Enclosure 1

Attachment 1 of Agreed Order between the Natural Resources and Environmental Protection Cabinet of the Commonwealth of Kentucky and the US Department of Energy

PGDP Procedure CP4-CU-CH6430, In-storage Fissile Cylinder Inspections (pertinent pages)

ATTACHMENT 1

CYLINDER MANAGEMENT PLAN FOR DEPLETED URANIUM HEXAFLUORIDE (DUF_6)

I. **DUF_6 Cylinder Surveillance Program.** The cylinder surveillance program consists of inspections, ultrasonic thickness testing, and radiological surveys. This DUF_6 Management Plan applies to the present and future inventory of Department of Energy (DOE)-owned DUF_6 cylinders at the Paducah Gaseous Diffusion Plant (PGDP) for which DOE accepts and exercises regulatory authority and responsibility for cylinder management under the Atomic Energy Act. This Plan does not apply to (a) DOE-owned DUF_6 cylinders for which the United States Enrichment Corporation (USEC) exercises cylinder management responsibility or (b) DUF_6 cylinders not owned by DOE. The inventory of cylinders to which this Plan applies may increase or decrease in the future, as DOE converts its inventory of DUF_6 cylinders, accepts ownership and responsibility for additional cylinders (from USEC or off-site sources), or ships DUF_6 cylinders off-site.

A. **Inspections**

The inspections shall be documented on a checklist that has been developed by DOE that includes an entry for the size, type, number, and location of the cylinder, and that describes the criteria for identifying DUF_6 cylinder defects. All accessible areas of all cylinders shall be visually inspected to determine their containment integrity according to the criteria contained in the checklist. If any defect conditions are noted during any inspection required by this DUF_6 Management Plan, DOE will take action it deems appropriate, consistent with recognized industrial applications and practices, to determine the nature and extent of the defect condition and the method of repair or dispositioning of the DUF_6 cylinder or other appropriate action. Key inspection criteria (which are more explicitly described on the DOE checklist) include, but are not limited to, those listed below:

1. **DUF_6 Cylinder Inspection Criteria**

Note: Empty (i.e., net weight zero as indicated in the Nuclear Material Control and Accountability database) cylinders are exempt from cylinder defect criteria inspections.

a. **Mechanical Integrity**

- Visible hole in cylinder
- Evidence of visible leakage/contamination/reaction products (on cylinder or ground)
- Bulge – protruding one-half inch or more
- Gouge or cut – greater than one-sixteenth inch deep
- Dent – greater than one-sixteenth inch deep
- Stiffening ring condition – cracked weld or separation of ring from body
- Severe pitting/corrosion - heavy rust scale on cylinder over one-eighth inch thick and over two inches in diameter
- Lug misaligned/defective

- Visible crack in Cylinder Wall

b. **Cylinder Body Contact Point**

- Body to ground contact
- Stiffening ring ground contact
- Evidence of water/cylinder contact or cylinder in standing water
- Lifting lug contact–Evidence of lifting lug contact
- Wood saddle/resting block–cracking, splitting, rotting, or sinking
- Concrete saddle—missing, cracking, chipping, corrosion or sinking
- Debris between saddle and cylinder
- Coating system failure

c. **Valve End of Cylinder**

- Evidence of contamination on valve
- Bent valve body
- Bent/separated skirt
- Scale in skirt
- Skirt in ground contact
- Weep hole in skirt plugged
- Valve end not accessible
- Packing nut missing/cracked
- Port cap missing/cracked
- Valve stem condition
- Valve protector condition
- Identification (I.D.) plate missing
- I.D. plate loose/cracked welds
- Non-standard valve
- Cracked valve body

d. **Plug End of Cylinder**

- Evidence of contamination on plug
- Bent, missing, or damaged plug
- Bent/separated skirt
- Scale in skirt
- Skirt in ground contact
- Weep hole in skirt plugged
- Plug end not accessible
- Rusted plug
- Plug sealed or welded

2. **Inspection Frequency**

a. All DUF_6 cylinders in storage shall be visually inspected at least every four years using the DUF_6 cylinder inspection criteria of I.A.1.

b. DUF_6 cylinders identified by DOE as having severe corrosion of cylinder surfaces or skirt areas shall be visually inspected annually using the DUF_6 cylinder inspection criteria of I.A.1.

c. If any of the following defect conditions are noted during any inspections required by the DUF6 Management Plan, recognized industrial applications and practices shall be used to determine the nature and extent of the defect condition and the method of repair or disposition of the DUF6 cylinder:

1) Cracks in cylinder wall
2) Presence of DUF6 reaction products other than on valves/plugs (i.e., cylinder breach)

Subject matter experts, such as individuals cognizant with ASME, ANSI, ANS, or other applicable codes, will be selected to evaluate the nature and extent of the defect condition. This team will provide recommendations for repair to the cylinder.

