



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

December 28, 2011

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

SUBJECT: NUCLEAR REGULATORY COMMISSION'S DESIGN VERIFICATION TEAM
INSPECTION REPORT NO. 70-143/2011-009

Dear Mr. Henry:

The enclosed report contains the results of the inspection conducted from November 28 through December 2, 2011, at the Nuclear Fuel Services (NFS) facility in Erwin, TN. The purpose of this inspection was to assess the operational performance capability of selected safety systems through an in-depth, multi-disciplinary review to verify that the selected systems were capable of performing their intended safety functions. Additionally, the inspection verified that the design basis, licensing basis, and performance capability of components have not been degraded through modifications. Finally, the inspection also assessed NFS' capability to track and trend safety equipment issues. The focus of the inspection was on processes in the fuel manufacturing facility, as that area of the facility had been operational for the longest period of time since the restart of operations after the extended shutdown in late 2009. The findings were discussed with you and members of your staff on December 2, 2011.

No findings of significance were identified. The inspection determined that NFS adequately maintained configuration control of safety controls and systems. In addition, NFS' documentation and testing adequately justified design assumptions and boundary conditions. Finally, with regard to the corrective action program, NFS was adequately identifying and resolving issues noted in the process areas.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure 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/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Manuel G. Crespo, of my staff, at 404-997-4733.

Sincerely,

/RA/

Frank J. Ehrhardt, 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. 70-143/2011-009

cc w/encl:
Christa B. Reed
Director, Operations
Nuclear Fuel Services, Inc.
Electronic Mail Distribution

Mark P. Elliott
Director
Quality, Safety & Safeguards
Nuclear Fuel Services, Inc.
Electronic Mail Distribution

Debra G. Shults
Director
TN Dept. of Environment & Conservation
Electronic Mail Distribution

William D. Lewis
Mayor
Town of Erwin
211 N. Main Avenue
P.O. Box 59
Erwin, TN 37650

cc w/encl: (Cont'd on page 3)

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cc w/encl: (Cont'd on page 3)

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☐ SENSITIVE

☒ NON-SENSITIVE

ADAMS: ☒ Yes

ACCESSION NUMBER: ML11362A387

☒ SUNSI REVIEW COMPLETE ☒ FORM 665 ATTACHED

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OFFICIAL RECORD COPY DOCUMENT NAME: G:\DNMSII\FBII\REPORTS\Draft Inspection Report
Folder\NFS\NFS IR 2011-009 (Design Verification).docx

J. Henry

3

(cc w/encl: cont'd)
Gregg Lynch
Mayor
Unicoi County
P.O. Box 169
Erwin, TN 37650

Johnny Lynch
Mayor
Town of Unicoi
Unicoi, TN 37692

Letter to Mr. Joseph G. Henry from Frank J. Ehrhardt dated December 28, 2011

SUBJECT: NUCLEAR REGULATORY COMMISSION'S DESIGN VERIFICATION TEAM
INSPECTION REPORT NO. 70-143/2011-009

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

DESIGN VERIFICATION TEAM INSPECTION

Docket No.: 70-143

License No.: SNM-124

Report No.: 70-143/2011-009

Licensee: Nuclear Fuel Services, Inc.

Location: Erwin, Tennessee 37650

Dates: November 28 through December 2, 2011

Team: M. Crespo, Senior Fuel Facility Inspector, Division of Fuel Facility Inspection
(DFFI) (Team Leader)
R. Gibson, Senior Fuel Facility Inspector, DFFI
T. Powell, Criticality Safety Inspector, Division of Fuel Cycle Safety and
Safeguards
P. Startz, Fuel Facility Inspector, DFFI

Approved by: Frank J. Ehrhardt, Acting Chief
Fuel Facility Inspection Branch 1
DFFI

Enclosure

EXECUTIVE SUMMARY

Nuclear Fuel Services, Inc.
NRC Integrated Inspection Report 70-143/2011-009
November 28 - December 2, 2011

Inspectors from Region II and Headquarters conducted inspections in the areas of permanent plant modifications, criticality safety, safety operations, and radiological controls during normal shifts. 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, independent verification of safety system status, corrective actions, and a review of facility records.

Design Verification

- NFS adequately maintained configuration control of safety controls and systems. In addition, NFS' documentation and testing adequately justified design assumptions and boundary conditions. Finally, with regard to the corrective action program, NFS was adequately identifying and resolving issues noted in the process areas. (Paragraph A.1)

Attachment

Partial List of Persons Contacted
List of Items Opened, Closed, and Discussed
Inspection Procedures Used
Partial List of Documents Reviewed

REPORT DETAILS REPORT DETAILS

Summary of Plant Status

The following process areas were operating during the inspection: 1) Fuel Manufacturing Facility (FMF); 2) Blended Low Enriched Uranium (BLEU) Preparation Facility (BPF) which included the Uranium (U)-Aluminum, U-Oxide, U-Metal, Solvent Extraction, and the down-blending lines; and 3) Building 301 Commercial Development lines which included the Column Dissolvers, uranium hexafluoride line, and the Ammonium Diuranate system. There were no plant upsets or unusual operational occurrences during the onsite inspections.

