76 and should be approved. The renewed Certificates of Compliance will be issued for a period of 5 years, ending on December 31, 2008, after issuance of this report.

CHAPTER 6

INSPECTIONS

Part 76, Subparts F and G; 10 CFR 76.70; 10 CFR 76.72; 10 CFR Part 95; and 10 CFR Part 2 address NRC inspections of the GDPs, violations of NRC regulations, and civil penalties. These regulations implement NRC authority to take enforcement action for violations of the AEA, NRC regulations, or conditions of a certificate, Compliance Plan, or Order. Further, these regulations state that NRC may impose civil penalties for certain violations of NRC regulations.

Violations of NRC regulations are classified into one of four severity levels, with Severity Level I being assigned to violations that are most significant and Severity Level IV being assigned to violations that are least significant. Further, there are other violations of minor safety or environmental significance that are below the level of significance of Severity Level IV violations. These violations, which must meet certain criteria, are not usually the subject of formal enforcement action. To the extent such violations are described in NRC inspection reports, they are noted as non-cited violations (NCVs). A group of Severity Level IV violations may be evaluated in the aggregate and assigned a single, increased severity level (Severity Level III) if the violations have the same underlying cause or programmatic deficiencies. More information about NRC's Enforcement Policy is provided in NUREG-1600, Rev.1, "General Statement of Policy and Procedures for NRC Enforcement Actions," and NUREG/BR-0195, Rev. 1, "NRC Enforcement Manual."

During the 5-year reporting period from October 1, 1998, to September 30, 2003, NRC performed 150 inspections overall, at both Paducah and Portsmouth, totaling 37,213 inspection-hours. These inspections include the activities of two resident inspectors at each GDP site and specialist inspections by inspectors from NRC's Region III office and NRC's Headquarters office. These inspection efforts identified a total of 168 violations at both GDPs. Except for six special inspections, two at Paducah, and four at Portsmouth, all the inspections were routine inspections. The number of inspections conducted per FY at both GDPs, and the number of inspection-hours spent, are shown in the following table:

Table 4. Number of Inspections and Inspection-Hours Spent per FY at Paducah and Portsmouth GDPs

FY	Number of inspections	Number of inspection-hours
1999	42	10,353
2000	37	8,202
2001	23	6,224
2002	27	6,657
2003	21	5,777
Total:	**150**	**37,213**

The majority of the violations were in the areas of plant operations, criticality safety, security, and maintenance and surveillance. Most violations at both plants involved procedural violations, for either implementing incorrect procedures or failing to follow procedures. Most violations were either Severity Level IV or NCVs, except for seven more severe violations, which are discussed below:

Paducah

- A Severity Level II violation was identified at Paducah for discrimination against a company employee for engaging in protected activities, which is specifically prohibited in 10 CFR 76.7(a). This violation involved a plant supervisor being transferred to a lower non-managerial position as a result of expressing nuclear safety concerns to his supervisor. This violation resulted in a $88,000 civil penalty.

- Two Severity Level III violations, with no civil penalty assessed, were identified at Paducah for a failure to control classified information. These violations stemmed from an incident involving the production of classified information in an unapproved information system, and failure to report the security infraction immediately to either plant management or NRC, as required by plant procedures.

- A Severity Level III violation, with no civil penalty assessed, was identified at Paducah for discrimination against a company employee for engaging in protected activities, which is specifically prohibited in 10 CFR 76.7(a). This violation was issued as a result of threatening comments a supervisor made to another employee about a classified information security incident.

- A Severity Level III violation, with a $60,000 civil penalty, was issued to Paducah for repeated failure to control classified information. This violation involved failure to properly secure and store classified information, and producing classified information in unsecured information systems.

Portsmouth

- A Severity Level III violation was identified at Portsmouth for failure to classify an emergency situation as an Alert. On December 9, 1998, a substantial fire occurred, that involved the process UF_6 cascade and had the potential to release hazardous materials to the environment. The event was not properly classified as an Alert, as required by the plant's Emergency Plan (EP). This violation resulted in a $55,000 civil penalty.

- A Severity Level III violation was identified at Portsmouth related to NCS controls. The violation occurred when the TSRs for maintaining NCS controls were not met. No civil penalty was issued for this violation.

For these violations, and all other ones identified during inspections, USEC either took immediate corrective actions to bring the facility back into compliance with NRC regulations or implemented comprehensive corrective action plans (CAPs).

INSPECTION SUMMARY FOR PADUCAH

During the period of October 1, 1998, through September 30, 2003, NRC Headquarters and regional personnel, including resident inspectors, conducted 71 routine inspections and two special inspections at the Paducah GDP, totaling 18,928 inspection-hours. The following table shows the number of inspections and inspection-hours spent for each FY covered by the reporting period:

Table 5. Number of Inspections and Inspection-Hours Spent per FY at the Paducah GDP

FY	Number of inspections	Number of inspection-hours
1999	18	3,693
2000	18	4,385
2001	10	3,453
2002	13	3,484
2003	14	3,913
Total:	**73**	**18,928**

These inspections were focused on the areas of: (1) plant operations; (2) plant maintenance; (3) plant support; (4) engineering; (5) fire safety; (6) chemical process safety; (7) NCS; (8) MC&A; and (9) security of classified information. The first special inspection had the purpose of evaluating the plant's radiation protection program. This special inspection, which was conducted at both the Paducah and Portsmouth GDPs, was conducted as a result of allegations regarding concerns relating to DOE legacy radiological materials. The second special inspection was an operational readiness inspection conducted to verify the completion of the Higher Assay Upgrade Project and to determine Paducah's readiness to operate at the requested higher enrichment level.

The inspections resulted in one Severity Level II violation, four Severity Level III violations, and 47 Severity Level IV violations. The inspections also identified 41 NCVs. The following table illustrates the number of violations in each FY covered by the reporting period:

Table 6. Number of Violations Identified per FY at the Paducah GDP

FY	Number of violations
1999	24
2000	18
2001	15
2002	19
2003	17

The total number of violations identified at Paducah for the previous two annual reporting periods of March 3, 1997, through September 30, 1997, and October 1, 1997, through September 30, 1998, were 35 violations and 47 violations, respectively. The totals for this 5-year reporting period reflect a decline in the number of violations identified per FY at this facility, but appear to have stabilized at the current level.

There were a total of 93 violations identified at Paducah. Most of the violations were identified in the areas of plant operations, NCS, security, and maintenance and surveillance activities. Specifically, 23 violations were identified in plant operations. These violations were mostly procedural violations; plant personnel either failed to follow procedures or implemented incorrect procedures. There were 18 violations in the area of NCS, also mostly procedural violations. Nineteen violations were identified in the area of security. Most of the security violations consisted of failure to properly secure and safeguard classified information. In other instances, violations concerned individuals without proper security clearances. Finally, 16 violations were identified in the areas of maintenance and surveillance. These 16 violations were mostly for procedural violations or ineffective corrective actions.

In addition, violations were also identified in the areas of: (1) radiation protection; (2) management organization and controls; (3) training; (4) fire protection; and (5) MC&A. A total of 17 violations was identified in these areas, most of them resulting from failure to follow plant procedures.

