



DEPARTMENT OF ENERGY

**OPERATIONAL READINESS ASSESSMENT REPORT
FOR THE REPLACEMENT OF INOPERABLE
HIGHLY ENRICHED URANIUM
CYLINDER VALVES
AT THE
PORTSMOUTH GASEOUS DIFFUSION PLANT**

May 8, 1998

OPERATIONAL READINESS ASSESSMENT REPORT FOR THE REPLACEMENT OF INOPERABLE HEU CYLINDER VALVES

1.0 INTRODUCTION

During the ongoing down-blending of highly enriched uranium (HEU) at the Portsmouth Gaseous Diffusion Plant (PORTS), several 8-inch and 12-inch HEU cylinder valves became inoperable. To complete the down-blending activities, those cylinder valves must be replaced. With the possession limits stated in Table 1-3 of the Safety Analysis Report, the United States Enrichment Corporation (USEC) is not permitted to perform this activity under Nuclear Regulatory Commission (NRC) jurisdiction. Therefore, USEC approached the Department of Energy (DOE) on the temporary conversion from NRC regulation to DOE regulation under the Regulatory Oversight Agreement (ROA) and the subsequent re-establishment of NRC regulation.

By letter dated July 30, 1997, the USEC proposed to the DOE a conceptual approach for the temporary conversion of a portion of the X-705 facility at PORTS from the current NRC regulation to the past DOE ROA regulation. The purpose of this temporary conversion was to provide the most appropriate area for the replacement of damaged HEU cylinder valves so that refeeding of the HEU material could proceed. The X-705 South Annex was chosen for the valve replacement as it was designed and analyzed for this type of operation. The conversion back to NRC regulation would occur after both regulatory agencies had been satisfied that appropriate regulatory measures had been met.

In a letter dated August 21, 1997, DOE gave its tentative concurrence with the proposed conversion process conditional upon USEC receiving NRC approval of this process. In addition to the Technical Safety Requirements (TSRs) and Transitional Requirements (TRs) proposed in the July 30, 1997, letter, DOE made its approval of the temporary conversion contingent upon application of additional TRs.

On February 3, 1998, USEC submitted a Certificate Amendment Request to the NRC which requested an amendment to the PORTS Certificate of Compliance. This amendment described the process for temporary conversion of the X-705 South Annex from NRC to DOE regulation for the replacement of inoperable HEU cylinder valves. Also included in this request, USEC proposed a revision to Safety Analysis Report Section 3.7, the *Fundamental Nuclear Material Control (FNMC) Plan*, and related Issue

A.4, *Possession of Uranium Enriched to Greater Than 10% ²³⁵U*, of the Compliance Plan. DOE had previously provided its approval of this Compliance Plan change in its letter dated November 18, 1998.

By letter dated April 9, 1998, USEC notified DOE that it had completed an Operational Readiness Assessment (ORA) for the valve replacement activities proposed in the X-705 South Annex. In concert with NRC's forthcoming approval of USEC's request dated February 3, 1998, members of the DOE Regulatory Oversight staff visited the PORTS site to perform an independent assessment of USEC's operational readiness efforts during the week of April 13, 1998. DOE's letter dated April 23, 1998, documented five (5) findings/recommendations for the proposed valve replacement operations. USEC's letter of April 29, 1998, provided resolution of these observations.

2.0 DESCRIPTION OF THE FACILITY

The X-705 South Annex is a closed room at the south end of Building X-705. It is used for disassembling contaminated equipment, including all X-326 Process Building converters and compressors contaminated with technetium or higher-assay uranium. The annex is also used for the changing of cylinder valves when the internal pressures of the cylinder cannot be determined, handling traps, cutting scrap, handling damaged F-can transfers, and similar activities.

