July 18, 2007

Mr. Stephen A. Toelle
Director, Nuclear Regulatory Affairs
United States Enrichment Corporation
2 Democracy Center
6903 Rockledge Drive
Bethesda, MD 20817

SUBJECT: REVISION TO TECHNICAL SAFETY REQUIREMENTS SECTIONS 1.0, 2.2, AND 3.2.2 TO ESTABLISH CONTROLS FOR CONTROLLED/COLD FEEDING OF UF_6 CYLINDERS AT THE PADUCAH GASEOUS DIFFUSION PLANT

Dear Mr. Toelle:

By letter dated April 25, 2007, the United States Enrichment Corporation (USEC) submitted a certificate amendment request (CAR) regarding the Certificate of Compliance for the Paducah Gaseous Diffusion Plant (PGDP). This Certificate Amendment Request proposes to revise Technical Safety Requirements (TSR) Sections 1.0, 2.2, and 3.2.2 to establish controls for controlled/cold feeding of UF_6 cylinders.

Specifically, the TSR changes will provide PGDP the capability to use a controlled/cold feeding process similar to the process that the Portsmouth Gaseous Diffusion Plant has utilized since its initial Nuclear Regulatory Commission (NRC) certification. The staff notes that since the proposed controlled/cold feeding operations do not allow UF_6 to liquefy during the feeding process, the risk associated with this operation is much lower than the currently approved feeding methods involving liquid uranium hexafluoride (UF_6) at PGDP. Therefore, because there is no increase to risk to public health and safety, and the issuance of this amendment would not be inimical to either the common defense and security of the United States, or the maintenance of a reliable and economical domestic source of enrichment services as required by 10 CFR 76.22, this amendment request is approved.

The Certificate Evaluation Report of the proposed changes to your certificate has been completed, and is attached as Enclosure 1. Enclosure 2 contains Revision 11 to your Certificate of Compliance.

In addition, as regular security operations are in place, Temporary Certificate Amendment 18 has been deleted.

If there are any questions regarding this action, please contact the Project Manager, Michael G. Raddatz, via telephone at (301) 492-3108, or via email, to mgr@nrc.gov

In accordance with 10 CFR 2.790 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 NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA, by B. Smith for/

Gary S. Janosko, Deputy Director
Fuel Cycle Licensing Directorate
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7001
Certificate No.: GDP-1
Amendment 11

Enclosures:
1. Compliance Evaluation Report
2. Certificate of Compliance GDP-1

cc:
Randall M. DeVault, DOE-Oak Ridge
Steve Penrod, Paducah

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DOCKET NUMBER: 70-7001

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

SUBJECT: REVISION TO TECHNICAL SAFETY REQUIREMENTS (TSR) SECTIONS 1.0, 2.2, AND 3.2.2 TO ESTABLISH CONTROLS FOR CONTROLLED/COLD FEEDING OF UF_6 CYLINDERS

PROPOSED CHANGES

By letter dated April 25, 2007, the United States Enrichment Corporation (USEC) submitted a certificate amendment request (CAR) regarding the Certificate of Compliance for the Paducah Gaseous Diffusion Plant (PGDP). The amendment would make changes to PGDP Technical Safety Requirements (TSR). This CAR proposes to revise TSR Sections 1.0, 2.2, and 3.2.2 to establish controls for controlled/cold feeding of uranium hexafluoride (UF_6) cylinders.

Specifically, the TSR changes will provide PGDP the capability to use a controlled/cold feeding process similar to the process that the Portsmouth Gaseous Diffusion Plant has utilized since its initial Nuclear Regulatory Commission (NRC) certification. Since the proposed controlled/cold feeding operations do not allow UF_6 to liquefy during the feeding process, the risk associated with this operation is much lower than currently approved feeding methods involving liquid UF_6 at PGDP. These changes are being requested to allow USEC to remove the UF_6 from cylinders that either have damage or that have been overfilled in the past. These conditions would prevent their conventional feed into the cascade.

BACKGROUND

This proposed change will add two new modes of operation for the C-333-A and C-337-A UF_6 feed facilities entitled Mode 7 & 8.

Mode 7 will be used to designate the controlled feeding process where UF_6 will be removed from a cylinder through sublimation under special heating controls that prevent liquefaction of UF_6. Mode 8 will be used to designate the cold feeding process where UF_6 will be removed from a cylinder through sublimation (directly from solid to gas) without the addition of heat.

The proposed changes associated with the new operating Mode 7 will include installation of new autoclave temperature and pressure control setpoints that will monitor cylinder wall temperature and pressure, and a new TSR to define the operability requirements for this new system. Existing TSR controls for the UF_6 feed facilities that involve heating UF_6 cylinders in Mode 5 (liquefaction of UF_6) will be revised to also be applicable in the new Mode 7, where it is practical to do so. The operability requirements include an evaluation of every cylinder for damage to clarify if they can be emptied by conventional means or whether the new 7 & 8 Modes are appropriate.