A. Design Verification (Inspection Procedures (IP) 88016, 88020, 88030 and 88070)

1. Inspection Scope and Observations

The inspectors reviewed the nuclear criticality safety evaluations (NCSEs) for Areas 800 and 900 and for the Waste Water Treatment Facility (WWTF), which was modified in 2010, to determine that criticality safety of risk-significant operations was ensured through engineered and administrative controls with adequate safety margin. The inspectors verified that controls that were developed and defined in NCSEs were appropriately translated into implementing procedures. The inspectors verified that NCSEs were performed by qualified nuclear criticality safety (NCS) engineers, that independent reviews of the evaluations were completed by qualified NCS engineers, that subcriticality of the systems and operations was assured through appropriate limits on controlled parameters, and that double contingency was assured for each credible accident sequence leading to inadvertent criticality. The inspectors verified that NCS controls for equipment and processes assured the safety of the operations. The inspectors noted that the evaluations and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations were within subcritical limits as defined in the licensing and design bases.

The inspectors performed an in-depth review of selected safety systems related to radiation protection, operational safety, and fire protection in the Recovery Area of the 300 complex and Areas 600 and 800 to assess the operational performance capability of each selected system. The safety systems were reviewed to ensure that any potential accident sequences were properly accounted for and addressed. The inspectors also reviewed the integrated safety analysis (ISA) changes that were made during the past six months for radiological accident consequences, bounding accident sequences, process hazardous analysis scenarios, and the calculation of radiological dose from a potential accident.

The inspectors verified that the licensee had management measures in place to ensure that items relied on for safety (IROFS) designed for the Recovery Area of the 300 complex and Areas 600 and 800 were capable of performing their intended safety function. The inspectors also verified that the operating procedures contained the appropriate safety steps and that training on the systems was provided, as necessary. The inspectors performed a walk down of the functional aspects of several Health Physics and operational safety related IROFS to determine if the designs were authorized according to applicable procedures and to verify compliance with 10 *CFR* 70.62.

The inspectors evaluated the Area 800 fire detection system to verify that the sensors and systems were appropriate for detecting the hazards identified in the design and licensing basis. The detection equipment was located throughout the production area to promote rapid detection should a leak or fire occur. The inspectors also noted proper calibration of the detectors. The fire detection systems were connected to a central programmable logic controller (PLC) that ensured reliable system detection, malfunction reporting, troubleshooting, alarm, and shutdown of the combustible gas supply system. The inspectors reviewed and verified samples of the PLC program relative to the software specification documents, functional design specifications, testing and validation plans, and other configuration control requirements. Instrumentation and equipment setpoint calculations and documentation were reviewed for appropriateness. The inspectors reviewed the licensee's operational testing and calibration activities. The inspectors performed walkdowns and verified the installation was in accordance with design documentation, that the design assumptions were appropriate for the hazards involved, and that the performance capability of the components had been maintained in a manner that would ensure the system would function reliably when needed.

The inspectors also evaluated six in-line gamma radiation monitors that were designed to detect excess uranium concentrations in liquid transfer streams and automatically initiate the closure of redundant valves to ensure nuclear criticality safety. The inspectors performed field verifications of all six in-line monitoring systems and determined that the detectors were installed as defined in documentation and drawings. The inspectors also noted that the controls for the monitors were secured to prevent inadvertent modification. The inspectors noted that the system was functioning within specifications and would operate in a fail-safe bias. The redundant valves were of the correct type as defined in system drawings, properly installed, and were confirmed to be functionally tested. The spreadsheet database used to calculate the various system setpoints was confirmed to produce the specified statistical results for the given inputs. The inspectors independently evaluated the radiation detector systems to ensure they were appropriately installed in accordance with facility drawings. The inspectors reviewed and verified samples of the PLC program for the in-line monitoring systems. The inspectors review software specification documents, functional design specifications, testing and validation plans, and other configuration control requirements. In addition, the inspectors reviewed instrumentation and equipment set point calculations and documentation.

The inspectors reviewed several modification packages (enterprise change requests) to verify that NFS was properly identifying any necessary safety controls. The inspectors also performed walkdowns of the modified systems to ensure the current drawings reflected the modified equipment. The inspectors reviewed the setpoint calculations for the new controls to ensure the assumptions used reflected the process conditions in the plant.