When equipment is decontaminated and disassembled or a valve is changed in the annex, precautions are taken to ensure that contamination does not spread and that area personnel are not exposed. Paper or plastic is fastened to the floor from the airlock to the boundary, if necessary. The south roll-up doors adjacent to the annex are closed, and the door chain is tagged "DO NOT OPERATE." The north roll-up annex doors are closed, and the circuit breaker for the doors is tripped off and tagged. The South Annex west pedestrian doors are closed and tagged. The annex exhaust system is switched on and tagged, and the door buffer blower is placed in the "hand" or "auto" mode. The annex heater unit is tripped off and the circuit breaker tagged. The annex fire protection sprinkler system is isolated and tagged out during operations involving unsafe masses of fissile material to prevent inadvertent moderation from a sprinkler system actuation. Personnel entry to the annex is through an air lock. Proper protective equipment as specified in the Radiation Work Permit is required at all times. If the equipment is for "planned expeditious handling" or there is some uncertainty regarding nuclear safe handling, Nuclear Criticality Safety is notified. When a cylinder valve change is scheduled to take place in the annex, plant site emergency response organizations will be notified.

The ventilation system for the South Annex consists of a 3-hp, 480-V, 5200-cfm (150-m³/min) direct-drive fan that pulls air through four supply ducts directly connected to the exhaust duct housing the fan. Automatic louvers inside the building near the top of the exhaust stacks automatically open when the exhaust system is operating. An exhaust stack cover prevents rain [which might promote degradation of the high-efficiency particulate air (HEPA) filters] from entering the exhaust stack. Roughing prefilters minimize rapid plugging of the HEPA filters. A two-stage pressure differential switch will alarm when the filters become plugged.

3.0 INTENDED USE OF THE AREA

The X-705 South Annex will be utilized for the replacement of inoperable 8-inch and 12-inch cylinders HEU cylinder valves. Based upon the number of inoperable cylinder valves to be replaced and the level of effort required to replace a cylinder valve, the maximum anticipated valve replacement time is approximately four (4) weeks. It is estimated that an additional two (2) weeks will be required to transfer the area back to NRC regulation via the process described in Compliance Plan Issue A.4, Section entitled "Transition to NRC Regulatory Oversight." NRC, DOE and USEC will agree on the temporary conversion start and end dates. USEC will receive written approval from NRC and DOE to proceed with temporary conversion to DOE ROA regulation prior to beginning the work activity.

4.0 EVALUATION OF READINESS

The DOE ORA team visited the Portsmouth site on April 16 -17, 1998. On the first day of the site visit, an entrance briefing was held with representatives of the USEC operating contractor staff. On the morning of the second day, a dry-run was held in the South Annex to demonstrate the proposed process for replacement of an HEU cylinder valve. On the afternoon of the second day, an exit briefing was held wherein observations were shared with representatives of the USEC contractor staff.

Members of the DOE ORA team were assigned various functional areas to review and observe. The evaluation methodology, subsequent observations and ultimate closure status for each of these functional areas are discussed below.

4.1 Management / Operational Readiness Assessment

USEC provided a copy of the HEU Cylinder Valve Replacement ORA Report to DOE in a letter dated April 9, 1998 (Toelle to DeVault). The USEC operating contractor's ORA team consisted of three (3) individuals, including a team leader. The team concluded that acceptable evidence of readiness had been verified and recommended that USEC

request that DOE perform their usual independent verification.

A DOE inspector noted that ORA Plan criteria did not mention Technical Safety Requirements (TSRs), Transitional Requirements (TRs), or Operational Safety Requirements (OSRs) associated with the valve replacement activities. When the contractor ORA Team Leader was questioned about which safety basis requirements would apply during the valve replacement evolution, he was not sure what that meant. Upon further questioning, he admitted that a review of the applicable TSRs, TRs, and OSRs and their associated surveillance requirements had not been performed as part of the ORA effort. The contractor ORA team had not performed a verification that the TSRs and TRs required by USEC's letter dated July 30, 1997, and by DOE's letter dated August 21, 1997, had not been performed. This observation resulted in a finding as stated in DOE's letter of April 23, 1998.

In response to this finding, USEC provided a April 29, 1998, response which stated that a conduct of operations review had been performed. USEC also stated that its operating contractor had verified that all applicable TSR and TR requirements had been flowed-down into procedures and that the associated surveillances had been performed. Based upon this response, this open item is considered closed. No further open items remain that are associated with this functional area.

4.2 Operations and Maintenance

A review was performed of the Operations and Maintenance activities associated with the replacement of the damaged valves on HEU cylinders. These activities consist of the removal of the damaged valve, installation of the new valve, disposition of the damaged valve, and soap testing of the new valve upon installation. Each of these activities with the exception of the soap test activity will be performed in the South Annex of X-705. The soap test effort will be performed as part of the HEU Refeed effort in the Product Withdrawal Area of X-326.

