

March 25, 2004

MEMORANDUM TO: Joseph G. Giitter, Chief
Special Projects Branch
Division of Fuel Cycle Safety
and Safeguards

THRU: Brian W. Smith, Chief /RA/
Gas Centrifuge Facility Licensing Section
Special Projects Branch, FCSS

FROM: Timothy C. Johnson /RA/
Senior Mechanical Systems Engineer
Gas Centrifuge Facility Licensing Section
Special Projects Branch, FCSS

SUBJECT: MARCH 9-10, 2004, MEETING SUMMARY: LOUISIANA ENERGY
SERVICES' INTEGRATED SAFETY ANALYSIS IN-OFFICE REVIEW

On March 9 - 10, 2004, U.S. Nuclear Regulatory Commission (NRC) staff met with Framatome staff to discuss the Integrated Safety Analysis documentation for the Louisiana Energy Services (LES) gas centrifuge uranium enrichment plant project proposed to be located in Eunice, New Mexico. I am attaching the meeting summary for your use. This summary contains no proprietary or classified information.

Docket: 70-3103

Attachment: Louisiana Energy Services
Meeting Summary

cc:	William Szymanski/DOE	Claydean Claiborne/Jal
	Rod Krich/Exelon	Monty Newman/Hobbs
	James Curtiss/W&S	Troy Harris/Lovington
	Peter Miner/USEC	Betty Richman/Tatum
	James Ferland/LES	Glen Hackler/Andrews
	Dennis Holmberg/Lea County	William Floyd/New Mexico
	James Brown/Eunice	Richard Ratliff/Texas
	Michael Marriotte/NIRS	Jerry Clift/Hartsville
	CO'Claire/Ohio	Lee Cheney/CNIC
	Derrith Watchman-Moore/NM	

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Summary of Meeting with
Louisiana Energy Services on Integrated Safety Analysis

Dates: March 9 - 10, 2004

Place: Framatome offices
Marlborough, MA

Attendees:

D. Brown/NRC	H. Felsher/NRC
T.C. Johnson/NRC	J. Klein/NRC
W. Troskoski/NRC	R. Wescott/NRC
D. Green/Excel	G. Harper/Framatome
M. Kennedy/Framatome	D. Pepe/Framatome

Purpose:

The purpose of this meeting was to review and discuss the unclassified backup documentation prepared for the Louisiana Energy Services (LES) Integrated Safety Analysis (ISA) for its gas centrifuge uranium enrichment plant proposed to be located in Eunice, New Mexico. Framatome is the LES contractor responsible for coordinating the unclassified ISA preparation.

Discussion:

After introductions, Mr. M. Kennedy discussed the general approach LES had taken to prepare its ISA for its proposed gas centrifuge plant in New Mexico (see Attachment 1). LES used a HAZOP process as the ISA Method for all safety disciplines, fire, and external events. He also explained the documentation used for the project and how it related to the application documentation that had been previously prepared for the Hartsville, Tennessee, site. All documentation for the Hartsville site was reviewed to assess what changes would be needed for it to be used for the Eunice site. Documentation on the review process was prepared showing which documents required or did not require changes.

M. Kennedy explained the status of the facility design. He stated that equipment functions are known and described in the application. Process and instrumentation diagrams (P&IDs) are also not expected to change. However, since procurement has not started, details on equipment manufacturer, models, final dimensions, etc., have not yet been determined for final design.

Staff reviewed detailed documentation and calculations in the following areas:

- Uranium and hydrogen fluoride (HF) consequence assessment limits;
- Criticality safety;
- Airborne releases from buildings and the evaporation basin;
- Hazardous and mixed waste generation;
- Gaseous effluent ventilation system;
- Fire safety;
- Emergency response.

The staff conducted a vertical slice review of the Blending and Sampling System. This system was chosen based on greatest relative risk posed by uranium hexafluoride (UF₆) in the liquid state. Topics covered during the review included the design update review, system node

breakdown, HAZOP tables, accident sequence descriptions, action item lists, an integrated review of other site areas that could affect the system, P&IDs, criticality safety assessments, system descriptions, bounding calculations, fire, and flooding effects.

The staff also reviewed the ISA Consequence Assessment for Airborne Releases, which contained appropriate information related to the performance of the consequence assessments, UF_6 source terms, atmospheric dispersion factors, and leak flow path rates for each scenario. The methods and assumptions were extensively based on Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants."

Other ISA documents included in the staff's review were the Chemical Inventory/Hazards List, Natural Gas Pipeline Hazard Risk Determination, and the Product Take-Off System HAZOP and Risk Determination Analysis. The information in the ISA documents appeared to be of appropriate detail for the complexity of the gas centrifuge process and addressed radiological hazards, chemical hazards, facility hazards, potential accident sequences, the consequences and likelihood of occurrence, and items relied on for safety (IROFS). The natural gas hazard evaluation considered over-pressure on plant structures from potential shock waves, missile impact from an air burst detonation and radiant heat flux. The staff noted that the distance from the natural gas pipeline to the plant would exceed the calculated safe distance by a substantial margin.

