



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

September 14, 2011

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

**SUBJECT: NUCLEAR REGULATORY COMMISSION'S URANIUM HEXAFLUORIDE  
PROCESS RESTART READINESS ASSESSMENT TEAM INSPECTION  
REPORT NO. 70-143/2011-007**

Dear Mr. Henry:

On January 7, 2010, the Nuclear Regulatory Commission (NRC) issued Confirmatory Action Letter 2-2010-001 (ML100070118) in response to your letter dated December 30, 2009 (ML093641023). Your letter contained additional actions (commitments) to ensure that the root causes of the October 13, 2009, process upset had been adequately evaluated and appropriate corrective actions had been implemented for all potentially affected processes before you resumed operations of those processes.

As with the previous four restart readiness assessments, an NRC Restart Readiness Assessment Team was established to assure that the "Actions Prior to Restart of Operations," identified in your December 30, 2009 letter, had been satisfactorily completed with respect to the uranium hexafluoride process. The NRC team also evaluated the status of corrective actions you implemented to address the four management issues identified in the Confirmatory Action Letter which focused on improvements in the Nuclear Fuel Services' (NFS') management oversight of facility process changes, the elimination of perceived production pressures, improving the questioning attitude of both workers and management, and communication improvements. Additionally, the NRC team performed an evaluation of procedures, maintenance, design bases, the corrective action program, and management oversight initiatives. The team conducted its on-site inspection activities from May 2 through May 6, 2011, and additional in-office follow-up. On July 12, the NRC completed its inspection of NFS' readiness to restart the process. The enclosed report documents the inspection results which were discussed with you and other members of your staff in a public exit meeting on August 16, 2011, in Erwin, TN.

The team determined that all 15 "Actions Prior to Restart of Operations" contained in the Confirmatory Action Letter were satisfactorily completed as they pertained to the uranium hexafluoride process. As this is the final process line to be restarted, NFS has completed all commitments listed as "Actions Prior to Restart of Operations" in the Confirmatory Action Letter. The team did not identify any safety or risk significant issues during our inspections. Therefore, by letter dated July 12, 2011 (ML11930272), the Region II Regional Administrator authorized restart of the uranium hexafluoride process.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, and its enclosure not otherwise withheld from public disclosure 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>.

Should you have any questions concerning this inspection, please contact Steven J. Vias, of my staff, at 404-997-4560.

Sincerely,

**/RA/**

Anthony T. Gody, Director  
Division of Fuel Facility Inspection

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

Enclosure:  
NRC Inspection Report No. 70-143/2011-007

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)

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, and its enclosure not otherwise withheld from public disclosure 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>.

Should you have any questions concerning this inspection, please contact Steven J. Vias, of my staff, at 404-997-4560.

Sincerely,

**/RA/**

Anthony T. Gody, Director  
Division of Fuel Facility Inspection

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

Enclosure:  
NRC Inspection Report No. 70-143/2011-007

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)  
 PUBLICLY AVAILABLE     
  NON-PUBLICLY AVAILABLE     
  SENSITIVE     
  NON-SENSITIVE  
 ADAMS:  Yes     
 ACCESSION NUMBER: ML112570351     
  SUNSI REVIEW COMPLETE  FORM 665 ATTACHED

OFFICE	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI
SIGNATURE	via email	via email	via email	/RA/	/RA/	/RA by LPitts for/	/RA by LPitts for/
NAME	MRomano	MBaker	JFoster	OLopez	MCrespo	JPelchat	SVias
DATE	9/7/2011	8/29/2011	9/6/2011	9/7/2011	9/6/2011	9/9/2011	9/9/2011
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	RII:DFFI

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 Anthony T. Gody dated September 14, 2011

SUBJECT: NUCLEAR REGULATORY COMMISSION'S URANIUM HEXAFLUORIDE  
PROCESS RESTART READINESS ASSESSMENT TEAM INSPECTION  
REPORT NO. 70-143/2011-007

Distribution w/encl:

PUBLIC

T. Gody, RII

E. Cobey, RII

S. Vias, RII

G. Smith, RII

M. Crespo, RII

J. Pelchat, RII

M. Chitty, RII

R. Trojanowski, RII

J. Weil, OCA

R. Johnson, NMSS

K. Ramsey, NMSS

R. Hannah, RII

[Webwork.resource@nrc.gov](mailto:Webwork.resource@nrc.gov) (NFS website)

[nmed@inl.gov](mailto:nmed@inl.gov)

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

RESTART READINESS ASSESSMENT FOR THE URANIUM HEXAFLUORIDE PROCESS

Docket No.: 70-143

License No.: SNM-124

Report No.: 70-143/2011-007

Licensee: Nuclear Fuel Services, Inc.

Location: Erwin, Tennessee 37650

Dates: May 2 through May 6, 2011 (on-site)  
May 9 through June 30, 2011 (in-office)

Team: M. Crespo, Senior Fuel Facility Inspector, Division of Fuel Facility Inspection (DFFI) (Team Leader)  
M. Baker, Senior Project Manager, Fuel Cycle Safety and Safeguards (FCSS)  
C. Fisher, Fuel Facility Inspector, FCSS  
J. Foster, Fuel Facility Inspector, DFFI  
O. López, Senior Fuel Facility Inspector, DFFI  
M. Romano, Fuel Facility Inspector, DFFI

Approved by: Steven J. Vias, Chief  
Fuel Facility Inspection Branch 1  
DFFI

Enclosure

## **EXECUTIVE SUMMARY**

### **NRC Inspection Report No. 70-143/2011-007**

The objective of this Restart Readiness Assessment Team inspection was to verify the completion of actions by Nuclear Fuel Services, Inc. (NFS) in response to the January 7, 2010, Confirmatory Action Letter (CAL) as it related to the uranium hexafluoride (UF<sub>6</sub>) process and to evaluate the NFS organization's readiness to restart the process. The team also inspected the effectiveness of NFS' corrective actions for management oversight of facility process changes, perceived production pressures, lack of a questioning attitude by workers and management, and poor communications with a focus on the readiness to safely restart these processes. In addition, the team reviewed procedures, maintenance records, design basis of select accident sequences, the corrective action program (CAP) and backlog, and management oversight initiatives. The Restart Readiness Assessment Team conducted these reviews from May 2 through June 30, 2011.

The team determined that the 15 "Actions Prior to Restart of Operations" contained in the CAL were satisfactorily completed as they pertained to the UF<sub>6</sub> process. As this is the final process line to be assessed for restart, NFS has completed all commitments listed as "Actions Prior to Restart of Operations" in the CAL. The team did not identify any safety or risk significant issues that would preclude a safe startup of the UF<sub>6</sub> process.

#### **Attachment:**

##### **Supplemental Information**

- Key Points of Contact
- List of Items Opened, Closed, and Discussed
- List of Documents Reviewed
- List of Acronyms

## **REPORT DETAILS**

### **BACKGROUND**

On October 13, 2009, an unexpected exothermic reaction (Event Number 45446) occurred within the uranium-aluminum processing portion of the Blended Low Enriched Uranium (BLEU) Prep Facility (BPF) at NFS in Erwin, Tennessee. The NRC chartered an Augmented Inspection Team (AIT) in October 2009, to review the circumstances surrounding the event. In December 2009, based on preliminary results from the AIT, the NRC undertook a review of NFS' operations and performance dating back to the issuance of a Confirmatory Order in February 2007. On the basis of the interim review of NFS' performance, the NRC determined that additional actions needed to be taken by NFS to provide reasonable assurance that the NFS facility could be operated safely.

The NRC engaged the management of NFS with the results of this interim assessment and obtained a commitment from NFS to maintain the facility process lines shutdown until certain specific actions were completed. The licensee submitted its commitments in writing by letter dated December 30, 2009 (ML093641023). The NRC confirmed these commitments in CAL No. 2-2010-001, dated January 7, 2010 (ML100070118). Following an inspection of NFS' readiness to restart, the NRC authorized the Navy fuel, uranium-metal/oxide, uranium-aluminum, and ammonium diuranate lines to restart on March 23, 2010 (ML100820047), May 19, 2010 (ML101390388), July 6, 2010 (ML101870634), and October 22, 2010 (ML102950474), respectively.

