



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

January 30, 2012

Mr. Joseph Henry
President
Nuclear Fuel Services, Inc.
P. O. Box 337, MS 123
Erwin, TN 37650

SUBJECT: NRC INTEGRATED INSPECTION REPORT NO. 70-143/2011-005

Dear Mr. Henry:

This refers to the inspection conducted from October 1, 2011 to December 31, 2011, at the Nuclear Fuel Services (NFS) facility in Erwin, TN. The purpose of this inspection was to determine whether activities authorized under the license were conducted safely and in accordance with NRC requirements. The enclosed report presents the results of this inspection. The findings were discussed with members of your staff at an exit meeting held on December 21, 2011, for this integrated inspection report.

During this inspection, the NRC staff examined activities conducted under your license as they related to public health and safety and to confirm compliance with the Commission's rules and regulations, and with the conditions of your license. Areas examined during the inspections are identified in the enclosed report. Within these areas, the inspections consisted of selected examinations of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of these inspections, no cited violations or deviations were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

J. Henry

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

Sincerely,

/RA/

Manuel G. Crespo, Acting Chief
Fuel Facility Inspection Branch 1
Division of Fuel Facility Inspection

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

Enclosure: NRC Inspection Report No. 70-143/2011-005
w/ attachment

cc w/encl: (See page 3)

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ADAMS: ☒ Yes ACCESSION NUMBER: ML12030A226 ☒ SUNSI REVIEW COMPLETE ☒ FORM 665 ATTACHED

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U. S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket No.: 70-143

License No.: SNM-124

Report No.: 70-143/2011-005

Licensee: Nuclear Fuel Services, Inc.

Facility: Erwin Facility

Location: Erwin, TN 37650

Dates: October 1 through December 31, 2011

Inspectors: G. Smith, Senior Resident Inspector
M. Chitty, Resident Inspector
M. Crespo, Senior Fuel Facility Inspector
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R. Prince, Fuel Facility Inspector
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Approved by: M. Crespo, Acting Chief
Fuel Facility Inspection Branch 1
Division of Fuel Facility Inspection

Enclosure

EXECUTIVE SUMMARY

Nuclear Fuel Services, Inc.
NRC Integrated Inspection Report 70-143/2011-005
October 1 - December 31, 2011

Inspections were conducted by the resident and regional inspectors during normal and off normal shifts in the areas of safety operations, radiological controls, and facility support. The inspectors performed a selective examination of licensee activities that were accomplished by direct observation of safety-significant activities and equipment, tours of the facility, interviews and discussions with licensee personnel, and a review of facility records.

Safety Operations

- Plant operations were performed safely and in accordance with approved plant procedures. Required maintenance and surveillance tests for items relied on for safety were completed prior to the startup of the Commercial Development Line. The resident inspectors monitored the restart of this line and observed that processing of uranium hexafluoride cylinders occurred without incident. (Paragraph A.1)
- Criticality controls were followed throughout the facility. (Paragraph A.2)
- Fire Protection equipment and barriers were adequately maintained. (Paragraph A.3)

Radiological Controls

- The licensee adequately implemented the radiation protection program consistent with the license and regulatory requirements. (Paragraph B.1)
- The licensee's bioassay and radiation monitoring programs adequately assessed personnel radiation exposures. Radiation protection equipment was adequately maintained and available for use. Radiological safety-related issues were identified and addressed in accordance with the licensee's corrective action program. (Paragraph B.2)
- Radioactive material transportation activities were performed in accordance with applicable Department of Transportation regulations. (Paragraph B.3).
- Radioactive waste management practices were performed in accordance with approved plant procedures. (Paragraph B.4).

Facility Support

- The licensee's performance exhibited several of the traits of a positive nuclear safety culture. (Paragraph C.1)
- The licensee's graded biennial exercise was credible, technically correct, and sufficiently complex to test key elements of the licensee's emergency response plan. The event was properly classified and appropriate protective action recommendations were communicated to the local authorities. (Paragraph C.2)

Special Topics

- The residents followed up on a number of previously identified topics. (Paragraph D.1)

Attachment

Key Points of Contact

List of Items Opened, Closed and Discussed

Inspection Procedures Used

REPORT DETAILS

Summary of Plant Status

The facility began the inspection period with the following process areas operating: 1) Naval fuel manufacturing facility (FMF); 2) Blended Low Enriched Uranium (BLEU) Preparation Facility (BPF) which included the Uranium (U)-Oxide, U-Metal, Solvent Extraction (SX), and the down-blending (DB) lines; and 3) Building 301 Commercial Development (CD) lines which included the Column Dissolvers and the Ammonium Diuranate (ADU) system. The U-Hexafluoride (UF₆) systems in the CD line of Building 301 were restarted in October 2011.

A. Safety Operations

1. Plant Operations (IP 88135)

a. Inspection Scope and Observations

The inspectors performed daily tours of plant operating areas housing special nuclear materials (SNM) and determined that equipment and systems were operated safely and in compliance with the license. Daily operational meetings and turnover meetings were observed throughout the period where production status and operational issues were discussed. The inspectors reviewed selected licensee-identified events and corrective actions for previously identified events. The inspectors focused on plant operations, safety related equipment (i.e. valves, sensors, instrumentation, in-line monitors, scales, etc.) and items relied on for safety (IROFS).