The staff also conducted discussions with the applicant concerning the proposed quantitative standards for determining the performance criteria specified in 10 CFR 70.61. The proposed values for HF and UO_2F_2 , contained in Table 6.3-5, Enhanced Definition of Consequence Severity Categories, were extrapolated from the Acute Exposure Guideline Levels (AEGL) values in effect at the time of the license application submittal. NUREG-1520, Section 6.4.3.1, Process Chemical Risk and Accident Sequences, notes that acute chemical release limits may not be adjusted by a time-weighted average calculation unless a rational basis is provided in the ISA Summary. The applicant stated that the revised AEGL values for HF and UF_6 (which reacts with water in the atmosphere to produce HF and UO_2F_2) and the time-weighted average approach contained in the National Academy of Sciences latest revision to the AEGLs (2004) would be used in determining the consequence levels. LES will provide updated information to reflect the latest information.

Documentation of chemically hazardous and mixed chemical and radioactive waste generation were reviewed. LES is preparing a Resource, Conservation, and Recovery Act (RCRA) small generator permit application. Under this application, chemically hazardous and mixed wastes cannot be stored on-site for more than 90 days. NRC staff was concerned that all chemically hazardous and mixed waste have a reasonable assurance of being properly treated and disposed of. The LES generation estimates are based on experience for similar facilities at the Urenco facilities in Europe. Mixed wastes are expected with the U.S. Environmental Protection Agency RCRA hazardous chemical designations D001, D002, D003, F001, F003, and F005. Information was also provided on potential treatment and disposal services for mixed wastes that are properly permitted by the U.S. Environmental Protection Agency or its authorized States and licensed under NRC or its Agreement State requirements (see Attachment 2). Five facilities were identified as possible treatment and disposal options for these wastes. This information satisfied NRC staff's concerns in this area.

Staff reviewed the determination of aircraft hazards and the margin in these calculations for potential growth in flights from the Eunice airport, the nearest airport to the proposed site, 15 miles away. The aircraft hazard analysis used methods based on NRC guidance in NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility." Based on Federal Aviation Administration data, about 480 flights per year use the Eunice airport. Based on NUREG-1520, 22,500 flights per year would be needed to trigger more detailed review of accident hazards at the facility from local flight activity. Therefore, there appears to be sufficient margin in the number of flights to allow for possible future growth in flight activity at the Eunice airport.

Staff reviewed the Hazard and Risk Determination Analyses and the four bounding documents that were used as part of the ISA process for nuclear criticality safety, which were:

- "Criticality Safety Assessment for the Main Separation Plant," UPD/0200530 (11/12/03);
- "Criticality Safety Evaluation of Evacuating an Assay Unit into a Single Tails Cylinder," UPD/0202631 (11/05/02);
- "Preliminary Criticality Safety Assessment for the LES-2 Technical Services Building (TSB)," UPD/0202783 (10/31/02); and
- "Determination of Critical and Safe Parameters of Generic Uranyl Fluoride Systems of 5% and 6% U-235 Enrichment," UPD/9903096

In addition to the four documents reviewed above and additional documents provided by Framatome, and discussions with applicant personnel, LES contractor staff understands NRC's nuclear criticality safety regulatory requirements better and NRC understands LES' approach for nuclear criticality safety better.

In the areas of radiological protection, emergency planning, and decommissioning, staff reviewed the following documents and calculations:

- "Gaseous Effluent Ventilation System HAZOP and Risk Determination Analysis"
- "Contamination Workshop and Decontamination System HAZOP and Risk Determination Analysis;"
- "Chemical Laboratory System HAZOP and Risk Determination Analysis";
- "ISA Consequence Assessments for Airborne Releases;"
- "Potential Doses Due to Effluent Discharges from the NEF, New Mexico Site Exfiltration Estimate;" and
- "Liquid Effluent Collection and Treatment System Estimated Uranic Discharge Treated Effluent Evaporative Basin."

The staff reviewed the ISA Consequence Assessment for Airborne Releases, which included the applicant's approach and assumptions for calculations of both on-site and off-site radiological and chemical concentrations and exposures. The approach and assumptions were found to be conservative and based largely on NRC regulations. In particular, staff reviewed backup documentation on airborne releases from exfiltration of buildings. These calculations were based on American Society of Heating, Refrigerating, and Air Conditioning Engineers methods for determining leakage from buildings under various pressure difference scenarios. LES calculations considered conservative pressure differentials caused by wind effects and computed air leakage from buildings containing radioactive materials. These computations have a reasonable basis and use standard calculation methods.

