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October 31, 1996

Dr. Carl J. Paperiello
Director, Office of Nuclear Material
Safety and Safeguards
Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SERIAL: GDP 96-0188

Paducah Gaseous Diffusion Plant (PGDP)
Docket No. 70-7001
Certificate Amendment Request-Autoclave Manual Isolation System

Dear Dr. Paperiello:

In accordance with 10 CFR 76.45, the United States Enrichment Corporation (USEC or Corporation) hereby submits a request for amendment to the proposed certificate of compliance for the Paducah, Kentucky Gaseous Diffusion Plant (GDP). This certificate amendment request incorporates a new Technical Safety Requirement (TSR) associated with the Autoclave Manual Isolation System.

Issue 3 of the Plan For Achieving Compliance with NRC Regulations for the Paducah Gaseous Diffusion Plant, requires, in part, that the C-333A and C-337A autoclaves containment systems be modified by installing three manual actuation devices which can be used to place the autoclaves into containment upon confirmation of a UF_6 release. This certificate amendment request incorporates these manual actuation devices into the TSRs as required by this Issue of the Compliance Plan.

Enclosure 1 to this letter provides a detailed description and justification for the proposed changes. Enclosure 2 is a copy of the new TSR pages and revised pages for SAR Sections 3.2.5.7 and 4.3.1.1.1, TSR Table of Contents and Compliance Plan Issue 3. Enclosure 3 contains the basis for USEC's determination that the proposed changes associated with this certificate amendment request are not significant.

Since this proposed certificate amendment request is not required to support continued operation, USEC requests NRC review and approval at your earliest convenience. The amendment should become effective 60 days from issuance.

Any questions related to this subject should be directed to Mr. Mark Smith at (301) 564-3244.

Sincerely,

James H. Miller
Vice President, Production

Enclosures: As Stated

cc: NRC Region III Office
NRC Resident Inspector - PGDP
NRC Resident Inspector - PORTS
Mr. J. Dale Jackson (DOE)

OATH AND AFFIRMATION

I, James H. Miller, swear and affirm that I am Vice President, Production, of the United States Enrichment Corporation (USEC), that I am authorized by USEC to sign and file with the Nuclear Regulatory Commission this Certificate Amendment Request for the Paducah Gaseous Diffusion Plant, that I am familiar with the contents thereof, and that the statements made and matters set forth therein are true and corrrect to the best of my knowledge, information, and belief.

James H. Miller

Subscribed to before me on this 31 day of OCTOBER, 1996.

Notary Public

United States Enrichment Corporation (USEC)
Proposed Certificate Amendment Request
Autoclave Manual Isolation System
Detailed Description of Change

Issue 3 of the *Plan for Achieving Compliance with NRC Regulations at the Paducah Gaseous Diffusion Plant*, (Compliance Plan) requires that a TSR revision be submitted to the NRC to include the requirements for the autoclave manual isolation system. The function of this system is to provide the capability to isolate a suspected UF_6 release in a feed header downstream of the autoclave containment system from the source of UF_6 (the cylinder within the autoclave) while exiting the facility. The need for this system was identified during the preparation of the *Application for United States Nuclear Regulatory Commission Certification Paducah Gaseous Diffusion Plant Safety Analysis Report*.

A manual isolation system was installed in each of the feed facilities, C-333-A and C-337-A. The system is actuated by pulling any one of three actuation devices (mushroom-type pull-buttons) located in the Operations Monitoring Room, the crane bay exit near the local cylinder yard, and the Area Control Room (ACR) of the associated cascade building. These devices transmit a signal to the programmable logic controller (PLC) which sends a signal to initiate closure of each containment valve on all autoclaves within that facility.

The proposed SAR, TSR and Compliance Plan page changes are included as Enclosure 2. The sections of the SAR changed include 3.2.5.7 and 4.3.1.1.1. Compliance Plan Issue 3 was also modified. The description of the actuating devices was corrected to comply with the as-built design (pull-type devices instead of push-type devices). A pull-type device was used in place of a pushbutton to reduce the potential for inadvertent actuation, especially in the high traffic area of the OMR. The physical operation of the pull-type device, in comparison to the operation of a pushbutton, presents no undue burden to the operator. The accident analysis section was updated to remove references to the Compliance Plan. SAR Section 3.15 will be updated to include the autoclave manual isolation system as an AQ system in accordance with the Configuration Management Compliance Plan schedule (Issue 21).

The TSR was written to include those devices located within the feed facilities. The actuating devices in the ACRs are provided for operational flexibility, but are not relied upon for a rapid isolation capability; consequently, these devices are not addressed in the TSR. The TSR provides actions to be taken and time limits for those actions should the system become inoperable. The time limits are commensurate with the significance of the function provided and the availability of alternate means of isolation. The TSR also provides the surveillance requirement (SR) for this system. The SR functionally tests the actuation devices and the logic signal from the PLC. To avoid a complete shutdown of the feed facility, testing of the autoclaves will be performed sequentially rather than testing all autoclaves at once. The closure of the containment valves is verified by the autoclave high pressure isolation system surveillances.

The proposed changes to TSR 2.2 and SAR Section 3.2.5.7 and 4.3.1.1.1 provide the assurance that the autoclave manual isolation system will be available if required.

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Table of Contents viii	**Table of Contents** viii
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Issue 3 Pages 1 through 7	**Issue 3** Pages 1 through 7

3.2.5.1 Conductivity Monitoring

Each autoclave is provided with redundant conductivity cells to monitor the atmosphere within the autoclave to detect the presence of any HF that would result from UF_6 that might leak from a cylinder. The conductivity cell constantly withdraws a portion of the steam vapor, condenses it, and measures the electrical conductivity of the condensate. UF_6 leakage into the autoclave will form HF, which results in high conductivity, which in turn operates an interlock system to isolate the autoclave by closing the redundant inlet steam valves, evacuation valves, feed line valves, vent valves, condensate drain valves, and conductivity valves to contain any UF_6 release products within the autoclave. Procedural controls dictate that at least one of the conductivity cells must be in operation at all times to detect any small leaks of UF_6.