By letter dated March 24, 2011 (ML110940144), NFS notified the NRC of its readiness to restart the UF<sub>6</sub> process. The specific portions of the NFS facility included the sublimation stations 1 - 3, the vent and tap station, the hoke tube processing station, the uranyl fluoride (UO<sub>2</sub>F<sub>2</sub>) transfer system / UF<sub>6</sub> knockout off-gas and trap system, and the tray dissolver and filtration station. The NRC conducted inspection activities at NFS from May 2 to May 6, 2011, followed by additional in-office reviews and documentation. On June 30, 2011, the NRC completed the inspection of the licensee's readiness to restart the processes. The team did not identify any safety or risk significant issues that would preclude a safe startup of the UF<sub>6</sub> process. Therefore, by letter dated July 12, 2011 (ML111930272), the Region II Regional Administrator authorized restart of the process.

### **Inspection Scope**

On May 2, 2011, the NRC dispatched a team of team to evaluate NFS' readiness to restart the UF<sub>6</sub> process. The objectives of the inspection were as follows:

- Assure that the "Actions Prior to Restart of Operations" was satisfactorily completed.
- Verify that the licensee's assessment and corrective actions adequately addressed the concerns involving the adequacy of NFS' management oversight of facility process changes, perceived production pressures, lack of questioning attitude by workers and management, and poor communication.
- Assess the licensee's readiness to restart the UF<sub>6</sub> process.



**A. ACTIONS PRIOR TO RESTART OF OPERATIONS**

- 1. The restriction NFS management put in place following the Bowl Cleaning Station (BCS) Incident prohibiting the processing of granular metallic "fines" in the Uranium-Aluminum process will be institutionalized.**

This corrective action was reviewed during the Navy fuel line readiness inspection (documented in Inspection Report 70-143/2010-005 (ML101530164)). The NRC determined that the restriction NFS management put in place prohibiting the processing of granular metallic "fines" in the uranium aluminum process was properly institutionalized. This item was not applicable to the UF<sub>6</sub> process.

- 2. NFS will institutionalize improvements to the change control process, which was delineated in a temporary procedure. Training on the process will be provided to appropriate operations, technical, oversight and management staff.**

During the previous four readiness inspections, the NRC reviewed the licensee's corrective actions to improve the change control process to address the problems identified from the October 13, 2009 BCS event and concluded that the licensee had adequately identified and institutionalized improvements into their plant-wide change control process procedure.

During the UF<sub>6</sub> process readiness inspection, the team reviewed documentation of maintenance activities and equipment modifications that were completed while the facility was shutdown to ensure the work was completed in accordance with the enhanced modification process procedures. The team determined that Enterprise Change Requests (ECRs) and technology review documents selected for review were prepared in accordance with the newly enhanced process change procedures and contained the appropriate level of detail and technical basis documentation to allow for thorough licensee reviews.

Based upon the team's observations made during the UF<sub>6</sub> process readiness inspection, NFS continues to satisfactorily meet this commitment.

- 3. The incident investigation, including detailed causal analysis, of the BCS Incident will be completed.**

During the Navy fuel line readiness inspection, the NRC reviewed the licensee's initial Root Cause Analysis (RCA) report of the BCS event and interviewed several members of the investigation team. The NRC evaluated whether the level of detail of the investigation was commensurate with the significance of the problem, included consideration of prior occurrences of the problem and knowledge of prior operating experience, addressed the extent of condition and extent of cause, and appropriately considered the safety culture components of the problem. The team concluded that the licensee completed an adequate RCA of the BCS event that involved techniques and methodologies generally consistent with expected investigation practices.

Based upon the team's review of the investigation into the minor violation involving the procedure modification error (discussed in section C.1. "Procedures" below), NFS continues to satisfactorily meet this commitment through implementation of adequate investigations and corrective actions.

**4. The near-term corrective actions needed to address the causal factors identified by the investigation of the BCS incident will be determined and implemented.**

During the Navy fuel line readiness inspection, the team reviewed the licensee's corrective actions identified from the RCA of the BCS event. The NRC verified that appropriate near-term corrective actions were specified for each causal factor with due dates commensurate with the significance of the issue. The team concluded that the licensee determined and implemented near-term corrective actions to address the causal factors identified by the investigation of the BCS incident.

During the UF<sub>6</sub> process readiness inspection, the team made observations of the effectiveness of the implementation of corrective actions. One of the corrective actions reviewed was the implementation of the revised Configuration Management Program which provided a technical basis with sufficient detail for hazards analysis. The team conducted a detailed review of a recent technology review document involving the UF<sub>6</sub> Venting Filter System to ensure it was conducted in accordance with the guidance in procedures NFS-CM-004, "NFS Change Control Process," Revision (Rev.) 7 and NFS-TS-009, "Configuration Management of Process Change," Rev. 2. The team determined that the technical review was completed in accordance with licensee procedures and documented adequate technical basis to allow for a thorough review of the process changes by licensee personnel.

Based upon the team's observations made during the UF<sub>6</sub> process readiness inspection, NFS continues to satisfactorily meet this commitment.

**5. The extent of condition reviews of process area safety basis conducted after the BCS incident will be expanded to include the BPF Uranium-oxide Dissolution Process.**

This item was evaluated in detail during the Navy fuel line inspection by reviewing the revised extent of condition analysis described in NFS Investigation Problem Identification, Resolution, and Correction System (PIRCS) #110389. The NRC had verified that any associated safety assumptions and controls matched the field conditions. Additionally, the NRC had verified the licensee's review of the associated criticality, radiological, chemical and fire safety basis documents (including set points and periodic tests) for the uranium-oxide process. Therefore, NRC concluded that the extent of condition reviews were detailed and adequately evaluated the vulnerabilities of the uranium-oxide system.

Based upon the team's observations made during the UF<sub>6</sub> process readiness inspection, NFS continues to satisfactorily meet this commitment.

**6. An extent of cause analysis for each causal factor will be completed and specific interim corrective actions will be identified and implemented as appropriate.**

The licensee completed an extent of cause analysis for each causal factor identified in their root cause evaluation. The Navy fuel line readiness inspection determined that the extent of cause was applied to all processes. The Navy fuel line readiness inspection made further evaluations of the identified causal factors as they related to the

implementation of NFS-TS-009 and the rigor of Technical Basis documentation. Based upon the team's observations made during the UF<sub>6</sub> process readiness inspections, NFS continues to satisfactorily meet this commitment.

7. **Each facility accident scenario involving nitrogen compound gas (NO<sub>x</sub>) generation will be re-evaluated to ensure appropriate items relied on for safety (IROFS) have been identified and implemented to provide adequate protection and that management measures for those IROFS are sufficient to ensure these IROFS are available and reliable to perform their intended safety function when needed.**

During the previous four process readiness inspections, the NRC performed a review of NO<sub>x</sub> accident scenarios and verified that adequate IROFS and associated management measures were in place to ensure compliance with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 70.61, Performance Requirements. The NRC concluded that the licensee had effectively conducted a review of NO<sub>x</sub> generating scenarios and identified appropriate IROFS with associated management measures.

This item was not applicable to the UF<sub>6</sub> process as there are no NO<sub>x</sub> generating systems.

8. **Following completion of restart actions, NFS will have an independent review conducted to verify implementation of the restart actions. Personnel participating in these reviews will have no responsibility for the conduct or oversight of NFS operations.**

The team reviewed documentation associated with NFS' independent review conducted for the UF<sub>6</sub> process. The team verified that the review was conducted by three technical individuals who did not have responsibility for the conduct or oversight of NFS operations. The three individuals were from B&W Y-12 Oak Ridge, B&W Lynchburg, and Epithermal Services. The documentation summarized six main findings along with a list of 24 detailed findings. The team interviewed NFS staff on the status of the main findings and verified the completion from a sample of the detailed findings. The team concluded that each had either been completed or the item was properly assigned to staff.

