

November 17, 2010

Mr. Steven A. Toelle, Director  
Regulatory Affairs  
U. S. Enrichment Corporation  
2 Democracy Center  
6903 Rockledge Drive  
Bethesda, MD 20817-1818

SUBJECT: APPROVAL OF CERTIFICATE AMENDMENT REQUEST RELATED TO  
TECHNICAL SAFETY REQUIREMENTS REVISION TO THE R-114 COOLANT  
OVERPRESSURE CONTROL SYSTEM, PADUCAH GASEOUS DIFFUSION  
PLANT (TAC NO. L32754)

Dear Mr. Toelle:

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the June 22, 2010, certificate amendment request (CAR), submitted by the United States Enrichment Corporation (USEC), Paducah Gaseous Diffusion Plant (PGDP), regarding revision of Technical Safety Requirements (TSRs), Section 2.3.4.4, R-114 Coolant Overpressure Control System. The proposed changes would modify the body of the TSR to correctly reference the coolant overpressure "control" system and remove incorrect references to the overpressure "relief" system. The word "cell" would be removed from Condition A and B and the Surveillance Requirements to correctly characterize the scope of applicability to additional equipment such as boosters and pumps. The Required Actions for Conditions A, C, and E would be modified to remove the requirement to de-energize the affected equipment and place the system in mode Cascade 1. Additionally, the revised actions would allow the operator to continuously monitor either pressure or temperature in order to take action to lower pressure. The revised action would be required to remain in place "indefinitely," until the system is restored to an operable condition. Finally, the basis would be amended to discuss the responsibilities of the operator to follow approved plant procedures and be capable of promptly reducing system pressure when necessary. The CAR from USEC dated June 22, 2010, is available via NRC's Agencywide Documents Access and Management System (ADAMS), Accession Number ML101800341.

The staff completed the review of the CAR and found the proposed revision to the PGDP TSRs acceptable. The staff's Certificate Evaluation Report is contained in Enclosure 1. Enclosure 2 contains Revision 7 to the PGDP's Certificate of Compliance reflecting the revisions approved for this request. The approval of this amendment request is documented in the Certificate of Compliance GDP-1 by the addition of a reference to the June 22, 2010, letter from USEC regarding this CAR.

Neither an environmental assessment nor an environmental impact statement is required for the proposed action because the requested amendment is subject to the categorical exclusion provided in Title 10 of the *Code of Federal Regulations* (10 CFR) 51.22(c)(19) and will not have a significant impact on the human environment.

In accordance with 10 CFR, Section 2.390 of the NRC's Rules of Practice, a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's ADAMS. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

If you have any questions regarding this action, please contact Kevin Mattern at (301) 492-3221 or [kevin.mattern@nrc.gov](mailto:kevin.mattern@nrc.gov), or Tilda Liu at (301) 492-3217 or [tilda.liu@nrc.gov](mailto:tilda.liu@nrc.gov).

Sincerely,

**/RA/**

Marissa G. Bailey, Deputy Director  
Special Projects and Technical  
Support Directorate  
Division of Fuel Cycle Safety  
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Office of Nuclear Material Safety  
and Safeguards

Enclosures:  
As stated

Docket No. 70-7001  
Certificate No. GDP-1

cc: Mr. Vernon Shanks, USEC-Paducah  
Paducah Gaseous Diffusion Plant  
PO Box 1410  
Paducah, KY 42001

Mr. Randall M. DeVault  
U.S. Department of Energy - Oak Ridge  
PO Box 2001  
Oak Ridge, TN 37832

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DOCKET NUMBER: 70-7001

CERTIFICATE NUMBER: GDP-1

CERTIFICATE HOLDER: United States Enrichment Corporation  
Paducah Gaseous Diffusion Plant  
Paducah, Kentucky

SUBJECT: COMPLIANCE EVALUATION REPORT FOR CERTIFICATE  
AMENDMENT REQUEST RELATED TO TECHNICAL SAFETY  
REQUIREMENTS CHANGE TO REVISE THE R-114 COOLANT  
OVERPRESSURE CONTROL SYSTEM