The daily tours included walk-downs of the BPF, CD line, FMF, storage areas, vaults, and the waste treatment facility. The inspectors verified that there was adequate staffing and that operators were attentive to their duties and the status of alarms and annunciators. The inspectors observed activities during normal and upset conditions for compliance with procedures and station limits. The inspectors noted that safety systems were in place to ensure proper control of SNM. The inspectors verified the adequacy of communications between supervisors and operators within the operating areas. The inspectors walked down portions of safety-significant operating systems and verified that IROFS were identified and operable. The inspectors reviewed log books, Lockout/Tagout records, and Letters of Authorization (temporary modifications) to obtain information concerning operating trends and activities. The inspectors verified that the licensee actively pursued corrective actions for conditions requiring temporary modifications and that appropriate compensatory measures were prescribed as required.

The inspectors performed periodic tours of the outlying facility areas during the inspection period and determined that equipment and systems were operated safely and in compliance with the license. The focus of these tours centered on the evaluation of potential hazards and protection features, combustible material storage and fire loading, hazardous chemical storage, storage of compressed gas containers, potential degradation of plant security features, and potential fire hazards. During these tours, the inspectors also verified that required notices to workers were appropriately and conspicuously posted in accordance with 10 CFR 19.11.

The inspectors attended various plan-of-the-day meetings throughout the inspection period in order to determine the overall status of the plant. The inspectors evaluated the adequacy of the licensee's response to significant plant issues as well as their approach to solving various plant problems.

Uranium Hexafluoride (UF₆) Processing

Beginning on October 3, 2011, the inspectors observed the restart of the UF₆ sublimation line, the last area of the CD line to be restarted following the restart readiness assessment inspection conducted in May 2011 and documented in Inspection Report no. 70-143/2011-007. This system was shut down on November 14, 2009, due to a small fluorine fire in sublimation station #3. The inspectors reviewed the training, post-maintenance, and safety-related equipment (SRE) tests performed prior to restart of the UF₆ - related systems.

The inspectors observed the movement of UF₆ shipping drums from the storage area in building 306 to the operating floor of building 301. During removal of cylinders from the shipping drums, the inspectors noted that operators wore the appropriate personal protective equipment (PPE) and that atmospheric samples were taken at various stages while the inner and outer lids and drum seals were removed to gain access to the UF₆ cylinders contained therein. The inspectors then monitored the removal of the cylinders from the drums for venting and subsequent processing.

The inspectors noted that a number of the first cylinders selected for venting did not have the expected fittings, which presented operational and engineering challenges. During this time, the inspectors evaluated the licensee's performance in regards to management decision-making, communications, and procedural compliance. The inspectors noted that the decisions made by operations and engineering personnel were conservative and that safety remained the highest priority throughout the decision-making process. The inspectors noted that a few of the SRE tests required to be performed just prior to venting and sublimation did not pass and necessitated the performance of additional maintenance. The inspectors noted that the post maintenance testing and subsequent SRE tests were successful.

The inspectors verified that the venting of the UF₆ cylinders was performed safely and without incident. The venting was performed in the newly installed vent and tap station which was installed specifically to deal with the possible presence of a fluorine cover gas in the UF₆ cylinders. NFS previously reported to the NRC that calculations had suggested that some cylinders were over-pressurized (see event report #45642 dated January 20, 2010). The inspectors noted that during the systematic venting of UF₆ cylinders, measured pressures were significantly less than the previously estimated pressures. Of the cylinders vented through the end of 2011, only five cylinders contained pressures above atmospheric pressure. The results of those calculations suggested that these five cylinders contained UF₆ at pressures ranging from 130.4 to 471 pounds per square inch gauge (psig). The actual measured pressure in these cylinders ranged from 2 to 10 psig. The difference between calculated and actual pressures was attributed to the fact that the calculated pressure did not account for a "reverse" reaction that occurs as pressure increases. As the fluorine cover gas pressure increases, the reverse reaction causes some fluorine gas to recombine with any existing solid UF₅ (to form solid UF₆) which then mitigates the pressure increase. Since this reaction rate is not clearly known, it was not included in the original calculations. Thus, the original calculated pressures were estimated in a very conservative fashion.

The inspectors also evaluated the first "tapping" of a 2S cylinder which occurred on December 20. This evolution was performed in the vent and tap station as well. Tapping was required if valve clarity could be determined and involved drilling a hole in the side of a 1S or 2S cylinder in order to relieve any pressure in the cylinder prior to sublimation. The tapping rig included dedicated piping that provides a flow-path from the

drilled hole directly into specially designed fluorine gas traps in the vent and tap station. Cylinder tapping was authorized to be performed when the cylinder valve failed during testing. Tapping was authorized only on smaller 1S or 2S cylinders and not on larger 5A/5B cylinders.