3.2.5.2 Water Inventory Control

As mentioned in Section 3.2.3, the maximum pressure generated in an autoclave from an accidental UF_6 release and subsequent reaction with the available water is best controlled by limiting the water in the autoclave shell. Redundant condensate level probes, LE-527-**A and LE-527-**B, are mounted in the 3-in. drain pipe slightly below the autoclave. These probes are referred to as the primary condensate probes. If the ultrasonic probes detect high water levels, the steam supply isolation valves close to limit the total water in the autoclave. To prevent false alarms, a time delay feature requires the system to be in the alarm state for five seconds before the alarm will initiate steam valve and thermovent line block valve closure. This system has been designated a system required to be included in the technical safety requirements (TSR) (see Figure 3.2-2). A secondary condensate probe, located lower in the condensate drain line provides an alarm before the condensate level reaches the primary probes. The secondary system is not a TSR system.

3.2.5.3 Autoclave Steam Pressure Control

The autoclave steam pressure control system is required to be included in the TSR and is used to stop the steam flow to the autoclave while heating a cylinder prior to reaching temperatures that could result in reaching its maximum allowable working pressure. If the autoclave pressure reaches 8 psig, the steam pressure control system closes the steam isolation valves and the thermovent line block valve and sounds an alarm. The components of this system are the pressure transmitters PT-514 and PT-515, pressure switches PSH-514 and PSH-515, steam supply isolation valves PV-520 and XV-524, and associated relays, solenoids and switches (see Figures 3.2-2 and 3.2-4). The thermovent line block valve is not covered by a TSR since the isolation function is accomplished by closing the steam isolation system.

3.2.5.4 Autoclave High Pressure Isolation System

The autoclave high pressure isolation system causes the autoclave to go into the containment mode and sound an alarm if the internal pressure of the autoclave reaches 15 psig. In addition, the system disables the hydraulic system required to open the autoclave shell preventing the autoclave from opening until the alarm condition has been cleared. This system is identified as a system required to be included in the TSR. The components of this system include the autoclave shell, head, and locking ring, pressure transmitters PT-514 and PT-515, pressure switches PSHH-514 and PSHH-515, containment block valves XV-504, CV-504, XV-505, CV-510, CV-511 XV-516, PV-520, XV-524, PV-525, XV-528, FV-529, XV-532, CV-533, and XV-565, and associated relays and switches, see Figures 3.2-2 and 3.2-4.

3.2.5.5 Autoclave Relief System

The autoclave relief system consists of the autoclave rupture disc PSE-518 and relief valve PSV-513, which vents pressure in excess of 200 psig (MAWP of the autoclave) to the atmosphere through a vent line through the roof (see Figure 3.2-2). The relief valve closes when the autoclave pressure drops below the MAWP to limit the amount of any release. This system is required to be included in the TSR.

3.2.5.6 UF_6 Detection System

Although the autoclaves are designed to contain a UF_6 release, UF_6 detection heads are installed above the autoclave head ring, the heated housing at the autoclave head, above the jet station piping, and in the piping trench. These systems consist of one detector each and will detect any leakage from the autoclave seal, the heated housing piping, the jet station piping, or the piping trench. If a leak is detected, an alarm is sounded locally at each autoclave and on the UF_6 detector alarm panel. The UF_6 detection systems located for the heated housings, jet station, and piping trench are designated as a system required to be included in the TSR (see Figures 3.2-5 and 3.2-6).

3.2.5.7 Autoclave Manual Isolation System

The autoclave manual isolation system contains three manual actuation devices, one at the Operations Monitoring Room, one at the crane bay exit near the local cylinder yard, and one in the ACR. When one of these devices is actuated, containment valve closure is initiated for each facility autoclave. The system is used upon confirmed UF_6 outleakage to mitigate the release.

3.2.5.8 Operational Systems

The following operational systems are intended to prevent challenges to the safety systems. Although these systems are not relied upon to provide safety functions, they do provide diversity while performing their intended function of improving autoclave operations.

- The low cylinder pressure system closes the steam isolation valves and the thermovent line block valve and sounds an alarm if the cylinder pressure fails to reach 24 psia in 1 3/4 hours. The components of this system are the timer (internal to the programmable logic controller), pressure transmitter PT-502, pressure switch PSL-502, steam supply isolation valves PV-520, XV-524, and thermovent line block valve XV-565, and associated relays, solenoids, and switches.

- The high cylinder pressure system closes the steam isolation valves and sounds an alarm if cylinder pressure exceeds 90 psia. The components of this system are the pressure transmitter PT-502, pressure switch PSH-502, steam supply isolation valves PV-520, XV-524, and thermovent line block valve XV-565, and associated relays, solenoids, and switches.

- The cylinder pressure relief system relieves pressures in excess of 100 psig (lowest MAWP of the cylinders heated) from the feed cylinder and closes the steam isolation valves and the thermovent line block valve. The components of this system are the 100 psig relief discs, PSE-506 and PSE-508,

Because the cylinder valve is always in the 12 o'clock position, any UF_6 released from a leak at the valve or pigtail connection would be in the vapor phase. The UF_6 would react with the available water to form HF which would be detected within 30 sec by the conductivity cells. If the leak were small, the autoclave pressure would not rise rapidly and the conductivity cells would detect the leak and sound an alarm locally and in the control room. A loss of power or a containment signal generated either by the conductivity cells or the autoclave high pressure isolation safety system will also cause the cylinder valve to automatically close, thus terminating the UF_6 release into the autoclave. The cylinder valve is closed with an air-operated cylinder valve closer at each autoclave.

