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July 16, 2009
GDP 09-0022

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 Regarding Certificate Amendment Request (CAR) to Allow a Flyover Radiological Survey at the Paducah Gaseous Diffusion Plant (PGDP) (TAC L32721)

Dear Mr. Weber:

The purpose of this letter is to provide the United States Enrichment Corporation's (USEC's) response to the NRC's June 29, 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. Commitments contained in this submittal are contained in Enclosure 2.

Sincerely,

S. A. Toelle

Steven A. Toelle
Director, Regulatory Affairs

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Reference: NRC letter from Tilda Y. Liu (NRC) to Steven A. Toelle (USEC), Request for Additional Information Regarding Certificate Amendment Request (CAR) to Allow a Flyover Radiological Survey, Paducah Gaseous Diffusion Plant (PGDP) (TAC L32721), dated June 29, 2009.

Enclosure 1: USEC Response to the NRC Request Additional Information Regarding the CAR to Allow a Flyover Radiological Survey at the Paducah Gaseous Diffusion Plant

Enclosure 2: Commitments Contained in this Submittal

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

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RAI-1

"The certificate holder stated that the radiological survey will be performed from the air using a helicopter. The helicopter will be flying at an altitude of approximately 150 feet and traversing a 25 mile^2 area at 250-foot intervals for approximately 8 hours. To ensure that the aerial survey does not inadvertently initiate an emergency response, the certificate holder is requested to discuss how the scheduling and execution of the proposed aerial survey will be coordinated with the U.S. Nuclear Regulatory Commission Operations Center, the Federal Aviation Administration, and other relevant Federal and State authorities. In addition, the certificate holder is requested to address its notification and coordination with local law enforcement and emergency services of the proposed aerial survey so that they will be on standby in case of an emergency."

USEC Response

DOE contractors will perform activities that involve coordination with the following:

- The Federal Aviation Administration, local air traffic control, and the local airport (i.e., Barkley Regional Airport)
- The Tennessee Valley Authority
- Western Kentucky Wildlife Management Area (WKWMA)
- McCracken County Sheriff's Department
- The Plant Shift Superintendent (PSS) at the United States Enrichment Corporation (USEC)

The PSS at USEC will notify the NRC Operations Center, the Paducah-McCracken County Office of Emergency Management, and the relevant on-site emergency service organizations of the pending flights. Should a helicopter accident occur during the aerial survey operations then the off-site organizations will support the plant's emergency response to the accident if needed in accordance with existing mutual aid agreements.

RAI-2

"The certificate holder stated that in the highly unlikely event that an aircraft accident does occur during the survey, the overall risk from a release of uranium hexafluoride or hazardous material remains very low. It further stated that the probability of a crash of the helicopter into a large enrichment process building is less than 10^{-6}. The certificate holder is requested to provide a reference discussing how crash sequences are defined and how the probability of a helicopter crash threshold, 10^{-6}, is to be applied to screening sequences."

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USEC Response

Telephone discussions with NRC representatives on June 24, 2009, clarified that this RAI requests additional information concerning the methodology used to determine the probability of a helicopter accident occurring during the aerial survey, and adversely affecting PGDP facilities. NRC personnel specifically requested statistical analysis of the helicopter safety information to address the variability of the data used in determining failure rates. The evaluation methodology and the results of the additional statistical analysis are discussed below.

The methodology for determining the probability that a helicopter crash occurring during the proposed aerial survey could adversely affect PGDP facilities involved a three-step process. The first step of the process determined the anticipated failure rate for the type of helicopter used to perform the survey flights. The proposed work plan identifies that the project will use a Bell 412/HP helicopter. This commercial multi-engine turbine helicopter has single-engine flight capability. The Helicopter Association International maintains a database documenting the United States civil helicopter safety statistics between 1997 and 2006. This data shows that all makes and models of multi-engine turbine helicopters experienced 145 accidents over 4.291E+06 flight-hours of operation during the identified 10-year period. Accidents specifically involving the Bell 412 model helicopter represent a small subset of this larger data set. The evaluation initially determined the helicopter failure rate as the ratio of the total number of accidents over the total number of flight-hours that multi-engine turbine helicopters experienced during the identified 10-year period (i.e., 3.379E-5 accidents/flight-hour). However, additional statistical evaluations addressed uncertainties of this historical data by identifying the upper 95 percent confidence interval for the data set. The statistical evaluation constructed the upper confidence limit of the upper one-sided interval using the Poisson parameter methodology discussed in NUREG-1475[a]. This analysis indicates with 95 percent confidence that multi-engine turbine helicopters will experience less than or equal to 166.427 accidents during 4.291E+06 flight-hours of operation. This results in a conservative accident rate of 3.878E-05 accidents/flight-hour.