During sublimation, NFS consistently identified, evaluated, and corrected conditions adverse to quality as prescribed by the corrective action program (CAP). The inspectors verified all issues were entered into the CAP and promptly addressed according to their significance. One item of note occurred on November 12 and was documented in the CAP as Problem Identification Resolution and Correction System (PIRCS) item #32223. In this instance, NFS noted an elevated effluent count rate (but below regulatory limits) in the building 301 continuous air monitor (CAM) at the start of the sublimation of a 5A cylinder. The sublimation process was immediately shut down and the condition was evaluated. The CAM was installed as a precautionary measure in order to obtain a real-time measurement of the radiological condition of the building 301 gaseous effluent. An investigation revealed that all but one of the UF_6 gaseous effluent flow paths were routed through the sodium-fluoride traps prior to entering the building scrubber system and then ultimately to the stack. This particular flow path directed effluent gases from the knockout column via an air gap through an ultra low penetration air (ULPA) filter into the building scrubber. Further investigation revealed that the internals of the ULPA filter were not optimally compatible with a hydrofluoric (HF) acid environment. NFS removed this ULPA filter and rerouted the effluent path from the knockout column through an existing ULPA filter that was compatible with HF located on the cylinder over-pack station between sublimation stations #1 and #2. Following system modification and restart of sublimation, the effluent radiation levels returned to normal. The inspectors noted that NFS consistently addressed system deficiencies and made adequate corrective actions when necessary. From the restart of UF_6 sublimation in October through the end of 2011, NFS completed sublimation of three 5A/5B, one 1S, and six 2S cylinders. As of December 31, NFS had six 5A/5B, 39 1S, and 61 2S cylinders remaining (not including Hoke tubes) on site to be processed.

The inspectors also evaluated the operation of the ADU system as well as the ADU calciner that was used to further process high enriched uranium (HEU) that was in excess of a contractually determined enrichment, for ultimate transfer back to the Department of Energy. All other HEU in the ADU form was redissolved and transferred to the DB line via the building 333 SX system.

Safety System Walkdown

During the inspection period, the inspectors performed two walk-downs of safety-significant systems involved with the processing of SNM. As part of the walk-downs, inspectors verified the as-built configuration matched approved plant drawings. The inspectors interviewed operators in order to ensure that plant personnel were familiar with the assumptions and controls associated with system-related IROFS and instrumentation for maintaining plant safety. The inspectors also verified that IROFS controls were properly implemented in the field. The inspectors reviewed the related Integrated Safety Analysis (ISA) to verify the systems' ability to perform its function was not affected by outstanding design issues, temporary modifications, operator workarounds, adverse conditions, or other system-related issues. The inspectors also

verified that there were no conditions that degraded plant performance, the operability of IROFS, safety-related devices, or other support systems essential to safety system performance. Systems examined included:

- BPF Shear Station
- Areas 300, 400, and 500 in building 302

To determine the correct system alignment, the inspectors reviewed the procedures, drawings, related ISAs, and 10 CFR 70.61. During the walk-downs, the inspectors verified the following:

- Criticality safety hazards and controls were maintained;
- Chemical safety hazards and controls were maintained;
- The configuration of metal and glass columns was maintained in accordance with Nuclear Criticality Safety Evaluations;
- Valves were correctly positioned and did not exhibit leakage that would impact the valve's function;
- Electrical power was available as required;
- Major system components were correctly labeled, lubricated, cooled, ventilated, etc.;
- Hangers and supports were correctly installed and functional;
- Tagging clearances were appropriate with breakers and valves correctly positioned and locked as required by the lockout/tagout program;
- Cabinets, cable trays, and conduits were correctly installed and functional;
- Visible cabling appeared to be in good material condition;
- Essential support systems were operational; and,
- Ancillary equipment or debris did not interfere with system performance.

b. Conclusion

No findings of significance were identified.

2. Criticality Safety (IP 88135)

a. Inspection Scope and Observations

During daily production area tours, the inspectors verified various criticality controls to be in place, that personnel followed criticality station limit cards, and that containers were adequately controlled to minimize potential criticality hazards. The inspectors sampled a number of criticality-related IROFS for operability and for adequate identification in the field as well as on drawings. The inspectors noted that operators were knowledgeable of the requirements associated with IROFS.

b. Conclusion

No findings of significance were identified.

3. Fire Protection (IP 88135)

a. Inspection Scope and Observations

During daily plant tours, the inspectors verified that transient combustibles were being adequately controlled and minimized and that fire barriers located between fire areas were being properly maintained. During the inspection period, the inspectors conducted fire safety tours of three areas to verify adequate control of combustible material. The inspectors walked down various fire suppression components and systems that supplied the areas and verified these systems were properly aligned and operational. The inspectors verified that various aspects of the fire protection/prevention strategies conformed to the applicable nuclear criticality safety evaluation.

- Building 303
- Building 304
- Chemical Storage Area

b. Conclusion

No findings of significance were identified.

B. Radiological Controls

1. Radiation Protection (IP 88135)

a. Inspection Scope and Observations

During tours of the production areas, inspectors observed radiation protection controls and practices implemented during various plant activities including: the proper use of personnel monitoring equipment; required protective clothing; and, frisking methods for detecting radioactive contamination on individuals exiting contamination controlled areas.

The inspectors noted that plant workers properly wore dosimetry and used protective clothing in accordance with applicable Radiation Work Permits (RWPs). The inspectors also noted that radiation area postings complied with plant procedures and included radiation maps with up-to-date radiation levels. The inspectors monitored the operation of radiation protection instruments and reviewed the calibration due dates of those instruments. The inspectors reviewed RWP's associated with the following Safety Work Permits (SWPs):

- On November 11, inspectors performed a review of SWP #11-32-019, "U-Metal Dissolution Pump Replacement."
- On November 22, inspectors performed a review of SWP #11-29-046, "Replace Gasket on Column K."
- On December 19, inspectors performed a review of SWP #11-10-016, "Repair Dry Process Equipment."