It is expected that the cylinder valve will close in no more than 2 minutes. The amount of UF_6 released inside the autoclave would depend on the size of leak, but would be no more than 80 lbs/min. The only reaction products to leave the autoclave would be those exiting through the condensate drain line (and the vent line during initial heatup) in the time required to detect the release and isolate the autoclave. Any release large enough to cause a significant release via the condensate sample line would also cause a pressure great enough to actuate the autoclave UF_6 high pressure isolation safety system.

The autoclave steam pressure control safety system utilizes pressure sensors which are set to close the steam inlet valve if autoclave pressure exceeds 8 psig. If the autoclave pressure continues to rise, the autoclave high pressure isolation safety system will put the autoclave into containment at 15 psig. All redundant block valves will close within 10 sec following the signal from the pressure sensors.

Figure 4.3-2, from the Barber calculations, shows that during a large release the autoclave pressure rises rapidly, reaching a maximum in less than 30 seconds.[2] In this case, the use of a pressure sensor provides a more rapid isolation than that obtained from a conductivity cell. Because the Barber calculations are based on a completely closed vessel, tests have been conducted to prove that the pressure rise is fast enough to actuate a pressure sensor for rapid isolation of the autoclave, despite the pressure loss caused by the open condensate drain and conductivity cell sample line isolation valves. These valves would be open during operation. Figure 4.3-3 shows that pressure decay characteristics of a typical autoclave from 90 psig with the drain and sample line valves open. Figure 4.3-4 shows the pressure decay from 50 psig with selected valves closed. Consequently, the autoclave isolation system is initiated by the pressure sensor for those releases having a large and rapidly rising pressure for which the reaction time of the conductivity cell could be marginal, and by the conductivity cell for those releases which are small and result in a pressure below the trip point of the pressure sensor.

The amount of reaction products lost through the condensate drain line would be too small to present any health hazard. The amount of UF_6/H_2O reaction products released through the condensate drain is

not vastly different regardless of whether the incident is detected and terminated by the conductivity system or by the autoclave high pressure isolation system. The following discussion assumes the conductivity system fails.

For very small releases from the cylinder (2 lb/min UF_6), the pressure rise would be slow, resulting in the condensate drain remaining open for a longer period of time until the pressure rises to a level sufficient to actuate either the autoclave steam pressure control or the autoclave high pressure isolation system. However, because of the low release rate, a relatively small quantity of UF_6/H_2O reaction products are available for release out the condensate drain. The estimated release of UF_6/H_2O reaction products through the condensate drain line is 0.1 pound UO_2F_2 if the conductivity system detects and terminates the incident, and 2.9 pounds UO_2F_2 if the autoclave high pressure isolation system detects and terminates the incident.

As the UF_6 release rate from the cylinder/pigtail increases, the amount of UF_6/H_2O reaction products available for release increases accordingly. However, the pressure transient would be correspondingly more rapid, resulting in quicker detection and termination by the autoclave high pressure isolation system. Consequently, the condensate drain line would be open for a shorter period of time. The estimated release of UF_6/H_2O reaction products through the condensate drain line for a release rate of 20 lb/min UF_6 from the cylinder is 2.4 pounds of UO_2F_2 if the conductivity system detects and terminates the incident, and 2.4 pounds UO_2F_2 if the autoclave high pressure isolation system detects and terminates the incident. At release rates greater than 20 lb/min UF_6 from the cylinder, the autoclave high pressure isolation system detects the incident more rapidly, and the amount of UO_2F_2 released decreases (to 0.2 pounds UO_2F_2 at an 80 lb/min UF_6 release rate from the cylinder).

The feed autoclaves are designed with a maximum allowable working pressure (MAWP) of 200 psig. Assuming full UF_6 reaction with the maximum allowable water inventory in the autoclave, there would be no release to the atmosphere. Calculations show that following an initial pressure spike to 103 psia, autoclave pressures will not exceed 87 psia as a result of the accident postulated above. Should the UF_6 react with an excessive amount of water, the autoclave is protected from overpressurization by the autoclave pressure relief safety system. This system consists of a rupture disk and relief valve which vent reaction products to the atmosphere. The relief system is sized to prevent pressures from exceeding 110% of the MAWP. The relief valve recloses at the MAWP to limit any potential release.

The likelihood of such an accident happening in an autoclave is considered to be low due to the administrative controls concerning testing of cylinder valves, pigtails, and connections.

A release resulting from a valve or pigtail failure with the autoclave open would be detected by the UF_6 release detection system located above the autoclave locking ring and alarmed in the local area, the ACR, and C-300. An autoclave closure button is available near the autoclave head which must be continuously depressed to close the autoclave. The administrative controls referenced above are relied upon to prevent releases with the autoclave open.

A release from a line outside the autoclave would be detected by the UF_6 release detection system located in the heated housing, at the jet stations, and in piping trenches and alarmed in the local area, the ACR, and C-300. The autoclave manual isolation system provides a remote isolation device at the feed facility operations monitoring room (OMR), at the cylinder yard crane bay exit, which is the most likely point

of egress from the autoclave area, and the ACR.

4.3.1.1.2 Cylinder Drop and Puncture

All UF_6 feed cylinders are moved to the autoclaves with overhead cranes. The possibility of a cylinder drop due to crane or lifting fixture failure is always present. The drop and subsequent puncture of a UF_6 feed cylinder does not present a serious safety concern because the UF_6 in the cylinder is in the solid state. Cylinders are empty (except for heel quantities of UF_6 and/or non-volatile uranium-bearing compounds such as UO_2F_2) when removed from the autoclaves and no unique safety hazard is present in this operation.