The team also reviewed the Operational Readiness Review (ORR) conducted by the licensee. The team determined that the ORR was completed in accordance with procedure NFS-GH-902, "Operational Readiness Review (ORR) Program," Rev. 6. The team reviewed the memo dated April 21, 2011, "ORR Board Confirmation of UF<sub>6</sub> Operations Readiness for NRC Review," and interviewed staff regarding the scheduled completion of pre-start activities. The team verified that the actions left to be completed were activities best done immediately before restart. As part of the ORR review, the team reviewed the Vent and Tap Process Narrative, Final Independent Design Review Response/Closure of UF<sub>6</sub> Vent and Tap, Rev. 2, and the ORR Confirming Reference for Independent Design Review of UF<sub>6</sub> Changes. As part of the ORR, NFS conducted an Independent Design Review of the UF<sub>6</sub> process. Four NFS engineers who were not responsible for the design and implementation of the UF<sub>6</sub> equipment performed the review. The team determined that the Independent Design Review and the sample of ORR reviewed were adequate.

The team also reviewed the Fire Hazard Analysis conducted as part of the UF<sub>6</sub> process review and verified that the new equipment had been added to the Fire Hazard Analysis.

Based upon the team's observations made during the UF<sub>6</sub> process readiness inspections, NFS continues to satisfactorily meet this commitment.

9. **NFS will allow sufficient time for NRC to perform inspections of restart actions. The NRC will be provided with a two-week notice prior to the time NFS management would like for the NRC team to arrive at the NFS site.**

On March 24, 2011, Mr. Henry, President of NFS, issued a letter to Mr. McCree, NRC Region II Administrator, requesting the NRC review of the UF<sub>6</sub> process.

10. **Implement a Senior Engineering Watch (SEW), to provide additional technical coverage on the process floor. The SEW will have the sole duty of providing independent technical oversight of process operations to promote the identification, adjudication and resolution of potential safety concerns. The SEW will functionally report to the Vice President (VP) of Operations. NFS will maintain this watch for a minimum period of six months after restart of all operations.**

During the Navy fuel line inspection, the NRC reviewed the licensee's procedures for implementation of the SEW, which were contained in licensee standing order, NFS-SO-09-006, "Enhanced Operations, Management and Communications," and interviewed the SEWs, operating staff, and management. The team concluded that the licensee had put in place appropriate processes, procedures, and personnel to effectively implement the SEW.

During the UF<sub>6</sub> process inspection, the team reviewed and discussed the standing order for the SEW program, NFS-SO-11-003, "Senior Engineering Watch," effective May 5, 2011, which was the latest Rev. to the SEW Standing Order. The licensee's experience with the SEW role was determined to be successful and therefore NFS was taking steps to establish the SEW as a permanent program. Standing Orders had expanded the technical responsibilities and reporting requirements for the SEW, while continuing to meet the commitment in the CAL.

The team interviewed and observed the activities of two SEW engineers to assess the effectiveness of the SEW program. The SEW engineers were providing oversight in the Navy fuel area as well as BPF and Building 301, and were effectively meeting the expectations for all processing lines. The team observed the SEW engineer having an integral role in communicating issues and process issues from one shift to the next as exemplified in shift turnovers when there was a 301 Column Dissolver process issue the night before. In addition, the Director of Operations indicated that the SEW continued to meet the expectations for the SEW's roles, responsibilities, and authorities. The team confirmed that the licensee had properly implemented the SEW to assess and assist in the identification and communication of potential safety issues.

Based upon the observations made during the UF<sub>6</sub> process readiness inspection, NFS continues to satisfactorily meet this commitment.

11. **Implement an initiative to increase management presence and engagement on the process floor that will better enable open and timely communication of potential safety concerns. This initiative will be structured around a series of daily meetings held by management with processing personnel.**

During the Navy fuel line inspection, the team reviewed the licensee's procedures for implementation of an initiative to increase management presence and engagement on the process floor. This guidance was contained in licensee standing order, NFS-SO-09-006. The team determined that the licensee had put in place appropriate processes, procedures, and personnel to increase management presence and engagement on the process floor to better enable open and timely communication of potential safety concerns.

During the UF<sub>6</sub> process readiness inspection, the team observed daily meetings and shift turnover meetings between management and processing staff for BPF and Building 301. The team determined that the meetings continued to be an effective method of open and timely communication of potential safety concerns.

The team discussed and reviewed the changes to the Management By Walking Around schedule and noted that the licensee continued increased management presence on the floor by a Senior Management Observation (SMO) program, both inside and outside the Material Access Area (MAA), managed by the Human Performance Manager. The team determined that the licensee continued to assess and rate Conduct of Operations attributes. The team also reviewed the logs for the Senior Management team observations and concluded that the increased management presence enabled timely communications and assessment of potential safety concerns. In addition, for the start-up of the UF<sub>6</sub> process, the licensee planned an increased schedule for the SMO for the processing of each cylinder type.

Based upon the team's observations during the UF<sub>6</sub> process readiness inspection, NFS continues to satisfactorily meet this commitment.

12. **Develop updated programmatic guidance to provide specific criteria to invoke Corrective Action Review Board (CARB) review of investigations, corrective actions and effectiveness reviews to help ensure appropriately broad investigations and effective corrective actions.**

This item was comprehensively reviewed during the Navy fuel line readiness inspection. The team concluded that the licensee had put in place appropriate processes, procedures, and personnel to effectively provide criteria to invoke CARB reviews to ensure appropriately broad investigations and effective corrective actions.

Based upon the team's observations during the UF<sub>6</sub> process readiness inspection, NFS continues to satisfactorily meet this commitment.

13. **Revise and implement the procedure that requires processes, process parameters and process inputs be clearly defined prior to implementation. This program is designed to prevent changes such as a change in the composition and physical characteristics of the feed material that may result in abnormal occurrences during processing.**

This item was comprehensively reviewed during the Navy fuel line readiness inspection. That inspection reviewed NFS-CM-004, "Change Control Process," Rev. 3, which addressed increased management oversight in the change process and NFS-TS-009, "Configuration Management of Process Change," which required a technology review for a subset of those changes. NFS-TS-009 stated that all changes either due to new processes or changes to existing processes must be documented by an approved technical basis in accordance with NFS-CM-004.

The team reviewed recent changes to procedure NFS-CM-004, "Change Control Process," Rev. 7, and reviewed facility modifications related to the processing of UF<sub>6</sub>. The team concluded that the licensee effectively implemented the procedure that required process parameters and process inputs be clearly defined prior to implementation.

During the UF<sub>6</sub> process readiness inspection, the team discussed facility changes involving the processing of UF<sub>6</sub> and associated technology reviews. The completed technology reviews for the venting and processing of UF<sub>6</sub> cylinders were evaluated as part of the review of the design basis for this inspection. The team determined that ECRs, Internal Authorized Changes (IACs), and the technology review documents selected for review were prepared in accordance with the newly enhanced process change procedures and contained the appropriate level of detail and documented technical basis to allow for thorough licensee reviews.

Based upon the team's observations made during the UF<sub>6</sub> process readiness inspection, NFS continues to satisfactorily meet this commitment.

**14. Conduct an independent review of NFS' investigation processes. This review will be conducted by a subject matter expert (SME) to establish a plan to implement enhancements necessary to ensure adequate breadth and depth of investigations.**

This item was completed comprehensively during the Navy fuel line inspections. The team concluded that the licensee had put in place appropriate processes, procedures, and personnel to effectively conduct an independent review of their investigation processes and establish a plan to implement enhancements necessary to ensure adequate breadth and depth of investigations.

During the UF<sub>6</sub> process readiness inspection, the team evaluated NFS' response and investigation into the procedural modification error (discussed in section C.1 "Procedures" below). The team concluded that the licensee continued to adequately conduct quality investigations as necessary. Therefore, NFS continues to satisfactorily meet this commitment.

**15. Revise the procedure that provides guidance for preparation of set-point analysis documentation to enhance the basis of evaluation, specifically to provide guidelines for justifying the basis for critical parameters.**

During the Navy fuel line inspection, the team reviewed ENG-EPS-A-003, "Setpoint Verification and Design Parameter Documentation," Rev. 1, dated January 1, 2010, and its preceding 2006 version. NRC concluded that the licensee had put in place the appropriate procedure to provide guidance for setpoint analysis documentation, including a new worksheet for critical parameter documentation.