REGULATORY REQUIREMENTS

10 CFR 76.87(d) states, in part, that the technical safety requirements (TSR) must include an evaluation of the proposed changes, encompassing at a minimum, the following categories: (1) Safety limits; (2) Limiting control settings; (3) Limiting conditions for operation; (4) Design features; (5) Surveillance requirement; and (6) Administrative controls. As the applicant is requesting a change to the TSRs, the staff has evaluated the application to ensure that these requirements were met. As the change requested by the applicant requires the addition of new technical specifications, USEC has requested an amendment to its certificate.

DISCUSSION

What follows has been excerpted from the Certificate Amendment Request (CAR) provided by USEC in support of the TSR change request.

The applicant has identified the following as credible accidents for the controlled/cold feeding modes of operations:

1. the autoclave steam control valve failing open;

2. releases of solid/gaseous UF_6 to atmosphere;

3. evacuation of UF_6 handling and storage facilities; and

4. an inadvertent criticality.

STEAM CONTROL VALVE FAILING OPEN

The primary requirement for the controlled/cold feeding modes of operation (Mode 7 & 8) is that the UF_6 within the cylinder will not become either liquefied or overpressurized during any of these accident scenarios. The only accident of concern that could challenge the "no liquefaction" criteria is the existing accident analysis scenario that could result from the autoclave steam control valve failing open[1].

The applicant states that an accident scenario involving an autoclave steam control valve failing to open is an anticipated event (AE) analyzed as part of the initial Certification of Paducah. This event can be initiated by the steam control valve failing in such a manner that it goes to the full open position. The proposed change will install an additional adjustable steam regulator upstream of the existing steam control valve. This will allow for a more precise regulation of the steam pressure at the lower pressure limits, however, the existing steam control valve, and its controls, are not being changed. The new steam pressure regulator being added upstream of the steam control valve is a manually controlled valve and is not credited for any safety function. The new steam pressure regulator is manually set, and can not impact operation or

[1] This accident does not apply to the cold feeding mode of operation (Mode 8) since no heat will be added to the cylinder. Therefore, Mode 7 operations are the focus of this evaluation.

cause a failure of the existing steam control valve. This proposed change will not affect the functional requirements and system functional analysis specified in safety analysis report for the autoclave steam pressure control system.

Since the autoclave steam control valve is not affected by this proposed change, there will not be a significant increase in the probability of the steam valve failing and initiating this event.

An autoclave steam valve failing open is a scenario that was analyzed for the new controlled feeding mode of operation. The analysis determined that if the initial temperature of the autoclave is not allowed to exceed 142.9°F, then the final temperature of the UF_6 and the autoclave would not reach the triple point and no liquefaction of the UF_6 would occur. The scenario assumes that the autoclave and UF_6 cylinder are at 142.9°F when the steam valve fails open. The steam valve is assumed to fail to the 100 percent open position allowing maximum steam flow. The steam flow is modeled to continue until the autoclave pressure reaches the set point of the high pressure isolation system, 15 psig. Once this pressure is reached, the model allows an additional 15 seconds of steam flow into the autoclave while the system responds and the valve is shut. For conservatism, no throttling of the steam is assumed. The valve is assumed to be full open for the entire 15 seconds. Following the isolation of the steam source, all of the energy added by the steam during the event is assumed to be absorbed by the autoclave and UF_6 cylinder. For conservatism, no heat is was assumed to be allowed to escape from the autoclave shell during the event. The resulting temperatures are calculated and were determined to be less than the UF_6 triple point temperature of 147.3°F, demonstrating that no UF_6 liquefaction would occur during this event. With the temperature remaining below the triple point, the maximum pressure inside the UF_6 cylinder will be below the triple point pressure of 22 psia.

As a prerequisite for controlled feeding, the UF_6 cylinders that have been determined to be damaged or have an unknown ullage (void volume) will be required to pass the cold pressure check. This ensures that cylinder internal pressure is below 10 psia prior to heating and provides a high confidence that UF_6 cylinder integrity will be maintained during the controlled feeding process. The new adjustable steam pressure regulator could potentially be set to limit inlet pressure to the autoclave below the 15 psig setpoint of the high pressure isolation system. For this scenario, the reduced pressure steam admitted to the autoclave would result in a significantly slower temperature rise within the autoclave with corresponding rise in UF_6 cylinder temperature. This would be terminated by the new autoclave temperature control system prior to 142.9°F. The steam would be isolated within 15 seconds as with the high pressure isolation system actuation.

With less than 15 psig steam remaining in the autoclave after isolation there is insufficient energy to further heat the cylinder to the triple point (147.3°F). Therefore, this sub-scenario is bound by the analysis of full pressure steam filling the autoclave due to the steam control valve failing full open.

As a result of the above, there will be no significant increase in the probability or consequences of an event involving the autoclave steam control valve failing open.

RELEASES OF SOLID/GASEOUS UF_6 TO ATMOSPHERE

The release of solid/gaseous UF_6 to atmosphere due to accidents involving a loss of cylinder integrity is an AE that can occur during routine lifting and moving operations for controlled/cold feeding, or during cold feeding with the autoclave open. This scenario is not possible during controlled feeding since the autoclave is closed. Various design and administrative controls are currently identified to minimize the potential for loss of cylinder integrity in the hazards analysis results for the UF_6 handling and storage facilities. The same design and administrative controls that are in place for current operations will continue to be implemented and applicable to the controlled feeding mode.