On rare occasions, a cylinder which is filled or partially filled with liquid UF_6 may develop a plugged valve. If this condition should arise, the cylinder is not removed from the autoclave until it has solidified. It can then be moved to the cylinder yard. The feed facility overhead cranes are not approved for handling liquid cylinders. Options are being pursued to approve the C-337-A double hook crane to handle liquid cylinders.

Failure of crane cables, hooks, brakes, and controls are considered unlikely because of the routine maintenance and periodic inspections by qualified inspectors.

4.3.1.1.3 Autoclave Leakage

The autoclave/gasket/isolation valve system will be tested at accident pressure. The accident pressures appear to spike to approximately 103 psia and then relax to about 85 psia for the C-360 autoclaves; the other autoclaves will reach a pressure of about 96 psia. Therefore, a test pressure of 90 psig (104.7 psia) will be used for all autoclaves.

The leakage of the autoclave may be measured as an air leak rate or pressure decay rate. The allowable leakage will be less than or equal to 12 standard cubic feet of air per minute or a pressure decay of less than 10 psig in one hour with the autoclave at peak accident pressure. Derivation of these leak rates is shown below.

The autoclave containment system will be tested quarterly and prior to the routine replacement of the gasket. The time to gasket failure and the number of use cycles to failure will be recorded. The proofing of an adequately installed new gasket shall be by a pressure decay test or leak rate test. The autoclave containment system will also be tested every time a component whose performance could impact containment performance is replaced.

Allowable Leakage Rates

The allowable leakage of the autoclave should be less than or equal to 12 standard cubic feet of air per minute or a pressure decay of less than 10 psig in one hour with the autoclave at peak accident pressure. These limits are derived as follows:

1. This leak rate, assuming the instantaneous dispersion within the hemispherical volume defined by the point of the leak and the exit from the facility, approximately 75 feet, limits the intake to a worker following the plant "see and flee" policy to less than 10 mg of uranium. According to the NUREG-1391, a 10 mg intake of uranium is approximately the threshold value for transient kidney damage. It is also the weekly limit for soluble uranium intake specified in 10 CFR 20. The Statement-of-Considerations for 10 CFR 76 identifies a 30 mg uranium acute intake as a level where kidney damage may result.

2. Exposure Volume = 2/3 x π x $(75)^3$ = 883,575 ft^3 or 883,575 x 2.832E-2m^3/ft^3 - 25,022 m^3

3. Intake = Average Air concentration (mg/m^3) x 1.2 m3/hr x Exposure Time (minutes)/60.

   Air Concentration - intake x 60/1.2 or 500 mg/m^3

4. This concentration is an average concentration for the workers intake, therefore the pounds of uranium leaked is equal to the concentration times the exposure volume divided by 454,000 mg/#.

   #U leaked = 500 x 25,022/454,000 = 27.5 pound

5. The appropriate leak rate is 27.5 pounds per minute; this converts to a leak rate of 160 scfm.

For a one minute exposure, the HF concentration derived in NUREG-1391 as 137 mg/m^3. Four moles of HF are formed when one mole of UF_6 reacts with water vapor and condensate. The concentration of uranium associated with 137 mg/m^3 of HF is:

1. 1/4 x (137/20,000) x 238,000 or 408 mg/m^3

2. The uranium release, for a one minute release that is, produces an exposure of 408 mg/m^3 is

   408/454,000 x 25,022 = 22.4 pounds per minute.

3. This converts to a leak rate of 132 standard cubic feet per minute at peak accident pressure.

If the above leak rates are divided by a factor of 10 to account for dispersion model and evacuation time uncertainties, it is recommended that 12 scfm be used as the leak rate for the test at peak accident pressure. This corresponds to a pressure loss of 24 psig per hour and 12 psig per hour for the feed and sampling autoclaves respectively.

The pressure decay (in psi per hour) for a feed autoclave with a volume of 622 ft^3 is computed as follows:

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SECTION 2.2 SPECIFIC TSRs FOR UF_6 FEED FACILITIES (C-333-A AND C-337-A)

2.2.4 GENERAL LIMITING CONDITIONS FOR OPERATION

2.2.4.13 AUTOCLAVE MANUAL ISOLATION SYSTEM

LCO 2.2.4.13: The autoclave manual isolation system actuation devices located in the feed facilities shall be operable.

APPLICABILITY: Modes: 4, 5

ACTIONS:

Condition	Required Action	Completion Time
A. The actuation device located in the OMR is inoperable.	A.1 Position an operator such that the "see-and-flee" path provides access to the actuation device located at the cylinder yard crane bay exit. TSR 1.6.2.2d is not applicable.	4 hours
B. The actuation device located at the cylinder yard crane bay exit is inoperable.	B.1 Provide continuous stationing of an operator in the OMR. TSR 1.6.2.2d is not applicable.	4 hours
C. Both feed facility actuation devices inoperable.	C.1 Restore operability to at least one actuating device. TSR 1.6.2.2d is not applicable.	4 hours
D. Required action C not satisfactorily accomplished.	D.1 Place the autoclaves in mode 2. OR D.2 Close containment valves XV-503, CV-504, XV-505, XV-511 and CV-510 on each autoclave.	Immediately Immediately

SECTION 2.2 SPECIFIC TSRs FOR UF_6 FEED FACILITIES (C-333-A AND C-337-A)

2.2.4 GENERAL LIMITING CONDITIONS FOR OPERATION

2.2.4.13 AUTOCLAVE MANUAL ISOLATION SYSTEM

SURVEILLANCE REQUIREMENTS:

