USEC
A Global Energy Company

April 1, 2009
GDP 09-0010

Mr. Michael F. Weber
Director, Office of Nuclear Material Safety and Safeguards
Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Paducah Gaseous Diffusion Plant (PGDP)
Docket No. 70-7001, Certificate No. GDP-1
Response to NRC Request for Additional Information
Certificate Amendment Request (CAR) – Technical Safety Requirement (TSR) Change to Revise Normetex Pump UF_6 Release Detection System Controls at the Paducah Gaseous Diffusion Plant (PGDP) (TAC L32477)

Dear Mr. Weber:

The purpose of this letter is to provide the United States Enrichment Corporation's (USEC's) response to the NRC's March 20, 2009, request for additional information regarding the subject Certificate Amendment Request (CAR). The request for additional information (RAI) was provided to USEC in the Reference. USEC's response to the NRC's request for additional information is provided in the Enclosure.

Should you have any questions related to this submittal, please contact me at (301) 564-3250. There are no new commitments contained in this submittal.

Sincerely,

S. A. Toelle

Steven A. Toelle
Director, Regulatory Affairs

NM5501

USEC Inc.
6903 Rockledge Drive, Bethesda, MD 20817-1818
Telephone 301-564-3200 Fax 301-564-3201 http://www.usec.com

Reference: NRC letter from Tilda Liu (NRC) to Steven A. Toelle (USEC), Request For Additional Information Regarding Technical Safety Requirement Change to Revise Normetex Pump Uranium Hexafluoride Release Detection System Controls, Paducah Gaseous Diffusion Plant (TAC No. L32477), dated March 20, 2009.

Enclosure: USEC Response to NRC Request for Additional Information Regarding the Technical Safety Requirements (TSR) Changes to the Normetex Pump UF_6 Release Detection System Controls at the PGDP

cc: J. Henson, NRC Region II Office
M. Miller, NRC Sr. Resident Inspector - PGDP
M. Raddatz, NRC Project Manager

USEC Response to NRC Request for Additional Information Regarding the Technical Safety Requirements (TSR) Changes to the Normetex Pump UF_6 Release Detection System Controls at the PGDP

Request for Additional Information

"The bases for review of the proposed Technical Safety Requirement (TSR) are contained in *Title 10 of the Code of Federal Regulations* (10 CFR) 76.87 and 10 CFR 76.35. It is necessary for the U.S. Nuclear Regulatory Commission staff to evaluate whether the proposed TSR change for the Normetex Pump uranium hexafluoride (UF_6) Release Detection System Controls will provide adequate protection of the public health and safety, and that appropriate management controls and oversight will be provided to ensure that activities relevant to nuclear safety are conducted in an appropriately controlled manner that ensures protection of employee and public health and safety.

RAI-1

Provide additional technical justification as to how the proposed administrative control (i.e., 'smoke watch') for a period of up to 14 days provides adequate protection of employee and public health and safety. The certificate holder is requested to consider in its response the following:

a. a comparison of the effectiveness of each control (automatic and smoke watch), including the minimum detectable concentration of UF_6 which can be sensed by each method, along with its associated minimum detectable release rate, the maximum response time required to mitigate the hazard, from the onset of the release to the ultimate termination of the release; and a discussion of how the minimum leak rate and concentration detectable by human means is considered adequate for meeting the facility certificate requirements;

b. additional information regarding the effectiveness of a smoke watch , as an adequate compensatory measure, when considering human factors (e.g., fatigue, attentiveness) and environmental conditions (e.g., heat, noise); and

c. a discussion of whether there is additional risk to plant workers or the public associated with 'smoke watches,' and, if so, provide justification as to why the use of a smoke watch during the proposed time frame is still considered adequate for assuring the health and safety of plant workers and the public."

USEC Response to NRC Request for Additional Information Regarding the Technical Safety Requirements (TSR) Changes to the Normetex Pump UF_6 Release Detection System Controls at the PGDP

USEC Response

"Provide additional technical justification as to how the proposed administrative control (i.e., 'smoke watch') for a period of up to 14 days provides adequate protection of employee and public health and safety. The certificate holder is requested to consider in its response the following:

a. a comparison of the effectiveness of each control (automatic and smoke watch), including the minimum detectable concentration of UF_6 which can be sensed by each method, along with its associated minimum detectable release rate, the maximum response time required to mitigate the hazard, from the onset of the release to the ultimate termination of the release; and a discussion of how the minimum leak rate and concentration detectable by human means is considered adequate for meeting the facility certificate requirements;"

