UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
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ATLANTA, GEORGIA 30303-8931

[redacted]

August 2, 2004

Nuclear Fuel Services, Inc.
ATTN: Mr. Kerry Schutt
President/General Manager
P. O. Box 337, MS 123
Erwin, TN 37650

SUBJECT: NRC INSPECTION REPORT NO. 70-143/2004-05

Dear Mr. Schutt:

This refers to the operational readiness review team inspection conducted from March 29 through June 18, 2004, at your Erwin facility. The purpose of the inspection was to determine whether activities requested in your license amendment request dated February 28, 2002, specifically, operation of the Blended Low Enriched Uranium Preparation Facility (BPF), could be conducted safely and in accordance with NRC requirements. The inspection included a review of your operations, management, and safeguards programs to insure that your BPF facility was ready to operate safely and in compliance with your license request.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, a review of the new equipment installed for the process, interviews with personnel, and observation of activities in progress.

Based on the results of the inspection, no violations or deviations were identified.

[redacted]

[redacted]

[redacted]

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and Enclosure 1 will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room). [redacted]

Should you have any questions concerning this letter, please contact us.

Sincerely,

/RA/

David A. Ayres, Chief
Fuel Facilities Branch 1
Division of Fuel Facilities Inspection

Docket No. 70-143
License No. SNM-124

Enclosures: 1. NRC Inspection Report (Part 1)
2. NRC Inspection Report (Part 2), [redacted]

cc w/encls:
B. Marie Moore
Vice President
Safety and Regulatory Management
Nuclear Fuel Services, Inc.
P. O. Box 337, MS 123
Erwin, TN 37650

Distribution w/encls: (See page 3)

[redacted]

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	70-143
License No.:	SNM-124
Report No.:	70-143/2004-05
Licensee:	Nuclear Fuel Services, Inc.
Facility:	Erwin Facility
Location:	Erwin, TN 37650
Dates:	March 29 - June 18, 2004
Inspectors:	D. Rich (Team Leader), Senior Resident Inspector L. Berg, Criticality Safety Inspector (NMSS) M. Crespo, Fuel Facility Inspector (RII) J. Jimenez, Nuclear Safety Intern (RII) N. Rivera, Fuel Facility Inspector (RII) C. Taylor, Health Physicist (RII) G. Wertz, Senior Resident Inspector (BWXT) M. Williams, Senior MC&A Physical Scientist (NMSS)
Approved by:	D. A. Ayres, Chief Fuel Facility Branch 1 Division of Fuel Facility Inspection

Enclosure 1

[redacted]

NRC Inspection Report 70-143/2004-05 (Part 1)

EXECUTIVE SUMMARY

This report is a summary of the special operational readiness review team inspection of the licensee's proposed operation of a high enriched uranium downblending facility, which is phase two of the licensee's proposed Blended Low Enriched Uranium (BLEU) Project. The operational readiness review inspection was conducted over a period of several weeks, with specialized inspectors from the NRC Office of Nuclear Materials Safety and Safeguards (ONMSS) and Region II (RII). The results of the operational readiness review (ORR) inspection are contained in the Report Details section of this report. The Report Details section has been prepared to exclude the use of information the licensee identified as proprietary and for which the licensee submitted an affidavit pursuant to 10 CFR 2.390. The inspection was conducted through a review of selected records, procedures, interviews with personnel, and direct observation of equipment testing and work activities in the following areas: criticality safety, chemical safety, fire protection, environmental protection, waste management, operator training, emergency preparedness, safety program and integrated safety analysis, physical safeguards, radiation protection, operations, management measures, and maintenance and surveillance.

Safety Program and Integrated Safety Analysis (ISA)

- The licensee's safety program met regulatory requirements and license conditions (paragraph 2).

Operations

- Implementation of Items Relied On For Safety (IROFS) satisfied the design safety functions specified in the ISA summary. Safety related equipment (SRE) tests generally showed IROFS fulfilled the design safety function. The inspectors identified several SRE tests which were inadequate in that the tests did not properly verify the IROFS safety function and required significant modification. (Paragraph 3.a). The licensee adequately corrected the test methods such that IROFS were properly tested before startup.

- IROFS instrument and alarm setpoint determinations utilized conservative engineering analyses, and accounted for instrument response and accuracy parameters, and were generally well documented. Documentation of one calculation was improved to demonstrate adequate safety margin (Paragraph 3.b).

[redacted]

[redacted]

- The licensee had adequately implemented the sole IROFS for the BPF to ensure they provided their safety function. The licensee's IROFS modifications were within those allowed by NRC regulations and guidance. (Paragraph 3.c).

- The licensee's configuration control was adequate in that process equipment was installed in accordance with drawings and was adequately documented and labeled (paragraph 3.d).

- The licensee's procedures were adequately written to clearly instruct operators on how to operate the facility safely and how to respond to process upsets (Paragraph 3.e).

Radiation Protection

- The radiation protection program for the BPF process met regulatory requirements (paragraph 4).

Nuclear Criticality Safety

- The inspectors had reasonable assurance that the downblending, uranium [redacted], and the solvent extraction areas would be safe to operate with controls as stated in the nuclear criticality safety evaluations (NCSEs). The field installation of safety equipment was as stated in the NCSEs (Paragraph 5.a.).

- The inspectors had reasonable assurance that the nuclear criticality safety NCS function would be adequate for maintaining acceptable levels of safety (Paragraph 5.b.).

- No safety concerns were identified regarding criticality accident alarm system coverage at the BPF (Paragraph 5.c.)