INSPECTION SUMMARY FOR PORTSMOUTH

During the period of October 1, 1998, through September 30, 2003, NRC Headquarters and regional personnel, including resident inspectors, conducted 73 routine inspections and four special inspections at the Portsmouth GDP. These inspections totaled 18,285 inspection-hours. The following table shows the number of inspections and inspection-hours spent for each FY covered by the reporting period:

Table 7. Number of Inspections and Inspection-Hours Spent per FY at the Portsmouth GDP

FY	Number of inspections	Number of inspection-hours
1999	24	6,660
2000	19	3,817
2001	13	2,771
2002	14	3,173
2003	7	1,864
Total:	**77**	**18,285**

These inspections were focused on the areas of: (1) plant operations; (2) plant maintenance; (3) plant support; (4) engineering; (5) fire safety; (6) chemical process safety; (7) NCS; (8) MC&A; and (9) security of classified information.

Of the four special inspections conducted at Portsmouth during this reporting period, two were conducted to assess the plant's emergency response to a fire in one of the process buildings. Another special inspection was conducted to verify completion of corrective actions regarding NCS issues identified during the previous reporting period. The last special inspection, conducted at both the Paducah and Portsmouth GDPs, had the purpose of evaluating the plants' radiation protection programs. This special inspection was conducted as a result of allegations about concerns related to DOE legacy radiological materials.

The inspections resulted in two Severity Level III violations, and 68 Severity Level IV violations. The inspections also identified five NCVs. The following table illustrates the number of violations in each FY covered by the reporting period:

Table 8. Number of Violations Identified per FY at the Portsmouth GDP

FY	Number of violations
1999	31
2000	9
2001	20
2002	9
2003	6

The total number of violations identified at Portsmouth for the previous two annual reporting periods of March 3, 1997, through September 30, 1997, and October 1, 1997, through September 30, 1998, were 30 violations and 55 violations, respectively. The totals for this reporting period reflect a decline in the number of violations identified per FY at this facility.

A total of 75 violations was identified at the Portsmouth GDP. Most of the violations were identified in the areas of plant operations, NCS, and maintenance and surveillance activities. Specifically, 23 violations were identified in plant operations activities. These violations were mostly procedural violations; plant personnel either failed to follow procedures or implemented incorrect procedures. There was also one instance of improper implementation of the requirements of 10 CFR 76.68 for evaluating and self-approving plant changes. There were 16 violations in the area of NCS. These involved procedural violations, inadequate changes to plant procedures, and failure to implement adequate corrective actions for the NCS program. Finally, 17 violations were identified in the area of maintenance and surveillance. These 17 violations were mostly for procedural violations or ineffective corrective actions.

In addition, a smaller number of violations were also identified in the areas of: (1) security; (2) radiation protection; (3) emergency preparedness; (4) management organization and controls; (5) training; (6) chemical safety; (7) environmental protection; (8) waste management; and (9) MC&A. A total of 19 violations was identified in these areas, most of them resulting from failure to follow plant procedures. There were four violations related to security, and those involved failure to follow plant procedures or to properly secure and safeguard classified information.

CHAPTER 7

EVENT REPORTS

Section 76.120 of Part 76, describes the requirements for reporting certain events to NRC. The regulations specify events that must be reported to NRC within three different time limits and describe the contents and schedule for submitting written follow-up reports. USEC is required to report any criticality event, loss of special nuclear material, or emergency conditions that have been declared an alert or site area emergency, to the NRC Operations Center, within 1 hour after discovery. Events that prevent immediate protective actions necessary to avoid releases or exposures to radiation or radioactive materials that could exceed regulatory limits must be reported to the NRC Operations Center within 4 hours after discovery. The third reporting requirement specifies that: (1) certain contamination events; (2) failure of certain TSR-required safety equipment with no backup equipment available; (3) fires or explosions that damage radioactive material or containers holding radioactive material; and (4) events that require offsite medical treatment of a contaminated person, must be reported to the NRC Operations Center within 24 hours. USEC reports losses and compromises or possible compromises of classified information or materials as required by 10 CFR 95.57. Although not required by 10 CAR Part 76, USEC also reports safety system actuations, notifications made to other State and Federal agencies, and loss of contingency for NCS. DOE has a separate event reporting system for DOE-regulated operations, and DOE statistics are not included in this summary.

A summary of event reports for events that occurred between October 1, 1998, and September 30, 2003, is provided next.

EVENT NOTIFICATION SUMMARY FOR PADUCAH

A total of 253 events was reported during this reporting period at the Paducah GDP. Of these, 25 events were either: (1) retracted by USEC as not meeting the reporting criteria; or (2) classified as primarily reportable to another Federal or State agency, rather than NRC. Therefore, USEC reported a total of 228 NRC-reportable events to NRC during the reporting period. The majority of these 228 events involved classified information security and NCS issues. Table 9 illustrates the number of events reported per FY at the Paducah GDP for the 5-year period covered by this report:

Table 9. Number of Events Reported to NRC per FY at the Paducah GDP

FY	Number of Events Reported
1999	83
2000	60
2001	36
2002	28
2003	21

The information in this table illustrates a decreasing number of events reported each year. This decrease in the number of events reported reflects, to some extent, progress in correcting identified deficiencies, improvement in plant performance, and the effectiveness of corrective actions. There have also been changes in event reporting criteria which have reduced the frequency of some types of event reports.

There were 113 events reported related to security of classified information. Most of these events involved classified information that was improperly secured and potentially compromised. There were also cases involving personnel with improper security clearances. In the area of NCS, there were a significant number of events reported, most of which involved loss of an NCS control reportable under NRC Bulletin 91-01, "Reporting Loss of Criticality Safety Controls." A total of 65 events was reported under this requirement, which requires reporting to NRC any loss or degradation of a single NCS control. For the majority of these events, the safety significance was minimal because of the maintenance of at least one of the two controls normally required. In addition, there were several instances in which the CAAS was declared inoperable. These were caused by loss of air to the alarm horns or loss of power. There were also instances in which safety equipment TSR required to be available and operable failed or was discovered to be not in a ready-to-use condition. There were 23 events of this kind reported, mainly related to autoclaves, UF_6 release detection systems, and fire protection equipment failures. Autoclave-related events consisted of actuations of autoclave safety systems or failures of autoclave subsystems. Events related to UF_6 release detection systems mainly consisted of detector head failures or inadvertent actuations of the alarm system. There were also events reported for cases in which fire protection equipment was declared inoperable. These incidents were mainly caused by corroded sprinkler heads.

USEC also reported 15 safety equipment actuation events, two instances in which transportation packages exceeded external contamination limits, one event in which a UF_6 shipment was not shipped according to the transportation package's certificate of compliance, and one event in which a Normetex pump tripped, resulting in exceeding a safety limit and a safety system actuation. There were no events at Paducah that were declared as an "Alert" or "Site Area Emergency," or required the activation of the Emergency Operations Center (EOC).

If the event notification involved a noncompliance with NRC regulations, USEC took actions to assure that compliance was promptly reestablished.

EVENT NOTIFICATION SUMMARY FOR PORTSMOUTH

A total of 268 events was reported during this reporting period at the Portsmouth GDP. Of these, 40 events were either: (1) retracted by USEC as not meeting the reporting criteria; or (2) classified as primarily reportable to another Federal or State agency, rather than NRC. Therefore, USEC reported a total of 228 NRC-reportable events to NRC during the reporting period. The majority of these 228 events resulted from NCS and classified information security issues. Table 10 illustrates the number of events reported per FY at the Portsmouth GDP for the 5-year period covered by this report:

Table 10. Number of Events Reported to NRC per FY at the Portsmouth GDP

FY	Number of events reported
1999	77
2000	64
2001	50
2002	24
2003	13

The information in this table illustrates a decreasing number of events reported each year. This decrease in the number of events reported reflects, to some extent, progress in correcting identified deficiencies, improvement in plant performance, and the effectiveness of corrective actions. There have also been changes in event reporting criteria which have reduced the frequency of some types of event reports.