The inspectors reviewed the corrective action history for the last six months for the in-line monitoring system, Area 800, and the Recovery Area. The review focused on entries with a priority of moderate or higher. The inspectors noted that the corrective action program was being used to identify potential safety issues and was actively being used by operators. In addition, the inspectors noted that NFS was properly resolving potential safety issues in a timely manner.

The inspectors also reviewed the backlog of maintenance activities for 2011. The

inspectors noted that the backlog had trended upward during the early summer. However, since then, NFS had improved the planning and management of work to return the backlog to the historical level.

2. Conclusion

No significant issues were identified.

B. EXIT MEETING

During the course of the inspection, the team provided members of the plant staff and management with summaries of inspection observations on a daily basis. The team presented the inspection results to members of the plant staff and management on December 2, 2011. The plant staff acknowledged the results of the inspection.

SUPPLEMENTAL INFORMATION

1. KEY POINTS OF CONTACT

Licensee

J. Henry, President, Nuclear Fuel Services
R. Dailey, Director, Engineering
M. Elliott, Director, Quality, Safety, and Safeguards
C. Reed, Director of Operations
J. Wheeler, Licensing and ISA Manager
R. Shackelford, Nuclear Safety & Licensing Manager
R. Droke, Senior Regulatory Advisor
M. Tester, Senior Radiological Control Manager

Other licensee employees contacted included operation, management staff, engineers, HP- technicians, security and office personnel.

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Discussed

None

Closed

None

3. INSPECTION PROCEDURES USED

IP 88016	Nuclear Criticality Safety Evaluations and Analyses
IP 88020	Operational Safety
IP 88030	Radiation Protection
IP 88070	Permanent Plant Modifications

4. LIST OF DOCUMENTS REVIEWED

Nuclear Criticality Safety Evaluations

- 54T-10-0032, "Nuclear Criticality Safety Evaluation (NCSE) for BPF Liquid Waste Discard System," Revision (Rev.) 6, dated November 2010
- 54T-10-0033, "NCSE for Waste Water Treatment Facility (WWTF) Caustic Receipt Tank-26," Rev. 1, dated November 2010
- 54X-07-0022, "NCSE for Area 800 of the Production Fuel Facility," Rev. 8, dated November 28, 2011
- 54X-04-0045, "NCSE for ENCLOS-8901 in Area 900 of the Production Fuel Facility," Rev. 0, dated December 13, 2004
- 54X-10-0007, "NCSE for ENCLOS-5901 in Area 900 of the Production Fuel Facility," Rev. 3, dated September 9, 2010

- 54X-10-0008, "Control Flowdown and Field Verification for ENCLOS-5901 in Area 900 of the Production Fuel Facility, Revision 3, of NCSE issued on 9/1/10," Rev. 0, dated September 7, 2010

Procedures

- NFS-SS-003, "Stabilization of 333 BPF Caustic," Rev. 0, dated March 28, 2007
- SOP 299, "Waste Water Treatment Facility," Rev. 16, dated June 3, 2011
- SOP 401, "Area 800," Rev. 15, dated August 24, 2011
- NFS-HS-A-58, "Nuclear Criticality Safety Evaluations (NCSE)," Rev. 11, dated March 27, 2009
- NFS-HS-A-62, "Implementation of Nuclear Criticality Safety Evaluations," Rev. 5, dated September 16, 2009
- NFS-HS-A-68, "ISA Risk Assessment Procedure," Rev. 4, dated October 26, 2007
- NFS-HS-A-79, "Identification and Control of Items Relied on for Safety (IROFS) Procedure," Rev. 8, dated October 7, 2011
- NFS-HS-CL-04, "Nuclear Criticality Safety Configuration Control Requirements," Rev. 4, dated November 11, 2011
- NFS-HS-A-84, "Operation of the downblending in-line monitoring system", Rev. 3
- NFS-HS-A-86, "Operation of the Process Discard in-line monitoring system" Rev. 2
- SOP 416, Section 0, "Management of PLC Software," Rev. 4
- 21T-05-1802, "Technical Basis document, process discard in-line monitors", Rev. 0
- 21T-11-0509, "Items relied on for safety and SRE for Bldg 301 utilities and MC&A", Rev. 8
- 21T-11-1698, "Items relied on for safety and SRE for Bldg 333 solvent extraction", Rev. 20
- 21T-10-0811, "Items relied on for safety and SRE for Bldg 333 liquids discards", Rev. 8
- 21T-09-0389, "Items relied on for safety and SRE for Bldg 333 downblending", Rev. 11

Miscellaneous Documents

In-line Monitor Systems - N306MONITR4WD01; N301MONITOR5A15;
N333MONITR4CAUS; N333MONITR4COND; N333MONITR4RAFF;
N333MONITRE4B11