In the environmental area, staff reviewed several calculations, including:

- "ISA Consequence Assessments for Airborne Releases," 32-2400503-0;
- "LES-2 Building Volumes and Profiles," 32-2400504-0;
- "LES-2 UF₆ Release Estimates," 32-2400505-0;
- "Potential Doses Due to Effluent Discharges from the NEF, New Mexico Site," 32-2400513-00;
- "Exfiltration Estimate," L4-50-01-CALC;
- "Conceptual Calculation: Liquid Effluent Collection and Treatment System Estimated Uranic Discharge," L4-53-45-CALC; and
- "Calculation: Treated Effluent Evaporative Basin," L4-53-56-CALC

After reviewing "ISA Consequence Assessments for Airborne Releases," staff requested be submitted to NRC specific sections of the calculation that included: (1) a detailed description of the chemical and radiological consequence assessment method used by LES; and (2) a summary of source terms for various areas throughout the plant. At the close of the review, Framatome staff agreed to seek LES approval to grant staff's request.

During review of "Calculation: Treated Effluent Evaporative Basin," staff compared data for local evaporation rates (in inches per year) and Treated Effluent Evaporative Basin (TEEB) surface area (in square feet), each of which were design parameters for the TEEB. A preliminary calculation by staff indicates that the volume of evaporated water would exceed the volume of treated and untreated wastewater normally discharged into the basin. As a result, staff are concerned that LES' s assumption that the TEEB would be dry 10 percent of the time is probably too low. Staff will continue to evaluate the source term for fugitive emissions from the TEEB.

The fire protection review consisted of a review of general facility fire protection information and specific calculations performed by the applicant to support some of the safety evaluations of postulated fire scenarios. The general facility fire protection documents reviewed were:

- "Fire Hazards Analysis for License Application", L4-50-01-FHA; and
- "Assessment of Facility Fire Risk at NEF for ISA and Design Basis", 51-2400-00.

The first document, "Fire Hazards Analysis for License Application," provided a brief qualitative analysis of fire potential in areas containing UF₆ and listed flammable and combustible hazards and if a self-sustaining fire was credible. The potential for flashover was also evaluated for these various areas. Significant information obtained from these area evaluations was a listing of expected combustibles in these various areas and the primary means of fire protection. The document calls for most of the areas to be analyzed further for combustible loading controls or other measures when the design is finalized. The document also describes the fire protection water supply as capable of supplying a demand flow of 1000 gallons per minute for 2 hours with 100 percent redundancy. A staff concern that arose from the review was the need for an evaluation of the likelihood and consequences of a hydrogen explosion in the Chemical and Environmental Laboratories.

The second document, "Assessment of Facility Fire Risk at NEF for ISA and Design Basis," provided justification for the fire initiation index of -2 (no fires in combined Urenco facility experience of 30 years). The document also stated that worker training and orientation are being credited with the high reliability being assigned to administrative fire controls. The

document also referenced calculations for determining service vehicle fire effects on the Uranium Byproduct Cylinder (UBC) storage pad, vegetation fire on the UBC fire pad, Cylinder Receipt and Dispatch Building (CRDB) Truck Bay fire, and the 74 gallon transporter fuel limit identified in IROFS 36. "Safety Evaluation Report for the Claiborne Enrichment Center, Homer, Louisiana," NUREG-1491, was cited as the source of the 74 gallon fuel limit requirement. The analysis cited in NUREG-1491 was performed by the NRC staff for the proposed enrichment plant in Homer, Louisiana. In addition, the document identified battery charging areas as requiring additional evaluation for hydrogen explosion potential.

Staff also reviewed the following fire safety calculations:

- "CRDB Truck Bay Fire," 32-2400519-00;
- "Vegetation Fire Effects on UBC Pad," 32-2400518-00; and
- "Service Vehicle Fire Effects on UBC Pad," 32-2400517.

All the above calculations were performed to determine the integrity of UF₆ cylinders under various potential fire conditions. The CRDB Truck Bay Fire calculation assumed a heat source from a 500 liter pool of diesel fuel confined by the geometry of the truck bay into a 5 meter diameter pool. The critical temperature of the UF₆ which would result in cylinder failure was assumed to be 650° C as determined from test results. Radiant energy release from the hydrocarbon fuel fire was calculated using techniques from the SFPE Handbook for Fire Protection Engineering for hydrocarbon pool fires and applied to the cylinder. The cylinder temperature was determined using standard heat transfer calculations considering the cylinder location, steel mass of the cylinder, and duration of the fire. At a distance of 1.0 meter from the truck bay, the cylinder was determined to reach a temperature less than the critical temperature. The vegetation fire calculation postulated a large vegetation fire at the tree line approximately 89 meters from the UBC pad. The assumed temperature of the fire was 1005° C and the Stefan-Boltzman equation was used to calculate radiant energy heat transfer. Maximum resulting temperatures of a 30B and 48Y cylinders were determined to be below the critical temperature. The staff considered this calculation to be reasonable and appropriate. The service vehicle fire was also based on a pool containing 500 liters of diesel fuel. The pool was assumed to be the width of the access road and was 9.14 meters from the edge of the UBC. The fire temperature was assumed to be 1026° C and the Stefan-Boltzman equation was used to calculate radiant energy heat transfer. The resulting temperature of the cylinder was calculated to be below the critical temperature. The staff considered all the above calculations to be reasonable and appropriate for the postulated fire scenario.

Action Items:

None.

Attachments:

1. Framatome meeting handouts
2. EPA list of currently operating mixed waste facilities