Surveillance	Frequency
SR 2.2.4.13-1 Perform functional test of the system actuation devices located in the Feed Facilities.	Annually

BASIS:

The autoclave manual isolation system provides the means to remotely isolate all facility autoclaves in the event of a UF_6 release from a line outside the autoclave containment boundary. The system consists of two local (within the feed facilities) actuation devices located in the OMR and at the cylinder yard crane bay exit (the most likely point of egress from the autoclave area), and one remotely located actuation device in the associated cascade building ACR. The actuating devices in the ACRs are provided for operational flexibility, but are not relied upon for a rapid isolation capability; consequently, these devices are not addressed in the TSR. Actuating the system will initiate closure of all containment valves for each of the autoclaves within the affected facility. In the event of a UF_6 release from a line outside the autoclave containment boundary, the operator, while exiting the facility in accordance with the "see-and-flee" policy, would actuate the system to isolate the release point from the UF_6 source and limit the amount of material released. Closure of valves XV-503, CV-504, XV-505, XV-511, and CV-510 isolate a cylinder within an autoclave from piping outside the containment boundary thereby eliminating the source of UF_6 available for release. [SAR Section 4.3.1.1.1]

The autoclave manual isolation system closes the same containment valves as those described in TSR 2.2.3.1 for the autoclave high pressure isolation system. Therefore, the operability and surveillance requirements for these valves are included in Section 2.2.3.1. TSR surveillance 2.2.4.13-1 is not required to include the actual closure of all of the containment valves on all autoclaves simultaneously as this would require complete shutdown of the feed facility. The test will be performed by disabling the local actuation devices from the autoclaves not being tested and verifying the appropriate containment logic output from the programmable logic controller for the autoclaves being tested. Testing of all autoclaves in a facility will verify operability of the manual isolation system. Containment valve closure is verified quarterly by the performance of the TSR surveillance requirement 2.2.3.1-2.

Autoclave Upgrades

REQUIREMENTS

10 CFR 76.35(a)(6)—"The application for an initial certificate of compliance must include the information identified in this section. (a) A safety analysis report which must include the following information: . . . (6) A description of equipment and facilities which will be used by the Corporation to protect health and minimize danger to life or property . . ."

10 CFR 76.85—"The Corporation shall perform an analysis of potential accidents and consequences to establish the basis for limiting conditions for operation of the plant with respect to the potential for releases of radioactive material. Special attention must be directed to assurance that plant operation will be conducted in a manner to prevent or to mitigate the consequences from a reasonable spectrum of postulated accidents which include internal and external events and natural phenomena in order to ensure adequate protection of the public health and safety."

10 CFR 76.87(c)(5)—"(c) Appropriate references to established procedures and/or equipment to address each of the following safety topics must be included in technical safety requirements: . . . (5) Radiation protection."

COMMITMENT

Source: Safety Analysis Report

3. Facility and Process Description

3.2 UF_6 Feed Facilities

3.2.5 Instrumentation

3.2.5.4 Autoclave High Pressure Isolation System [Rev. 3, 5/31/96]

"The autoclave high pressure isolation system causes the autoclave to go into the containment mode and sound an alarm if the internal pressure of the autoclave reaches 15 psig. In addition, the system disables the hydraulic system required to open the autoclave shell preventing the autoclave from opening until the alarm condition has been cleared. This system is identified as a system required to be included in the TSR [Technical Safety Requirements]."

3.2.5.7 Autoclave Manual Isolation System [Rev.]

"The autoclave manual isolation system contains three manual actuation devices, one at the Operations Monitoring Room [OMR], one at the crane bay exit near the local cylinder yard, and one in the ACR [Area Control Room]. When one of these devices is actuated, containment valve closure is initiated for each facility autoclave. The system is used upon confirmed UF_6 outleakage to mitigate the release."

3.4 UF_6 Product Withdrawal Facility
3.4.7 Instrumentation [Rev. 3, 5/31/96]
3.5 UF_6 Tails Withdrawal Facility
3.5.7 Instrumentation [Rev. 3, 5/31/96]

"The cylinder valve closer is air operated with a nitrogen backup. On loss of plant air or low plant air pressure, a pressure switch on the air supply line (set at or above 75 psig) actuates to open a solenoid valve which makes nitrogen available to the air supply line. The cylinder valve can be closed by the nitrogen in 30 seconds. The nitrogen connection to the air supply line is made downstream from a check valve in the line which prevents loss of nitrogen pressure. The nitrogen bottle which supplies the system with backup nitrogen is a 1.55 ft^3 tank and must have an indicated pressure of at least 1200 psig. The nitrogen is regulated to an indicated 80 psig.

Check valve operability is verified during quarterly testing by monitoring for detectable flow from tubing located upstream from the check valve that is open to atmosphere (no detectable flow after nitrogen has been supplied to the supply header down stream from the check valve indicates the valve has seated properly). Another indication of proper check valve performance is closing a cylinder valve using the nitrogen backup (also part of the quarterly test). If the cylinder valve will close within the required 30 seconds using nitrogen, then the check valve is providing sufficient resistance to backflow for the system to function properly if called upon to do so."

3.6 Uranium Hexafluoride Sampling and Transfer Facility
3.6.7 Instrumentation [Rev. 3, 5/31/96]

"Instrumentation for the UF_6 sampling and transfer facility is designed to monitor and control those operations involved in the heating, sampling, and transferring of UF_6."

3.6.7.2 UF_6 Detection [Rev. 3, 5/31/96]

"The laboratory area (Zone 1) contains two UF_6 detectors. When either detector is activated, the associated circuitry initiates closing the UF_6 sample line isolation valves, XV-*51 and XV-*48, closing the UF_6 transfer line sample isolation valves, XV-*49 and XV-*52, and sounding of alarms. This isolates all sample cabinets from their corresponding autoclave. The alarms sound at the local autoclave panel, the C-360 supervisor's office, and in the CCF [Central Control Facility] in C-300. The Zone 1 detection system does not initiate building containment.

