



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

November 4, 1999

Mr. James N. Adkins
Vice President, Production
United States Enrichment Corporation
Two Democracy Center
6903 Rockledge Drive
Bethesda, MD 20817

SUBJECT: PORTSMOUTH 91-01 REPORT: SEPTEMBER 24, 1999, LOSS OF
MODERATION CONTROL EVENT

Dear Mr. Adkins:

This refers to the 4-hour reportable (Bulletin 91-01) event that occurred on September 24, 1999. Your event report indicated that a previously unanalyzed chemical compound, identified subsequently as $\text{UO}_2\text{Cl}(\text{OH})\cdot 2\text{H}_2\text{O}$, was discovered in the side purge piping that had an H/U of 5, which exceeded the maximum assumed H/U of 4 in the cascade. Your report also indicated this condition left the side purge cascade in a singly contingent state where only mass control remained. Based on information that has been provided in the event report, and our knowledge concerning the configuration and composition of deposits within the cascade, the Nuclear Regulatory Commission (NRC) staff does not believe that an immediate safety concern exists. Despite this, there remain actions that should be taken to ensure continued safety of the as-found condition, as well as longer-term concerns that may impact other areas of the plant.

Based on your report, it is my belief that the existence of this compound may also invalidate one of the main criticality safety bases of the plant, namely that H/U in the cascade cannot exceed a value of 4. I am not persuaded that the history and mode of formation of this compound is well-known or that the assumed process conditions (related to the Building X-326 fire) preclude its existence in other portions of the cascade. The existence of an unpredicted chemical form of uranium is itself a cause for concern. Consequently, it is not evident to me how mass control was established or maintained to prevent more than a safe mass from accumulating. Your report indicated that mass control was maintained because the deposit contained less than a safe mass of uranium, in the as-found condition. That a critical mass was not reached for this particular deposit does not mean that mass control was maintained in this case.

In the near future, we plan to schedule a meeting with you to discuss the significance of the concerns that we have identified. At this meeting, you should be prepared to discuss the interim measures in place committed to in your September 24, 1999, event report and reiterated in a telephone conversation with Ms. Melanie Galloway of my staff on October 15, 1999. These measures include: (1) USEC will continue to maintain isolation of the equipment to ensure that additional mass cannot intrude from the outside; (2) USEC will not conduct operations, maintenance, or otherwise handle fissile material in the affected areas until completion of the associated NCSA; and (3) USEC will complete a root cause analysis. You should also be prepared to explain why this does not represent a unreviewed safety question, why you have assurance that the facility is in a safe condition at the current time, and what long term measures will be taken to resolve this issue.

NFOS

Please submit answers to the following questions within 30 days of the date of this letter:

- (1) What declared controls existed on the side purge system and remained in place to maintain mass control? (Include a discussion of controls to ensure that additional mass does not enter the area.) What engineered features (e.g., geometry control) remained after formation of the deposit to prevent a criticality accident? In particular, justify the assertion that criticality cannot occur without additional uranium mass.
- (2) The deposit consisted of a previously unanalyzed uranium compound. What constitutes a safe mass for such an unanticipated material? If this is unknown, is the mass limit based on optimally moderated U-235?
- (3) What is the impact of the invalidation of this assumed process condition ($H/U \leq 4$) on the safety basis of the plant? How will the cascade safety basis including the certificate application be reevaluated to take this new information into consideration? When addressing this question, justify the maximum H/U ratio that can be credibly obtained in the cascade and provide the basis for why it cannot be exceeded. Include in this a description of any revisions that have been made or are planned to any NCSA/E (nuclear criticality safety approval/evaluation) as a result of this event.
- (4) Please address the following issues related to the as-found condition: (1) where, when, and how the deposits were identified; (2) the mechanism of how the deposits were formed; (3) the source of chlorine in the deposit; (4) the total quantity of the compound $UO_2Cl(OH) \cdot 2H_2O$ formed during the fire, including how much total U-235 was contained in the deposits; and (5) how well the surrounding equipment is characterized.
- (5) What assurance is there that similar compounds do not exist elsewhere in the cascade in greater than safe mass quantities, and what prevents their formation in the future?
- (6) The likelihood of a fire in Building X-326 has been evaluated and documented in the SAR. Why was the chemical reaction that resulted from the fire and the formation of deposits with $H/U > 4$ not also evaluated as a credible contingency?

Please contact the NRC Portsmouth Project Manager, Mr. Yawar Faraz, at (301) 415-8113, with any questions.

Sincerely,



Robert C. Pierson, Chief
Special Projects Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket: 70-7002
Certificate: GDP-2

Please submit answers to the following questions within 30 days of the date of this letter:

- (1) What declared controls existed on the side purge system and remained in place to maintain mass control? (Include a discussion of controls to ensure that additional mass does not enter the area.) What engineered features (*e.g.*, geometry control) remained after formation of the deposit to prevent a criticality accident? In particular, justify the assertion that criticality cannot occur without additional uranium mass.
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Sincerely,

signed by R. Pierson

Robert C. Pierson, Chief
Special Projects Branch
Division of Fuel Cycle Safety
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 P. Hilland
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- (6) The likelihood of a fire in Building X-326 has been evaluated and documented in the SAR. Why was the chemical reaction that resulted from the fire and the formation of deposits with $H/U > 4$ not also evaluated as a credible contingency?

The information received to date indicates that USEC is not sufficiently cognizant of process conditions within the cascade, which raises regulatory and safety concerns. NRC disagrees with USEC that the safety significance is low since it appears to indicate lack of process understanding.

Please contact the NRC Portsmouth Project Manager, Mr. Yawar Faraz, at (301) 415-8113, with any questions.

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B. Pierson

will more fully characterize deposits in this portion of the cascade to determine the composition, distribution, and amounts of fissile material in the side purge area, by —; and (4) USEC will complete revision of all affected NCSA/Es by —. Please contact the NRC Portsmouth Project Manager, Mr. Yawar Faraz, at (301) 415-8113, with any questions.

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*Returned to Ann
10/25
J/Camm*

The information received to date indicates that USEC is not sufficiently cognizant of process conditions within the cascade, a condition which is a significant regulatory and safety concern.

NRC disagrees with USEC that the safety significance is low since it appears to indicate lack of process understanding.

In the near future, we plan to schedule a management meeting with you to discuss the safety concerns that we have identified. In addition, we expect that you will provide responses to the above questions for our detailed review within 30 days of the date of this letter. Please contact the NRC Portsmouth Project Manager, Mr. Yawar Faraz, at (301) 415-8113, with any questions.

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