The inspectors determined that the reviewed RWPs contained sufficient detail and were adequately implemented in order to ensure personnel exposure was maintained as low as reasonably achievable (ALARA).

b. Conclusion

No findings of significance were identified.

2. Radiation Protection (88030)

a. Inspection Scope and Observations

The inspectors held discussions with responsible individuals about the licensee's organization structure and staffing associated with the radiation protection program. The inspectors found that no significant organization or personnel changes had been made since the last inspection. The responsibilities and functions of the radiation protection program were described in approved procedures that addressed key elements of the radiation protection program.

During tours of production areas and the Building 234 area, the inspectors observed radiological control measures implemented in support of various plant activities, remediation work, and maintenance evolutions. The inspectors noted the proper use of personnel monitoring equipment, protective clothing and respiratory protection equipment. The inspectors observed the implementation of radiological control measures by radiation technicians (RT) providing job coverage. The inspectors noted effective interaction and communication between the job coverage RT, operators, and workers during the course of radiological work activities. Based on discussions with RTs and other personnel, the inspector found that personnel were knowledgeable of the requirements of applicable RWPs.

The inspectors reviewed selected RWPs to evaluate the adequacy of prescribed radiological protective measures. The inspectors found that RWPs contained sufficient detail and provisions to provide adequate radiological safety measures for a given task.

The inspectors reviewed the licensee's personnel dosimetry program for adequacy in assessing worker exposures. The inspectors noted that assessments of personnel exposures were primarily based on airborne contamination monitoring data. The airborne contamination monitoring program consists of a combination of the use of stationary air sample stations and individual lapel air samplers. The inspectors found that air sampling data was used in conjunction with an individual's assigned work location(s) and stay-time. Worker exposures were calculated based on this information.

In addition the licensee conducts an *in vitro* (urine analysis) and *in vivo* (lung counter) bioassay program in conjunction with air sampling to assess potential internal uptakes by workers. The inspectors observed equipment and facilities associated with the urine analysis and lung counter facilities. Equipment was adequately maintained and calibrated. Calibration sources and standards utilized to verify the operability and performance of the lung counter and urine analysis equipment were appropriate for their intended function and source certifications were available. The inspectors reviewed procedures associated with the collection and analysis of urine samples and interviewed personnel responsible for the performance of bioassay measurements and the review of associated records. The inspectors reviewed bioassay data packages for accuracy and completeness. The inspectors found that individuals were knowledgeable of program requirements. The inspectors determined that the licensee's bioassay program was conducted in accordance with applicable regulatory requirements and approved procedures.

The inspectors observed the location and operability of stationary air sample stations located within the Material Access Area (MAA). The inspectors noted that the monitoring stations were positioned at appropriate locations to obtain representative air samples in work areas normally occupied by operators. The inspectors interviewed personnel responsible for the collection and analysis of work area air samples, and reviewed the operability and calibration status of equipment utilized to analyze air samples. Appropriate controls were in place to ensure the accuracy of air sample data and the timely review of results to identify any adverse trends. The inspectors found that the analysis of air sample results in conjunction with the use of lapel air samplers provided an accurate assessment of worker exposures. The inspectors noted that the routine bioassay program provided additional assurance that personnel exposures were adequately assessed.

The inspectors reviewed selected survey results for accuracy and completeness. The licensee's routine radiological surveillance activities accurately assessed plant radiological conditions and verified that areas were appropriately posted to reflect radiological conditions of plant areas. Radiological sign postings were clearly visible and posted in accordance with regulatory requirements.

The inspectors reviewed records associated with the calibration of portable survey instruments and personnel contamination monitors. Selected portable survey instruments and fixed monitoring equipment were examined to determine operability and calibration status. The inspectors reviewed calibration sources for appropriate configuration and to confirm suitability of sources for their intended function. The inspectors reviewed selected calibration records for accuracy and completeness. Instrument calibration and functional performance checks were adequately addressed in approved procedures. The inspectors found that personnel responsible for the calibration and maintenance of radiation protection monitoring equipment were knowledgeable of associated procedural requirements.

The inspectors interviewed personnel responsible for the implementation of the ALARA program and the trending and tracking of personnel exposures. The inspectors noted that the Safety and Safeguards Review Committee (SSRC) served as the ALARA committee. Meetings were held on a routine basis. The SSRC committee meeting agendas included a review of personnel exposures, and contamination control issues. The inspectors noted that safety-related radiological trending data presented to the SSRC for review and evaluation was comprehensive and displayed in a manner that facilitated the identification of adverse trends. Key performance metrics related to the radiation protection program were tracked and trended to provide early indication of adverse trends. The inspectors noted an example whereby the licensee utilized established trending mechanisms to identify a potential source of airborne contamination. Based on the licensee's evaluation of the data, the source of the elevated airborne concentration was identified and corrective actions were implemented. These efforts resulted in the timely identification and resolution of a potential issue at a low radiological safety threshold. Based on a review of exposure records and interviews with responsible personnel, the inspectors determined that the licensee's ALARA program was implemented in accordance with approved procedures.

The inspectors reviewed the licensee's CAP data base (PIRCS) pertaining to issues involving radiological safety matters. The threshold for radiological safety-related problem identification was adequate and corrective actions implemented in accordance with the licensee's corrective action program.

b. Conclusion

No findings of significance were identified.

