



Nuclear Regulatory Commission
 Exhibit # - NRC000048-MA-BD01
 Docket # - 07007015
 Identified: 01/25/2011

Admitted: 01/25/2011 Withdrawn:
 Rejected: Stricken:

NRC000048

March 22, 2005

NOTE TO: FILE

FROM: Rex Wescott, Sr. Fire Protection Engineer /RA/
 Gas Centrifuge Facility Licensing Section
 Special Projects Branch, FCSS

SUBJECT: CONFIRMATORY CALCULATIONS FOR FIRE PROTECTION
 REVIEW OF NATIONAL ENRICHMENT FACILITY INTEGRATED
 SAFETY ANALYSIS (ISA) SUMMARY

The three attached calculations were performed using the computer models in NUREG-1805 "Fire Dynamic Tools (FDTs) - Quantitative Fire Hazard Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program" (November 2004). The model used for all calculations was "03-HRR-Flame-Height-Burning-Duration-Calculation.XLS." The model spreadsheet program was from the December 2004 revised CD that was issued following the NUREG. The fuel assumed for all calculations was diesel fuel with the following properties (NUREG-1805):

Mass burning rate	0.045 (kg/m ² -sec)
Heat of combustion	44,400 (kj/kg)
Density	918 (kg/m ³)

The first calculation was performed to verify the limit of 74 gallons of fuel for UF₆ cylinder transporters that was determined by NRC in the Claiborne Enrichment Center SER, NUREG-1491 and cited by LES as IROFS36c (accident identifiers 7-1, 42-1, and 43-1 in the ISA Summary). This fuel limit was determined for the purpose of preventing a fire which could rupture the cylinder. The assumed limit on burning time was based on the paper referenced in the Claiborne SER "Clayton, D.G. et al. "Modeling of the Thermal Behavior of 48 inch Cylinders." Second International Conference, Uranium Hexafluoride Handling, Oak Ridge, TN, October 29-31, 1991. Using this reference, 20 minutes was selected as a safe burning time based on the internal pressure vs time curves and the yield pressure vs temperature curves provided in the paper.

In the first calculation a circular pool, 10 ft in diameter was assumed. This was considered a reasonable assumption and the computer model calculated a burning time of 13 minutes for 74 gallons of diesel fuel which is less than the assumed allowable burn time of 20 minutes.

The second calculation was performed as part of the same verification. However, a more conservative configuration of the pool of 10 ft by 5 ft was assumed. The 48X cylinder is approximately 10 ft long and 4 ft in diameter. (A 48Y cylinder is longer, holds more UF₆ and, thus would require a longer exposure time to rupture) The burning time for this pool is 20.5 minutes, about the same as the SER calculation.

-2-

The third calculation was to verify the acceptability of a DOT approved thermal protective assembly (IROFS36h) to protect a UF₆ cylinder from a truck fire in the CRDB. An approved protective assembly is designed to protect the cylinder from a 800 °C fire for 30 minutes. The

calculation used the applicant's assumed fuel load of 328 gallons spread over a 16 ft diameter circular pool (Accident identifier FF5-2, in the ISA Summary). The staff calculated a fire duration of 22.6 minutes as compared to the applicant's calculation of 22 minutes, verifying the applicant's calculation.

Attachment : As stated

Docket No.: 07-3103

cc: Brian Smith
Tim Johnson

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Tim Johnson

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