Chemical Process Safety

- The licensee adequately implemented chemical safety controls to ensure that operations would be conducted in a safe manner (Paragraph 6).

Fire Protection

- The licensee had implemented a fire protection program that provided reasonable assurance that workers and the public would be protected. The pre-fire plan required updating and was revised during the inspection (Paragraph 7).

[redacted]

[redacted]

Emergency Preparedness

- The changes incorporated to the existing emergency preparedness plan appropriately addressed new hazards and were adequately implemented (Paragraph 8).

Environmental Monitoring and Waste Management

- The licensee's environmental protection program was adequate to support operation of the BPF. The expected gaseous and liquid effluents released to the environment were predicted to be a small fraction of regulatory limits (Paragraph 9).

Management Measures

- Management measures for IROFS as described in the ISA Summary appeared to provide adequate administrative controls for configuration, maintenance, calibration, functional testing, periodic maintenance, vendor specification information, and audit review (Paragraph 10).

Operator Training

- The licensee's lesson plans contained the appropriate information to communicate safety hazards to the operators. Supervisors were knowledgeable of facility operation and safety requirements. Operator training was not complete at the time of the inspection (Paragraph 11).

Attachment:
Partial Listing of Persons Contacted
Inspection Procedures Used
List of Items Opened, Closed, and Discussed
List of Acronyms

[redacted]

[redacted]

REPORT DETAILS

1. Summary of Plant Status and Description of Facility

Construction of the blended low enriched uranium preparation facility (BPF) was complete with some modifications and testing performed as the inspection progressed. The BPF systems had been operated with various surrogate materials for the purpose of testing, but processing of special nuclear material had not commenced.

[redacted].

The NFS BPF was proposed to oxidize and dissolve high-enriched uranium [redacted], refine the high-enriched uranium solution in a solvent-extraction process, and blend those high-enriched uranium solutions with natural uranium to create low-enriched uranyl nitrate suitable for use in manufacturing commercial nuclear reactor fuel. The facility also included waste treatment and disposal facilities.

2. Safety Program and Integrated Safety Analysis (Inspection Procedure (IP) 88005, Temporary Instruction (TI) 2600/006)

a. Inspection Scope

The inspectors reviewed the licensee's safety program and integrated safety analysis (ISA) to verify they meet regulatory requirements and licences conditions.

b. Observations and Findings

10 CFR 70.62 requires the licensee to establish and maintain a safety program, including performance of an ISA. The inspectors reviewed various aspects of the safety program including change management, maintenance of process safety information, information pertaining to the technology, and the equipment of the process. The inspectors verified the licensee's documentation demonstrated compliance with License Application Section 2.12, regarding documentation of design, configuration, testing, and reliability of items relied on for safety (IROFs). The inspectors observed testing and verified installation of various IROFS as noted in Section 3 of this report. As part of the safety program, the licensee committed to establish management measures to maintain

[redacted]

the reliability of IROFS. These measures were reviewed and are discussed in detail in Section 11 of this report. No significant deficiencies were identified.

c. Conclusions

The licensee's safety program met regulatory requirements and commitments.

3. Operations (Inspection Procedure (IP) 88020, TI 2600/006)

a. Review and Functional Testing of IROFS

(1) Inspection Scope

The inspectors generally reviewed all IROFS associated with BPF systems by review of the ISA summary, safety related equipment (SRE) test records, and other supporting documents. The inspectors reviewed selected IROFS in detail by examination of installation and calibration records and field inspection to verify reliability and availability. These inspections included review of IROFS in the [redacted] Downblending, Solvent Extraction (SX), and building support systems, to verify that the equipment installed would perform the safety functions outlined in the ISA summary. The inspectors observed the functional testing of selected IROFS to verify that the testing was conducted according to procedure and to verify the test validated the IROFS safety function. The test procedures and test records were also reviewed to verify that the actual IROFS systems were challenged and tested and not a non-IROFS process control function.

(2) Observations and Findings

The inspectors reviewed IROFS for the process and support systems and found they were generally installed and tested as described in the design documentation and the ISA summary, and were capable of performing the safety functions specified in the ISA summary.

In the SX area inspectors noted that adequate controls were in place to prevent criticality [redacted]. The inspectors also reviewed several IROFS functional test records for the SX system, including the in-line radiation monitor installed to prevent transfer of raffinate discard with excessive fissile material content to unfavorable geometry waste tanks. No issues were noted with the tests or the results.

[redacted]

The inspectors observed that the IROFS for the ventilation system, which consisted mostly of High Efficiency Particulate Air (HEPA) filters, were designed and installed to y prevent the accumulation of fissile material into the system. The administrative control IROFS were found to be adequately controlled in written procedures.

During the review of the IROFS for the downblending system, the inspectors noted several deficiencies in the area of testing of IROFS. For IROFS [redacted], the inspectors noted that the underground section of the low enriched uranium (LEU) solution transfer line was designated an IROFS, but no periodic test had been established to verify integrity [redacted]. Upon notification of this observation, the licensee developed and satisfactorily performed a safety related equipment (SRE) test [redacted], which demonstrated the [redacted] integrity. The inspectors reviewed the [redacted] test and found no issues.

The inspectors also noted an issue with testing of the blend tank high-level switch. The test did not have instructions for the operator to isolate the tank should the level switch fail to actuate. The process engineer agreed and revised the test to instruct the operator to monitor and stop the tank fill action.