The second step of this process determined the probability of a helicopter crash occurring during the flight operations supporting the radiological survey project. The proposed work plan states the project requires approximately 8 flight-hours to complete planned objectives. This effort assumes that 16 flight-hours bound the helicopter flight operations required to complete all survey operations. This assumption allows for limited

[a] NUREG-1475, Applying Statistics, Chapter 18, Poisson Experiments, Dan Lurie and Roger Moore, February 1994.

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modification in the work plan associated with the number and types of flights (geo-referencing, etc) used to accomplish the project's objectives without invalidating the analysis supporting the effort. Previous discussions identified that the accident rate for multi-engine helicopters at the upper 95 percent confidence level is 3.878E-05 accidents per flight-hour. Assuming 16 flight-hours bound the total flight time required to complete the project's objectives, then the probability that a helicopter accident will occur during the proposed aerial survey project is 6.205E-04.

The final step of the process determined the probability that a helicopter crash occurring during the aerial survey project could adversely affect PGDP facilities. The proposed work plan identifies the survey area is approximately 25 mile^2. Section 2.1.2 of the Safety Analysis Report (SAR) for PGDP states that PGDP is located on a 3,423-acre site (~5.348 mile^2), of which approximately 650 acres (~1.016 mile^2) are within the Controlled Access Area (CAA). This information illustrates that the PGDP site represents a small fraction of the proposed survey area. Process buildings within the PGDP site occupy relatively large areas (e.g., SAR Section 3.3.2.2 identifies 000 buildings are approximately 1,098 ft by 970 ft in overall plan dimensions and are approximately 83 ft high) and the process buildings are separated from each other by various distances. Given the size of the individual facilities and their separation distances, engineering judgment indicates that a single postulated helicopter crash would not significantly affect more than one plant facility. Therefore, this effort defined the probability of a helicopter accident affecting PGDP as the ratio of the target area for the affected facility divided by the total survey area. The calculations for target area of the affected facility included inputs for both the facility's floor plan (i.e., length and width) plus the facility's height. This is a conservative approach since it results in a larger target area than a target area simply defined by the floor plan of the affected facility. Results from these calculations identified that 000 buildings pose the largest target area (4.147E-02 mile^2) and present the largest probability of being affected by a helicopter crash (i.e., 4.147E-02 mile^2/25 mile^2 = 1.659E-03). Given that previous discussions identified that the probability of a helicopter crash occurring during the survey project is 6.205E-04 and the probability of a crash adversely affecting a PGDP facility is 1.659E-03, then the probability that a helicopter crash occurring during the survey project would adversely affect a PGDP facility is 1.029E-06 or less for any individual facility. This probability is conservative since its supporting calculations incorporate helicopter accident data at the upper 95 percent confidence level.

The above discussions identify that a helicopter failure occurring during the proposed aerial survey project and resulting in a crash that adversely affects a PGDP process facility is a low probability but credible accident sequence. The PGDP SAR section 2.8.1 currently acknowledges that an aircraft crash could credibly affect the largest evaluated

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structures (i.e., the process buildings). SAR Table 4.2-11 identifies an aircraft crash as a non-limiting event that does not exceed Plant Safety Operational Analysis (PSOA) thresholds. The supporting Process Hazards Analysis (PrHA) states that the potential impact of a small aircraft crash could potentially damage the external panels of the building and a process line as well as result in a fire. The PrHA does not address consequences of an aircraft crash in the cascade process since the types of failures that could result from an aircraft crash are addressed in other (i.e., limiting or higher frequency) scenarios. This logic applies to the proposed DOE aerial survey operations. Therefore, plant operations remain bounded by the worst case release scenarios presented in the SAR.