The SAR accident analysis discusses the requirements that the automatic system must meet to provide effective UF_6 release mitigation. As stated in SAR Section 3.15.4.8.4, "the UF_6 Release Detection System – Normetex Pump is credited for controlling postulated releases before they exceed off-site evaluation exposure guidelines (see Section 4.3.2.2.17)." SAR Section 4.3.2.2.17, postulates a worst case release rate of 4.83 lb/s UF_6. The accident analysis determined that the unmitigated release of 4.83 lb/s UF_6 could continue for 373 seconds before exceeding the AE off–site exposure guideline of 10 mg soluble uranium. The accident analysis does not specify the response time for the system. TSR 2.3.4.3 does not require the Normetex UF_6 detection system to function in a specified response time. The surveillance requirement, TSR SR 2.3.4.3–1 requires a functional (not timed) test (actuation of two adjacent heads with "smoke") of the system to demonstrate that once tripped the system will shut the Normetex pump discharge valve (isolating sources of UF_6 above atmospheric pressure) and trip the Normetex pump. The Normetex pump UF_6 release detection system is effective because it will activate and accomplish the required safety function well within the 373 seconds assumed by the accident analysis.

As stated in SAR Section 3.15.4.8.1, the UF_6 Release Detection System - Normetex Pump safety function is to detect a UF_6 release from the UF_6 primary system, automatically trip the compression source (Normetex pump), and isolate the pump from sources of UF_6 that are above atmospheric pressure. The minimum detectable concentration or release rate that this system is capable of detecting is not specified in the SAR. However, SAR Section 3.3.5.9.5.1 discusses the release quantity that would actuate UF_6 detectors in the Cascade cell housings. The types of detectors in the Cascade are the same as the detectors used for the Normetex UF_6 detection system. As stated in SAR Section 3.3.5.9.5.1, "The UF_6 release quantity that would actuate the detectors is established as follows. On the basis of the drawing of a typical cell housing ("000"), it was calculated that the volume internal to the cell housing was approximately 116,000 ft^3 (after subtracting the volume of the cell equipment itself). Assuming a release that is perfectly mixed within the cell housing, a release of 2.14 lb of UF_6 would provide a

USEC Response to NRC Request for Additional Information Regarding the Technical Safety Requirements (TSR) Changes to the Normetex Pump UF_6 Release Detection System Controls at the PGDP

concentration of 200 mg/m^3, which would activate all of the detectors in the cell housing within 30 seconds. This indicates that a UF_6 release that is much smaller than the 4.83 lb/s UF_6 release assumed by the accident analysis will be detected by these types of detectors within a fraction of 373 seconds assumed by the accident analysis.

Therefore, though not identified specifically in the SAR, the response time for the UF_6 Release Detection System - Normetex Pump to complete its safety function is much quicker than 373 seconds.

The effectiveness of the manual system is determined by its ability to accomplish the same safety function that the automatic system is required to perform. As stated in the proposed change to TSR 2.3.4.3 Basis Statement, "In the event that one or more detector heads and/or manual trip/isolation circuitry is inoperable, a smoke watch can be utilized for pumps in Mode 2. In the event of a UF_6 release, the smoke watch would detect the release and notify the ACR to utilize the emergency stop button to trip and isolate the pump." The minimum detectable concentration or release rate that a smoke watch is capable of detecting is not specified in the SAR. However, SAR Section 3.1 states that, "If UF_6 were released at room temperature, only the gas and solid phases of the UF_6 would be involved, producing a cloud of dense "smoke" in the area. The smoke is composed of UF_6, HF, and UO_2F_2 produced from the reaction of UF_6 and moisture in the air. The reaction products of 1 mg of UF_6 in moist air produces a visible white cloud." SAR Section 4.3.2.2.17 states "Workers in the immediate area of the release could be exposed to a significant uranium dose and/or HF exposure. In the event of a release, the plant see and flee policy requires personnel to evacuate the area for their own protection. The essential methods of detection for workers within the withdrawal buildings are: (1) visual indication of a "white smoke" (i.e., reaction products of UF_6 and moisture) or (2) the odor of HF, which is a product of the reaction of UF_6 and moisture. The visual indication or the odor of HF will provide indication of (1) the occurrence of a release and (2) the need for the workers to evacuate the area of the release..... Consequence analysis of the bounding event scenario (e.g., 4.83 lb/s released for 373 seconds) predicted that under F2 meteorological conditions, the predicted exposure for off-site personnel is a uranium toxicological intake of 10.0 mg, and a HF exposure of 6.4 ppm." The American Industrial Hygiene Association has stated that the odor threshold range for HF is 0.04-0.13 ppm. This indicates that humans are capable of detecting UF_6 releases (1 mg visually or .04-0.13 ppm by odor) that are small compared to the release rates assumed in the accident analysis.