Detector heads in the basement area (Zone 4) are located above the receiving cylinder pigtail, cold trap, the relief tanks, surge drums and on the ceiling in the transfer room. When any of these detector heads is actuated, the associated circuitry initiate closing the UF_6 transfer line block valves on all autoclaves (XV-*52 and XV-*50), closing the transfer line block valve WV-042, closing the receiving cylinder valve, actuating building containment which allows the automatic door closures on the drain station enclosure to close, providing confinement, and sounding alarms. The Zone 1 and portions of the Zone 4 detection systems are identified as systems required to be included in the TSR. . . .

The cylinder valve closer is air operated with a nitrogen backup. On loss of plant air or low plant air pressure, a pressure switch on the air supply line (set at or above 75 psig) actuates to open a solenoid valve which makes nitrogen available to the air supply line. The cylinder valve can be closed by the nitrogen in 30 seconds. The nitrogen connection to the air supply line is made downstream from a check valve in the line which prevents loss of nitrogen pressure. The

nitrogen bottle which supplies the system with backup nitrogen is a 1.55 ft^3 tank and must have an indicated pressure of at least 1200 psig. The nitrogen is regulated to an indicated 80 psig.

Check valve operability is verified during quarterly testing by monitoring for detectable flow from tubing located upstream from the check valve that is open to atmosphere (no detectable flow after nitrogen has been supplied to the supply header down stream from the check valve indicates the valve has seated properly). Another indication of proper check valve performance is closing a cylinder valve using the nitrogen backup (also part of the quarterly test). If the cylinder valve will close within the required 30 second using nitrogen, then the check valve is providing sufficient resistance to backflow for the system to function properly if called upon to do so."

3.6.7.5 Autoclave High Pressure Isolation System [Rev. 3, 5/31/96]

"The autoclave high pressure isolation system causes the autoclave to go into the containment mode and sound an alarm if the internal pressure of the autoclave reaches 15 psig. The relay logic does not currently lock out the autoclave hydraulics upon autoclave high pressure isolation system actuation. However, the alarm response procedure and emergency response procedure do not direct autoclave opening until the alarm condition is cleared. This system is identified as a system required to be included in the TSR."

3.6.7.7 Operational Systems [Rev. 3, 5/31/96]

"The cylinder pressure relief system relieves pressures in excess of 100 psig from the feed cylinder to the cylinder relief tanks, and closes the steam supply isolation valves and the thermovent line block valve. . . .

The autoclave opening prevention system is used to prevent the opening of an autoclave when the internal pressure exceeds 1.25 psig and gives a visual indication. . . .

The cylinder roll interlock prevents the rolling of a cylinder while the pigtail is pressurized."

DESCRIPTION OF NONCOMPLIANCE

This issue involves a total of twenty-two autoclaves. There are eight autoclaves in C-333A, ten autoclaves in C-337A, and four autoclaves in C-360. There are no autoclaves in C-310 or C-315, but liquid UF_6 is transferred to product withdrawal cylinders there.

1. The three manual actuation devices for the C-333A and C-337A autoclave containment system, one at the OMR, one at the crane bay exit near the local cylinder yard, and one in the ACR used to place the autoclaves into containment upon confirmation of a UF_6 release, are not installed.

2. The reset function for the C-333A and C-337A Autoclaves High-Pressure Isolation System initiates the opening of certain containment valves. This could result in the opening of valves that are not intended to be opened.

3. The indicating range for the pressure transmitters on the autoclave opening prevention and cylinder roll interlock systems in C-360 is so much larger than normal operating pressures that calibration and instrument accuracies cannot be assured.

4. The present pressure monitoring instrumentation does not have the capacity, accuracy, and resolution to reliably measure the vacuum required by UF_6 piping test procedure to verify integrity of piping connections. In addition, the present pressure monitoring instrumentation on the autoclaves in C-333A, C-337A, and C-360 has too large of a pressure range to accurately measure the small difference between the operating and the steam shutoff (8 psig) pressure.

5. The SAR Upgrade activities have identified transfer and sampling piping in C-360 where the UF_6 detection systems located in Zones 1 and 4 initiate closure of only one containment isolation valve on the transfer/sampling piping.

6. The performance criteria and test plan for determining plant air isolation check valve operability on loss of plant air and for allowing the bottled nitrogen system to operate the emergency valve closing for C-310, C-315, and C-360 has not been developed.

7. The autoclaves in C-360 do not have a low instrument air pressure switch to initiate containment upon loss of instrument air.

8. The relay logic for the autoclaves in C-360 does not lock out the hydraulics to prevent the autoclaves from being inadvertently opened when an Autoclave High-Pressure Isolation System containment signal is present.

9. The transfer manifold for the parent-daughter transfer operation in C-360 is not provided with pressure relief protection.

10. The capability to perform a pressure decay test separately for the inner and outer containment valves, and assuring that backpressure does not mask leaks, does not exist for all autoclaves in C-333A, C-337A, and C-360.

JUSTIFICATION FOR CONTINUED OPERATION

1. In the event of a release of UF_6 in C-333A or C-337A, the UF_6 detection system will actuate an annunciator in the OMR, the ACR, and the CCF. In response to such an alarm where more than one indication of UF_6 release has occurred, the following actions will be required:

   - Personnel will immediately evacuate the local area of the feed facility except for the OMR in accordance with the "see and flee" policy.