In the area of NCS, there were a significant number of events reported, most of which involved loss of a NCS control reportable under NRC Bulletin 91-01. A total of 101 events was reported under this requirement, which requires USEC to report to NRC any loss or degradation of a single NCS control. In addition, there were several instances in which the CAAS was declared inoperable. These were caused by loss of air to the alarm horns or loss of power. There were 69 events reported related to security of classified information. Most of these events involved classified information that was improperly secured and potentially compromised. There were also cases involving personnel with improper security clearances. In addition to these, there were several instances in which safety equipment TSR required to be available and operable failed or was discovered to be not in a ready-to-use condition. There were 13 event reports of this kind, which were mainly related to autoclaves, UF_6 release detection systems, and fire protection equipment failures. Autoclave-related events consisted of actuations of autoclave safety systems or failures of autoclave subsystems. Events related to UF_6 release detection systems mainly consisted of detector head failure or inadvertent actuation of the alarm system. There were also events reported for cases in which fire protection equipment was declared inoperable. These reports were for corroded fire sprinkler heads in the process buildings.

During the reporting period, there were two events classified as “Alerts.” The first event involved a fire, at one of the process buildings, that caused damage to the UF_6 gas cascade boundary and caused the release of a small amount of radioactive material. However, releases were well below NRC regulatory limits. NRC conducted a special inspection to evaluate USEC’s response to the accident and to evaluate the direct cause of the event. The inspection identified a USEC violation regarding failure to declare the event as an “Alert” and not activating the onsite EOC. As a result, USEC implemented comprehensive corrective actions to its emergency response programs. The second “Alert” was reported after all the site’s criticality accident alarms were declared inoperable. USEC declared all alarms inoperable after plant

staff determined that all the alarms were calibrated improperly. The EOC was immediately activated. The “Alert” was terminated after all alarms were properly calibrated.

In addition to these, several additional events were reported. USEC reported 32 safety equipment actuation events and two instances in which transportation packages exceeded external contamination limits.

If the event notification involved a noncompliance with NRC regulations, USEC took actions to assure that compliance was promptly reestablished.

CHAPTER 8

REGULATORY ACTIVITIES

RULEMAKING

Before the starting date of this reporting period on October 1, 1998, NRC initiated rulemaking to revise Part 76. This rulemaking had the objective of improving the processes for reviewing and acting on certificate amendment and renewal requests, to make them more efficient and effective. The specific revisions to Part 76 included: (1) modifying the processes for certificate renewals and amendments; (2) revising the appeal process for amendments; (3) eliminating the significance determination for amendments; (4) simplifying the criteria for persons who are eligible to file a petition for review of an amendment action; (5) removing references to the initial application because the initial certificates had been issued; and (6) lengthening the time periods for filing a petition for review. The proposed rulemaking was published in the **Federal Register** for public comment on September 15, 1998 (63FR49301). The comment period ended on November 16, 1998. NRC received only two minor comments regarding the proposed rule. The final rule was published in the **Federal Register** on August 17, 1999 (63FR44645), and was made effective on September 16, 1999.

EMERGENCY PREPAREDNESS EXERCISES

Under the requirements of 10 CFR 76.91, “Emergency Planning,” USEC is required to conduct biennial onsite exercises at both GDPs to test response to simulated emergencies. Participation of offsite response organizations, although recommended, is not required. Several emergency preparedness exercises were conducted at both plants from October 1, 1998, to September 30, 2003, and are discussed below.

Two full-scale emergency preparedness exercises were conducted at the Paducah GDP during this reporting period. The first exercise was conducted on September 21, 2000. The second one was conducted on July 15, 2003.[3] NRC inspectors observed both exercises, and NRC Headquarters staff participated in the second drill. The response organizations of the State of Kentucky and the County of McCracken participated in the first exercise. The purpose of these exercises was to test the plant’s capabilities to implement its EP, including the response of the various participants and the effectiveness of the information flow from the Paducah EOC. Overall performance during these exercises demonstrated that the onsite EP was effective, and that the staff was capable of implementing the EP by: (1) correctly classifying scenario emergencies; (2) notifying offsite agencies of the event; (3) activating emergency response personnel and facilities; (4) providing protective action recommendations when warranted; and (5) taking accident mitigation actions.

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[3] On October 22, 2002, NRC issued an exemption, to USEC, from the requirement to perform biennial emergency exercises, to allow postponement of the exercise scheduled for November 13, 2002, to the summer of 2003, so as to not interfere with higher-priority efforts to implement enhanced plant security measures required by the NRC Order issued on June 17, 2002.

Two emergency preparedness exercises were conducted at the Portsmouth GDP during this reporting period. The first exercise was conducted on September 14, 1999. The second exercise was conducted on April 24, 2002.[4] NRC staff participated in the first exercise but did not participate in the second exercise. The first exercise was conducted with full participation of the onsite emergency response organization and partial participation of the State of Ohio and the County of Pike. The overall performance during the exercise was satisfactory, and demonstrated the effectiveness of the site EP, and USEC staff's capability to properly implement it. Another exercise is scheduled to be conducted at the Portsmouth GDP on October 8, 2003, just after the closing date for this reporting period.

AVLIS

The USEC Privatization Act granted USEC the exclusive commercial right to deploy and use Atomic Vapor Laser Isotope Separation (AVLIS) patents, processes, and technical information owned or controlled by the Federal Government, on completion of a royalty agreement with DOE. To the extent requested by USEC before privatization, and subject to the requirements of the AEA, the President was required to transfer title to all the property owned by the United States or under its control that is useful for the development of AVLIS or alternative technologies for enriching uranium.

AVLIS technology involves processing uranium metal alloy feedstock rather than UF_6 gas, through the use of lasers and separator systems. Based on engineering studies, it was expected that an AVLIS facility would use only about 5 percent of the power used by the GDPs, require less capital investment than a new centrifuge plant, and use 20 to 30 percent less uranium to produce comparable amounts of EU.

In July 1994, USEC's Board of Directors authorized USEC management to begin taking steps necessary to commercialize the AVLIS technology. In April 1995, USEC entered into an agreement that provided for the transfer of intellectual and physical property pertaining to AVLIS technology from DOE. By letter dated October 6, 1998, USEC informed NRC that it expected to submit a license application to NRC no earlier than December 1999, to obtain an NRC license to construct an AVLIS facility.

In support of this objective, USEC conducted research and development efforts with several institutions, mostly at Lawrence Livermore National Laboratory in Livermore, California. In June 1999, after conducting comprehensive assessments of the economic viability of this technology, USEC concluded that the risks and capital expenditures of developing and constructing an AVLIS plant outweighed the expected returns. USEC decided to suspend further development of AVLIS enrichment technology.

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[4] On December 7, 2001, NRC issued an exemption, to USEC, from the requirement to perform biennial emergency exercises, to allow postponement of the exercise originally scheduled for September 12, 2001, until no later than April 30, 2002, because of the September 11, 2001, terrorist attacks against the United States.

GAS CENTRIFUGE ENRICHMENT TECHNOLOGY

USEC continues to actively pursue research and development of gas centrifuge technology for uranium enrichment. On June 17, 2002, USEC and DOE signed an Agreement, in which, among other commitments, DOE committed to work with USEC in its development and deployment of an advanced gas centrifuge uranium enrichment plant.