3. Inspection of Transportation Activities (IP 86740)

a. Inspection Scope and Observations

The inspectors reviewed procedures and supporting documentation associated with the radioactive material transportation program. Procedures adequately described the responsibilities and roles of personnel and organizations responsible for the transportation of radioactive materials.

The inspectors performed facility walk-downs and interviewed personnel responsible for the storage, packaging, preparation, shipment, and receipt of radioactive materials. The inspectors concluded that personnel were knowledgeable of waste disposal site criteria, NRC regulations, and Department of Transportation (DOT) regulations related to the management of radioactive material shipments. The inspectors observed multiple activities involving the preparation and shipment of radioactive product. Preparation activities were implemented utilizing peer checks and performed in accordance with written procedures. Personnel were knowledgeable of requirements associated with the shipment of radioactive materials.

The inspectors reviewed radioactive waste shipment manifests for completeness and accuracy. The inspectors found that the manifests correctly reflected the classification, quantity, and labeling requirements for each respective shipment. The inspectors interviewed personnel and determined that personnel responsible for certifying shipments were knowledgeable of their duties and DOT regulatory requirements.

The inspectors observed the operation a radioactive material assay system used for transportation activities. The inspectors interviewed personnel regarding equipment operation and maintenance and determined that personnel were knowledgeable of equipment operating procedures and acceptance criteria. The inspectors reviewed associated operating procedures and equipment operability records and found that equipment was adequately maintained.

The inspectors reviewed training and qualification records for individuals responsible for key aspects of the radioactive material transportation program. The inspectors found that training records were current and that licensee training and qualification requirements were applicable to licensee procedures and regulatory requirements.

b. Conclusion

No violations of NRC requirements were identified.

4. Radioactive Waste Management (IP88035)

a. Inspection Scope and Observations

The inspectors performed walk-downs of radioactive waste storage and handling areas. The inspectors noted that entrances to storage locations were properly posted and that containers were labeled in accordance with approved procedures and regulatory requirements. The physical condition of storage containers was noted to be adequate.

The inspectors interviewed personnel regarding Transportation and Waste Management (T&WM) activities. The inspectors concluded that personnel were knowledgeable of the requirements associated with the storage and control of radioactive waste material and the routine inspection requirements for storage locations.

The inspectors reviewed records associated with the generation and tracking of radioactive waste material. The inspectors found that radioactive material containers were properly inventoried, inspected, and stored in specified locations. The inspectors observed that appropriate labeling had been applied to storage containers in accordance with written procedures. Radioactive waste package certification records were current and cognizant personnel were knowledgeable of program requirements for tracking radioactive waste material. Licensee documents accurately reflected the location, amounts, and description of radioactive waste material.

The inspectors reviewed procedures and found that procedures adequately described the responsibilities and roles of T&WM personnel and organizations with radioactive waste management program responsibilities.

The inspectors reviewed internal audits/assessments of the radioactive waste management program and the tracking of assessment findings. The licensee's Quality Assurance group had developed a schedule to routinely assess the radioactive waste management program. The inspectors reviewed selected audits and confirmed that assessment findings were entered into the licensee's corrective action program for tracking.

b. Conclusion

No violations of NRC requirements were identified.

C. Facility Support

1. Management Organization and Controls (IP 88135)

a. Inspection Scope and Observations

During the inspection period, the inspectors noted several instances where NFS exhibited the traits of a positive safety culture as defined in NRC's Safety Culture policy statement, dated June 14, 2011. The following specific examples were noted:

- **Problem Identification and Resolution:** During the 4th quarter 2012, NFS entered 985 issues into the CAP and 4593 for the entire year. The inspectors verified that conditions adverse to quality were being properly identified, evaluated, corrected, and tracked to closure. The inspectors noted that the issues were prioritized in accordance to their safety significance.
- **Work Processes:** NFS has continued to implement a work control program which was begun in 2011. The work control group has developed more detailed work packages and testing requirements than were provided to the operators and mechanics in the past. This program has helped to improve the quality of maintenance as well as post maintenance testing.
- **Questioning Attitude:** On November 15, an operator noted an anomalous condition associated with a chemical bottle in Area 800. NFS management chose to shut down process area 800 to investigate the condition. Following a review by plant

engineering and implementation of corrective actions, the system was safely restarted.

- **Leadership Safety Values and Action:** As noted in Paragraph A.1 of this report, on November 12, NFS management shut down the UF₆ systems to address elevated radiation levels in the building 301 stack. The system was modified and radiation levels were reduced to nominal values. Although the radiation levels were well below regulatory limits, NFS management showed a commitment to ALARA and radiation safety by ceasing production until the situation was resolved.
- **Effective Safety Communication:** During the inspection period, NFS frequently sent out plant-wide e-mails regarding conditions requiring a focus on safety. This tool effectively communicated potential safety issues and provided a real-time operating experience to plant personnel.
- **Personal Accountability:** The inspectors noted several examples in the FMF and CD lines, when operators could not perform a procedure as written, the operations were stopped and the procedure was either changed or a letter of authorization was developed to deal with an abnormal condition.
- **Continuous Learning:** Continuous training was conducted using training modules called "tool boxes." For example, NFS trained personnel on the construction and implementation of the new control point entrance/exit pathway to the 105 and 302/303 building complex. Tool box OPR-TB-DEC11-04 explained the reasoning for and benefits of the renovations. The toolbox effectively explained the phases of the project and required actions. All personnel allowed entry to the material access areas were required to complete the training.
- **Respectful Work Environment:** The inspectors noted a significant improvement in the shift turnover process where individuals were encouraged to raise issues and provide feedback to peers and management without fear of retaliation. This was based on direct observation of shift turnover meetings by the inspectors.
- **Environment for Raising Safety Concerns:** The inspectors frequently questioned members of the licensee's organization from mid-level managers to front line employees and noted a willingness to raise safety concerns. The inspectors also periodically met with the employee concerns program manager and noted an improvement in the metrics (ex: number of concerns) used to track a healthy safety conscious work environment.

b. Conclusion

No findings of significance were identified.