During the design basis portion of the UF<sub>6</sub> process readiness inspection, the team verified setpoint calculations associated with IROFS for the vent and tap station, sublimation station 1, 2, and 3, the hoke tube station, and the tray dissolver. Selected safety-related equipment (SRE) tests were examined to verify that the IROFS function was being appropriately tested. The team examined various setpoint calculations to ensure the design basis as described in the accident consequence evaluations was constructed in an accurate and logical fashion. The team determined that the set points were being properly developed in accordance with procedure.

Based upon the team's observations, NFS continues to satisfactorily meet this commitment.

## **B. MANAGEMENT ISSUES**

During review of the above items, the team evaluated whether the licensee's assessment and corrective actions adequately addressed the management issues listed in the CAL. Those issues involved the adequacy of NFS' management oversight of facility process changes, perceived production pressures, lack of questioning attitude by workers and management and poor communications. NFS completed a broad set of corrective actions to address the four management issues.

### **1. Management Oversight of Facility Process Changes**

#### Inspection Scope:

The readiness restart assessment teams for the four previous readiness inspections concluded that the process change enhancements provided for adequate management oversight of the change process. NRC determined that these enhancements were effective in addressing the causal factors identified from the licensee's investigation of the BCS event. During the UF<sub>6</sub> process readiness inspection, the team evaluated several modifications to determine if the configuration management program had been properly implemented.

#### Observations:

The team reviewed seven ECRs and related configuration control packages and service requests/work orders to ensure they were developed in accordance with the recent enhancements to the change process. The team verified that the change process enhancements directed at ensuring adequate technical basis reviews were completed and documented with appropriate management oversight and approvals. Based on this review, the team determined that the ECRs were prepared in accordance with approved procedures and the technical basis documentation contained appropriate information to allow a thorough review by licensee personnel.

The team assessed the management oversight of process changes at the facility. The team reviewed the recent technology review documents associated with the new vent and tap station, which is designed to relieve the excess fluorine (and subsequently any excess pressure) in the UF<sub>6</sub> cylinders. No issues of significance were identified.

The team observed a configuration control board (CCB) meeting. The team noted that the CCB met the criteria specified in procedure NFS-CM-005, "NFS Change Control Board," Rev. 4 for board composition, and the CCB members showed adequate technical rigor during the review of proposed facility changes.

Conclusions:

No findings of significance were identified. The process change enhancements developed to improve management oversight of facility change processes continue to be adequately implemented.

**2. Perceived Production Pressures**

Inspection Scope:

The restart readiness assessment teams for the four previous readiness inspections concluded that the licensee had instituted sufficient measures to provide a reasonable assurance that production pressures would be reduced during operations. During the UF<sub>6</sub> process readiness inspection, the team observed management presence during Daily Stand Up meetings on the floor and during operations throughout BPF. The team also observed management and staff at PIRCS screening meetings, Plan of the Day meetings, CARB meetings, and uranium tetrafluoride (UF<sub>4</sub>) status and discussion meetings. The team reviewed the Conduct of Operations procedure, NFS-OPS-001, Rev. 2, and associated procedures to verify the prioritization of safety over production. The team conducted interviews with a selection of licensee staff to evaluate the effectiveness of the initiatives designed to reduce production pressure.

Observations:

The team observed field and management meetings and interactions on the process floor during operation of the Navy fuel line and throughout BPF. The team observed the shift turnover meetings and determined that the appropriate management, SEW, and staff participated in the meetings. The team also noted that the shift turnover meetings were held in accordance with the NFS-OPS-001, "Conduct of Operations," Rev. 2.

The team also independently evaluated the licensee's response to a process issue on May 4, 2011, involving the 301 Column Dissolvers. The issue, entered in the corrective action program (CAP) as P29807, occurred when an operator noticed vapor in the enclosure for the column dissolvers. The team noted that the operator, SEW, and management acted in a conservative manner, stopping the process to assess the issue further. The team attended the PIRCS screening meeting where the issue and immediate actions were discussed. The team noted the licensee staff and management demonstrated conservative decision making by stopping work and questioning the conditions surrounding the operation; alerting and discussing the event with the SEW and management on the floor; elevating the concern to the appropriate levels of operations and engineering management; and reviewing both NFS-OPS-001, "Conduct of Operations," and NFS-EP-001, "Unusual Incident Evaluation Procedure," to ensure appropriate steps were followed, if necessary. An engineering analysis determined that the white vapors were steam generated from overheating of sections of the column dissolvers.



The team noted that as the process was evaluated, safety over production was effectively communicated to, and by, the management staff. The team observed a continued emphasis on safety over production through the licensee's methodical approach to the restart of the previous process lines.

Conclusions:

No findings of significance were identified. The team concluded that the initiatives developed to prevent the perception of placing production over safety were being adequately implemented by the licensee's management team.

**3. Questioning Attitude by Workers and Management**

Inspection Scope:

The previous four restart readiness assessment teams concluded that, in general, the licensee had put in place appropriate processes, procedures, and personnel to effectively address the lack of questioning attitude that was previously prevalent in the organization. This inspection team observed PIRCS screening meetings and BPF shift turnover meetings and evaluated management and operator interaction for evidence of a questioning attitude. The team reviewed a sample of PIRCS items entered into the CAP to determine if questioning attitude was reflected in the items reviewed. The team reviewed the SEW metric which evaluated the questioning attitude of operators and supervisors throughout the month of April.

Observations:

The team observed communications during PIRCS screening meetings. The participants demonstrated a questioning attitude as they discussed whether past corrective actions were effective, questioned whether equipment were designated as IROFS, and identified the relationship of one item to a related, recurring issue.

The team observed communications during routine BPF shift turnover meetings. The operators, supervisor, and attending SEW demonstrated a questioning attitude with regard to identifying vapor in the 301 Column Dissolvers enclosure. Upon noticing the unusual condition, the operators did not hesitate to report to their supervision. The supervisors did not hesitate to shut the equipment down for engineering evaluation. The willingness to shut the equipment down in the face of uncertainty was an example of a safety over production attitude. An engineering analysis determined that the white vapors were steam generated from overheating of sections of the column dissolvers.

The team reviewed PIRCS items entered into the CAP between April 18 and May 5, 2011. The PIRCS reviewed included entries from operators, supervisors, and management and were of varying risk significance. The team noted that multiple PIRCS entries demonstrated an operator questioning attitude, including reports of unusual material condition of equipment and placing equipment in safe standby until an evaluation was conducted.

The team reviewed the SEW feedback metric for April 2011 and noted that "questioning attitude" was routinely evaluated by the SEW observer. In April 2011, a positive questioning attitude was observed by the SEW in multiple instances.

Conclusion:

No findings of significance were identified. The licensee organization exhibited several indications of continued improvement in questioning attitude.

**4. Communications**Inspection Scope:

The previous four restart readiness assessment teams concluded that the licensee had put in place appropriate processes, procedures, and personnel to effectively address the poor communications that were previously present within the organization. This team observed PIRCS screening meetings, Plan of the Day meetings, a Three Week Look Ahead meeting, and BPF shift turnover meetings and evaluated management and operator communication.

Observations:

The team observed communications during PIRCS screening meetings, Plan of the Day meetings, and a Three Week Look Ahead meeting. During the meetings, the team observed an active participation from the participants. The team noted that the relaxed atmosphere of the meetings encouraged participation and that participants did not hesitate to participate.

The team observed communications during routine BPF shift turnover meetings. The BPF shift change meetings demonstrated consistency when information from the third shift was briefed to the first shift and the first shift briefed the second shift. The attending SEW demonstrated positive interaction and communication with the operators and supervisors present at the shift turnover meetings. The meetings demonstrated appropriate depth and detail in the turnover briefings.