This review included the procedures to be used for each step of the valve replacement: *HEU Refeed From PW Feed and Topping Station*, XP4-CO-CN2400, Rev. 3, Change I; *Temporary Transfer of X-705 Area Between NRC and DOE Regulatory Oversight*, XP2-RA-RR1031, Rev. 0; and *Cylinder Valve Replacement on 8A, 8S, & 12A UF₆ HEU Cylinders*, XP2-CU-MM4030, Rev. 0. Also, discussions were held with X-326 Operations personnel responsible for HEU Refeed and a dry-run of a valve replacement in the South Annex was observed by the DOE inspectors.

Procedure XP4-CO-CN2400, Rev. 3, Change I, Step 8.7 was added to require a soap test of the HEU cylinder valve, threads, and valve stem following the valve

replacement in the South Annex. Discussions with a X-326 Area Control Room First Line Manager and Product Withdrawal Operator concluded that each individual was unfamiliar with this new procedural step. Confirmation that X-326 personnel are familiar with this new requirement must occur prior to the first soap test of an HEU cylinder with a new valve.

By letter dated April 29, 1998, from Mr. Steven A. Toelle (USEC) to Mr. Randall M. DeVault (DOE), USEC committed to perform crew briefings of all affected personnel before the HEU cylinder valve replacement activity is initiated. This item is considered closed pending completion of these crew briefings which will be verified by the DOE Site Safety Representative. There are no other open items regarding Operations and Maintenance activities for the replacement of HEU cylinder valves in the X-705 South Annex.

4.3 Procedures

As part of USEC's ORA, the procedures for Operations, Maintenance, Nuclear Regulatory Affairs, and Security were reviewed to verify that HEU cylinder valve replacement activities were incorporated and approved. The evaluation of the adequacy of the procedures included a review of the affected procedures, interviews with personnel, and an observation of a simulation of a HEU cylinder valve replacement.

The portions of the following procedures that were impacted by HEU cylinder valve replacement activities were reviewed: XP4-CO-CN2400, *HEU Refeed from PW Feed and Topping Station*, Revision 4; XP2-RA-RR1031, *Temporary Transfer of X-705 Area between NRC and DOE Regulatory Oversight*, Revision 0; XP2-CU-MM4030, *Cylinder Valve Replacement on 8A, 8S, & 12A UF₆ HEU Cylinders*, Revision 0; XP4-CU-CH1116, *Nuclear Material Inventory MBA 2*, Revision 0, Change A; and XP4-CU-DC1600, *HEU Small Cylinder Cleaning Inventory*, Revision 0, Change B.

Review of the procedures resulted in two findings. The first finding involved the requirement to perform a soap test of the HEU cylinder valve, threads, and valve stem following the valve replacement. The soap test will be accomplished in X-326 and was added to procedure XP4-CO-CN2400, *HEU Refeed from PW Feed and Topping Station*. However, the requirement was not added to the X-326 HEU Refeed Checklist, Form A-1878. The addition of this requirement to the checklist will ensure completion of the required steps. The second finding identified that procedure XP2-CU-MM4030, *Cylinder Valve Replacement on 8A, 8S, & 12A UF₆ HEU Cylinders*, did not assign responsibility to ensure that all precautions and limitations were met prior to proceeding with the HEU cylinder valve replacement operation. Therefore, Step

8.2.1 should be revised to read: "The FLM(s) shall ensure all Precautions/Limitations, Section 5, and Prerequisites, Section 6, have been met and items in Section 7 are readily available in the South Annex."

The personnel interviews and the observation of the HEU cylinder valve replacement simulation provided supportive evidence that the personnel in the X-705 South Annex were knowledgeable of the procedures and that the procedures were adequate to perform the operation. However, as previously noted, operations personnel in X-326 were unfamiliar with the addition of the soap test requirement following the valve replacement.