Gas centrifuge technology involves the use of centrifugal forces to achieve the separation and subsequent extraction of uranium enriched in the U^{235} isotope. Similar to the gaseous diffusion process, it employs the use of gaseous UF_6 feedstock. In this process, UF_6 gas is placed in a centrifuge machine consisting of a large vertical rotating cylinder and piping for the feeding of UF_6 and the withdrawal of enriched and depleted UF_6 streams. The cylinder is rotated at high speed to achieve separation of the heavier gas molecules (containing U^{238}) and the lighter gas molecules (containing U^{235}). Several hundred centrifuge machines may be connected in either a series or parallel arrangement to form a cascade to achieve the desired U^{235} assay.

USEC's plan for the development and deployment of gas centrifuge technology consists of three phases:

1. Demonstration Phase - This phase involves obtaining detailed test data on the gas centrifuge machines. On December 20, 2002, USEC signed a lease with DOE for use of centrifuge-related equipment and facilities owned by DOE from its former Gas Centrifuge Program. These facilities are located at the DOE East Tennessee Technology Park site in Oak Ridge, Tennessee. This phase of the project is conducted under DOE's regulatory oversight.

2. Lead Cascade Phase - This phase of the project involves the development, design, installation, and operation of a Lead Cascade Facility. The Lead Cascade is a test and demonstration facility designed to provide reliability, performance, cost, and other data related to the centrifuge machines and auxiliary systems. This information would be used to understand and forecast the operational performance of a full-scale commercial gas centrifuge deployment. This phase of the project will be conducted under NRC's regulatory oversight, once UF_6 gas is introduced.

3. Commercial Deployment Phase - This phase consists of the construction and operation of a commercial gas centrifuge plant. This phase of the project will be conducted under NRC's regulatory oversight.

In December 2002, USEC announced that it would site its Lead Cascade Facility at DOE's Portsmouth GDP, in Piketon, Ohio. The Lead Cascade will operate up to 240 full-scale centrifuge machines in a recycle mode, in which no enriched material is withdrawn, except for laboratory samples, to confirm the enrichment process. On February 11, 2003, USEC submitted an application, to NRC, for a license, under the provisions of 10 CAR Part 70, to possess and use special nuclear, source and byproduct material in the American Centrifuge Lead Cascade

Demonstration Facility (Lead Cascade Phase). The facilities used for the Lead Cascade are part of the former DOE Gas Centrifuge Program; therefore, no new facilities will be constructed.

NRC is currently in the process of reviewing USEC's application for the Lead Cascade, under the guidance of a Part 70 Standard Review Plan. NRC anticipates completing its technical review by February 2004. On April 9, 2003, NRC published in the **Federal Register** (68FR17414), a notice of opportunity to request a hearing within 30 days, on USEC's Lead Cascade application. No petitions for a hearing were received. USEC is expected to announce a site location for the commercial gas centrifuge plant by the end of 2003 and submit a license application for the commercial-scale facility to NRC in late 2004.

CHAPTER 9

NRC CONSULTATION WITH EPA AND DOE

RESULTS OF DOE CONSULTATION

Between FY 1999 and FY 2003, DOE provided NRC with a series of annual reports on the status of HS&E conditions at the Paducah and Portsmouth GDPs to help NRC to prepare this report. DOE issued the first of these reports, "Department of Energy Annual Report on the Status of Environmental, Safety, and Health Conditions at the Paducah and Portsmouth Gaseous Diffusion Plants for Fiscal Year 1999," DOE/ORO-2087, in November 1999. Subsequent reports include the following: DOE/ORO-2104 (FY 2000); DOE/ORO-2120 (FY 2001); DOE/ORO-2142 (FY 2002); and DOE/ORO-2158 (FY 2003) (not yet released).

These DOE reports provide information on the status of the following: (1) HS&E conditions and initiatives in the DOE-managed (non-leased) areas of the GDPs for which DOE retains oversight responsibility; (2) environmental management activities at both GDPs; (3) HEU activities at the Portsmouth GDP; (4) activities for long-term management of DOE-owned DUF_6 and other uranium materials; (5) the DOE Regulatory Oversight Program; (6) the Lease between DOE and USEC; (7) DOE's review of Certificate Amendment Requests (CARs) related to the Compliance Plans; (8) the MOU and other agreements employed by DOE and NRC in their joint oversight of activities at the GDPs; and (9) reportable occurrences related to the non-leased areas of the GDPs.

DOE activities to enhance and improve HS&E conditions at both the Paducah and Portsmouth GDPs between October 1, 1998, and September 30, 2003, have been numerous and extensive.[5] As input for NRC to use in preparing this report, DOE provided a summary of its activities at the GDPs. This summary is included herein as Appendix C to this report, as provided by DOE.

RESULTS OF EPA CONSULTATION

EPA was provided an opportunity to comment on a preliminary draft of this report, or provide other input. EPA Headquarters consulted with its Regional Offices responsible for Ohio and Kentucky and had no comment because remedial action and environmental compliance issues of concern at the Paducah, Kentucky and Portsmouth, Ohio GDP locations are matters for which DOE has responsibility. EPA was provided with a separate opportunity to provide comments regarding the recertification of the GDPs; it responded by letter stating that EPA had "no official comment."

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[5]DOE integrates HS&E protection into all its projects at the GDPs. DOE HS&E-related activities at the GDPs include: (1) environmental protection; (2) nuclear safety; (3) industrial hygiene; (4) industrial safety; (5) radiation protection; (6) transportation safety; (7) risk management; and (8) occupational medicine.

CHAPTER 10

SUMMARY ASSESSMENT OF PERFORMANCE

The GDPs at Paducah and Portsmouth are more than 40 years old, and have been enriching uranium since the 1950s (In fact, the Paducah plant completed 50 years of continuous enrichment in 2003). They were built at a time when design standards and quality assurance standards were significantly different from current requirements, and documentation requirements were less stringent. The age of the facilities, some poor documentation of design and safety bases, and the requirements in effect when the plants were constructed have resulted in difficulties in maintaining the material condition of the facilities. Although DOE replaced virtually all the uranium equipment at Paducah in a major upgrade project in the 1970s and 1980s, these shortcomings have continued to present a challenge to USEC's performance. However, both the material condition of the plants and the design and safety bases documentation have been substantially upgraded as part of the completion of Compliance Plan requirements, as discussed elsewhere in this report.

During the review period, the Paducah and Portsmouth GDPs have provided adequate protection of HS&E conditions and have generally operated in compliance with NRC regulatory requirements. There were no radiation-related deaths nor illnesses from the use of radioactive materials, and no significant radiation exposures. At both plants, offsite radiological doses, as well as doses to the workers, remained very low, and well within NRC regulatory limits. Neither facility incurred a loss or diversion of certified material, nor were there any nuclear criticality events at either facility. Over the assessment period, the Portsmouth plant stopped uranium enrichment and was placed in a standby condition. As discussed below, a significant event, a fire, occurred at Portsmouth in December 1998.

Overall performance at the Paducah GDP was acceptable. Safety was maintained and materials were safeguarded. Plant operations and engineering staff worked together effectively to identify and correct conditions that could lead to the degradation of safety systems. During the first half of 2003, plant management safely operated the facility during an extended (20-week) strike by operations and maintenance personnel. The quality of procedures and plant staff's adherence to procedures continue to be areas needing improvement.

Paducah plant maintenance and surveillance activities, associated with safety-related systems, structures, and components, were adequate. Continued improvement in the plant staff's handling of shutdown activities was noted during the implementation of large-scale seasonal power reductions. However, the plant staff's implementation of the corrective action program remained an area needing improvement.

The Paducah plant staff effectively implemented security upgrades to the facility in response to the September 11, 2001, terrorist attack on the United States. The staff's identification and control of classified material continues to be an area needing improvement. This long-standing problem, along with issues associated with the plant staff's adherence to procedures, indicate that a continued focus on implementation of the corrective action program is warranted.