During document reviews, the team observed an error in interdepartmental communication. A technical employee had included information on a post-it note (a department practice) that went unnoticed by the intended recipient (who was from a different department). An NRC review of the document demonstrated that the information included on the post-it note was not safety-significant. The NRC interviewed staff and determined that post-it communication between departments was not routine and determined that typical interdepartmental communications occurred in person, on the phone, or through e-mail. The error in the interdepartmental communication was subsequently corrected by the licensee.

Conclusion:

No findings of significance were identified. The team concluded that the licensee was adequately implementing improvements to communications across the organization.

**C. READINESS TO RESTART THE UF<sub>6</sub> PROCESS**

To evaluate whether the issues identified by the NRC in late 2009, which led to the issuance of the CAL, have been sufficiently addressed, the staff further evaluated the UF<sub>6</sub> process in the areas of procedures, maintenance, corrective actions, design basis, and management oversight.

## 1. Procedures

### Inspection Scope:

The team performed a detailed review of seven procedures applicable to the vent and tap station, sublimation stations 1, 2, and 3, the hoke tube station, and the tray dissolver. The team selected a sample of administrative IROFS from the licensee's IROFS lists (IROFS-301-GENERAL, IROFS-301-PROCESS, and IROFS-301-UTILMCA), and verified that those administrative IROFS identified in the Integrated Safety Analysis (ISA) Summary were correctly transcribed into the applicable written operating procedures. The team selected a sample of administrative IROFS in the procedures for the area and walked down the sublimation station 1 with procedure SOP 409, Section 55-301, to verify if those IROFS were in place in the station. The team evaluated the procedures' content with respect to process operating limits, operator responses for upset conditions, safety systems and functions, precautions, and warnings. The team also evaluated procedures with respect to various operational aspects, including startup, temporary operation, normal operations, and shutdown as required by license condition. The team also reviewed the licensee's training plans for the system.

### Observations:

Walkdowns of procedures for the sublimation station 1 and for the packaging system on the process floor verified that appropriate IROFS were in place and the procedures could be performed as written. The team noted no issues with the outstanding procedure changes which the licensee had yet to implement for the inspected process areas. The team verified that limits needed to assure safety for selected controlled parameters were adequately described in the procedures.

During the procedure reviews, the team noted an issue with the annotation of IROFS-related to procedure steps in some procedures. The issue was that IROFS step annotations were inconsistent and sometimes misaligned in the procedure. Based on a review of NFS' training program, the annotation of IROFS-related procedure steps assisted in alerting the operator to have a heightened awareness that the particular procedural step was an administrative or enhanced administrative IROFS. However, the absence of the annotation did not authorize the operator to skip or omit steps from the procedure. Based on this training, the team determined that misplaced or omitted IROFS annotations represented little risk to safe operations.

After being notified of the error in IROFS annotations, the licensee conducted an extent of condition review for all the procedures related to UF<sub>6</sub> processing. During the review, the licensee identified that the tray dissolver procedures had missing procedure steps related to administrative IROFS. The missing procedure steps provided the operator with methods to verify that the criticality safety mass limits for the tray dissolvers were being maintained. As written, the procedure required the operator to ensure that the mass limits were maintained when placing containers into the enclosure. However, the procedure did not specify the method for performing the mass verifications. The team concluded that the operator, by procedure, was required to stop and question the supervisor regarding what methods to use to verify that the mass limits were maintained. The procedure had not been implemented and mass limits had not been exceeded. Therefore, the improper modification of the procedure was a violation of minor significance and is not subject to formal enforcement action.

Upon identification of the deficiency, the licensee performed an apparent cause investigation (#112964) on the above missing procedure steps issue. The investigation identified several corrective actions to ensure modifications of procedures were performed more thoroughly. The corrective actions included adding specific guidance for when IROFS flow-down verifications are required to be performed for a procedure modification. The corrective actions also included performing a toolbox training session for engineering groups to emphasize the importance of verifying the adequacy of IROFS steps. In addition, the investigation assigned two additional extent of condition reviews.

The first extent of condition review was to identify other occurrences of improper characterization of procedure modifications as “administrative,” which occurred in this case. Characterizing the change as “administrative” indicated to reviewers that the modification should have no impact on the procedure and was only to address minor typos. The quality of the reviews was not impacted by the characterization of the modification. NFS reviewed 216 administrative ECRs (the entire population) and identified six ECRs that were improperly characterized as “administrative.” NFS’ review of the mischaracterizations concluded that there was no safety significance as a result. The team reviewed the six ECRs and determined that the mischaracterization of the ECRs did not impact the safety reviews conducted. The mischaracterized ECRs contained extensive changes to procedures which inherently triggered thorough reviews by the safety disciplines. The licensee identified that all six ECRs were approved by the same configuration management specialist. The configuration management specialist has since been retrained on the requirements for characterizing an ECR as “administrative.”

The second extent of condition review was to verify IROFS steps and annotations for all operating procedures in the plant that contained IROFS. The review identified 34 instances of improper annotation of IROFS steps and identified zero instances of missing IROFS steps. As stated previously, the improper annotation of IROFS steps was determined to be of minor safety significance. The team determined that the licensee adequately identified, investigated, and responded to the deficiencies in the operating procedures.

The team reviewed training documentation including the “Building 301 Vent and Tap Station” lesson plan and the respective exams. The training plan was comprised of classroom training and process walk downs. The team verified that the lesson plan addressed administrative IROFS and that key knowledge of safety and operation were tested in the exam. The team also reviewed the ‘Building 301 Sublimation, Heel Removal, UO<sub>2</sub>F<sub>2</sub> Transfer and UF<sub>6</sub> Off-gas/ Trap System Training’ lesson plan and identified no issues of significance. The team reviewed “The 300 complex/ Building 440 Operational Areas Familiarization Training” to verify that training on the Commercial UF<sub>6</sub> process and associated hazards had been included for maintenance personnel and not limited to operators responsible for operating the line. The team determined that the training plans adequately included a discussion of the hazards associated with hydrofluoric (HF) acid and the personnel protective equipment associated with handling HF.

The team interviewed the training manager and the trainer specializing in the new Vent and Tap station. The team determined that the operator training of the UF<sub>6</sub> process was consistent with the licensee process for training for a new system. The operator training for the process had not been conducted at the time of the NRC inspection as the

licensee's intent was to minimize the time span between training and operation. The team determined through the review of documents and trainer interviews that the training program for the Commercial Development Line was adequate.

Conclusions:

No findings of significance were identified. The operating procedures for the UF<sub>6</sub> process adequately support safe operations.

**2. Maintenance/Modifications**

Inspection Scope:

The team reviewed maintenance activities and other modifications completed on the UF<sub>6</sub> sublimation stations, tray dissolvers, and UF<sub>6</sub> vent and tap station. The team reviewed a selection of completed service/work requests to evaluate the status of tracking, documentation, and management of maintenance activities in support of process startups. The team reviewed post-maintenance and post-modification testing documentation to verify that testing of SRE had been adequately completed following maintenance work on the affected system or equipment.

The team interviewed maintenance personnel to assess the maintenance organization's ability to accommodate the additional workload that would result from the startup of the processes.

The team examined technology review documents associated with the UF<sub>6</sub> process to verify that the technical reviews were rigorous and met the requirements outlined in the licensee's configuration management procedures.

Observations:

The team reviewed the licensee's implementation of the work management program for service/work requests applicable to the UF<sub>6</sub> process. The team noted that the licensee adequately identified work requests required for the startup and completed the required work prior to the inspection. The team interviewed engineers and safety reviewers and noted improved communications. The team observed that safety reviewers demonstrated good understanding of the changes they were approving.

The team reviewed seven ECRs and related configuration control packages and service requests/work orders associated with the UF<sub>6</sub> process. The team verified that the service/work requests were properly categorized in accordance with the licensee's standard operating procedure (SOP) governing work requests. The team also verified that the service/work requests contained the necessary work group reviews and approvals, and that SRE requiring a functional test following completion of the work was appropriately identified in the work request. The team verified applicable field work had been completed and that the functional tests were completed satisfactorily. The team performed a walkdown of the UF<sub>6</sub> processes and determined that calibration tags were in place and current.