During the observation of the test for process monitor [redacted], the inspectors noted deficiencies in the test methodology. The functional test for the monitor did not adequately isolate the IROFS, which was a hardwired interlock, from the process controls, controlled by computer software. Therefore, the inspectors could not determine if the IROFS or the process logic computer had actuated the safety interlock. The licensee revised the test to correct the issue and reviewed other facility tests to ensure the same issue did not exist in other tests. The inspectors were unable to find other examples of this deficiency and concluded that the issue was an isolated example. Also on the same test, the inspectors noted that the calibration standard used to actuate the monitor alarm circuitry was well above the limiting condition for operation specified in the ISA Summary. Therefore, the test did not verify the monitor would alarm at the required setpoint. The licensee revised the test to use a conservative standard which accurately demonstrated the required performance. Following the revisions, the inspectors observed that the equipment passed the test.

The inspectors reviewed several other IROFS and test records for the downblending area as well as the electrical drawings to verify the proper test conditions and electrical relay jumper installation. No issues or discrepancies were noted.

The inspectors' review of the IROFS for the [redacted] system indicated that the system was adequately safeguarded against criticality and fire concerns. The inspectors verified that the functional testing of the IROFS for the [redacted] system adequately separated the [redacted] interlocks from the PLC controllers for the tests. The inspectors identified one significant deficiency in the [redacted] which was part of an IROFS. Fluctuations in the [redacted] measurements of the total [redacted] in the system

[redacted]

[redacted]

enclosures prevented the system from passing the functional test. The licensee incorporated [redacted] feature and also reduced the allowed [redacted] in the enclosures. The combination of the two provided for adequate safety function and allowed the system to pass the functional test.

During the review of the fire protection IROFS for the [redacted] system, the inspectors noted that the functional test of the [redacted] detection interlocks did not verify that the [redacted] detector was in calibration prior to performance of the test. By review of records, the inspector verified that the system was in calibration. The licensee planned to incorporate a verification step into the test procedure. The inspectors found no other issues with the IROFS for the [redacted] system.

The inspectors noted two deficiencies with the functional testing of IROFS for the [redacted] process. The test for the [redacted] PLC [redacted] limit control did not provide clear steps on how to properly complete the test. The licensee revised the test procedure to provide clear instructions. The inspectors also identified the procedure for the [redacted] nitric acid supply routing and shutoff valves did not list a minimum pressure for the conduct of the pressure test. The licensee modified the test procedure to include the minimum pressure requirement. No other issues were noted for the [redacted] system.

The inspectors also reviewed and observed several tests of IROFS that prevented backflow from the operations areas into the [redacted] chemical areas. Only one test deficiency was identified. The inspectors noted that the test for [redacted] used a pressure indicator (PI), but PI was incorrectly located in the system to provide the desired indication. The licensee modified the test. No other issues were noted.

(3) Conclusions

Implementation of IROFS satisfied the design safety functions specified in the ISA summary. SRE tests generally showed IROFS fulfilled the design safety function. The inspectors identified several SRE tests which were inadequate in that the tests did not properly verify the IROFS safety function and required significant modification. The license adequately corrected the test methods such that IROFS were properly tested.

b. Setpoint Analysis of IROFS Review

(1) Inspection Scope

The inspectors reviewed the analyses for the setpoints of selected IROFS to verify that the setpoint determinations were documented, used conservative engineering analyses, and accounted for all instrument response and accuracy parameters as required by license condition S-49.

[redacted]

[redacted]

(2) Observations and Findings

The inspectors reviewed the set point calculations for the IROFS that [redacted] in the SX system. The inspectors found the calculations to be conservative and incorporated system accuracies and safety limits [redacted].

The inspectors reviewed the setpoint calculations and calibration methodology for two in-line monitors with the cognizant nuclear criticality safety (NCS) and instrumentation engineers. The inspector also reviewed and observed the calibration procedure for an in-line monitor. No issues were noted in the review.

The inspectors independently verified the setpoint calculation for the density monitor [redacted] for the downblending process, and verified that the grams uranium per liter limit equated to the alarm setpoint in milliamps specified in the SRE test. No issues were identified.

The inspectors reviewed the setpoint analysis for fire protection IROFS of the [redacted] system with the cognizant engineer to determine if an adequate level of conservatism was used. The inspectors found that the initial calculations for the nitrogen supply tank indicated very little safety margin or conservatism for the safety system to fully function. The licensee subsequently performed a more detailed assessment of the system which demonstrated adequate safety margin was present to ensure the IROFS would be available. The inspectors found no issues with the revised calculations. No other issues were noted with the IROFS setpoint calculations.

(3) Conclusions

IROFS instrument and alarm setpoint determinations used conservative engineering analyses, and accounted for instrument response and accuracy parameters, and were generally well documented. Documentation of one calculation was improved to demonstrate adequate safety margin.

c. Review of Sole IROFS and Modifications of IROFS

(1) Inspection Scope

The inspectors reviewed in detail the sole IROFS of the BPF areas to verify they were installed and able to perform their safety function. The inspectors also reviewed the modifications to IROFS since the approval of the original ISA Summary, dated February 6, 2004, in order to verify that required safety functions and overall design conservatism were maintained.

[redacted]

[redacted]

(2) Observations and Findings

Through walkdowns of the systems and discussions with the design engineers, the inspectors verified that the sole IROFS were adequately installed according to the design specifications of the ISA. The inspectors also verified that the sole IROFS would be able to perform their safety function. The inspectors noted no issues during the detailed review of the sole IROFS of the processes.

The inspectors noted that several sole IROFS, which referred to the tank structure for [redacted] chemicals [redacted], had been deleted from the ISA that had been approved by the NRC licensing branch. The inspectors reviewed the licensee analyses and calculations which demonstrated the accident scenario was no longer led to an intermediate or high consequence event. Subsequent guidance from the NRC licensing branch indicated deletion of sole IROSF under these circumstances was acceptable. The inspectors also interviewed licensee engineers, and found no issues with the analyses or with the licensee's rationale to delete chemical [redacted] structures as IROFS.