Overall performance at the Portsmouth GDP and conduct of plant operations was acceptable. During the review period, the plant staff shut down the plant without incident and effectively placed the cascade in the current standby condition. Improvements continued to be made in the plant staff's adherence to nuclear criticality controls for routine operations, as demonstrated by a reduction in the number of noncompliances that resulted in reportable events. The quality of procedures and plant staff's adherence to procedures continue to be areas needing improvement.

Portsmouth GDP plant maintenance and surveillance activities, associated with safety-related systems, structures, and components, were adequate. The plant staff's implementation of the chemical safety program was effective in ensuring that personnel were not exposed to hazardous chemicals. However, deficiencies continued to be identified in the implementation of the configuration control program, particularly with regard to valve positioning.

The Portsmouth plant staff's safeguarding of nuclear material was adequate. The plant staff's effective implementation of security upgrades in response to the September 11, 2001, terrorist attack on the United States was noteworthy. The plant's implementation of the EP program was adequate. However, the plant staff failed to properly classify an emergency in December 1998, involving a significant fire in one of the cascade buildings, and did not fully activate the emergency response organization. As a result, the plant staff's response to the situation was delayed. This inadequate classification and response to the fire resulted in NRC taking escalated enforcement action. Subsequently, the plant staff implemented effective corrective actions to address the deficiencies that were identified in the post-fire reviews. Continued focus on the plant staff's implementation of the corrective action program is warranted, particularly regarding adherence to plant procedures.

CHAPTER 11

SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS

USEC has made considerable progress in completing issues in the Compliance Plans during this period. USEC's Compliance Plan Status Reports to NRC show that the GDPs at Paducah and Portsmouth are now in compliance with NRC regulations. Exceptions, which are described in the Compliance Plans approved by NRC at the time of original certification, have all been addressed and all actions needed to establish compliance have been completed. For those instances where, during the normal course of operations, violations of NRC regulations occurred, USEC took actions as needed to reestablish compliance, and develop and implement CAPs to prevent recurrence.

USEC is required to comply with all NRC regulations applicable to the GDPs, most specifically Part 76. Other NRC regulations, or portions thereof, that apply include 10 CFR Part 19, "Notices, Instructions, and Reports to Workers: Inspection and Investigations"; Part 20, "Standards for Protection Against Radiation"; 10 CFR Part 21, "Reporting of Defects and Noncompliance"; Part 70, "Domestic Licensing of Special Nuclear Material"; 10 CFR Part 71, "Packaging and Transportation of Radioactive Material"; 10 CFR Part 73, "Physical Protection of Plants and Materials"; 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material"; and Part 95, "Security Facility Approval and Safeguarding of National Security Information and Restricted Data."

As part of recertification activities, NRC has reviewed USEC's applications for recertification, to determine compliance with NRC regulations. The results of this review are described in CERs, one each for the Paducah and Portsmouth GDPs, which the NRC staff will issue after issuance of this report to Congress, in support of an NRC staff decision to renew the GDP Certificates of Compliance. In those reports, the NRC staff concludes that the applications fulfill the requirements of Part 76 and that there is reasonable assurance that the plants will continue to be operated such that public health and safety will be adequately protected. The Compliance Plans approved as part of the initial certification remain in place, and USEC has rectified all noncompliances addressed in the Plans, with the exception of the autoclave upgrades at Portsmouth, discussed in Chapter 3. In addition, as part of NRC's review and approval of privatization in 1998, the Commission determined that the private corporation would meet all applicable NRC regulatory requirements, including those derived from the National Industrial Security Program, which restricts foreign involvement in entities that require access to classified information, and the USEC Privatization Act, regarding foreign ownership, control, and domination; common defense and security; and the maintenance of a reliable and economical source of domestic enrichment services. No changes have occurred, since privatization was completed on July 28, 1998, that would alter those determinations.

Between October 1, 1998, and September 30, 2003, NRC identified 93 violations of NRC regulations, TSRs, or Compliance Plan commitments at Paducah and 75 at Portsmouth. USEC self-identified some of these violations, whereas NRC inspectors identified others while performing inspections. The totals reflect a significant reduction in the rate of identified violations at both plants, compared to the previous reporting periods. The majority of the violations were in the areas of NCS, security, and procedural deficiencies--either through inadequate procedures, or through failing to follow procedures.

The most serious violation was a Severity Level II violation, identified at Paducah for discrimination against an employee engaging in protected activities. This violation resulted in a civil penalty. A second Severity Level III violation was assessed for a less serious infraction of the same kind. Also at Paducah, a Severity Level III violation with no civil penalty was issued to USEC for failure to properly control classified information. A second Severity Level III violation, involving repeated failure to properly control classified information at Paducah, resulted in a civil penalty. At the Portsmouth plant, two Severity Level III violations occurred. One involved failure to classify an emergency situation as an Alert, and resulted in a civil penalty. The other Severity Level III violation was issued for failure to meet TSRs for NCS. No civil penalty was issued for this violation.

For those instances where noncompliances with NRC regulations were identified, plant management took corrective actions to bring the plant back into compliance or implemented a CAP to bring the plant back into compliance. In many cases, plant management also identified long-term actions to prevent recurrence.

APPENDIX A

ABBREVIATIONS AND ACRONYMS

AEA	Atomic Energy Act
AQ-NCS	Augmented Quality-Nuclear Criticality Safety
AVLIS	atomic vapor laser isotope separation
CAAS	criticality accident alarm system
CAP	corrective action plan
CAR	Certificate Amendment Request
CER	Compliance Evaluation Report
CFR	U.S. Code of Federal Regulations
CY	calendar year
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
DU	depleted uranium
DUF_6	depleted uranium hexafluoride
D&D	decontamination and decommissioning
EOC	Emergency Operations Center
EA	Environmental Assessment
EP	Emergency Plan
EPA	U.S. Environmental Protection Agency
EP Act	Energy Policy Act of 1992
ETTP	DOE's East Tennessee Technology Park
EU	enriched uranium
FEMP	Fernald Environmental Management Project
FR	**Federal Register**
FSAR	final safety analysis report
FY	fiscal year
GDP	gaseous diffusion plant
HEU	highly enriched uranium
HS&E	health, safety, and environmental
ISMS	Integrated Safety Management System
JP	Joint Procedure
km	kilometer
LEU	low-enriched uranium
LFA	Lead Federal Agency
LLW	Low-level waste
LWCs	Lost workday cases
MC&A	material control and accounting
MOU	memorandum of understanding
mrem	millirem; a measure of radiological dose
mSv	milliSievert; SI (*System Internationale*) measure of radiological dose
MT	metric ton
NCS	nuclear criticality safety
NCSA	nuclear criticality safety approval
NCSE	nuclear criticality safety evaluation

NCV	non-cited violation
NOV	Notice of violation
NRC	U.S. Nuclear Regulatory Commission
oz	ounce
PAAA	Price Anderson Amendments Act
PORC	plant operational review committee
ppm	parts per million
RAI	request for additional information
RIIs	Recordable Injuries/Illnesses
ROA	Regulatory Oversight Agreement
SAR	safety analysis report
TCE	trichloroethylene
TSR	technical safety requirement
U^{235}	uranium-235
UF_6	uranium hexafluoride
USEC	United States Enrichment Corporation
wt%	weight percent