The team verified that safety and regulatory reviews of ECRs were conducted in accordance with approved procedures. The team determined that the bases for the

licensee's conclusions were adequately supported by the documentation. Based on the reviewed ECRs, work requests, and interviews, the team determined that the implementation of the ISA Screening Guidelines had been an effective tool to help ISA reviewers understand the scope of changes and determine when a detailed review was necessary. The team did not identify any issue where a change was approved and implemented without the appropriate reviews.

The team reviewed maintenance backlog information, maintenance staffing levels, and the implementation of the licensee's new work control program. The review was conducted to determine if the maintenance organization could successfully support an increased workload following the startup of the UF<sub>6</sub> process. The team interviewed maintenance managers and maintenance supervisors during the inspection. The team verified that the backlog of maintenance work was being tracked by the licensee as part of their maintenance performance metrics. The team noted that the backlog of maintenance activities for the plant had begun to increase beyond the normal two week period. However, the licensee was in the process of hiring additional planners to ensure the backlog remained under control.

The team reviewed a technology review document related to the UF<sub>6</sub> venting filter system. The technology review was performed to evaluate and select the appropriate construction materials that were compatible with the expected chemicals. The team determined the technology review document met the requirements for a detailed technical basis review of changes to existing processes as defined in NFS-TS-009, "Configuration Management of Process Change," Rev. 2. The team noted that the technology reviews properly identified the risks associated with the proposed material changes. The team verified that the risks identified were assigned appropriate prevention and mitigation requirements in the technology review document. The team verified that the technology review package contained adequate supporting documentation, including the vendor's material compatibility charts, needed to support their conclusion. The team verified that design requirements and process limits were incorporated in safety analysis and operating procedures. The team did not identify any issues with the detailed technology review.

#### Conclusions:

No findings of significance were identified. The licensee adequately managed the maintenance and modification programs to support safe startup of the UF<sub>6</sub> process.

### **3. Corrective Action Program**

#### Inspection Scope:

The team evaluated the licensee's CAP to ensure that outstanding items were being adequately prioritized, assessed and addressed. The team also evaluated the current backlog of corrective action items against the historical trend to identify potential deficiencies in resource loading and verify the licensee's ability to support the restart of an additional process line. It should be noted that the more thorough inspection of the licensee's CAP occurred in February, 2011, with the NRC conducting a Problem Identification and Resolution inspection. The scope of this readiness restart inspection was limited to 1) those corrective action items that directly involved the UF<sub>6</sub> process, 2)

the prioritization and resolution of any existing safety issue, and 3) the status of the backlog of corrective action items that may indicate a resource limitation to continue to operate an effective CAP.

The team observed several PIRCS screening meetings and one CARB meeting, and reviewed the CAP department procedures. The team reviewed 27 corrective action items and nine investigations in the PIRCS database related to the UF<sub>6</sub> process startup. The team also attended meetings and reviewed engineering troubleshooting documentation regarding ongoing process difficulties involving processing runs of UF<sub>4</sub> in the Building 301 Column Dissolvers. Additionally, the team discussed the staffing and resource allocation for the CAP department as well as licensee management and staff responsible for corrective actions.

#### Observations:

The team reviewed 27 corrective action items and nine investigations in the PIRCS database related to the UF<sub>6</sub> process startup and verified that there were no safety significant outstanding corrective actions for those areas. The team noted one corrective action item, C10841, was still "in progress" and not complete. All others reviewed were complete, closed, and, if required, closed by a CARB review. The one incomplete corrective action item addressed the lesson plans to train employees on the hazards of strong oxidizers as well as the potential expected and unexpected conditions in the area. The team noted that this action item was scheduled to be complete and the training conducted prior to the restart of operations in the area; the team acknowledged training well in advance of restart would not be prudent. The team assessed that no outstanding significant issues were identified in this review that would impact the safe restart of the UF<sub>6</sub> process.

The team attended and observed the PIRCS screening meetings and a CARB meeting while onsite. The team assessed the implementation of these meetings and noted there was an increase in the scope of items discussed in the PIRCS screening meeting. In addition, formal discussions were noted for the extension of due dates for corrective actions in the CARB. The recent changes in the licensee's CAP procedures required a CARB approval commensurate with the safety significance and/or priority of an item for certain extensions to corrective action items. The team confirmed the licensee's approval of extensions was in accordance with the approval process and CAP procedures. The team determined that the CARB showed an adequate questioning attitude and discussion of issues when reviewing prioritization of corrective actions and investigations. In addition, the team determined that the CARB was focused on ensuring that extent of condition and extent of cause investigations were performed when warranted.

The team reviewed the licensee's metrics for the CAP program and discussed the backlog of overdue corrective actions with licensee management. The team noted that the backlog of overdue "high" and "very high" priority corrective action items had decreased significantly since the streamlining effort began in early November 2010, but the remaining backlog remained fairly consistent. To assess the significance of the overdue corrective actions, the team independently evaluated a sample of approximately 30 overdue corrective actions to ascertain 1) if each was prioritized with an appropriate due date for completion, and 2) if there were any latent safety issues that were not actively being addressed and corrected. The team determined that the overdue items

did not present a potentially safety significant issue. The team's evaluation of the data concluded that there was no existing outstanding safety related issue that had been left unaddressed.

The team also attended meetings and reviewed engineering troubleshooting documentation regarding an ongoing processing issue with runs of UF<sub>4</sub> in the Building 301 Column Dissolvers. An "Engineering Troubleshooting Evaluation" for the UF<sub>4</sub> processing issues was initiated by the licensee's Engineering department in March 2011 in addition to the investigations related to these issues. The team reviewed the troubleshooting guidance, ENG-HTG-041, the Why Tree Evaluation, the summary of findings, and the recommended corrective actions. The team also attended a senior management meeting where these results and the related prioritization of actions were discussed. The team assessed the extensiveness of this evaluation and determined that it was adequate and that the licensee was responding to the processing difficulties adequately.

#### Conclusions:

No findings of significance were identified. The CAP and the corrective action item backlog were adequately managed to ensure that safety issues were addressed in a timely manner. Although a consistent backlog of corrective action items remained, outstanding items were prioritized with an appropriate due date for completion. In addition, no issues were identified that would impact the safe start up of the UF<sub>6</sub> process.

#### **4. Design Basis**

##### Inspection Scope:

The team performed a review of the facility's ISA with a particular focus on the UF<sub>6</sub> process. As part of this review, the team selected several accident sequences to verify that the worst case consequence had been determined. In addition, the team evaluated if adequate IROFS had been designated as a result of the accident sequence evaluation. The team examined various IROFS to verify that adequate and appropriate management measures were implemented to ensure the IROFS could perform their intended safety function when needed. The team also performed walkdowns in the field to verify the presence of the IROFS. Selected SRE tests were examined to verify that the IROFS' safety function was being appropriately tested. Finally, the team examined various setpoint calculations to ensure the design basis as described in the accident consequence evaluation was constructed in an accurate and logical manner.

##### Observations:

The team reviewed multiple setpoint analyses performed by the licensee related to the UF<sub>6</sub> process to determine if the licensee had adequately implemented ENG-EPS-A-003, "Engineering Practice and Standards, Setpoint Verification and Design Parameter Documentation," Rev. 2. The team determined that the Engineering Practices and Standards document was being implemented properly and the setpoint analyses reviewed were performed with the appropriate level of rigor based on the complexity of



the processes. The IROFS evaluated consisted of overflows, temperature setpoints, pressure switches, flow rate setpoint for sodium fluoride (NaF) traps, and backflow preventers. No significant issues were identified.

The team reviewed the assumptions and initial conditions related to multiple IROFS and associated management measures in the UF<sub>6</sub> process and other equipment in Building 301. The team determined that the licensee made conservative assumptions to assure their availability and reliability. Also, the reviewed management measures, including functional tests, were determined to adequately test the safety function of the IROFS to ensure availability and reliability. No significant issues were identified.

The team performed multiple plant tours to develop potential accident scenarios. The team determined that the licensee had adequately addressed all the potential accident scenarios identified by the team.