SAR section 4.3.2.2.16 specifically identifies an aircraft crash as a potential initiator for the large fire associated with the cylinder hauling, cylinder storage, withdrawal, feed, toll transfer and sampling operations. The analysis assumed that a large fire initiated during cylinder handling operations could generate enough heat to compromise the physical integrity of the UF_6 cylinders. The thermal environment defined in 10 CFR 71 defines a reasonable basis for conducting the SAR analysis. The analysis assumed that the cylinders are at their maximum fill values (i.e., the mass of 28,000 lb UF_6 for a 48G cylinder) and the cylinders are fully engulfed in a 1475°F fire. The analysis indicates that there is a significant variation in the conditions at the time of failure and in the post failure release conditions. A range of possible source-term conditions exists because of uncertainties that include the fire duration, the fire temperature, the portion of a cylinder or cylinders immersed in a fire, and the effects of fire fighting activities. Because of the uncertainty of the source-term analysis, the dispersion analyses considered 400 lb, 4000 lb, and 8000 lb to represent the initial amount of UF_6 released from for this event. The flight operations for the proposed DOE aerial survey project do not adversely affect any of the assumptions used to evaluate the consequences of a large fire event in the cylinder yards.

This effort assumes the Bell 412 helicopter used in aerial project contains less than 600 gallons of combustible fluids. This is a conservative assumption since investigations indicate the Bell 412 helicopter would contain a maximum of 344 gallons of combustible fluids (fuel, oil, etc.). The source-term analysis in SAR section 4.3.2.2.16 discusses the 800 gallons of combustible liquids carried in cylinder hauling equipment as a credible source of fuel for the large fire event in a cylinder storage yard. The amount of combustible fluid in the helicopter used for the aerial survey operation is considerably less than that postulated for the cylinder yard large fire event evaluated in the SAR. Based on the combustible fluid capacity of the helicopter used in the aerial survey project, the consequences of a large fire in the cylinder yards resulting from a helicopter

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crash occurring during aerial survey operations would not exceed the consequences of the large fire event in a UF_6 cylinder storage yard currently evaluated in the SAR.

RAI-3

"In its letter dated April 17, 2009, the certificate holder cited flight statistics from U.S. Civil Helicopter Safety Statistics - Summary Report (1997-2006) where flight hours and crashes are tabulated for specific years. The reference lists crashes of multi-turbine helicopters for each year of a ten year period. During the period between 1997 and 2006, 145 crashes were recorded during 4,291,000 flights hours of multi-turbine helicopter operation. The certificate holder also discusses crashes of the Bell 412 helicopter, which is a type of multi-turbine helicopter, proposed for the aerial survey. The number of crash events and the flight hours are used to determine an estimate of the crash probability.

The certificate holder is requested to clarify how the reported events helicopter events were used to determine the probability of a helicopter crashing. Discuss how the events of the Bell helicopter were used in the calculations and how parameters of the probability calculation were determined."

USEC Response

The discussions specifically addressing the Bell helicopter events provided background information on the specific model of multi-engine turbine helicopter planned for use in the proposed aerial survey. The evaluation used accident data for all types of multi-engine helicopters to identify a conservative accident rate. The Bell 412 accidents represent a small subset of the accidents for multi-engine turbine helicopters used in the evaluation. This approach allows the DOE contractor to use any type of multi-engine turbine helicopter to accomplish the survey objective without invalidating the evaluations supporting the effort. The USEC response given for RAI-2 provides detailed information concerning the methodology used to determine the probability of a helicopter accident occurring during the aerial survey and adversely affecting PGDP facilities.

RAI-4

"In reviewing the certificate holder's submittal dated April 17, 2009, the staff noted that uncertainties were taken into account by doubling the flight time of the aerial survey. Doubling the flight time has the effect of doubling the estimated crash probability. The aerial survey is expected to take approximately 8 hours, and the crash probability was estimated using a survey flight time of 16 hours. However, the extent to which uncertainties are taken into account by simply doubling the flight time is unclear.

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Discuss the extent to which uncertainties in the crash probabilities are taken into account."

USEC Response

This effort assumed that 16 flight-hours bound the helicopter flight operations required to complete all survey operations. This assumption allows for limited modification in the work plan associated with the number and types of flights (geo referencing, etc) used to accomplish the project's objectives without invalidating the probability calculations supporting the effort. The USEC response given for RAI-2 provides detailed information concerning the methodology used to determine the probability of a helicopter accident occurring during the aerial survey and adversely affecting PGDP facilities. The discussions in the response to RAI-2 clarify how parameters of the probability calculation were determined.

Commitments Contained in this Submittal

The PSS at USEC will notify the NRC Operations Center, the Paducah-McCracken County Office of Emergency Management, and the relevant on-site emergency service organizations of the pending flights.