APPENDIX B

COMPLIANCE PLAN ISSUES

ISSUES COMMON TO BOTH PADUCAH AND PORTSMOUTH

Issues	Status[1]	
	Paducah	Portsmouth
Transition from DOE Regulations to NRC Regulations	Complete	Complete
Update the Application Safety Analysis Report	Complete	Complete
Autoclave Upgrades	Complete	Suspended
Nuclear Criticality Safety Approval Documents	Complete	Complete*
Nuclear Criticality Safety Approval Implementation	Complete	Complete*
Exceptions for Criticality Accident Alarm System	Complete	Complete
Radiation Protection Procedures	Complete	Complete
Posting of Radioactive Materials	Complete	Complete*
NVLAP (National Voluntary Laboratory Accreditation Program) Certification	Complete	Complete
Fire Protection Procedures/Hot Work Permit Program	Complete	Complete
Packaging and Transportation	Complete	Complete
Management Controls	Complete	Complete
Safety Committees	Complete	Complete
Plant Changes and Configuration Management	Complete	Complete*
Maintenance Program	Complete	Complete
Operations Program	Complete	Complete
Systems Approach to Training	Complete	Complete
Event Investigations and Reporting Program	Complete	Complete
Records Management and Document Control Program	Complete	Complete*
Procedures Program	Complete	Complete*
Quality Assurance Program Implementation	Complete	Complete
Emergency Plan Support Documents	Complete	Complete
Quality Control Program for LLW Disposal	Complete	Complete
Depleted Uranium Management Plan	Complete	Complete
Decommissioning Funding Program	Complete	Complete
Chemical Safety Mechanical Integrity Program	Complete	Complete
HEPA (High-Efficiency Particulate Air) Filter Systems Testing	Complete	Complete
Administrative Controls on Overtime	Complete	Complete
DOE Chemical Safety and Third-Party Use of Hazardous Chemicals	Complete	Complete

[1] (a) Complete - USEC has informed NRC that it has fulfilled all the individual actions described in a Compliance Plan issue.
(b) * indicates that the issue was completed between October 1, 1998, and September 30, 2003.
(c) Status is as of September 30, 2003.

COMPLIANCE PLAN ISSUES (Continued)

ISSUES COMMON TO BOTH PADUCAH AND PORTSMOUTH (Continued)

Issues	Status	
	Paducah	Portsmouth
Operational/Safety System Trip Redundancy	Complete	Complete
Codes and Standards	Complete	Complete
UF_6 (Uranium Hexafluoride) Leak Detector Sensitivity Testing	Complete	Complete
Criticality Accident Alarms for Nearby Buildings	Complete*	Complete
Materials Control and Accountability Manuals and Procedures	Complete	Complete
Receipts Based on Measured Values	Complete	Complete*
DOE Materials Stored in Leased Space	Complete	Complete

ISSUES SPECIFIC TO PADUCAH

Issues	Status
C-360 Crane Upgrades	Complete
Criticality Accident Alarm System Coverage	Complete
Radioactive Calibration Source Accuracy	Complete
Fire Alarm System Reliability	Complete
Fire Protection Water System Reliability	Complete
Fire Protection Equipment	Complete
Fire Protection Pre-Fire Plans	Complete
Public Warning Sirens and Controls	Complete
Public Address System	Complete
Training for Emergency Response Organization	Complete
Seismic Capability of Buildings C-331 and C-335	Complete*
Environmental Trending Procedures	Complete
High-Volume Ambient Air Samplers	Complete
Criticality Accident Alarm System - Horn Audibility	Complete*
Cascade Cell Trip Function Requirements	Complete
Measurement Systems	Complete
Inventory Program for Uranium Holdup	Complete

ISSUES SPECIFIC TO PORTSMOUTH

Issues	Status
X-705 Evaporator Heat Exchanger Modifications	Complete
X-705 Isolation Valve Testing	Complete

COMPLIANCE PLAN ISSUES (Continued)

ISSUES SPECIFIC TO PORTSMOUTH (Continued)

Issues	Status
X-705 Microfiltration Influent pH Shutdown System Replacement	Complete
Nuclear Criticality Safety Training for Managers	Complete
Fire Protection Compensatory Measures	Complete
Fire Protection Sprinkler Testing	Complete
Emergency Packets	Complete
Assessments	Complete
Training for Emergency Preparedness	Complete
Possession of Uranium Enriched to Greater Than 10 weight percent U^{235}	Complete*

APPENDIX C

SUMMARY OF DOE ACTIVITIES AT THE PADUCAH AND PORTSMOUTH GASEOUS DIFFUSION PLANTS

DOE SUMMARY OF ACTIVITIES COMMON TO PADUCAH AND PORTSMOUTH

DOE activities to enhance and improve HS&E conditions at both the Paducah and Portsmouth GDPs between October 1, 1998, and September 30, 2003, have been numerous and extensive. These activities include, but are not limited to, the following:

Health and Safety

- Completed all corrective actions that closed Defense Nuclear Facilities Safety Board Recommendation 95-1, “Improved Safety of Cylinders Containing Depleted Uranium” (FY 1999);
- Performed safety evaluations associated with review and approval of Compliance Plan CARs (FY 2000, FY 2001);
- Established resource centers at the Paducah and Portsmouth GDPs, in conjunction with the Department of Labor under the Energy Employees Occupational Illness Compensation Program Act, to handle workers' medical claims resulting from past operations at the GDPs (FY 2001);
- Conducted an Integrated Safety Management System (ISMS) initiative to verify implementation of ISMS (FY 1999) and implemented a CAP to support re-verification of the ISMS program at both GDPs (FY 2003); and
- Directed the preparation of, and reviewed, Documented Safety Analyses (DSAs) to achieve compliance with 10 CFR Part 830, Subpart B, “Safety Basis Requirements” (FY 2000 - FY 2003).

Inspections and Investigations

- Conducted independent investigations of past and current HS&E conditions at both GDPs and issued reports that concluded that current operations in DOE-controlled areas do not present an immediate risk to workers or the public (FY 1999, FY 2000);
- Developed and completed corrective actions to address all findings of the HS&E independent investigations (FY 2000 - FY 2003);
- Regulated the Federal arming and arrest authority of the GDP protective forces under the AEA, as amended, and DOE's Regulatory Oversight Agreement (ROA) with USEC (FY 1999 – FY 2003);
- Reviewed and approved revisions of USEC's “Arming and Arrest Authority Security Plan for the Paducah and Portsmouth Gaseous Diffusion Plants” (Security Plan), including Revision 3, that incorporated interim compensatory measures required by NRC after September 11, 2001 (FY 1999 - FY 2003); and
- Investigated historical uses of recycled uranium as part of a DOE complex-wide initiative (FY 2000, FY 2001).

Uranium Management

- Continued the transfer of approximately 14,000 DUF_6 cylinders from USEC to DOE, pursuant to agreements with USEC in FY 1998 and FY 2002 (FY 1999 - FY 2003);
- Developed and implemented a DUF_6 Long-Term Management Program for approximately 739,000 MT (815,000 tons) of DUF_6 stored at the GDPs, in response to Public Law No. 105-204 (FY 1999 - FY 2003);
- Issued a final Programmatic Environmental Impact Statement for dispositioning of stored DUF_6 (FY 1999);
- Awarded a contract for design, construction, and operation of a facility at each GDP for the conversion of DUF_6 to a more stable compound of uranium for reuse or ultimate disposal, pursuant to Public Law No. 197-206 (FY 2002);
- Issued system requirements documents, completed conceptual designs, and began preliminary design activities for the DUF_6 conversion facilities (FY 2003);
- Met with State regulatory agencies to discuss the permitting process for the DUF_6 conversion facilities and the planned transfer of DUF_6 cylinders from the DOE East Tennessee Technology Park (ETTP) to the Portsmouth GDP (FY 2003); and
- Entered into an agreement with USEC that ensures continued removal of Russian weapons-origin HEU, ensures domestic enrichment capabilities, facilitates the deployment of cost-effective advanced enrichment technology, replaces out-of-specification UF_6 that was previously transferred from DOE to USEC, and continues the transfer of DUF_6 cylinders from USEC to DOE (FY 2002).