The licensee extensively modified the originally proposed IROFS for [redacted] system fire protection. The inspectors reviewed the fire hazard analysis, conducted discussions and walkdowns with the fire safety engineer, and observed testing of the new IROFS. The inspectors compared protective functions of the modified IROFS with the original designs and concluded that the modified design improved on the original safety functions and provided a more robust system.

The inspectors noted several changes to IROFS involving removal of portions of the IROFS. The inspectors reviewed the justification for these modifications and noted that the modifications concurred with the nuclear criticality safety evaluations (NCSEs). No other issues were noted. The inspector concluded that no reduction in IROFS effectiveness resulted from the changes.

(3) Conclusions

The licensee had adequately implemented the sole IROFS for the BPF to ensure they provided their safety function. The licensee's IROFS modifications were within those allowed by NRC regulations and guidance.

d. System Configuration review

(1) Inspection Scope

The inspectors performed system walkdowns of process and support equipment with pipping and instruments diagrams (P&IDs) and the system engineers to verify the configuration of the system was properly documented and controlled.

[redacted]

[redacted]

(2) Observations and Findings

The inspectors reviewed the downblending system and verified the accuracy of the system description in the ISA Summary, Section 3.4, "Downblending Process." During the walkdown of the ventilation system, the inspectors were able to verify that the appropriate line separation was used to ensure that highly reactive combinations of gases were not generated. The inspectors reviewed one ventilation section which vented hydrogen waste gas and found the system to be conservatively designed to limit its concentration below the explosive threshold. No issues were identified.

The inspectors also walked down portions of the [redacted], solvent extraction, [redacted], and support systems. The P&IDs for the systems reviewed were generally accurate. Some minor discrepancies were noted that the licensee agreed to correct and provided corrected copies for review during the inspection. The inspectors' walkdowns of the process systems verified that the sections of drawings reviewed matched the equipment installed. The inspectors also noted that SRE observed was properly labeled with unique equipment identification numbers.

(3) Conclusions

The licensee's configuration control was adequate in that process equipment was installed in accordance with drawings and was adequately documented and labeled.

e. Procedure Review

(1) Inspection Scope

The inspectors reviewed the operating procedures for the processes to verify that safety items, such as safety controls and various hazards, were properly incorporated. The inspectors also verified that the procedures gave clear instructions to the operators for safe process operation.

(2) Observations and Findings

The inspectors reviewed the procedures for the various systems and noted that they contained adequate descriptions of the IROFS safety features and functions. The inspectors also noted that the procedures contained abnormal operating portions and alarm response tables, which provided the operators with guidance during upset conditions. The inspectors reviewed procedures addressing selected administrative and active engineered controls and noted no issues with the clarity or content of the instructions. No issues were identified.

[redacted]

[redacted]

(3) Conclusions

The licensee's procedures were adequately written to clearly instruct operators on how to operate the facility safely and how to respond to process upsets.

4. Radiation Protection (IP 83822)

a. Inspection Scope

The implementation of the licensee's radiation protection program was verified to ensure that the necessary equipment and procedures were in place to support operations of the BPF process. In addition, the inspector conducted walkdowns to verify and evaluate the identification of radiological hazards in the following areas: Check-Weigh Area; Low Enriched Uranium Area; [redacted]; Solvent Extraction Area; Downblending Area; [redacted].

b. Observations and Findings

From discussions with the licensee and a review of the licensee's ISA report, the inspector noted that the licensee did not identify any IROFS for the radiation protection area. The licensee also indicated that the radiation protection program for the BPF process would remain consistent with NFS's radiation protection program, with some minor changes. These changes emphasized the need to address the increased external gamma radiation present in the uranium [redacted] and uranium [redacted] feed material. The licensee indicated that posting, boundaries, and dose rate status maps with the results of daily surveys would be placed in areas where increased external radiation existed. Once operations began, the area would become a controlled area as described in the licensee's SOP. In addition, the license indicated that certain workers would be wearing electronic dosimeters to track their total dose and finger badges to monitor their extremity dose.

The inspectors determined that the feed material consisted of [redacted] The licensee had obtained background data on the material from [redacted] and [redacted] to derive a source term. Even though the background data from [redacted] was not as robust as the [redacted] data, the inspector concluded that enough information was available to derive a conservative source term that was used in the licensee's ISA evaluations.

From discussions with the licensee concerning radiological hazards of the [redacted], the inspector determined that the licensee had anticipated an increase in external radiation. The areas most affected included the material [redacted] areas, HEU [redacted] area, and the check-weigh area. For these areas and the overall BPF process, the licensee added electronic alarming dosimeters and finger badges to the monitoring program. The electronic dosimeters were preset to alarm at 20 mrem total dose and 20

[redacted]

mR/hr (constant beeping) to alert operators, clerks and warehouse personnel working in the BPF areas. Any individual receiving a daily dose equal to or exceeding 20 mrem in a shift would require notification of the area Health Physicist (HP) and work stoppage for the remainder of the shift. At the end of the shifts, the area HP was responsible for recording the daily doses for As Low As Reasonably Achievable (ALARA) and trend evaluations. The finger badges were to be worn when handling the material and exchanged monthly for the BPF operators. The inspectors also reviewed training and interviewed individuals on gamma versus alpha radiation exposure, and the concept of distance, time, and shielding principles. No significant issues were identified.