### 1.0 PROPOSED CHANGES

By letter dated June 22, 2010 (Agencywide Documents Access and Management System Accession Number ML101800341), United States Enrichment Corporation (USEC or certificate holder) submitted a certificate amendment request (CAR) to the U.S. Nuclear Regulatory Commission regarding its Paducah Gaseous Diffusion Plant (PGDP). The proposed CAR would revise PGDP's Technical Safety Requirement (TSR), Section 2.3.4.4, R-114 Coolant Overpressure Control System. Specifically, the proposed changes would revise the Limiting Conditions for Operation (LCO), Required Actions, and Basis statements in TSR, Section 2.3.4.4 to delete the requirement to place the affected equipment in mode Cascade 1 with process motors de-energized and alternatively require the operator to continuously monitor pressure or temperature to take action to lower pressure. It also clarifies that the R-114 overpressure system is a control, not relief, system and deletes the word cell from Condition A, Condition B, and the Surveillance Requirements. Additionally, it adds a paragraph to the basis which describes the required actions of the operator in compliance with the applicable American Society of Mechanical Engineers (ASME) code.

### 2.0 BACKGROUND

In its letter dated June 22, 2010, the certificate holder stated that the proposed changes are needed to restore overpressure control systems into compliance with TSR 2.3.4.4 in a planned, controlled process in accordance with the standard operating procedures for cells at PGDP. The proposed changes are in accordance with, and associated with, the Request for Enforcement Discretion (ML101260051) dated May 4, 2010, the Notice of Enforcement Discretion (ML101260043) dated May 6, 2010, and the Event Report (ML101730560) dated June 10, 2010. The certificate holder stated that its coolant overpressure control systems are not changed by the proposed TSR changes and continue to provide the level of safety credited in its Safety Analysis Report (SAR), Section 4.3.2.1.6, Coolant Tube Rupture Into Primary System (Pressure Increase).

### 3.0 DISCUSSION

USEC stated in their formal submittal that the overpressure "control" system is incorrectly referred to as the overpressure "relief" system in the body of TSR 2.4.3.4 and should be modified to insure consistency with the TSR title and avoid confusion with other systems. The staff finds that the change from "relief" to "control" does in fact increase consistency and decrease confusion with respect to overpressure systems. The PGDP TSR contains limiting conditions for both R-114 overpressure "protection" systems (TSR 2.4.2.2) and R-114

overpressure “control” systems (TSR 2.4.3.4). There is however, no reference or description in the SAR or TSR of R-114 overpressure “relief” systems specifically. PGDP does use other relief systems, such as the autoclave pressure “relief” system (TSR 2.1.3.2) and the UF<sub>6</sub> high pressure relief system (SAR 3.15.3.4.1), which have the potential to be confused with the R-114 overpressure control system. Additionally SAR 3.15.3.4 “High-Pressure Relief Systems,” confounds the issue further by grouping various “control” and “relief” systems into a single category entitled “relief systems.” The staff finds that the title of TSR 2.4.3.4 is correctly identified as the R-114 Overpressure “Control” System, which is consistent with the system description in PGDP’s SAR 3.3.5.5.5 “Cell Coolant Instrumentation and Overpressure Control System,” and that the TSR body should be made consistent with the title. This change is found to be administrative in nature, will not affect the requirements, completion time or required actions associated with the LCO, and will have no impact on plant safety.

USEC also requested an additional nomenclature modification to remove the word “cell” in Condition A and B and in the Surveillance Requirements to correctly characterize applicability to other system components. The staff agrees that this change would improve consistency with the TSR title, “R-114 Coolant Overpressure Control System” and ensure the broadest intended applicability to other system components is captured. The staff believes that the inconsistency resulted from SAR 3.3.5.5.5 “Cell Coolant Instrumentation and Overpressure Control System,” which describes the “cell coolant instrumentation” and the “coolant overpressure control system.” While the title is misleading and the term “cell” is used, this SAR section specifically discusses the “R-114 Coolant Overpressure Control System” and contains no additional linkage of the words “coolant” and “cell.” As a result the staff finds this change acceptable and administrative in nature, yielding no impact on safety.