Note: The presence of reaction products at a location other than the valve or plug represents a potentially unsafe condition. The area must be evacuated immediately, and the Plant Shift Superintendent is contacted for emergency response.

3. **Valve Inspections.** Valves identified by DOE as having buildup of DUF_6 reaction products or discoloration around valve/plug shall be inspected monthly to:

a. Ensure the protective cover is still in place

b. Check the protective cover integrity

c. Perform radiological survey for contamination to confirm if valve is leaking

- Taking a swipe sample from the valve to determine if removable, radioactive contamination (i.e. alpha, beta, and gamma) levels exceeding 10 CFR 835, Appendix D exist.

Note: A swipe sample is taken using a cloth or wipe smeared over an area, nominally 100 cm^2 in surface area, to pick up removable surface contamination from the surface of the cylinder. The wipe is then read by the appropriate instrument for contamination level, normally reported in dpm/100 cm^2 (dpm = disintegrations per minute).

- If the valve is determined to be leaking, the valve will be surveyed for removable contamination monthly and the protective cover integrity will be verified.

- Once the valve has been demonstrated not to be leaking, it will be removed from the monthly valve inspection list. All cylinder valves are

radiologically surveyed on a three-year rotation as described in Section I.C.

4. **Breached Cylinder Inspections.** DUF_6 cylinders that DOE has determined to be breached shall be inspected daily until the situation is mitigated. Inspections shall consist of the following:

   a. Ensuring that tarps, if utilized, are in place to prevent precipitation from coming in contact with the cylinder and that a catch pan has been placed beneath the cylinder to prevent material from dropping to the ground

   b. Ensuring that contamination boundaries are in place

      Note: A contamination boundary is an area established using a yellow and magenta rope or tape as determined by radiological survey.

   c. Determining hydrogen fluoride (HF) content in air

      Note: HF content in the air is determined by hand-held HF detectors (such as Draeger Model 21/31 or equivalent) which are calibrated instruments used to read out in concentration of HF.

   d. Collecting DUF_6 reaction products for weighing for nuclear material accountability

   e. Determining removable, surface radiological contamination levels in contamination boundary.

      Note: Determining radiation levels in contamination boundary shall be accomplished by utilizing calibrated radiation instruments to determine contact readings and general area radiation dose levels in mrem/hr or equivalent.

   f. Determining radiation levels in contamination boundary

      Note: General area radiation dose levels are typically determined using approved dose rate instruments taking measurements in millirem per hour (mrem/hr), or equivalent, approximately 1 meter off the ground. Dose rate surveys of cylinders are typically performed at contact and at 30 centimeters (cm). Radiation areas are posted in the cylinder yard for any cylinder or group of cylinders that exhibit a dose rate exceeding 5 mrem/hr at 30 cm.

5. **Movement Inspections.**

   a. All DUF_6 cylinders shall be visually inspected in accordance with the criteria in I.A.1 before movement (pre-relocation inspection) in accordance with applicable safety authorization basis documents.

      Note: The pre-relocation inspection is conducted in two steps. The cylinder is inspected while on the ground. The inspection is

completed after the cylinder is lifted which allows greater access by the inspector to the bottom of the cylinder.

b. All DUF_6 cylinders shall be visually inspected in accordance with the criteria in I.A.1 after movement (post-relocation inspection).

B. Ultrasonic Thickness Testing

1. Ultrasonic thickness testing of 100 cylinders shall be conducted (on an annual basis) using UT measurement techniques.

2. Selection of cylinders to be tested is based on two criteria: 1) cylinders with identified areas of reduced wall thickness may be reinspected, and 2) remaining cylinders are selected randomly.

3. A qualified UT inspector identifies locations on the cylinder (except on cylinder heads) to take random measurements to determine the original wall thickness. These locations are taken where the least amount of corrosion exists. Measurements are taken at locations where corrosion is anticipated to be the most severe to estimate minimum wall thickness values.

C. Radiological Surveys

1. A dose rate survey of the cylinder yards shall be performed at least annually using an approved, calibrated dose rate instrument to establish radiation levels within the cylinder yards and at the established cylinder yard boundaries. Any areas in the cylinder yards exceeding 5 mrem/hr are posted and controlled as radiation areas.