Subsequent to the inspection, both findings identified above have been resolved. Form A-1878, "X-326 HEU Refeed Checklist," has been revised to include the requirement to perform the soap test. Step 8.2.1 of procedure XP2-CU-MM4030, *Cylinder Valve Replacement on 8A, 8S, & 12A UF₆ HEU Cylinders*, has been revised to assign the FLM(s) the responsibility of ensuring that all precautions, limitations, and prerequisites are met for the valve replacement operation. Therefore, the two findings are considered closed.

4.4 Safeguards and Security

A review was performed of the Safeguards and Security requirements reflected in the *X-705 South Annex Interim Security Plan for HEU Cylinders Valve Replacements*, dated December 3, 1997, during the dry-run of a valve replacement conducted in the South Annex on April 17, 1998. Each requirement of this plan was verified except for the requirement that requires a Security Police Officer (SPO) to maintain the cylinder in direct line-of-sight under circumstances described in Section 4.3.

During the dry run of April 17, 1998, a DOE inspector noted that the line-of-sight for the SPO stationed at the South Annex viewing window may be obstructed. This obstruction may be caused by a lack of space at the viewing window, due to the deployment of a Maintenance Mechanic at the same area; or, due to the location of the work activities in X-705 South Annex.

By letter dated April 29, 1998, from Mr. Steven A. Toelle (USEC) to Mr. Randall M. DeVault (DOE), USEC committed to "utilize two Closed Circuit Television monitors to supplement the visual surveillance of the X-705 South Annex". Utilization of these monitors will provide an acceptable level of assurance; therefore, this item is closed. There are no other open items regarding Safeguards and Security activities for the replacement of HEU cylinder valves in the X-705 South Annex.

4.5 Material Control and Accountability

The evaluation of the Material Control and Accountability (MC&A) program included a review of MC&A plans and procedures applicable to the HEU Cylinder Valve Changeout. Interviews with the responsible MC&A personnel were conducted on the subject of the measurement control program, accounting system/procedures, and the operation of the site Dynamic Material Control and Accountability System (DYMCAS). Logs and records for randomly selected cylinders were reviewed to determine the traceability through the system. Training documentation was also examined to verify that MC&A personnel have completed the required training.

The evaluation did not identify any significant deficiencies in the MC&A program in support of the HEU Cylinder Valve Changeout. Based on the results of this evaluation, PORTS appears to have an adequate program to control and account for the SNM involved in the HEU Cylinder Valve Changeout. The program includes an approved nuclear materials control and accountability plan (per DOE Order 5633.3A) that addresses accounting, site DYMCAS, and the safeguards system. The MC&A program appears to be in a state of readiness for supporting HEU Cylinder Valve Changeout.

No deficiencies were noted in the area of MC&A; therefore, no open items remain.

4.6 Nuclear Safety

There are three (3) potential accidents associated with a HEU cylinder valve replacement in the X-705 South Annex. These are a release of hazardous or toxic chemicals, a fire, and a nuclear criticality. Basically, these three potential accidents have been analyzed in the Safety Analysis Report, boundary conditions implemented via the Technical Safety Requirements (TSRs) and/or Technical Requirements (TRs), and flowed down into applicable implementing procedures. Reference should be made to Section 4.14 for a more detailed discussion of these authorization basis documents.

Approval of the HEU valve replacement activities are predicated on the implementation of a safety evaluation of the proposed operation as controlled by TSRs and/or TRs that govern the bounding conditions. The DOE Regulatory Oversight Group had previously approved applicable authorization basis documents during the initial transition period to NRC regulation. The SERs associated with these approvals identified that the nuclear safety hazards associated with the operations were minor to moderate with nuclear criticality representing the most significant hazard followed by industrial hazards. Accidental release of radiological substances were determined to be minor. The proposed TRs addressed the significant active criticality controls with specific requirements. The remaining criticality requirements were treated under the Criticality

Safety Program. The SER concluded that the controls were adequate to result in no undue risk to the public or workers from the proposed operations and recommended that the operations be approved pending a determination that the controls are, in fact, in place.

No open items remain as a result of the functional area.

4.7 Chemical Safety / Waste Management

Chemical safety and waste management activities related to the X-705 South Annex cylinder valve replacement activities were reviewed and evaluated to ensure that the chemical process and waste management activities were performed in a safe manner. This evaluation included a review of the ORA evaluation criteria; an observation of a dry-run on the valve replacement process; and interviews with pertinent personnel.