USEC’s submittal requests the removal of the requirement to place the affected equipment in mode Cascade 1 with the process motor(s) de-energized within 24 hours, and further states that this revision will result in safer restoration of operability in the event that multiple systems are inoperable. Since this LCO applies to both mode Cascade 1 (below atmospheric pressure) and mode Cascade 2 (above atmospheric pressure) provided that process motors are energized, this revision to the TSR would result in two distinct changes. If mode Cascade 2 is entered and this system is declared inoperable, the plant would no longer be required to enter mode Cascade 1 or de-energize the process motors. If mode Cascade 1 is entered and this system is declared inoperable the process motors will be allowed to remain energized. It is stated in SAR 4.3.2.1.6 that, “This could lead to a UF<sub>6</sub> release regardless of whether the cell is operating above or below atmospheric pressure.” Therefore the staff concludes that the removal of the required action to perform a mode change does not increase the likelihood of any credible accident scenarios. USEC also stated that under the current required actions, if prompt shutdown of multiple cells commenced, the UF<sub>6</sub> inventory would remain in the cells, increasing the likelihood of equipment failures and introducing concerns that would require implementation and monitoring of additional Nuclear Criticality Safety controls. The staff reviewed coolant tube rupture as discussed in SAR, Section 4.3.2.1.6 “Coolant Tube Rupture Into Primary System (Pressure Increase).” The SAR states that, “A failure of coolant tube(s) in a cascade cell gas cooler could result in a significant pressure increase in the primary system. If the coolant leak should occur when the cell is tied to the cascade, sufficient volume is available within the cascade to allow for expansion of the coolant without causing any significant pressurization.” Furthermore, the SAR states that, “This event in an off-stream cell (limited volume for expansion) could result in a rapid pressure increase above the normal operating pressures within the primary system.” Additionally, the PGDP threshold consequence analysis, which was performed for the Process Hazards Analysis (PrHA) and referenced in SAR 4.3.2.1.6, models the case of release from an isolated cell. The threshold consequence analysis found no

offsite consequences as a result of the release and that the cell has the potential to rupture regardless of pressure conditions. As described in the SAR, the threshold analysis determined that offsite Evaluation Guidelines (EG) would not be exceeded for this event. USEC attests that the R-114 coolant overpressure control system is not credited in the revised SAR accident analysis and is not credited as an essential control for prevention or mitigation of any accident scenarios, as such; SAR 3.15 states that the system is classified as an Augmented Quality (AQ) system. Therefore, after review of the SAR and PrHA, the staff concludes that the removal of Required Actions A.2, C.2, and E.2, to enter mode Cascade I and de-energize process motors, would not result in any increase in the probability or consequences of an event; and could potentially result in decreased risk for certain accident scenarios such as coolant tube ruptures.

USEC's submittal requests the addition of "temperature" to the R-114 system monitoring parameters to increase operational flexibility and justifies the change by stating that pressure and temperature are equivalent at saturated operating conditions. SAR, Section 3.3.5.5 describes the Process Cooling System, where Subsection 3.3.5.5.5 describes the Cell Coolant Instrumentation and Overpressure Control System; and Subsection 3.3.5.9.3 describes the Temperature Instrumentation. Additionally, SAR Figure 3.3-13 shows a Simplified Schematic of the Cascade Coolant System. Finally, Section 3.15.3.4 describes the High-Pressure Relief Systems specifically. As described in the SAR, the system is based on natural circulation and utilizes R-114 as the working fluid. The system does not require pumps to operate and relies on the phase change of the R-114 to move the fluid around the system to transfer heat. The staff agrees that since the system operates at saturated conditions, temperature can be directly correlated to pressure via known material data and vapor pressure curves. The staff's review found that PGDP utilizes plant procedures which put this data in a tabular format for operators to easily relate temperature to pressure at saturated conditions during operations. While the staff notes that there is the remote possibility for this system to enter the superheating region under dynamic conditions, it is not possible to create superheated steam under equilibrium conditions with the presence of liquid R-114 as shown in the PGDP SAR referenced diagram. The SAR does not identify any credible accident scenarios which would result in superheated conditions; and furthermore, the staff finds that appropriate plant procedures could adequately address operator action to identify and react if deviation from saturation or level set point occurs. The staff's review found that the plant is operated at a range of temperatures which are all above the boiling point of R-114 and below its critical point, which ensure a well characterized material behavior in the operating region. The staff also notes that the plant procedures provide for a significant margin of safety in regards to operating at or near the critical temperature of the coolant. The staff concludes that the proposed TSR change to Required Actions, A.1.1, C.1.1, and E.1.1 to add temperature as an additional means to monitor R-114 system pressure increases operational flexibility with no measurable impact on overall plant safety.