From discussions with the licensee and a review of the licensee's dose evaluations and ALARA design guidance goals for the BPF process, the inspector determined that the licensee used computer software [redacted] to create dose profiles of the BPF process areas. The dose profiles were a good indicator of the elevated external radiation levels present in the areas where the material was already being weighed and stored. The inspectors observed the licensee perform surveys in the [redacted] area. The highest reading was 10 mR/hr at the back of the [redacted] area. The inspector reviewed survey documentation for the [redacted] the [redacted] areas. The highest dose rates were found in the [redacted] area that housed the [redacted]. These dose rates averaged 25-28 mr/hr in the [redacted] areas. The licensee indicated that a "first in, last out" policy would be used in retrieving the material, which would minimize exposure to personnel [redacted]. In addition, the licensee used tamper-sealed containers, which reduced the amount of time the clerks would need to take inventory.

In the Check-Weigh Area, the surface dose rates measured for a [redacted] on contact. In keeping with the ALARA philosophy, the licensee designed and made a lead transport cart and lead well to provide shielding in the work areas for the clerks and technicians. The well and transport cart reduced the exposures rates by a factor of four. The inspectors discussed with the licensee the possibility of reorganizing the work space to maximize the use of the lead well as a central location for handling the material. This would reduce the number of times the clerks and technicians came into contact with the material. The licensee indicated that this would be evaluated.

In the [redacted] and solvent extraction areas, the inspectors verified that stationary air samplers were placed in representative locations. The inspectors discussed with the licensee the addition of two stationary air samplers on the second floor in the dissolution and oxidation areas. The licensee indicated location of all the stationary air samplers would be verified in the representativeness study performed during facility startup. The main input to this study would be results from lapel samplers worn by operators.

[redacted]

The inspectors observed design features that placed HEU [redacted], which were an external exposure source, in [redacted] the process area where traffic was less frequent. The inspectors reviewed controls of maintenance requiring radiological controls and inspected glove boxes for design features which provided decontamination and limiting exposure to operators. The inspectors noted one area of concern and identified to the licensee the existence of sharp [redacted] edges on some of the proposed waste items generated inside the enclosures.

The licensee discussed with the inspectors the ALARA goal for this calender year. Based on the licensee's calculations, a limit of 500 mrem/yr for external exposure and a limit of 500 mrem/yr for internal exposure would be established for the BPF operations. The inspector emphasized the need to readjust the action limits for the BPF operations in order to provide some level of notification to alert the radiation safety staff of some adverse trend developing. The licensee decided to set alarm limits of 20 mrem total dose on the electronic dosimeters but no action limit was established for extremities in the BPF facility.

From discussions with the licensee, the inspector determined that once operations began in the BPF facility, the radiation staff planned to conduct initial radiation surveys for comparison to dose models. In addition, RWPs would be used for routine and non-routine operations until enough evaluations were made to develop a standard operating procedure. The inspector indicated that all routine operations performed under an RWP should become incorporated in written procedures as soon as practical. For example, the inspector observed the check-weighing of [redacted] material. The operation was performed under an RWP, but the operation was a routine occurrence. The licensee agreed with the inspector's assessment and indicated that those types of operations, once fully evaluated, would become incorporated in a standard operating procedure.

c. Conclusion

The radiation protection program for the BPF process met regulatory requirements.

5. Nuclear Criticality Safety (88015)

a. Plant Operations (88015)

(1) Inspection Scope

The inspectors performed plant walkdowns of the downblending, [redacted], and the Solvent Extraction areas to review activities in progress and to determine whether risk-significant fissile material operations associated with the BLEU Preparation facility (BPF) could be conducted safely and in accordance with regulatory requirements. The inspectors verified the adequacy of management measures for assuring the continued availability, reliability and capability of safety-

[redacted]

significant controls relied upon by the licensee for controlling criticality risks to acceptable levels.

The inspectors reviewed selected aspects of the following documents prior to performing the walkdowns:

- 54T-04-0039, "Nuclear Criticality Safety Evaluation Blended Low Enriched Uranium Preparation Facility, Downblending," revision 3, dated May 2004
- 54T-04-0038, "Nuclear Criticality Safety Evaluation for the Blended Low Enriched Uranium Preparation Facility," revision 3, dated May 2004
- 54T-04-0037, "Nuclear Criticality Safety Evaluation for the and High Enriched Uranium ," revision 3, dated May 2004
- 54T-04-0036, "Nuclear Criticality Safety Evaluation for the Blended Low Enriched Uranium Preparation Facility Solvent Extraction," revision 3, dated May 2004
- 54T-97-046, "Nuclear Criticality Safety Analysis for the High Efficiency Particulate Airborne Filters at NFS," dated December 1997
- 54T-04-0025, "Nuclear Criticality Safety Evaluation for BPF Raffinate Solidification System," revision 0, dated May 2004
- 54T-04-0022, "Nuclear Criticality Safety Analysis for the BPF Process Ventilation System," revision 2, dated April 2004
- 54T-04-0014, "Nuclear Criticality Safety Analysis for BPF Liquid Waste Discard System, revision 2, dated April 2004
- NFS-HS-CL-26, "Nuclear Criticality Safety for the BLEU Preparation Facility," revision 1, dated June 2004

(2) Observations and Findings

The inspectors verified that the controls identified in the NCS evaluations were installed or implemented and were adequate to assure safety. The cognizant NCS engineers were knowledgeable and had good interfaces with operators on the process floors.