All identified chemical hazards associated with a valve replacement were effectively addressed by engineering and administrative controls. Management controls and an Industrial Hygiene (IH) and Safety program are in place to protect employees, the general public, and the environment. The site Spill Control Program was evaluated and determined adequate for the cylinder valve replacement process. Interviews conducted with pertinent personnel revealed the Waste Management Plan was part of the Environmental, IH, National Environmental Policy Act, and Resource Conservation and Recovery Act Plan. It was determined that this plan adequately addressed all waste management concerns.

No deficiencies were noted in the area of Chemical Safety/Waste Management. However, a question was raised pertaining to the disposal of the liquid used to clean a damaged valve upon removal from the HEU cylinder. This issue was resolved when an agreement was reached that the liquid would be taken by the DOE Site Office and stored in the L-Cage area of the X-326 Building. Therefore, no open items remain.

4.8 Nuclear Criticality Safety

As noted in Section 4.6, nuclear criticality is the most significant nuclear hazard involved in the cylinder valve replacement operations. The nuclear criticality potential associated with the proposed operations is a concern in the South Annex due to the high enrichment and quantities of ²³⁵U involved.

The evaluation efforts concentrated on the review of the Nuclear Criticality Safety Approvals/Evaluations (NCSAs/Es) and reviews of the procedures for inclusion of criticality controls. Implementation of controls was examined closely.

For the operations, proposed nuclear criticality safety must focus on unsafe geometries and in particular interaction geometry which can be significant. The NCSA/Es show that the analyst had considered the range of possible operator errors and equipment malfunctions. Unsafe geometry containers were restricted and containers are carefully controlled. Because of the quantities of highly enriched material, the NCSAs/Es have properly restricted the use of the fire sprinkler system.

A review of the operating procedures revealed that all the requirements contained in the NCSAs/Es had been carried into the procedures and carefully marked. All areas in the facility were adequately marked with criticality requirements signs. One sign was noted by another reviewer as having wording that resulted in a verbatim compliance issue. When questioned about the posting, the fire hazard in the fissile control area was promptly removed. Because the South Annex area was currently under NRC regulation, no further DOE action is required. Also interviews with the operators indicated that the operators had a fundamental understanding of the criticality issues in the facilities.

After completing the examinations and reviews, it was concluded that all criticality issues identified in the NCSAs/Es have been addressed satisfactorily in the field. Further, the NCS department personnel and the field operators were cognizant of the issues and precautions relevant to safe nuclear operation and were prepared to respond to criticality related emergencies in the South Annex.

No deficiencies were noted in the area of Nuclear Criticality Safety; therefore, no open items remain.

4.9 Training

The evaluation of the training activities performed in support of the valve replacement process included a review of training attendance records and interviews with pertinent personnel. The DOE inspectors attended a pre-job briefing for personnel performing the simulation of a cylinder valve replacement.

Attendance sheets for pre-job briefings were in order. It was unclear from these sheets what type of training was being conducted. The training department personnel is in the process of developing a new attendance sheet which will prevent this from occurring again.

No deficiencies were noted in the area of Training; therefore, no open items remain.

4.10 Emergency Preparedness

The evaluation of the Emergency Preparedness (EP) activities to support the valve replacement activities included a review of the EP procedures and other pertinent documentation and interviews with EP management.

Because of the routine nature of this activity, no unique hazard was identified. Therefore, no changes in the Emergency Plan or EP procedures were needed. Current procedures for accountability and evacuation adequately covered the cylinder valve replacement activities and no other special EP actions were needed.

Interviews with EP personnel confirmed that they were knowledgeable about the valve replacement activities and had been involved with the anticipated conversion process of the South Annex. Notification of DOE and others will occur in accordance with Procedure XP2-EP-EP1033, *Notifications for Classified Emergencies*.

No deficiencies were noted in the area of Emergency Preparedness; therefore, no open items remain.