USEC stated that the removal of the 24 hour completion time requirement is consistent with ASME code since the code does not specify the duration that a pressure relief device can remain inoperable as long as it is in the process of being repaired or replaced. SAR, Chapter 1, Introduction and General Description of the Facility, Appendix A, Applicable Codes Standards and Regulatory Guidance, Section 2.2 ASME Boiler and Pressure Vessel Code (BPVC), 1995 Edition, describes that PGDP is satisfying the requirements of the 1995 edition of ASME BPVC, Section VIII or the edition in effect at the time of fabrication for specific pressure components and systems, including the cell coolant pressure relief system. Overpressure protection is discussed in ASME, Section VIII, "General Requirements for all Methods of Construction and All Materials" (UG)-125, "Overpressure Protection," in the applicable 2010 edition. UG-125(d) states, "Pressure relief devices shall be constructed, located, and installed so that they are

readily accessible for testing, inspection, replacement, and repair; and so that they cannot be readily rendered inoperative (see Appendix M).” ASME Section VIII, Appendix M, Subsection M-5.6 “Stop Valve(s) Provided Upstream or Downstream of the Pressure Relief Device Exclusively for Maintenance of that Device” describes the minimum requirements for use of stop valves with pressure relieving devices. It states that, “The system shall be isolated from its pressure relief path only for the time required to test, repair and or replace the pressure relief device.” The staff agrees that the code does not specify, reference, or imply any constraints on the length of time that the system or component may remain inoperative. Therefore the staff finds that the proposed revision to remove the 24-hour time requirement in the Completion Time section of LCO 2.4.3.4 Required Actions A.1.2, C.1.2., and E.1.2, would not conflict with established codes and standards. The staff concludes that revised Required Actions A.1, C.1 and E.1, requiring continuous operator monitoring while inoperable, would continue to provide adequate pressure control during system inoperability and the revised Required Actions would not have any significant impact on safety.

USEC stated that the Basis section will be revised to discuss the intent of the revised Required Action and clearly delineate that the R-114 cell coolant overpressure control system “shall be made operable expeditiously.” The revised Required Actions A.1, C.1 and E.1 will require an operator to continuously monitor the R-114 system pressure/temperature to take action to a lower pressure. The staff finds this action consistent with ASME BPVC Code, Section VIII, Appendix M-5.6(d), which states: “Procedures are in place to provide pressure relief protection during the time when the system is isolated from its pressure relief path. These procedures shall ensure that when the system is isolated from its pressure relief path, an authorized person shall continuously monitor the pressure promptly with documented, pre-defined action—either stopping the source of overpressure or opening alternative means of pressure relief. This authorized person shall be dedicated to this task and shall have no other duties when performing this task.” USEC has stated that PGDP’s plant procedures referenced in the proposed amended Basis regarding operator actions are consistent with the cited ASME code and were revised to address the conditions of the notice of enforcement discretion. The staff concludes that the proposed augmented Basis is sufficient to demonstrate consistency with ASME code, clarify the intent of the Required Actions, and define the operator’s required capability of maintaining pressure control during system inoperability. While the proposed Basis does not specifically address “expeditious operability” the staff concludes that procedures are in place to provide adequate “pressure relief protection” during system inoperability, as per ASME code, and that continuous operator monitoring provides additional operational incentive for restoring the system to operability expeditiously.

#### 4.0 ENVIRONMENTAL REVIEW

Issuance of the requested amendment to Certificate of Compliance GDP-1 is subject to the categorical exclusion provided in the Title 10 of the *Code of Federal Regulations* (10 CFR) 51.22(c)(19) and will not have a significant impact on the human environment. Therefore, in accordance with 10 CFR 51.22(b), neither an environmental assessment nor an environmental impact statement is required for the proposed action.

#### 5.0 CONCLUSION

Based on its review and evaluation of the information provided by USEC in its CAR dated June 22, 2010, the staff finds that the proposed revisions to PGDP TSR, Section 2.3.4.4, R-114 Coolant Overpressure Control System would not have a significant increase in risk to the workers; and would continue to provide adequate protection of public health, safety, safeguards,

security, and the protection of the environment, therefore, the staff concludes that the proposed revisions are acceptable and consistent with the requirements of 10 CFR Part 76.

PRINCIPAL CONTRIBUTOR

Kevin S. Mattern