[redacted]

(3) Conclusions

The inspectors had reasonable assurance that the downblending, [redacted], [redacted] and the solvent extraction areas would be safe to operate with controls as stated in the NCS evaluations. The field installation of safety equipment was as stated in the NCSEs.

b. NCS Function (88015)

(1) Inspection Scope

The inspectors reviewed NCS evaluations to determine that criticality safety of risk-significant operations was assured through engineered and human performance controls with adequate safety margin/certainty, preparation, and review by capable staff. The inspectors reviewed the current ISA summary and nuclear criticality safety evaluations (NCSEs) prepared in support of BPF processes to verify that the evaluations represented the existing configuration of the equipment, the controls specified by the NCSEs are appropriate and adequate to assure safety, and the ISA data supports a finding that the risk of a criticality accident is sufficiently low.

The inspectors reviewed selected aspects of the following documents:

- 54T-04-0039, "Nuclear Criticality Safety Evaluation Blended Low Enriched Uranium Preparation Facility, Downblending," revision 3, dated May 2004
- 54T-04-0038, "Nuclear Criticality Safety Evaluation Blended Low Enriched Uranium Preparation Facility [redacted]," revision 3, dated May 2004
- 54T-04-0037, "Nuclear Criticality Safety Evaluation for the [redacted] and High Enriched Uranium [redacted]," revision 3, dated May 2004
- 54T-04-0036, "Nuclear Criticality Safety Evaluation for the Blended Low Enriched Uranium Preparation Facility Solvent Extraction," revision 3, dated May 2004

(2) Observations and Findings

The inspectors determined that the evaluations were performed by capable NCS engineers, independent reviews were completed for the evaluations by other qualified NCS engineers, subcriticality of the operations was assured through appropriate limits on controlled parameters, and double contingency was assured for each credible accident sequence leading to inadvertent criticality. The inspectors determined that NCS controls for equipment and processes assured the safety of the operations.

[redacted]

[redacted]

The inspectors reviewed the accident sequences associated with [redacted]. The inspectors observed that the NCSEs identified the following accident sequences: [redacted]. The inspectors noted that the licensee identified the following additional IROFS: [redacted]. The inspectors determined that the identification of the additional IROFS assured subcriticality under credible abnormal conditions, and the double contingency principle was satisfied.

(3) Conclusions

The inspectors had reasonable assurance that the NCS function would be adequate for maintaining acceptable levels of safety.

c. Criticality Alarm System (88015)

(1) Inspection Scope

The inspectors reviewed criticality accident alarm system (CAAS) detector placement analyses to determine the adequacy of models, assumptions, and calculation results used to demonstrate adequate coverage of the BPF facility, [redacted] The inspectors visually inspected detector placement configuration to verify that dual detector coverage of risk significant operations was being maintained. The inspectors reviewed selected aspects of the following document:

- Contractor Technical Report, "Demonstration of Criticality Accident Alarm System (CAAS) Coverage for the BPF, [redacted]," revision 1, dated July 21, 2004

[redacted]

[redacted]

(2) Observations and Findings

The inspectors observed that the licensee's detector placement methodology employed a conservative source term based only on the prompt gammas emitted by primary fission events. The inspectors observed that the dose contribution from prompt neutrons, neutron-induced photons, and delayed fission/activation product photons was excluded from the coverage analyses. In addition, the inspectors observed that prompt gammas from secondary fission events (due to neutron absorption in proximal non-critical uranium sources, e.g., adjacent areas) were omitted.

The inspectors reviewed the calculated results for the BPF facility and observed that detector coverage of risk-significant operations appeared to be adequate for the [redacted] area [redacted] and for the HEU [redacted], given the uncertainty associated with the source term, materials of construction, and uncertainty with buildup factor data. The inspectors noted that the licensee's calculations for these two areas were slightly above the 20 mr/hr detector setpoint, that the calculated results were based on distances to a specific detector pair, and that the specific detector pair being evaluated was not identified. Based on the conservatism of the source term, the inspectors were able to reach a determination of reasonable assurance of adequate detector coverage.

(3) Conclusions

No safety concerns were identified regarding CAAS coverage at the BPF.

6. Chemical Process Safety (IP 88020)

a. Inspection Scope

The inspectors reviewed the chemical safety program to determine whether appropriate safety controls had been implemented in a manner that provided reasonable assurance that the facility can be operated safely.

The inspectors reviewed the following SOLE IROFS:

- [redacted] - material of construction for the supply lines of NaOH, $NaNO_3$, and HNO_3
- [redacted] - supply lines were located in non-traffic areas or elevated
- [redacted] - NaOH discard tank overflow line

[redacted]

The inspectors reviewed the following IROFS:

- [redacted] - HNO_3 and $NaNO_3$ and UNB transfer line maintenance procedures and training
- [redacted] - HNO_3 and $NaNO_3$ and UNB transfer line maintenance procedures and training
- [redacted] - HNO_3 supply line
- [redacted] - HNO_3 line elevation

The inspectors reviewed the following documents:

- [redacted] Chemical Make-up Lesson Plan for [redacted] Chemical [redacted]
- SOP 414, "IROFS Associated with Maintenance Activities for [redacted]"
- SOP 409, Section 7, "BPF Operation of [redacted] Chemical Supply Systems"

b. Observations and Findings

The inspectors verified that the HNO_3 line was welded in its entirety per the IROFS description (IROFS [redacted]). The inspectors observed a t-section in the HNO_3 line that a manual valve and a pressure gauge were not welded at their connections. The licensee locked out the valve and reviewed the SRE test procedure to include the necessary steps for the lock-out/tag-out of the valve.