DOE SUMMARY OF ACTIVITIES AT PADUCAH

DOE activities to enhance and improve HS&E conditions at the Paducah GDP between October 1, 1998, and September 30, 2003, include, but are not limited to, the following:

Health and Safety

- Worked more than 3 million hours, with no lost time from work related to Recordable Injuries/Illnesses (RIIs) for the 4-year period preceding August 28, 2002 (FY 1999 - FY 2002);
- Sampled selected leased and non-leased facilities for beryllium and funded health screening of current and former employees to identify cases of beryllium sensitivity (FY 2003); and
- Funded a preliminary investigation by the National Institute of Occupational Safety and Health to determine availability of exposure data for epidemiological studies of people who worked at the Paducah GDP for at least 30 days from 1952 to the present (FY 2003).

Inspections and Investigations

- Investigated HS&E conditions related to past projects involving weapons dismantlement, metals recycling, and radiation exposure (FY 2000 - FY 2002);
- Conducted inspections of USEC's implementation of the Security Plan and issued three DOE Severity Level III NOVs involving failures to record inspections of firearms, record test firings of weapons after repair, and maintain documentation related to the physical fitness program for the GDP protective force (FY 2000 - FY 2003); and

- Conducted an inspection of an accidental discharge of a weapon and issued one DOE Severity Level I, one DOE Severity Level II, and two DOE Severity Level III NOVs for failures to follow procedures regarding firearms handling, perform firearms risk analysis, and perform appraisals of the firearms safety program, which resulted in civil penalties totaling $41,250 (FY 2003).

Uranium Management

- Inspected all DUF_6 cylinders, constructed five new concrete cylinder storage yards for improved cylinder storage, relocated all cylinders for improved inspectability, and repainted cylinders at high risk for corrosion (FY 1999 - FY 2003);
- Received, since CY 1995, 5705 MT (6290 tons) of LEU as part of DOE's agreement to purchase downblended (formerly weapons-grade) uranium from Russia (FY 2003); and
- Assisted in the shipment to Russia, since CY 1995, of over 23,580 MT (25,900 tons) of unsold portions of the natural uranium-feed component derived from the Russian LEU (FY 2003).

Environmental Restoration

- Treated approximately 3360 million liters (887 million gallons) of contaminated groundwater (FY 1999 - FY 2003);
- Continued to remediate the site, including removing 7110 cubic meters (251,000 cubic feet) of crushed drums (FY 2000); initiating removal of over 23,600 MT (26,000 tons) of scrap metal and other material from scrap yards; and initiating cleanup of the North-South Diversion Ditch, one of the most contaminated locations at the Paducah GDP (FY 2002, FY 2003);
- Obtained regulatory approvals and issued regulatory reports relating to environmental remediation (FY 1999 - FY 2003);
- Initiated D&D of the C-410/C-420 Feed Plant Complex (FY 2001 - FY 2003);
- Developed remediation technologies, including the Lasagna™ technology developed by a consortium of DOE, regulatory agencies, and private companies, which reduced average concentrations of trichloroethylene (TCE) in soil from 84 parts per million (ppm) to less than 0.5 ppm (FY 1999 - FY 2003);
- Tested innovative cleanup technologies such as the Six-Phase Soil Heating technology for removal of a major source of TCE contamination in groundwater (FY 2002, FY 2003);
- Reached an agreement with Commonwealth of Kentucky regulatory agencies on enforceable milestones for environmental cleanup for FY 2003 through FY 2005 (FY 2003); and
- Signed a Letter of Intent with Commonwealth of Kentucky officials to promote accelerated cleanup, develop integrated planning and funding requests, meet commitments under the Paducah Federal Facility Agreement, and settle all identified outstanding enforcement and compliance issues through an Agreed Order (FY 2003).

Waste Management

- Treated, shipped, and disposed of approximately 9760 MT (10,760 tons) of waste and an additional 1761 cubic meters (62,000 cubic feet) of waste (FY 1999 - FY 2003);

- Provided waste management support for enrichment of uranium to a higher assay (FY 2001 - FY 2003);
- Saved an estimated $2.5 million in disposal costs by reaching an agreement to ship tanks and equipment once used in fluorine production to a private company for reuse (FY 2003); and
- Completed the Environmental Assessment (EA) for site-wide waste disposition activities (FY 2003).

HS&E Status

The maximum occupational radiation exposure received by a worker in the DOE radiation protection program at Paducah for CY 1998 - CY 2002 was 4.59 mSv (459 mrem) in CY 1998. Average occupational radiation exposure per person per year for personnel in the DOE radiation protection program at Paducah was 0.1 mSv (10 mrem) in CY 1998; 0.09 mSv (9 mrem) in CY 1999; 0.054 mSv (5.4 mrem) in CY 2000; 0.049 mSv (4.9 mrem) in CY 2001; and 0.017 mSv (1.7 mrem) in CY 2002. These exposure data indicate that occupational radiation exposures at Paducah are substantially less than the DOE occupational exposure limit of 50 mSv (5000 mrem) per person per year specified in 10 CFR Part 835. DOE prime contractor and subcontractors worked approximately 4 million hours and experienced 28 RIIs, including five Lost Workday Cases (LWCs), during the 5-year period.

During the 5-year period of this report, 119 incidents occurred in the non-leased areas at Paducah that DOE classified as reportable HS&E occurrences. Ninety-nine incidents were classified as "off-normal," and 20 were classified as "unusual." Eleven of the 99 occurrences were determined to be potential noncompliances with the Price Anderson Amendments Act (PAAA) regulations, but DOE assessed none as PAAA violations.

Environmental releases and discharges from DOE activities at Paducah during FY 1999 through FY 2003 remained within established regulatory limits, with the following exceptions: twenty-two exceedances of water permit limits occurred, and DOE received 23 NOVs for alleged violations and one Notice of Noncompliance for an alleged noncompliance from Federal and State regulatory agencies. In August 2003, DOE agreed to pay the Commonwealth of Kentucky $1 million to settle all identified outstanding enforcement and compliance issues at the Paducah GDP. The settlement, which is included in a letter of intent that DOE and the Commonwealth of Kentucky signed in August 2003, resolves most issues that have prevented officials from signing a formal accelerated cleanup agreement.

DOE SUMMARY OF ACTIVITIES AT PORTSMOUTH

DOE activities to enhance and improve HS&E conditions at the Portsmouth GDP between October 1, 1998, and September 30, 2003, include, but are not limited to, the following:

Health and Safety

- Prepared Safety Evaluation Reports and an Operational Readiness Assessment for changes in HEU operations in the X-705 facility (FY 1999);

- Worked over 25,000 hours to complete the transfer of uranium materials from the Fernald Environmental Management Project (FEMP) to the Portsmouth GDP without an accident (FY 2002);
- Worked for 2 years on the cylinder storage yard project and 1 year on the scrap metal removal project without an RII (FY 2002);
- Directed the preparation of, and reviewed, DSAs in accordance with 10 CFR 830 Subpart B, for the Portsmouth DUF_6 cylinder storage yards and all remaining Category 2 and 3 nuclear facilities (FY 2003);
- Initiated preparation of a site-wide beryllium characterization plan for implementation at the Portsmouth GDP in FY 2004 (FY 2003); and
- Reduced the RII rate from 11 RIIs in FY 2002 to 6 RIIs in FY 2003 (FY 2002, FY 2003).