   - The OMR operator will place the operating autoclaves into containment by placing the conductivity cell meters in the check calibration mode (simulating a high-high conductivity signal). To ensure that the conductivity cell meters will adequately perform this function, quarterly channel functional surveillance tests are performed.

   - Following initial evacuation and placement of the autoclaves into containment, the alarm response procedure requires that an operator don protective clothing and respiratory protection and investigate the alarm. The operator will use HF detection equipment to determine the presence of HF, indicating a release of UF_6.

Also, until the autoclave manual isolation devices are installed, quarterly system channel functional tests to verify containment valves closure and quarterly tests of each UF_6 detection head will be performed.

2. The Autoclave High-Pressure Isolation System cannot be reset until the autoclave pressure is below 15 psig, the limiting safety system setting. Until the control logic is modified so that the containment valves remain closed after reset of the containment signal, the operating procedure requires the operator to manually close these valves immediately after resetting the Autoclave High-Pressure Isolation System.

3. The autoclaves in C-360 are not currently in operation and will not be placed into operation until the pressure transmitters on the autoclave opening prevention and cylinder roll interlock systems are replaced.

4. Until replaced, the present pressure monitoring instrumentation for the C-333A, C-337A, and C-360 autoclaves is adequate to provide marginally acceptable capacity, accuracy, and resolution for autoclave operation. Also, the steam shutoff pressure trip is set sufficiently low to ensure that the desired 8 psig is not exceeded.

5. Until the UF_6 detection systems for Zones 1 and 4 are modified, sampling will not be allowed during transfer operations. Also, the operating procedure requires the operator to ensure that the drain valves remain shut when sampling operations are conducted.

6. The bottled nitrogen backup system for C-310, C-315, and C-360 is currently out of service. In C-310 and C-315, the plant air supply to the cylinder valve is being periodically verified by operator surveillance to ensure operability. Upon identification of a loss of the plant air supply, administrative controls require manual closure of the cylinder valve(s). This surveillance is not currently being performed in C-360 as the cylinder valve closer system is out of service.

7. For the autoclaves in C-360, there is redundant instrumentation to initiate containment upon a high-pressure indication. One channel of this instrumentation is a pressure switch which is not dependent on instrument air to perform its containment initiation function. This is sufficient for safe operation until the low instrument air pressure switch is added.

8. The alarm and emergency response procedures for the autoclaves in C-360 only allow the operator to open the autoclaves after clearing the alarm condition via an administratively controlled key switch. Also, the autoclave opening prevention system locks out the hydraulics to prevent the autoclaves from being opened when the pressure is greater than 1.25 psig. The autoclave opening prevention system is tested quarterly to verify its ability to perform this function.

9. The design of the liquid transfer for the parent-daughter transfer of UF_6 in C-360 was constrained by the need to protect against a catastrophic release of liquid UF_6 to the work or general environment. This constraint was addressed by providing a set of administrative procedures, four independent controls on the source of heat, and two sets of doubly redundant steam cutoffs.

10. Until the capability to perform a pressure decay test separately for the inner and outer containment valves, and assuring that backpressure does not mask leaks, is provided for all

autoclaves in C-333A, C-337A, and C-360, the following surveillance tests will be performed: (1) quarterly channel functional tests to verify containment valve closure and (2) quarterly overall autoclave containment pressure decay or leak rate.

The above discussion provides justification that the plant can continue to operate safely until the autoclave upgrades are installed as discussed in the Plan of Action and Schedule.

PLAN OF ACTION AND SCHEDULE

1. The C-333A and C-337A autoclave containment systems will be modified by installing three manual actuation devices, one at the OMR, one at the crane bay exit near the local cylinder yard, and one in the ACR which can be used to place the autoclaves into containment upon confirmation of a UF_6 release. [Complete] The associated TSR will be submitted to the NRC for approval. [Complete]

2. The control logic for the C-333A and C-337A Autoclave High-Pressure Isolation System will be modified such that upon reset of the containment signal, the valves will remain closed, but the valves can be opened by subsequent operator action. [Complete]

3. The pressure transmitters for the autoclave opening prevention and cylinder roll interlock systems in C-360 will be replaced. [Complete]

4. The pressure monitoring instrumentation serving the autoclave safety systems and defense-in-depth systems for C-333A, C-3337A, and C-360 autoclaves will be replaced. The scheduled completion date for this action is October 31, 1997.

5. The UF_6 detection systems for Zones 1 and 4 will be modified such that upon detection of a UF_6 release, multiple valves (FV-*50, *52, and *47 from Zone 1 and FV-*47 and *49 from Zone 4) will be closed on the transfer and/or sampling piping. The scheduled completion date for this action is August 31, 1997.

6. Performance criteria and a test plan will be developed to demonstrate whether the nitrogen backup can close the cylinder valve in 30 seconds in C-310, C-315, and C-360. Further design requirements will be completed pending the outcome of this testing. The scheduled completion date for this action is December 31, 1996.

7. Add a low instrument air pressure switch to the autoclaves in C-360 to initiate containment upon loss of instrument air. The scheduled completion date for this action is August 31, 1997.

8. Modify the controls for the autoclaves in C-360 to prevent them from being inadvertently opened when an Autoclave High-Pressure Isolation System containment signal is present. The scheduled completion date for this action is October 31, 1997.

9. A code interpretation from the ASME Code Committee will be obtained regarding the C-360 parent-daughter transfer system and the need for pressure relief on the transfer manifold. Based on this interpretation, the need for modifications to the system or operations will be assessed. Both the ASME Code interpretation and the assessment results will be submitted

to NRC for review and approval. The scheduled completion date for these actions is December 31, 1996.