During walkthroughs, the inspectors noted out of service piping connections that penetrated walls. All connections observed had a secure cap and an identification number. Also, the inspectors verified the general chemical safety IROFS for the supply lines, the SOP, and the training lesson plan. The inspectors noted that the SOPs and the chemical lesson plan for [redacted] provided instructions on how to respond to leaks. The inspectors also noted that reviewed SOPs contained a brief description of chemical hazards and referenced the Material Safety and Data Sheets. No significant problems were identified.

c. Conclusions

The licensee adequately implemented chemical safety controls to ensure that operations will be conducted in a safe manner.

7. Fire Protection (IP 88055)

a. Inspection Scope

The inspectors reviewed the changes made in the fire protection program. The inspectors reviewed the installation, maintenance of the BPF fire detection system, fire suppression system, and process fire barriers. The inspectors also reviewed the pre-fire

[redacted]

plan for the BPF areas and licensee inspections of the following areas: fire doors; fire dampers; fire wall/fire barriers; and fire extinguishers.

The inspectors reviewed the following documents:

- Fire Hazard Analysis, "BLEU Preparation Facility [redacted]," Revision 1, dated May 17, 2004
- "First Quarter 2004 Fire Brigade and Fire Support Training Lesson Plan," dated March 2004
- NFS-HS-A-71, "[redacted]Pre-Fire Plan 28," Revision 0, dated April 16, 2004

b. Observations and Findings

The inspectors toured the facility to verify the adequacy of the installation of the fire detection system, the fire suppression system and the process fire barriers. The inspectors observed portable extinguishers throughout the BPF areas. Portable fire extinguishers were charged to the normal operating zones and no visible damage was noted. The inspectors observed the heat activated, [redacted] fire suppression system in the solvent extraction area and reviewed maintenance records for the system. Also, the inspectors reviewed the fire hazard analysis for the BPF operations and the fire loading calculations for the solvent extraction area. No problems were identified in these areas.

During tours, the inspectors verified that the lesson plan for the fire brigade and fire support team included the BPF operations. Also, the inspectors discussed with the responsible fire safety personnel the training conducted for the team and verified the training records of the fire brigade and fire support team members.

Finally, the inspectors verified the contents of the pre-fire plan. The inspectors found some sections of the pre-fire plan relating to the BPF to be inaccurate. The licensee updated the pre-fire plan and the inspectors observed that the revisions were accurate and included sufficient details of the hazards and obstacles that could be found in the BPF in the event of a fire.

c. Conclusions

The licensee had implemented a fire protection program that provided reasonable assurance that workers and the public will be protected. The pre-fire plan required updating and was revised during the inspection.

[redacted]

[redacted]

8. Emergency Preparedness (IP 88050)

a. Inspection Scope

The inspectors reviewed changes to the NFS emergency preparedness plan (the plan) and verified that the necessary updates to the plan were implemented.

b. Observations and Findings

The inspectors noted the NFS emergency preparedness plan was applicable to the BPF and addressed hazards of operation in the BPF area. The inspectors reviewed the changes added to the plan with the emergency preparedness personnel. The major concern was with rupture of the product transfer line from BPF to the other buildings. The proper analysis was done to address this event and the necessary steps were described in the plan to mitigate the event in case of a large spill. This and other changes made to the plan were adequately implemented.

c. Conclusions

The changes incorporated to the existing emergency preparedness plan appropriately addressed new hazards and were adequately implemented.

9. Environmental Monitoring and Waste Management (IPs 88035, 88045)

a. Inspection Scope

The inspectors reviewed the changes in the environmental monitoring and waste management programs in the prevention of accidental releases of contaminants to the environment.

The following documents were reviewed:

- NFS-GH-40, "Gaseous Effluent Action Points," Revision 6, dated June 11, 2004
- SOP 409, Section 14, "Raffinate Treatment Process"
- "ISA Source Term Data and Radioactive Effluent Estimates for the [redacted] Project", dated March 4, 2002

b. Observations and Findings

The inspectors verified that the ventilation system in the BPF process was in place to maintain the process area at a negative pressure, ensuring that unmonitored and unfiltered airborne effluent releases from the building would not occur. The inspectors noted that the gaseous and liquid effluent releases from the BPF were expected to

[redacted]

cause a slight increase in NFS' releases, but the increases were expected to be a small fraction of regulatory limits.

The inspectors noted that the liquid effluent discharges from the BPF were controlled by passive, active and administrative/enhanced administrative controls. Passive engineering controls were in place for the prevention of accidental releases of contaminants to groundwater. Active engineered controls were in place in order to prevent overflow of the waste tanks. Administrative/enhanced administrative controls were in place to require independent verification of the system operation and maintenance practices. Finally, the inspectors reviewed the SOP related to the raffinate treatment process where solid waste will be generated. This will be controlled by the licensee's normal solid waste process.

c. Conclusions

The licensee's environmental protection program was adequate to support operation of the BPF. The expected gaseous and liquid effluents released to the environment were predicted to be a small fraction of regulatory limits.

10. Management Measures (IP 88005, TI 2600/006)

a. Inspection Scope

The inspector reviewed the management measures for IROFS as described in the ISA Summary in order to assess the adequacy of the licensee's administrative controls for configuration, maintenance, calibration, functional testing, periodic maintenance, vendor specification information, and audit review.

b. Observations and Findings

The inspector reviewed the configuration control program to assess the adequacy of the administrative controls designed to ensure that changes to IROFS were properly reviewed and approved. The inspector reviewed the change process, as described in "Safety and Regulatory Review Routing Form," with a cognizant safety engineer. Multi-discipline safety review of changes were performed in order to verify if the ISA Summary or SRE characteristics were affected, followed by a management review. The inspector concluded that the configuration control program, administered as described, was adequate to ensure proper control of IROFS.