The team reviewed the process ventilation associated with the UF<sub>6</sub> process. The team interviewed the engineer regarding the operation of the process ventilation system and determined that the system was consistent with the ISA Summary description. The team discussed maintenance changes proposed to the equipment and concluded that no major changes were planned. The team verified that a sample of process drawings were consistent with the equipment configuration for the associated scrubbers. The team verified the location of overflow valves, passive IROFS on the scrubber system, and determined that they were free of obstruction, properly tagged, and consistently located on the process drawings.

The team noted that prior to the scrubber system, the process off-gas from the UF<sub>6</sub> process is vented through alumina and NaF traps which remove fluorine and HF from the process gas. The process gas is also vented through ultra low particulate air filters prior the scrubber. The team walked down the UF<sub>6</sub> process equipment and verified that the associated process ventilation was routed through particulate filters, chemical traps, and the scrubber prior to release through the airborne effluent stack.

The team reviewed the room air exhaust ventilation in the Building 301. The team walked down the room ventilation system with the process engineer and noted that the ventilation utilized particulate filters. The team verified that the process glove boxes and process off-gas lines isolated air potentially contaminated with UF<sub>6</sub> or other chemicals from the building atmosphere. The team determined that the 301 room air exhaust ventilation system was adequate.

The team reviewed the vent and tap station with the process engineers and discussed the applicability of the various types of UF<sub>6</sub> cylinders. The team noted that engineering reviews for the UF<sub>6</sub> cylinder models 1S and 2S processing (venting and tapping) had been completed and approved. The team discussed the logistics of tapping the UF<sub>6</sub> cylinder models 1S and 2S, of maintaining a seal on the tapped cylinder, and of safely transporting the cylinders to the sublimation station. The team determined that NFS' processes were adequate. The licensee had completed the reviews and approval for the venting of UF<sub>6</sub> cylinder models 5A and 5B in which the cylinder valve passed the associated pressure test. In the case that the cylinder valve on a UF<sub>6</sub> cylinder model 5A or 5B was blocked or damaged, the licensee planned to move the cylinder to storage

until an engineering and safety evaluation is completed. The team determined that the Vent and Tap station, regarding the UF<sub>6</sub> cylinder models 1S and 2S and UF<sub>6</sub> cylinder models 5A and 5B with a clear cylinder valve, was adequate.

The team determined that the QA Project Plan and associated calibration, test gas certification, material certificates, and acceptance testing performed by Integrated Environmental Services demonstrated a high level of engineering competence. The team reviewed the passivation test report for components containing fluorine products. Materials of construction were verified to be in accordance with industry literature for compatibility with the various process chemicals and solutions. The team noted that the reviews were rigorous in identification of the proposed material selections. The team verified that the review package contained adequate supporting documentation, including the vendor's material compatibility charts needed to support their conclusion.

The team performed walkdowns of procedures for the vent and tap and sublimation process and verified that appropriate IROFS were in place and the procedures could be performed as written. Procedure revisions adequately addressed issues that had been identified by the operations' staff. The team verified that limits needed to assure safety for selected controlled parameters were adequately described in the procedures.

In January 2010, NRC staff, in response to Event Notification 45642, performed an evaluation of the consequences due to a release of UF<sub>6</sub> from the rupture of cylinders. At that time, staff determined that if all the cylinders were to release their entire contents, the concentration of HF, F<sub>2</sub>, or UF<sub>6</sub> at the fence (exposure to a member of the public) would not exceed the 60 minute Acute Exposure Guideline Level (AEGL)-1 concentration. The AEGL-1 concentration could result in discomfort and irritation, but would not represent a significant health effect for the individual. It would not impair the person's ability to take protective action, and would subside as soon as the person moved away.

During the UF<sub>6</sub> process inspection, the team verified that the licensee's independent calculations used realistic and conservative input data for the modeling software, and confirmed the licensee's results were adequate. The team examined the licensee's calculations of consequences due to a release of UF<sub>6</sub> from the largest cylinder (size 5A). NRC chemical engineering staff also performed an independent conservative calculation of the same potential accident. The team found the consequence to be negligible at the fence line of the facility.

The team reviewed the updated text in the site Emergency Plan, Rev. 15, dated February 2011, and concluded that the anticipated low levels of HF from any release did not require any additional protective action recommendations.

#### Conclusions:

No findings of significance were identified. The licensee adequately identified and implemented IROFS for the UF<sub>6</sub> process.

## 5. Management Oversight

### Inspection Scope:

The team assessed the effectiveness of programs to increase management presence on the floor and validate effective management oversight. The SMO and SEW programs assisted in monitoring activities throughout the facility. The SMO program, an expanded version of what was once called “Management By Walking Around,” was instituted to observe and collect pertinent data while scheduled senior managers walked down process areas. There are two schedules for these observations, one for inside the MAA and one for outside the MAA. The SEW was created as a result of the CAL to provide additional technical coverage on the floor and have the sole duty of providing independent technical oversight of process operations to promote the identification, adjudication and resolution of potential safety concerns.

The team reviewed the Conduct of Operations Procedure, NFS-OPS-001, Rev. 2, and the new Comprehensive Assessment Program procedure, NFS-GH-945, Rev. 2, which provided guidance and criteria for the SMO program as well as the observation scores. The SMO specifically scored the following Conduct of Business Attributes while observing operations: Personal Accountability, Procedure Compliance, Technical Inquisitiveness, and Willingness to Stop as well as communication in the area. The SMO’s observations were collected and used in the periodic human performance assessment metrics. The team noted that these metrics are reviewed monthly by the Senior Management team. The team also reviewed the specific feedback and the schedules for the managers on the floor for the last three months.

The team reviewed the SEW guidance contained in the standing order NFS-SO-11-003, “Senior Engineering Watch,” to evaluate the guidance provided to the SEW on roles and responsibilities. The team interviewed and observed members of the SEW during their daily routine and reviewed SMO and SEW log entries for the past three months to determine if they were adequately monitoring activities during their shift. The team noted the SEW also observed and rated the Conduct of Business attributes. The team discussed the SEW turnover briefings with both the Director of Operations and Director of Engineering to verify that appropriate issues encountered during the shift were brought to management’s attention. In addition, the team verified the SEWs continue to spend 80% or more of their time on the floor. The team reviewed the staffing and workload of the SEW position to verify that, with the restart of the UF<sub>6</sub> process, the SEW would be able to provide the level of technical oversight expected by management. The team also observed management presence on the floor during Daily Stand Up meetings, operations throughout the downblending operations, and during Senior Management walk arounds.

### Observations:

The team noted that in lieu of the Management Readiness Assessment (MRA) Board Waypoint Evaluation, as was conducted for previous restart assessments, the licensee conducted an ORR and an assessment of the results for the SEW, SMO, event management, and PIRCS metrics. This ORR also had a Joint Test Group to test and accept operations on a replicate vent and tap station using pure fluorine gas. This process provided a more in depth review and analysis of the vent and tap station, since this portion of the process was new.

The team reviewed NFS-SO-11-003, "Senior Engineering Watch," and verified by personnel interviews that the guidance provided to the SEW with respect to their roles and responsibilities and procedural compliance issues was well understood by both operations supervision and the SEWs. The team observed and interviewed members of the SEW staff during the inspection and observed them during their shift routines. During the interviews, the SEWs demonstrated adequate knowledge of the operational status and the SRE of the processing operations they are tasked to oversee. The SEWs were aware of PIRCS issues and process issues that arose during their shift and during the previous shift and attended turnover meetings in FMF and BPF to facilitate communication of such issues.

The team reviewed a sample of SEW log entries for a three month period and noted the entries contained pertinent observations and information on safety and operational issues in the facility. The team interviewed the Director of Operations and discussed the current and future role of the SEW as a permanent position. The team also reviewed and discussed the new Standing Order with both the Director of Operations and the Director of Engineering and noted that when issues arose during the shift that required management attention, they were properly communicated during the turnover to senior management. The team also reviewed the staffing level of the SEW and concluded it was appropriate, would provide flexibility for the SEWs, and would ensure an even distribution of weekend duties. The team noted no significant issues with regard to SEW staffing.