10. Modifications to allow a pressure decay test to be perfomed separately for the inner and outer containment valves, and assurance that backpressure does not mask leaks, for all autoclaves in C-333A, C-337A, and C-360 will be complete by December 31, 1996. A revised TSR to reflect the new configuration will be submitted to NRC by December 31, 1996.

SUMMARY OF REQUIREMENTS, COMMITMENTS, AND NONCOMPLIANCES

Issue: Autoclave Upgrades

Code of Federal Regulations	**Part**
Title 10	76.35(a)(6), 76.85, 76.87(c)(5)
Application Commitment	**Section**
Safety Analysis Report	3.2.5.4, 3.2.5.7, 3.4.7, 3.5.7, 3.6.7, 4.3.1.1.1, 4.3.5.4.3
Technical Safety Requirements	2.1, 2.2, 2.3
Application Noncompliance Statement	**Section**
Safety Analysis Report	3.16.2, 3.16.5, 3.16.10, 4.3.1.1.1, 4.10

United States Enrichment Corporation (USEC)
Proposed Certificate Amendment Request
Autoclave Manual Isolation System
Significance Determination

The United States Enrichment Corporation (USEC) has reviewed the proposed changes associated with this certificate amendment request and provides the following Significance Determination for consideration.

1. No Significant Decrease in the Effectiveness of the Plant's Safety, Safeguards or Security Programs

   The proposed changes enhance the operator's ability to isolate the feed autoclaves in the event of a leak in the piping outside the autoclave containment. The changes affect no other equipment functions or administrative requirements. The autoclave isolation function is not addressed in plant safety, safeguards or security programs contained in Volume 3 of the Application for United States Nuclear Regulatory Commission Certification for the Paducah Gaseous Diffusion Plant. Therefore, the effectiveness of these programs is unaffected by these changes.

2. No Significant Change to Any Conditions to the Certificate of Compliance

   The proposed changes enhance the operator's ability to isolate the feed autoclaves in the event of a leak in the piping outside the autoclave containment. The changes affect no other equipment functions or administrative requirements. None of the Conditions to the Proposed Certificate of Compliance for Operation of Gaseous Diffusion Plants (GDP-1) specifically address the autoclave manual isolation function. Thus, the proposed changes have no impact on any of the Conditions to the Proposed Certificate of Compliance.

3. No Significant Change to Any Condition of the Approved Compliance Plan

   The Plan of Action and Schedule for Issue 3 of the Plan for Achieving Compliance with NRC Regulations at Paducah Gaseous Diffusion Plant, requires the installation of the autoclave manual isolation switches and the development and submittal of Technical Safety Requirements for the switches. The proposed changes are submitted in accordance with the Compliance Plan and create no significant changes to the Compliance Plan nor to any conditions of the Compliance Plan. One minor change to the Compliance Plan has been made. The Compliance Plan refers to "push-buttons" in the description of the manual isolation devices. This description was based on the SAR presentation in Sections 3.2.5.7 and 4.3.1.1.1. To minimize the potential for inadvertent actuation of the switches, pull-type

devices have been installed. The SAR sections have been revised accordingly and the corresponding language of the Compliance Plan has been modified.

4. No Significant Increase in the Probability of Occurrence or Consequences of Previously Evaluated Accidents

The proposed changes enhance the operator's ability to isolate the feed autoclaves in the event of a leak in the piping outside the autoclave containment. The changes affect no other equipment functions. The autoclave isolation function is not involved in any precursor to an evaluated accident; therefore, the probability of occurrence of an evaluated event is unaffected. The autoclave manual isolation function is not directly involved in the mitigation of the consequences of previously evaluated accidents, but does provide a defense-in-depth ability to minimize leakage from piping outside the autoclave containment. Since the proposed changes provide enhanced assurance that the function will be available if required, the consequences of previously evaluated accidents are not increased

5. No New or Different Type of Accident

The proposed changes enhance the operator's ability to isolate the feed autoclaves in the event of a leak in the piping outside the autoclave containment. The changes affect no other equipment functions. The manual isolation switches permit the simultaneous isolation of all the autoclaves in the effected facility. Autoclave isolation was previously performed individually. The changes affect only the timing of autoclave isolation and create no new operating conditions or new plant configurations that could lead to a new or different type of accident.

6. No Significant Reduction in Margins of Safety

The proposed changes enhance the operator's ability to isolate the feed autoclaves in the event of a leak in the piping outside the autoclave containment. The autoclave manual isolation function is not directly involved in the mitigation of the consequences of previously evaluated accidents, but does provide a defense-in-depth ability to minimize autoclave leakage. Consequently, the proposed changes cause no reductions in the margins of safety.

7. No Significant Decrease in the Effectiveness of any Programs or Plans Contained in the Certificate Application

The proposed changes enhance the operator's ability to isolate the feed autoclaves in the event of a leak in the piping outside the autoclave containment. The changes affect no other equipment functions or administrative requirements. The autoclave manual isolation function is not mentioned in any program or plan contained in the Certification Application.

Therefore, the proposed changes have no impact on the effectiveness of these programs or plans.

8. The proposed changes do not result in undue risk to 1) public health and safety, 2) common defense and security, and 3) the environment.

The proposed addition of TSR 2.2.4.13, changes to SAR Sections 3.2.5.7 and 4.3.1.1.1, and corresponding changes to Compliance Plan Issue 3 enhance the operator's ability to isolate the feed autoclaves in the event of a leak in the piping outside the autoclave containment. By enhancing the ability to manually isolate the autoclaves, the defense-in-depth support of the mitigation of the consequences of postulated accidents has been improved. As such, these changes do not represent an undue risk to public health and safety. In addition, these revisions have no impact on plant effluents or on the programs and plans in place to implement physical security. Consequently, these proposed changes only enhance safety and pose no undue risk to the environment or the common defense and security.