The inspector reviewed the maintenance program to assess the adequacy of the administrative controls designed to ensure that IROFS are properly identified and maintained. SOP 392, Attachments I and II, "NFS Work Request Form," and "Work Request Acceptance Form," respectively, were reviewed with a cognizant safety engineer. The maintenance work request review included identification of SRE

[redacted]

components and an NCS review following work completion. The inspector concluded that the maintenance program, administered as described, was adequate to ensure proper maintenance of IROFS.

The inspector reviewed the periodic maintenance (PM) program including PMs on SRE pumps, valves and other components. The program had specific PM performance periodicity and work requirements properly delineated and appeared to effectively implement the PM program. Vendor information was reviewed for SRE liquid level switches. The equipment specification sheet capture the vendor's design, maintenance and testing information accurately.

The inspector reviewed the safety audit program as described in NFS-HS-A-16, "Safety Audits and Inspections," and discussed the audit process with a cognizant nuclear safety engineer. The program provided adequate guidance for NCS, Health Physics, Industrial and Environmental Safety audits by use of checklists. Discrepancies were captured in the Problem Identification, Resolution and Corrective Action System (PIRCS) for corrective action. The inspector noted that numerous maintenance and operating procedures required that any SRE failure must be repaired before use and documented in PIRCS. The inspector concluded that the safety audit program, including problem identification and resolution, was adequate.

Although no specific lessons learned from the Uranyl Nitrate (UN) building IROFS changes were maintained for inspector review, the licensee indicated that issues identified had been entered into the corrective action program as a matter of routine. Management practices included a continual review of PIRCS.

c. Conclusions

Management measures for IROFS as described in the ISA Summary appeared to provide adequate administrative controls for configuration, maintenance, calibration, functional testing, periodic maintenance, vendor specification information, and audit review.

11. Operator Training (IP 88010)

a. Scope

The inspectors reviewed the lessons plans for the training of the operators to verify that the appropriate safety information was covered. The inspectors also interviewed operators and supervisors to verify that they were aware of the safety controls for their respective systems.

[redacted]

[redacted]

b. Observations and Findings

The inspectors noted that the lessons plans for the process systems adequately described the IROFS and safety controls of the systems. The inspectors also noted that chemical hazards of the processes were also covered.

The inspectors discussed facility operation with supervisors and also conducted system and facility walkdowns. The supervisors were knowledgeable of process systems and area safety requirements and were qualified to perform their duties. The inspectors reviewed the qualification matrixes of the operators and noted that classroom training was still in progress and operators had not yet performed on-the-job training (OJT). The licensee planned to have the operators perform OJT during the initial runs of the processes with supervisors and trainers present. Interviews and procedure walkdowns with operators indicated that operators were adequately knowledgeable of their processes, with some deficiencies noted in knowledge of safety issues. The licensee acknowledged and planned to correct areas of weakness identified by the inspectors. No significant issues were noted.

c. Conclusions

The licensee's lesson plans contained the appropriate information to communicate safety hazards to the operators. Supervisors were knowledgeable of facility operation and safety requirements. Operator training was not complete at the time of the inspection.

13. Exit Meeting

The operational readiness review inspection scope and results were presented to members of the licensee management at various meetings throughtout the inspection period and were summarized on June 18, 2004. Although proprietary documents and processes were occasionally reviewed during this inspection, the proprietary nature of these documents or processes has been deleted from part one of this report. No dissenting comments were received from the licensee.

[redacted]

[redacted]

ATTACHMENT

1. PARTIAL LISTING OF PERSONS CONTACTED

Licensee Personnel

R. Booth, VP Corporate Services
D. Buck, VP Human Resources
R. Droke, Licensing and Compliance Director
J. Nagy, Technical Assistant
F. Peters, HEU Operations
K. Schutt, President & General Manager

2. INSPECTION PROCEDURES USED

TI 2600/006	Resident Inspection Program for Category I Fuel Cycle Facilities
IP 83822	Radiation Protection
IP 88005	Management Organization and Controls
IP 88010	Operator Training
IP 88015	Criticality Safety
IP 88020	Plant Operations
IP 88025	Maintenance/Surveillance
IP 88035	Waste Management
IP 88045	Environmental Protection
IP 88050	Emergency Preparedness
IP 88055	Fire Protection

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

None

4. LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
ALARA	As Low As Reasonable Achievable
BLEU	Blended Low Enriched Uranium
CFR	Code of Federal Regulations
CMMS	Computerized Maintenance Management System
CY	Calendar Year
°F	Degrees Fahrenheit

[redacted]

[redacted]

FHA	Fire Hazards Analysis
HVAC	Heating, Ventilation and Air Conditioning
ID#	Identification Number
IP	Inspection Procedure
IROFS	Items Relied On For Safety
ISA	Integrated Safety Analysis
mrem/yr	millirem per year
NCS	Nuclear Criticality Safety
NFS	Nuclear Fuel Services
OJT	On-The-Job-Training
P&ID	Process And Instrumentation Diagram
PIRCS	Problem Identification, Reporting, and Correction System
SER	Safety Evaluation Report
SNM	Special Nuclear Material
SOP	Standard Operating Procedure
SRE	Safety Related Equipment
[redacted]	[redacted]
TEDE	Total Effective Dose Equivalent
TI	Temporary Instruction
TK	Tank
UN	Uranyl Nitrate
UNB	Uranyl Nitrate Building

[redacted]