4.11 Health Physics / Radiation Protection

Personnel entry to the South Annex is through an air lock. Personal protective equipment (PPE), as specified in the Radiation Work Permit (RWP), is required to be used by all personnel involved in this evolution. The First Line Manager (FLM) will ensure that the applicable PPE and equipment listed in the RWP are available. Upon removal of the damaged valve, any release of airborne contamination from the HEU cylinder is controlled by the exhaust system which maintains a negative pressure with respect to the adjacent facility. Based upon the aforementioned, no observations or concerns associated with Health Physics and/or Radiation Protection were identified.

4.12 Fire Protection

The adequacy and completeness of Fire Protection related issues for the HEU cylinder valve replacement operation in the X-705 South Annex were evaluated. The evaluation included a review of associated documentation, interviews with Fire Protection personnel and a visual inspection of the area where the valve replacement activities will occur.

NCSA -0705_132, *Replacing 8- and 12-inch HEU Cylinder Valves*, requires that the X-705 South Annex sprinkler system be valved off and the sprinkler system header be drained. The actions are proceduralized in XP2-CU-MM4030, *Cylinder Valve*

Replacement on 8A, 8S, & 12A UF₆ HEU Cylinders, and discussions with Fire Protection personnel verified that they were very familiar with the requirements. A Fire Protection Engineer was involved in the review of the plant change review for the HEU cylinder valve replacement operation. Per discussions with Fire Protection personnel, they are very knowledgeable of the requirements of the valve replacement operation and are in the facility on a regular basis performing walk-downs, surveys, and inspections. A visual inspection of the X-705 South Annex confirmed that dry chemical fire extinguishers were present for use in mitigating the consequences of a fire and a Class D fire extinguisher was available for metal fires.

No fire safety issues were identified as a result of the evaluation and no findings were issued.

4.13 Quality Assurance

Quality Assurance (QA) activities were evaluated to determine if all QA requirements were completed for the HEU cylinder valve replacement operation. The evaluation included a review of documentation and interviews with personnel.

The QA requirements and documentation were reviewed for the wooden plug used for insertion into the cylinder valve hole if the valve or valve stem breaks off, if the replacement valve can not be installed, or if an open cylinder may be exposed to water or other moderators. No deficiencies were found in the review of the wooden plug or any other QA activity evaluated.

No findings were issued in the area of QA .

4.14 Operational Safety Requirements / Transitional Requirements

By letter dated July 30, 1997, USEC proposed Technical Safety Requirements (TSR) Section 2.6.3.4 (Criticality Accident [Radiation] Alarm Systems) and Transitional Requirements (TR) 4.11.16 (Floor Drains), 4.11.17 (Cylinder Cooldown), and 4.13.3 (Area Doors/Ventilation Systems) as safety requirements that would apply during HEU cylinder valve replacement. By letter dated August 21, 1997, DOE stated that TR 4.10.1 (Plant Operations Review Committee), 4.11.01 (Nuclear Criticality Safety Program), 4.24.1 (Records Retention), 4.25.1, 4.25.2, and 4.25.3 (Reporting Requirements) would also be applicable for this evolution.

Contrary to this requirement, the USEC contractor performed Safety Evaluation Number SE-97-0233, Rev. 0, dated October 9, 1997, in which Part H of the Operational Safety Requirements were reviewed. The TSR/TR sections mentioned in

the USEC letter dated July 30, 1997, were the only ones determined necessary to apply. The USEC contractor ORA did not document an evaluation of additional operational safety requirements that would apply during HEU cylinder valve replacement. During our site visit, the DOE team members were told that all of the TRs had been maintained in an active status should the X-705 facility revert to DOE regulation in the future and, therefore, all of the applicable TRs would still apply.

In response to the finding noted in DOE's letter dated April 23, 1998, USEC provided their response dated April 29, 1998, which stated that a conduct of operations review had been performed, all applicable requirements had been flowed down into procedures, and associated surveillances had been performed. Based upon USEC's response, DOE finds the TSR and TR requirements referenced in USEC's letter dated April 29, 1998, to be appropriate and, therefore, acceptable. No additional approvals are required as the TSRs and TRs associated with X-705 have been maintained in a active status.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the above evaluation, the X-705 South Annex is an acceptable location for the replacement of inoperable HEU cylinder valves. The associated programs, procedures and training have been reviewed and found to be acceptable. Therefore, a recommendation is made to accept the temporary transfer of the X-705 South Annex under DOE ROA regulation.