2. Maintenance/Surveillance (IP 88135)

a. Inspection Scope and Observations

The inspectors reviewed a sample of work requests and all PIRCS entries based on their safety or safeguards risk significance. The inspectors reviewed the licensee's CAP to ensure that items adverse to safety were being identified and tracked to closure. To aid in the identification of repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed frequent screenings of items entered into the CAP.

The inspectors performed a detailed review of two work requests (WRs) involving safety-related equipment or IROFS. The inspectors reviewed the WRs for proper identification of IROFS and inclusion of post maintenance SRE testing. The inspectors also evaluated the WRs for compliance with applicable procedures.

b. Conclusion

No findings of significance were identified.

3. Evaluation of Exercises and Drills (IP 88051)

a. Inspection Scope and Observations

On November 8, the inspectors observed and evaluated the licensee's graded biennial exercise. The inspectors walked down the plant to assess the effectiveness of the visual aids used during the course of the exercise and to verify that the licensee had not pre-staged equipment or personnel in anticipation of the exercise.

One inspector evaluated the command, control, and communications of the Emergency Response Organization (ERO) in the Emergency Control Center (ECC) while another inspector evaluated activities at the scene of the simulated event, and an additional inspector evaluated the coordination between licensee personnel and offsite response organizations. The inspectors found that the exercise scenario was credible, technically correct, and sufficiently complex to require the licensee's ERO to react to the event. The scenario also led to a simulated offsite release and adequately tested communications between the licensee and off-site agencies. The inspectors noted that the drill scenario was a challenging exercise for the site's ERO, fire brigade, and medical personnel and tested key elements of the site's emergency plan. The inspectors observed that the simulated event was properly classified by the ECC and that the determination was made within the regulatory time limits. The inspectors also noted that the protective action recommendations communicated to local authorities by the ECC were made in a timely fashion.

The inspectors evaluated the drill assessment performed by the licensee. Following the termination of the exercise, the licensee conducted a series of critiques in which members of the ERO, fire brigade, and offsite response organizations participated and were asked to provide comments on those aspects of the exercise that worked well as well as those aspects that needed improvement. Members of the licensee's management team and emergency preparedness staff facilitated the critiques and documented the comments. The inspectors found that the critiques were generally self-critical and captured all of the exercise deficiencies noted by the three NRC inspectors. The inspectors determined that the identified deficiencies were minor and were not violations of NRC requirements. The inspectors verified that the deficiencies identified during the licensee critiques were documented in the licensee's corrective action program.

b. Conclusion

No findings of significance were identified.

D. Special Topics

1. Follow-up on Previously Identified Issues

a. (Closed) Unresolved Item (URI) 70-143/2010-002-03: Evaluation of Combustible Loading of Tube Cleaning Room Due to Tar Roof and Resulting Consequence Evaluation

The inspectors reviewed licensee corrective actions associated with this URI that were documented in PIRCS # 24944. The corrective actions included the development of a new fire model of the tube room that took the tar roof into consideration. This model concluded the worst case scenario was a large fire involving the tar and gravel mezzanine roof. The model calculated a fire duration time and this value was inputted into the radiological and chemical Accident Consequence Evaluations (ACE). Both the radiological and chemical ACEs concluded that the worst case exposure to a member of the public at the site boundary was low and the accident was deemed low consequence. This conclusion was based on the materials and chemicals located in or near the tube room. The scenario was not deemed to be an occupational hazard as the workers in the area would evacuate in the event of a significant fire. As the fire accident sequence was of low consequence, no IROFS were required. It should be noted that the subject tar roof was completely removed in September 2011. The inspectors performed a walk-down of the mezzanine area and verified removal of the tar material. Thus, the original concern from the URI has been eliminated. This item is considered closed.

b. (Closed) URI 70-143/2010-002-04: Evaluation of Analysis Supporting “Unlikely” Probability of Fire in Solvent Extraction Area

The inspectors reviewed licensee corrective actions associated with this URI that were documented in PIRCS # 24943. This issue dealt with a fire scenario in the SX room located within building 333. The original scenario was deemed by NFS to be “intermediate consequence” and “unlikely” in an uncontrolled scenario, i.e. without IROFS. However the inspectors questioned the basis for the uncontrolled “unlikely” condition and opened this URI. Specifically, the licensee had previously assigned an initiating event of -1 (which is defined as “expected to occur during plant life”) to a fire that results in a release of solvent and an enabling event of -2 (which is defined as “not expected, but might occur during plant lifetime”) to the likelihood that solvent would ignite and continue to burn. The scenario was not deemed to be an occupational hazard as the workers in the area would evacuate in the event of a significant fire but rather it is considered an environmental hazard.