Inspections and Investigations

- Conducted over 60 inspections of HEU cylinder-cleaning activities at the Portsmouth GDP (FY 1999, FY 2000) and issued one Severity Level III NOV involving failures to adhere to NCS labeling and spacing requirements in the X-705 facility (FY 1999);
- Conducted inspections of USEC's implementation of the Security Plan and issued two Severity Level III violations involving the failure to retrieve an individual's Weapons Authorization Card on expiration and the failure to effectively implement the physical fitness program for the GDP protective force (FY 2000 - FY 2002);
- Regulated activities associated with uranium enriched to greater than or equal to 10 percent assay U^{235} discovered or made accessible in USEC-leased areas, under the ROA (FY 1999 - FY 2003); and
- Conducted a special review of USEC's Emergency Preparedness Program and participated in or observed Full Participation Emergency Management exercises at the Portsmouth GDP (FY 1999, FY 2002).

Uranium Enrichment Operations Shutdown

- Awarded a contract in August 2001 to maintain the Portsmouth GDP facilities in a cold standby condition after cessation of uranium enrichment operations in May 2001 (FY 2001);
- Performed uranium deposit removal activities on GDP cells required for cold standby (FY 2002 - FY 2003);
- Finalized an EA relating to a new heat source for DOE facilities (FY 2001); and
- Installed new heating systems for DOE facilities at the Portsmouth GDP that became operational on November 1, 2001 (FY 2001, FY 2002).

HEU Management

- Continued surveillance and maintenance of shutdown HEU cells (FY 1999 - FY 2003);
- Removed stored HEU materials from the X-345 facility and downgraded the facility to a Category III security level (FY 1999);
- Planned for removal of stored HEU-bearing material from the site (FY 2000 - FY 2003);
- Regulated HEU cylinder cleaning in the X-705 facility under the ROA (FY 1999, FY 2000);
- Transferred oversight responsibility for the X-705 facility to NRC after completion of HEU cylinder cleaning (FY 2001); and

- Shipped HEU oxides for downblending and sale (FY 1999 - FY 2002).

Uranium Management

- Inspected and restacked DUF_6 cylinders at the Portsmouth GDP (FY 1999 - FY 2003);
- Received 1799 30B cylinders containing LEU, as part of DOE's agreement to purchase downblended (formerly weapons-grade) uranium from Russia (FY 1999 - FY 2002);
- Prepared and issued a Programmatic EA addressing the consolidation of reusable uranium materials from various DOE sites (FY 2000 - FY 2003);
- Constructed a 1.42-hectare (3.5-acre) expansion of a DUF_6 cylinder storage yard for transfer of 2657 USEC cylinders to DOE (FY 2000);
- Renovated the X-744G building to store approximately 4000 MT (4400 tons) of potentially marketable uranium received from FEMP, Hanford, and universities (FY 1999 - FY 2002);
- Completed the transfer of approximately 4000 MT (4400 tons) of potentially marketable uranium from FEMP, Hanford, and universities to the Portsmouth GDP (FY 1999 - FY 2002); and
- Met with State regulators to develop new Ohio Director's Final Findings and Orders to address the planned transfer of approximately 6300 DUF_6 cylinders from the DOE ETTP site in Oak Ridge, Tennessee, to the Portsmouth GDP (FY 2003).

Environmental Restoration

- Continued to treat groundwater at the site, using techniques such as groundwater extraction and treatment and phytoremediation (FY 1999 - FY 2003);
- Completed 10 site remediation projects, including capping landfills, conducting pilot *in-situ* treatment projects, installing additional extraction wells, planting 3000 hybrid poplar trees to treat groundwater, and removing a neutralization pit (FY 1999 - FY 2003);
- Treated more than 492 million liters (130 million gallons) of contaminated groundwater through five onsite treatment facilities (FY 1999 - FY 2003);
- Obtained regulatory approval for two final quadrant-wide reports, with Decision Documents issued by Ohio EPA on Quadrant III (FY 1999) and Quadrant I (FY 2000);
- Upgraded the X-622 Groundwater Treatment Facility to increase flow capacity by 50 percent (FY 2001, FY 2002); and
- Completed corrective actions for three of the four quadrants at the Portsmouth GDP, with the exception of solid waste management units deferred until plant D&D, and initiated design activities for remedial actions to treat a groundwater plume containing high concentrations of TCE in Quadrant II (FY 1999 - FY 2003).

Waste Management

- Disposed of, treated, or recycled over 10,496 MT (11,570 tons) of waste and other material (FY 1999 - FY 2003);
- Treated over 79 MT (87 tons) of wastewater (FY 1999) and over 78,700 liters (20,800 gallons) of polychlorinated biphenyl mineral oil (FY 2001, FY 2002);
- Disposed of, treated, or recycled over 4950 containers, drums, and boxes containing TCE-contaminated soils, low-level waste (LLW) solids, Toxic Substances Control Act debris, and silver solutions (FY 2002); and

- Disposed of, treated, or recycled over 6360 cubic meters (224,000 cubic feet) of debris, LLW, LLW scrap metal, or sodium permanganate (FY 2003).

HS&E Status

The maximum occupational radiation exposure received by a worker in the DOE radiation protection program at the Portsmouth GDP for CY 1998 through CY 2002 was 2.11 mSv (211 mrem) in CY 2000. Average occupational radiation exposure per person per year for personnel in the DOE radiation protection program at The Portsmouth GDP was 0.0137 mSv (1.37 mrem) in CY 1998; 0.0251 mSv (2.51 mrem) in CY 1999; 0.0372 mSv (3.72 mrem) in CY 2000; 0.0185 mSv (1.85 mrem) in CY 2001; and 0.0157 mSv (1.57 mrem) in CY 2002. These exposure data indicate that occupational radiation exposures at the Portsmouth GDP are substantially less than the DOE occupational exposure limit of 50 mSv (5000 mrem) per person per year, as specified in 10 CFR Part 835. DOE prime contractor and subcontractors worked approximately 5.3 million hours and experienced 46 RIIs, including 22 LWCs, during the 5-year period. In FY 2000, DOE conducted an investigation after a worker was seriously injured in an accident at a technology demonstration site at the Portsmouth GDP.

During the 5-year period of this report, 89 incidents occurred in the non-leased areas at the Portsmouth GDP that DOE classified as reportable HS&E occurrences. Eighty-eight incidents were classified as "off-normal," and one was classified as "unusual." Several of the occurrences were determined to be potential noncompliances with PAAA regulations, but DOE assessed none as PAAA violations. Eighteen of the reportable occurrences involved violations of NCS procedures or indicated NCS programmatic deficiencies. None of these occurrences resulted in a nuclear criticality.

Environmental releases and discharges from DOE activities at the Portsmouth GDP during FY 1999 through FY 2003 remained within established regulatory limits, with the following exceptions: seven permit exceedances occurred at various outfalls, and DOE received nine NOVs for alleged violations and two Notices of Deficiencies for alleged noncompliances from Federal and State regulatory agencies.

OVERALL STATUS

During the 5-year period of this report, DOE continued to discharge its regulatory and oversight responsibilities at the Paducah and Portsmouth GDPs. DOE conducted its activities in a manner to enhance and improve HS&E conditions and achieve compliance with all applicable Federal and State laws and regulations. In those instances where potential violations of these laws and regulations were identified, actions were taken to notify appropriate authorities, identify the cause, and institute corrective measures.