In the event that a UF_6 release occurs at a Normetex pump while the UF_6 Release Detection System is inoperable, the smoke watch reports the leak and the location to the ACR operator and immediate actions to terminate the release are initiated. Based on operational experience, this will occur on the order of seconds. These examples show that very small releases can be easily detected by sight or odor detection and the leak isolated well within the maximum required time of 373 seconds.

USEC Response to NRC Request for Additional Information Regarding the Technical Safety Requirements (TSR) Changes to the Normetex Pump UF_6 Release Detection System Controls at the PGDP

b. "additional information regarding the effectiveness of a smoke watch , as an adequate compensatory measure, when considering human factors (e.g., fatigue, attentiveness) and environmental conditions (e.g., heat, noise); and"

USEC has extensive experience in the use of smoke watches. Existing TSRs that require the use of a smoke watch for inoperable UF_6 Release Detection Systems are TSRs 2.1.4.2b, 2.2.4.1, 2.3.4.1, 2.3.4.2, 2.3.4.3, 2.3.4.4, 2.3.4.5, and 2.4.4.1.

The existing procedure used by USEC personnel performing this duty requires the smoke watch to report any release detected and "See and Flee." Operations personnel are used to performing smoke watches and they are typically very familiar with the area they are monitoring. The primary means of communications is a hand held radio; however, a phone in the area could be used. The accident analysis assumes 373 seconds to detect UF_6 and isolate the pump. Given the relatively short distance from the Normetex pump area to the ACR, the smoke watcher could easily walk down to the control room and report a leak within this time frame.

Human factors are considered for personnel performing duties as a smoke watch. Specifically, personnel performing duties as a smoke watch shall remain attentive and responsive, at all times and fully aware of their purpose and expected contingency actions. Communications are established with the control room for periodic checks to maintain communication and personnel alertness. Shift First-Line Managers ensure these personnel shall remain attentive, responsive, and capable of performing their intended function. To guard against fatigue, consideration is given to periodic rotation of personnel and checks by managers during in-plant tours.

c. "a discussion of whether there is additional risk to plant workers or the public associated with 'smoke watches,' and, if so, provide justification as to why the use of a smoke watch during the proposed time frame is still considered adequate for assuring the health and safety of plant workers and the public."

The SAR accident analysis discusses the requirements that the automatic system must meet to provide effective UF_6 release mitigation. The accident analysis determined that a worst case release rate of the unmitigated release of 4.83 lb/s UF_6 could continue for 373 seconds before exceeding the AE off–site exposure guidelines. As shown above, the automatic system will detect a UF_6 release that is much smaller than 4.83 lb/s within a fraction of 373 seconds assumed by the accident analysis. It has also been shown that very small releases can be easily detected by sight or odor detection, and the leak isolated through manual means well within the maximum required time of 373 seconds assumed in the accident analysis. As noted in the subject CAR, the NRC has approved the use of smoke watches in several existing TSRs, which require the use of a smoke watch for other types of UF_6 Release Detection Systems during periods of inoperability. USEC has extensive experience in the use of smoke watches and have found them to be highly reliable.

USEC Response to NRC Request for Additional Information Regarding the Technical Safety Requirements (TSR) Changes to the Normetex Pump UF_6 Release Detection System Controls at the PGDP

This change is being requested because a significant event, such as a panel fire, could place the system in an inoperable status for a long period. The longer (14 day) period is being established to enable continuity of operations during such an event or other significant repair without a request for enforcement discretion. The manual push button will be tested at the same frequency as currently specified for the automatic circuitry or possibly more frequently if there is reason to expect it has been affected by a malfunction of some type. This will ensure the manual system is operable if it is being relied upon.

In summary, the manual system is as effective as the automatic system for performing the required safety function because, both systems will detect and isolate releases much smaller than that assumed by the accident in a time frame that is on the order of seconds. Therefore, this change will assure the health and safety of plant workers and the public is maintained.