As part of the corrective actions, NFS reanalyzed this scenario and added an administrative IROFS. This IROFS was FIRE-2 and represented the monthly surveillance for combustible material. Additionally, the licensee broke up the original initiating events (IE) and enabling events (EE) into five separate events as follows:

- IE - Release of solvent [Risk Index (RI) = -1]
- EE - Ignition source, ex. pump motor [RI = -1]
- EE - Failure to maintain solvent chemistry causing solvent to become more flammable [RI = -1]
- EE - Fire suppression system fails [RI = 0, this is conservative]
- EE - failure of fire detection/alarm and fire brigade to extinguish fire [RI = -1]

Adding the above RIs associated with the IE and four EEs to the RI of -2 for FIRE-2,

results in a controlled accident sequence RI of -6. For an intermediate consequence event, this sequence met the performance requirements of 10 CFR 70.61. It should be noted that the licensee performed a fire test on the solvent that demonstrated that the solvent was difficult to ignite and was easily extinguished by the fire suppression system. The SX room is equipped with a suppression system; however the inspectors observed that the suppression system may not sufficiently cover the pulsar pumps which are a contributor to the potential ignition source. Thus, the licensee did not credit the suppression system as an IROFS but rather chose to credit FIRE-2. This item is considered closed.

c. (Closed) VIO 70-143/2010-003-02: Failure to Follow Plant Procedures During SRE Testing

The inspectors reviewed licensee corrective actions associated with this violation as documented in PIRCS #27441. The issue dealt with the failure to follow a plant procedure on September 17, 2010. Specifically, an SRE test was performed on a plant air valve that was designated as an IROFS while the SX system remained in operation which was contrary to the procedure. The inspectors reviewed the corrective actions and the reply to the Notice of Violation, dated December 3, 2010. The corrective actions included training of all operators on the event as well as an effectiveness evaluation of compliance with SRE test procedures. This item is considered closed.

d. (Closed) Apparent Violation (AV) 70-143/2010-009-01: Failure to Provide Accurate Information In A Reply to Notice of Violation

This issue was initially identified as an apparent violation by letter dated July 20, 2010. An alternative dispute resolution (ADR) was subsequently held on October 4, 2010, which resulted in the issuance of a Confirmatory Order (CO) dated November 16, 2010. NFS then issued a, "Reply to a Notice of Violation: (EA-10-076)," dated December 15, 2010. The letter identified three sets of corrective actions. The first set identified corrective actions NFS had taken to address providing inaccurate information to the NRC in a Reply to Notice of Violation. The corrective actions were entered into NFS' corrective action program (CAP). The inspectors reviewed the licensee's corrective actions that had been entered into the CAP and that were identified in its response letter. The inspectors determined that the actions were adequate in scope and depth to prevent a reoccurrence. This issue is considered closed.

e. (Closed) AV 70-143/2010-009-02: Failure to Provide Accurate Information to NRC Inspectors

This issue was initially identified as an apparent violation by letter dated July 20, 2010. An ADR was subsequently held on October 4, 2010, which resulted in the issuance of a CO dated November 16, 2010. NFS then issued a, "Reply to a Notice of Violation: (EA-10-076)," dated December 15, 2010. The letter identified three sets of corrective actions. The second set identified corrective actions NFS had taken to address providing inaccurate information to NRC inspectors. The corrective actions were entered into NFS' corrective action program (CAP). The inspectors reviewed the licensee's corrective actions that had been entered into the CAP and that were identified in its response letter. The inspectors determined that the actions were adequate in scope and depth to prevent a reoccurrence. This issue is considered closed.

f. (Closed) VIO 70-143/2011-002-02: Failure to Perform Required Personal Monitoring Upon Exit from the Radiologically Controlled Area

The inspectors reviewed licensee corrective actions associated with this violation. The inspectors found that management observations of personnel contamination monitoring practices along with managements' efforts to re-enforce personnel survey expectations, and plant-wide communications efforts in this regard were effective in ensuring that required performance standards were achieved. The inspectors discussed recent enhancements to the radiation worker training program with responsible personnel. Licensee representatives stated that additional focus had been placed on proper personal contamination monitoring techniques and individuals were afforded more opportunities to practice these techniques. Based on field observations the inspectors found that plant personnel utilized proper contamination monitoring techniques in accordance with approved procedures and management expectations. This issue is considered closed.

g. (Closed) ORD 70-143/-00 - 4.a: Submit Reply to NOV Documenting Corrective Actions and Enhancements W/I 30 Days

In paragraph 4.a of the CO dated November 16, 2010, NFS was required to submit a Reply to a Notice of Violation within 30 days which documented its corrective actions and enhancements as discussed in section 3.3 of the same CO. Section 3.3 of the CO referred, in turn, to violations identified in a letter sent to NFS dated July 20, 2010. On December 15, 2010, NFS submitted a letter, "Reply to a Notice of Violation: (EA-10-076)," dated December 15, 2010. The letter contained corrective actions grouped into three sets documenting corrective actions related to the violations. Inspectors determined that the corrective actions and enhancements identified in the letter met the requirements of paragraph 4.a of the CO. This requirement is considered to have been met.

h. (Closed) ORD 70-143/-00 - 4.b: Conduct an Effectiveness Review of Corrective Actions Identified in the Reply to NOV Within 1 Year