As a result, there will be no significant increase in probability or consequences of a breach of a cylinder during cold feeding.

EVACUATION OF UF_6 HANDLING AND STORAGE FACILITIES

Evacuation of the facility is an AE that is assumed to be initiated by a spurious operation of the criticality accident alarm system, potential releases of hazardous material from another facility, or a fire within the facility. The primary concern during an evacuation is to prevent a release of hazardous material (e.g., UF_6). The primary objective of the scenario is to ensure the autoclave operation is equipped with sufficient controls to prevent or mitigate a failure of the UF_6 primary system in an evacuation event. The only safety action required is to maintain primary system pressure control. As demonstrated above, the new autoclave temperature control system is designed to maintain the UF_6 cylinder at less than 142.9°F during normal controlled feeding operations and below the UF_6 triple point temperature during postulated scenarios. This ensures that the cylinder pressure is maintained below the corresponding UF_6 triple point pressure. The other autoclave systems will continue to operate to support this safety action. This accident does not apply to the cold feeding mode of operation since no heat will be added to the cylinder.

As a result, there is no significant increase in the probability or consequences of a release from an autoclave during a feed facility evacuation event.

INADVERTENT CRITICALITY

An inadvertent criticality is an evaluation basis event. The controlled/cold feed operations have been analyzed for nuclear criticality safety. A loss of cylinder integrity was identified as the only controlled/cold feed initiating event that could significantly challenge nuclear criticality safety. The cylinder contents are controlled below the UF_6 triple point, preventing liquefaction, with the maximum pressure inside the UF_6 cylinder remaining below the triple point pressure of 22 psia. An engineering evaluation is performed to ensure that damaged cylinders targeted for controlled feeding will maintain an internal cylinder pressure of up to 22 psia. Due to these features, it is unlikely to have a loss of cylinder integrity. The reactivity insertion rate and feedback mechanisms, which in turn determine the consequences of a criticality, remain the same.

Therefore, there will be no increase in either the probability or consequences of a loss of UF_6 cylinder integrity during this accident scenario.

TSR Changes

The TSR changes were reviewed by NRC staff. The changes include surveillance requirements so that a cylinder must be evaluated and categorized to determine which feed mode is appropriate. Cylinders that have specific serial numbers, that are know to have an indeterminate void volume, are designated as a category "C" cylinder and can only be emptied using the Mode 7 or 8. In addition, if a cylinder does not pass the pre-heat inspection, then it will be administratively designated as a category "C" cylinder. Administrative requirements (that will be the basis for operating procedures) specify how the systems must be aligned to ensure that the steam supply is properly regulated and designate the required number of operators that must be present for different modes of operations. There are also Safety Limits specific to the different operations, such as the autoclave temperature control system that limits the cylinder surface temperatures to ensure that the cylinder contents do not liquify during Mode 7 transfer operations.

FINDINGS

The staff's analysis confirms with a high confidence that the UF_6 will remain in a solid state during the new modes of operations as well as during anticipated accidents. Therefore, the hazards associated with these new operations are bounded by the existing analysis which currently assumes liquid UF_6 for the initial conditions. The autoclave high pressure isolation system is credited with the prevention of the liquefaction of the UF_6 during credible accident scenarios involving the new modes of feed. In addition, prior to entering the controlled feed operation, the cylinders must pass a visual inspection, and a cold pressure check, to ensure the cylinder pressures remain low during controlled feeding. These controls are adequate to protect against the potential loss of cylinder integrity.

The staff agrees with the applicant that there is no significant increase in either the probability or consequences of any accident previously analyzed and no new or different type of accident has been identified. Therefore, as a result of the proposed change, there will be no undue risk to the public health and safety. This finding is based on the fact that the cylinders that are being emptied using the controlled/cold feeding process will not involve heating UF_6 cylinders to a liquid state and thus involve less risk than currently approved methods. The proposed change will have no impact on plant effluents or on the programs and plans in place to implement physical security, protection of classified matter, transportation security, or special nuclear material accountability.

The applicant provided the proposed TSR modifications that support operations in Mode 7 & 8. The staff reviewed these modifications and determined that the criteria of 10 CFR 76.87(d) has been satisfactorily met.

The approval of this amendment request is documented in the Certificate of Compliance GDP-1 by the addition of a reference to the April 25, 2007, letter from USEC describing the TSR revisions.

ENVIRONMENTAL REVIEW

Issuance of the requested amendment to Certificate of Compliance GDP-1 is subject to the categorical exclusion provided in 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.

CONCLUSIONS

Based on its review and evaluation of the information provided by USEC in its CAR of April 25, 2007, the NRC staff finds that the proposed revisions to TSR Sections 1.0, 2.2 and 3.2.2 to establish controls for controlled/cold feeding of UF_6 cylinders provide adequate protection of public health, safety and safeguards, and concludes that they are acceptable, consistent with the requirements of 10 CFR Part 76, and should be approved.

PRINCIPAL CONTRIBUTOR

Michael Raddatz