   Note: General area radiation dose levels are typically determined using approved dose rate instruments taking measurements in millirem per hour (mrem/hr) or equivalent approximately 1 meter off the ground. Dose rate surveys of cylinders are typically performed at contact and at 30 centimeters (cm). Radiation areas are posted in the cylinder yard for any cylinder or group of cylinders that exhibit a dose rate exceeding 5 mrem/hr at 30 cm.

2. Cylinder valves will undergo a radiological swipe survey for removable radiological contamination (i.e. alpha, beta, and gamma) at least once every three years.

   Note: A swipe sample is taken using a cloth or wipe smeared over an area, nominally 100 cm^2 in surface area, to pick up removable surface contamination from the surface of the cylinder. The wipe is then read by the appropriate instrument for contamination level, normally reported in dpm/100 cm^2 (dpm = disintegrations per minute).

   Note: Cylinder valves that are found to be leaking are placed on a monthly inspection schedule as described in I.A.3.

3. In the event DOE identifies a cylinder breach, radiological surveys will be performed to delineate the size of the radiologically impacted area and to establish the buffer area per applicable regulations.

4. A radiological survey of any breached cylinder and adjacent contamination zone shall be done daily until the breach is mitigated to address the potential for changing radiological conditions.

   Note: Radiological surveys performed for breached cylinders will include, but are not limited to, dose rate surveys and swipe surveys. Dose rate surveys will be performed with approved, calibrated instruments. Swipe surveys will be performed as outlined in the above note.

5. A radiological swipe survey of valves/plugs suspected of leaking shall be done monthly to determine levels of removable surface contamination (i.e., alpha, beta, and gamma).

II. **DUF_6 Cylinder Maintenance Program** shall consist of the following:

A. Defects identified by DOE during inspections as posing a threat to public health, safety, or environment during storage of the cylinders will be mitigated as determined by DOE in accordance with applicable requirements. The following defects will be corrected following identification:

- Leakage from the valve or plug
- Breach (loss of integrity) or leakage from the body of the cylinder

B. Cylinder maintenance activities could include, but are not necessarily limited to:

- Damage control patch applied
- Permanent welded patch applied
- Contaminated valve bagged
- Contaminated plug covered
- Valve end skirt cleaned
- Plug end skirt cleaned
- Valve replaced
- Identification plate replaced
- Identification plate reattached
- Valve end weep hole unplugged
- Plug end week hole unplugged

III. **DUF_6 Cylinder Storage Yard Surveillance and Maintenance Program**

A. Routine maintenance activities for the storage yards shall consist of:

- Identifying and controlling vegetation
- Identifying and replacing or repairing radiological postings
- Identifying and replacing ineffective barricades

- Identifying and repairing non-working lighting
- Concrete yard repair
- Gravel yard repair
- General housekeeping

B. Paducah currently has no ongoing cylinder recoating program or cylinder yard construction program.

IV. Contingency Plan

A. In the event the Paducah Emergency Plan is invoked in response to an emergency involving the DUF_6 cylinder yards:

1. Evacuate the area immediately.

2. Notify supervision and the Plant Shift Superintendent (PSS) immediately.

B. Appropriate technical personnel shall be summoned to evaluate the situation after the area is determined to be safe to enter by the incident commander.

C. Notification shall be made to the Commonwealth of Kentucky as required by the contingency plan.

D. Any breaches identified by DOE shall be evaluated on a case-by-case basis and corrective actions will be taken as DOE deems appropriate in accordance with applicable requirements to ensure protection to the environment (e.g., sampling of soil and/or surface water run-off areas as appropriate).

V. Records

A. Procedures and/or checklists shall be used to implement the surveillance and maintenance requirements.

B. All DUF_6 cylinder and cylinder yard surveillance and maintenance activities shall be logged/recorded and maintained as described in Section VI.

C. Computerized records may be used in lieu of logs and checklists.

D. Computerized inventory tracking system may be used.

VI. Records/Reporting

All records required by this Plan (e.g., logs and checklists) shall be maintained at the facility as required by DOE guidance, Orders, and facility procedures. until cylinder disposition. Notifications and reports regarding DUF6 storage shall be issued to the Commonwealth of Kentucky and other regulatory entities as required by DOE Orders and DOE program procedures.