Formal Work Package and Enterprise Change Requests (ECRs)

M156786, M156420, M156818, M156553, M155120, M155004, M153102, M150992,
M153635, M150535, M153633, ECR #20090310, ECR #2009088-2, ECR#20101702,

Corrective Action Reports

OPEN:

P28311, P28856, P30216, P30977, P32244, P28129, P28564, P28730, P28753,
P29628, P29836, P29867, P30397, P31117, P31137, P31290, P31464, P31582,
P31643, P31692, P31755, P31757, P31763, P31769, P31907, P31944, P32049,
P32059,

CLOSED:

P28105, P28389, P28526, P28595, P28604, P28809, P28811, P29264, P30325, P30346, P30645, P30944, P31219, P31231, P31269, P31277, P31289, P31292, P31380, P31382, P31702, P28165, P28194, P28230, P28269, P28276, P28278, P28374, P28378, P28379, P28476, P28479, P28501, P28506, P28539, P28642, P28764, P28792, P28869, P28880, P28887, P28921, P28943, P28944, P28956, P29004, P29058, P29110, P29163, P29191, P29196, P29240, P29272, P29275, P29276, P29362, P29376, P29381, P29417, P29441, P29459, P29461, P29551, P29700, P29712, P29893, P29905, P29939, P30030, P30055, P30105, P30119, P30121, P30123, P30133, P30138, P30145, P30150, P30158, P30240, P30301, P30364, P30371, P30481, P30487, P30591, P30776, P30786, P30938, P30958, P30985, P31038, P31141, P31142, P31149, P31195, P31197, P31253, P31254, P31255, P31284, P31303, P31328, P31389, P31497, P31537, P31543, P31544, P31583, P31603, P31605, P31665, P31677, P31693, P31694, P31696, P31740, P31749, P31756, P31768, P31801, P31807, P31826, P31839, P31855, P31872, P31953, P31992, P31993, P32022, P32043, P32051, P32056, P32061, P32126, P32143, P32177, P32178, P32191, P32202, P32207, P32222, I12980

Safety Related Equipment Functional Tests

NJCGSFLOFSVGS07; N306XOVRFLOF804; N307H2DILXXX800;
 NFC1XFLOFSVGS36; N307XFILTERD807; N307XFILTERB809; N307XALARMAB857;
 N307XFILTERC807; NFC1XFLOFSVGS35; NFC1XFLOFSVGS37; N307XFILTERB808;
 N306XOVRFLOB804; N306XFILTERD812; N306XOVRFLOA804; N306XFILTERC812;
 N307XVALVB874E1; N306VALVETWA874; N306XFILTERD811; N306H2DECTCTR800;
 N306XOVRFLOC804; N306XFILTERF812; N306XOVRFLOE804; N306XFILTERA808;
 N306XFILTERA811; N306FILTERE812; N306FILTERB812; N306XFILTERB807;
 N306XFILTERA809; N306H2DILXXX800; N306XFILTERB811; N306XFILTERF811;
 N306XFILTERE811; N306XFILTERA812; N306XFILTERA807; N306XOVRFLOA802;
 N306XOVRFLOD804

Process and Instrumentation Drawings Reviewed

- Drawing 306-F0013-D, dated June 5, 2001
- Drawing 306-F0014-D, dated July 17, 2001
- Drawing 306-F0015-D, dated June 6, 2001
- Drawing 306-F0016-D, dated April 18, 2001
- Drawing 306-F0046-D, "TANKXX-WD01 and TANKXX-WD02," Rev. W
- Drawing 333-F0550-D, "BPF Down Blending," Rev. T
- Drawing 333-F0601-D, "BPF Caustic Discharge Tank" Rev. J
- Drawing 333-F0600-D, "BPF Condensate Discharge Tank," Rev. J
- Drawing 333-F0603-D, "BPF Raffinate Treatment and Disposal," Rev. J
- Drawing 301-F0237-D, "301 WW Ion exchange Columns," Rev. P
- Drawing 333-F0710-D
- Drawing 013-F0078-D

IROFS and Setpoint Calculations

SA-RTD-4, CDWW-11, DB-BDB-10, BLW-4, FLW-4, FIRE8-1, FIRE8-2, FA8-15,
FA8-21, FLW-6, FLW-5, FA8-14, FIRE8-4, FIRE8-8, FIRE 8-5, FA8-38, FA8-39, FA8-28,
FA8-30, FAL-25, FAL-26, FAL-27, FAL-28, FAL-29, FAL-30, FAL-31, FAL-32,
FAD-26, FAD-27, FAD-23, FAD-33, FAG-6, FAG-7