This requirement originated from two apparent violations (AVs), AV 70-143/2010-009-01 and AV 70-143/2010-009-02, which were identified by letter dated July 20, 2010. Following an alternative dispute resolution (ADR) held on October 4, 2010, a CO dated November 16, 2010, was issued. Under paragraph 4.b of the CO, effectiveness reviews for each completed corrective action identified in NFS' written reply to the notice of violation were mandated. Inspectors assessed the corrective actions and the effectiveness review performed by NFS, and that were documented in the CAP under Corrective Action (CA) ID#14404. The inspectors noted that NFS had not identified any additional corrective actions as a result of its effectiveness reviews and discussed this observation with the licensee. The inspectors determined that the effectiveness reviews performed by the licensee met the requirements of paragraph 4.b of the CO and were adequate in scope and depth. This requirement is considered to have been met.

i. (Closed) ORD 70-143/-00 - 4.c: Conduct An Assessment of the Effectiveness of Actions to Assure Adequacy and Accuracy of Information Submitted to the NRC Within 6 Months

This requirement originated from two apparent violations, AV 70-143/2010-009-01 and AV 70-143/2010-009-02, cited by letter dated July 20, 2010. Following an ADR held on October 4, 2010, an effectiveness review of the related corrective actions identified in NFS' reply to the notice of violation was incorporated into paragraph 4.c of the CO dated

November 16, 2010. The inspectors evaluated the effectiveness review of the corrective actions performed by the licensee and documented in the CAP under CA ID#14405. The inspectors assessed the effectiveness review conducted by the Quality Assurance (QA) department and found that the QA department operated independently from the safety organization. The inspectors determined that the effectiveness review met the requirements of paragraph 4.c of the CO and was adequate in scope and depth. This requirement is considered to have been met.

j. (Closed) ORD 70-143/-00 - 4.g: Implement Metrics to Measure Overall Safety Performance

In paragraph 4.g of the CO issued to NFS, dated November 16, 2010, NFS was required to implement metrics to measure overall safety performance at the facility. Although the CO only required NFS to implement metrics related to safety, NFS developed and implemented metrics that measured Safety, Quality, Schedule, Cost, and Conduct of Business. The inspectors determined that NFS was monitoring 78 Key Performance Indicators (KPIs) that were eventually rolled-up into one of the five overarching categories mentioned above. Fifteen of the KPIs were dedicated to measuring safety. The inspectors noted that the NFS management team reviews the "Performance Metrics Program" as a matter of routine business and that the performance of the metrics affects decision-making. The inspectors noted that a link to Performance Metrics was placed prominently on NFS internal website, providing access to all NFS employees. The inspectors determined that the KPI's selected and monitored by NFS management were adequate and had been effective in affecting the overall safety performance of the plant. NRC inspectors will continue to monitor this program. This requirement is considered to have been met.

E. **Exit Meeting**

The inspection scope and results were presented to members of the licensee's staff at various meetings throughout the inspection period and were summarized on December 21 with Joseph Henry and his staff. No dissenting comments were received from the licensee. Proprietary information was discussed but not included in the report.

SUPPLEMENTAL INFORMATION

1. KEY POINTS OF CONTACT

<u>Name</u>	<u>Title</u>
R. Dailey	Engineering Director
R. Droke	Senior Regulatory Advisor
M. Elliott	Quality, Safety, & Safeguards Director
J. Henry	President
M. Lee	Licensing Specialist
M. Moore	Environmental Protection & Industrial Safety Section Manager
J. Nagy	Assurance Director
C. Reed	Operations Director
R. Shackelford	Nuclear Safety & Licensing Section Manager
M. Tester	Health Physics Manager
K. Weir	Security Manager
J. Wheeler	Licensing & ISA Manager

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Opened & Closed

None

Closed

70-143/2010-002-03	URI	Evaluation of Combustible Loading of Tube Cleaning Room Due to Tar Roof and Resulting Consequence Evaluation
70-143/2010-002-04	URI	Evaluation of Analysis Supporting "Unlikely" Probability of Fire in Solvent Extraction Area
70-143/2010-003-02	VIO	Failure to Follow Plant Procedures During SRE Testing
70-143/2010-009-01	VIO	Failure to Provide Accurate Information In A Reply to Notice of Violation

70-143/2010-009-02	VIO	Failure to Provide Accurate Information to NRC Inspectors
70-143/2011-002-02	VIO	Failure to Perform Required Personal Monitoring Upon Exit From the Radiologically Controlled Area
70-143/-00	ORD	4.a Submit Reply to NOV Documenting Corrective Actions and Enhancements W/I 30 Days
70-143/-00	ORD	4.b Conduct an Effectiveness Review of Corrective Actions Identified in the Reply to NOV Within 1 Year
70-143/-00	ORD	4.c Conduct An Assessment of the Effectiveness of Actions to Assure Adequacy and Accuracy of Information Submitted to the NRC Within 6 Months
70-143/-00	ORD	4.g: Implement Metrics to Measure Overall Safety Performance

Discussed

None

3. INSPECTION PROCEDURES USED

86740	Inspection of Transportation Activities
88030	Radiation Protection
88035	Radioactive Waste Management
88051	Evaluation of Exercises and Drills
88135	Resident Inspection Program For Category I Fuel Cycle Facilities