Within 30 days of receiving a written request by the Commonwealth of Kentucky for records required by this Plan, DOE and the Operating Contractor shall provide the records to the Commonwealth of Kentucky as outlined in the written request. If classification or sensitivity issues impact any of the information requested, DOE and the Operating Contractor will contact the Commonwealth of Kentucky and work out other arrangements for providing the information as allowed under applicable law, regulations, and DOE Orders. If DOE cannot respond to the request for information within 30 days, DOE shall notify the Commonwealth of Kentucky and provide a date by which it expects to be able to respond to the request.

Within five (5) working days of the discovery of a breach, a written report shall be submitted to the Commonwealth of Kentucky documenting the details of the release, environmental monitoring that has been completed, corrective actions completed to date, and any further actions to be taken. Recorded information shall include cylinder yard, section, row, position, breach size, possible causes, amount and locations of product released, and nameplate information (e.g., cylinder number, model).

VII. Training

DOE shall train all personnel directly involved in handling and inspecting cylinders, in order to comply with DOE procedures. Training shall be specific to the job performed, and shall include, if applicable, safe operation of cylinder-handling equipment, lifting and moving of cylinders, and emergency response procedures. Inspectors also shall be trained on proper inspection procedures, including identification, description, measurement, and recording of all inspection criteria. DOE shall maintain records of training at the facility.

ELECTRONIC
WORKING
COPY
VERIF. DATE: _____
INITIALS: _____

PADUCAH GASEOUS DIFFUSION PLANT
Operations Organization
Chemical Operations Group

IN-STORAGE FISSILE CYLINDER INSPECTIONS
CP4-CU-CH6430
Rev. 4

Effective Date: 02/08/08

Use Category	Case Determination	Group
General Intent	2	POP

Record of Changes

Change Letter	Affected Page(s)	Effective Date	Change Approved by (Initial/Badge #)

The new 5 -year periodic review date is 01/28/13.

Prepared by: R. K. Edwards

Approved by: E.V. Paine Date: 01/25/08
E. V. Paine, Chemical Ops. Mgr.

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5.0 PRECAUTIONS AND LIMITATIONS

None

6.0 PREREQUISITES

None

7.0 TEST EQUIPMENT, TOOLS, AND SUPPLIES

None

8.0 ACTION STEPS

8.1 Inspection Scope and Schedule

NOTE

The inspection of all cylinders every third year will ensure the requirement to inspect each cylinder at least once every four years is met, regardless of when during the inspection year the cylinder is inspected.

All cylinders were inspected between November 2003 and March 2004, therefore; 2006 will be the first inspection year of the 3-year schedule. The inspection will be tracked by PM Master# 000120.

8.1.1 On or after January 1 of the inspection years, perform the following:

A. Obtain NMC&A listing of all USEC-possessed cylinders at PGDP containing greater than or equal to **1.0 wt. %** ^{235}**U**.

B. Obtain NMC&A listing of all cylinders with potentially fissile heels. These are flagged in NuMAS by a container comment.

C. Ensure listing includes cylinder number, location, SAT and UNSAT check blocks, date of run, and page numbers.

8.1.2 FLM assign inspection of all listed cylinders to occur before the end of the calendar year.

8.2 Cylinder Inspection

NOTE
Cylinders need not be moved to directly view areas of cylinder in contact with a saddle.

8.2.1 Visually inspect valve, plug, and cylinder wall of listed cylinders to ensure that no degradation exists and that no abnormal corrosion products indicative of an active or impending breach are present, such as visible uranium oxide around corroded sections of cylinder wall, visible uranium oxide around valves or plugs, etc.

A. **If** an active breach is discovered, evacuate to a safe location and notify the Plant Shift Superintendent.

B. **If** degradation exists or visual abnormal corrosion products are discovered, and are determined indicative of an impending breach, mark UNSAT on NMC&A listing and notify FLM.

C. **If** no breach or visual abnormalities indicative of an impending breach are discovered, mark SAT on NMC&A listing.

D. Sign and date NMC&A listing.

8.2.2 Enter the date of inspection into computer for all listed cylinders inspected.

8.2.3 Turn in inspection results to FLM.

9.0 ACCEPTANCE CRITERIA

Acceptance criteria are specified in action steps.

10.0 POST-PERFORMANCE WORK ACTIVITIES

10.1 **If** cylinder has an UNSAT condition, disposition according to CP2-CU-CH1400, "Tracking of UF_6 Cylinders with Potential Problems."

10.2 **If** degradation exists, or abnormal corrosion products are detected, remove cylinder from service for repair and disposition.

10.3 **If** cylinder valve or plug leakage is suspected, notify Health Physics.