The team discussed and reviewed the changes to the Management By Walking Around schedule, noting the Senior Managers no longer have this schedule, but instead have a SMO schedule to assess and rate the aforementioned Conduct of Operations attributes. The team noted that Senior Managers were scheduled for observations lasting two to three hours in duration, a total of six times a week, with two scheduled each shift during the week (two first shift, two second shift, and two third shift slots). The team also reviewed the logs for the Senior Management team walk arounds and concluded that the increased management presence enabled timely communications and assessment of potential safety concerns. In addition, the team noted the licensee planned a specific increased oversight schedule for the initial start-up of UF<sub>6</sub> operations, to be continued for no less than one week for each type of UF<sub>6</sub> cylinder processed.

#### Conclusions:

No findings of significance were identified. The SMO program and SEW position provided adequate oversight and safety focus to the Navy Fuel line, BPF uranium-metal/oxide process line, the uranium-aluminum process line, and the ammonium diuranate process and other equipment in building 301. The licensee continued to ensure SEW and management presence on the floor would be maintained at a level adequate to handle the additional workload associated with the start up of the UF<sub>6</sub> process.

**D. 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 at a public meeting conducted on August 16, 2011, in Erwin, Tennessee. The plant staff acknowledged the findings presented

## SUPPLEMENTAL INFORMATION

### 1. KEY POINTS OF CONTACT

#### Licensee

J. Henry, President, Nuclear Fuel Services  
E. Athon, Director Applied Technology/Principle Scientist  
R. Dailey, Director, Engineering  
M. Elliott, Director, Quality, Safety, and Safeguards  
C. Reed, Director of Operations  
M. McKinnon, Director of Operations  
J. Nagy, Chief Nuclear Safety Officer  
J. Wheeler, Licensing and ISA Manager

### 2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

#### Discussed

None

### 3. LIST OF DOCUMENTS REVIEWED

#### Procedures

NFS-GH-918, "Directed Investigation Program," Rev. 7  
NFS-GH-922, "NFS Problem Identification, Resolution, and Correction System," Rev. 9  
NFS-GH-945, "Comprehensive Assessment Program," Rev. 2  
NFS-OPS-001, "Conduct of Operations," Rev. 2  
NFS-CM-004, "NFS Change Control Process", Rev. 7  
NFS-CM-005, "NFS Change Control Board", Rev. 4  
NFS-GH-901, "Configuration Management Program", Rev. 15  
NFS-GH-902, "Operational Readiness Review Program", Rev. 6  
NFS-HS-CL-28, "Nuclear Criticality Safety for the CDL Facility", Rev. 1  
NFS-HS-CL-28-02, Nuclear Criticality Safety CDL Sublimation Station #3 and Heel Removal Station, Rev. 4  
NFS-TS-009, "Configuration Management of Process Change", Rev. 2  
NFS-WM-001, Section 1, "Service Procedure Request", Rev. 2  
RS-409-72A-301, "301 Vent and Tap Station", Rev. 1  
RS-409-72B-301, "301 Vent and Tap Station", Rev. 1  
RS-409-72C-301, "301 Vent and Tap Station", Rev. 1  
RS-409-72D-301, "301 Vent and Tap Station", Rev. 1  
RS-409-55B-301, "UF<sub>6</sub> Sublimation Station 2, Runsheet 55B," Rev. 11  
RS-409-58B-301, "Trap Media Change-Out, Runsheet 58B," Rev. 1  
RS-409-52A-301, "Tray Dissolver Process, Runsheet 52A," Rev. 4  
SOP 409, Section 52-301, "Tray Dissolver and Filtration", Rev. 5  
SOP 409, Section 56, "UF<sub>6</sub> Sublimation Station 3", Rev. 10  
SOP 409, Section 70A, "301 Vent and Tap Station Cleanout", Rev. 0  
SOP 409, Section 72, "301 Vent and Tap Station", Rev. 0  
WI-409-72A-301, Vent and Tap Station Work Instructions for Non 5A/5B Cylinders, Rev. 0  
WI-409-72B-301, Vent and Tap Station Work Instructions for 5A/5B Cylinders, Rev. 0

**Miscellaneous Documents**

Fluorine Passivation, Component and Assemblies Passivation, January 4, 2011, Rev. 2  
 Fluorine Pressure Estimation in UF<sub>6</sub> Cylinders; Rev. 8; August 5, 2010  
 Chlorine Trifluoride in Uranium Hexafluoride Cylinders, Rev. 2, September 22, 2010  
 Uranium Accumulation on Filters-1V01, -1V02, -1V03, Rev. 0, September 29, 2010  
 Vent and Tap Process Narrative  
 Final Independent Design Review (IDR) Response/ Closure of UF<sub>6</sub> Vent and Tap, Rev. 2  
 ORR Confirming Reference for Independent Design Review (IDR) of UF<sub>6</sub> Changes  
 "Independent Review Team Activities," dated April 4-7, 2011  
 UF<sub>6</sub> Restart Independent Review Action Items  
 Building 301 Vent and Tap Station lesson plan  
 Building 301 Sublimation, Heel Removal, UO<sub>2</sub>F<sub>2</sub> Transfer and UF<sub>6</sub> Off-gas/ Trap System  
 Training lesson plan  
 The 300 complex/ Building 440 Operational Areas Familiarization Training  
 NFS-SO-11-003, "Senior Engineering Watch"  
 301 Utilities and MC&A, and BLDG 301 General Items Relied on for Safety and Safety Related  
 Catalog #01001: Alumina Particles: DRYsphere by Dynamic Adsorbents, Inc.  
 Design Review comments for UF<sub>6</sub> Sublimation Changes  
 Equipment Non-Criticality IROFS", Rev. 3  
 ISA-CF-301-FACILITY, "Control Flowdown and Field Verification For Bldg 301 Process, Bldg  
 NFS-TS-009: Technology Review of ECR 20101745  
 NFS-TS-009: Technology Review of UF<sub>6</sub> Venting Filter System  
 TB-20101692-03: Operation of the CDL Vent and Tap Enclosure  
 TB-20101745-01: Revision to SOP 409, Section 55 and 56 to address SSRC and Independent  
 TB-20102398: Raise Set point of TISHH-1X03  
 TB-20102562: Modification of Density Measurement of UF<sub>6</sub> Sublimation Stations 1, 2, 3  
 TB-20110121: Removing Nitric Acid from Tray Dissolver, Limiting Chemical Inputs  
 TB-20110192: Assembly of SRE Testing Rig  
 TB-20110541: Argon Flow Indicator Replacement  
 21T-10-0875, "IROFS-301-UTILMCA," Rev. 7, February 16, 2011  
 21T-11-0128, "CDL Vent and Tap ISA Risk Assessment," March 2011  
 21T-11-0165, "IROFS-310-GENERAL," Rev. 10, March 10, 2011  
 21T-11-0263, "IROFS-301-PROCESS," Rev. 16, April 6, 2011  
 21T-11-0843, "Fire Hazard Analysis in Building 301," Rev. 2, November 12, 2010  
 54T-11-0004, "Control Flowdown and Field Verification for CDL Vent and Tap Station Rev. 0 of  
 NCSE January 2011," Rev. 0, Performed February 2011  
 54T-10-0036, "NCSE for CDL Vent and Tap Station," Rev. 0, January 2011  
 54T-08-0050, "NCSE for Hoke Tube Processing," Rev. 0, May 2009  
 54T-10-0037, "NCSE for Sublimation Stations 1 and 2 and the Cylinder Tests and Overpack  
 Station," Rev. 5, February 2011  
 54T-10-0038, "NCSE for Sublimation Station 3, the Heel Removal Station, and the NaF/Alumina  
 Traps," Rev. 5, February 10, 2011  
 54T-09-0057, "NCSE for CDL Tray Dissolution System," Rev. 1, July 2009

**Enterprise Change Requests**

20110199, 20110426, 20101918, 20101627, 20101692-03, 20101745, 20110121

**Formal Work Package and Work Requests**

150779, 152452, 134317, 140156

**Corrective Action Reports**

C10837, 10838, 10839, 10840, 10841, 10842, 10843, 10844, 10845, 10846, 10849, 10870, 10871, 10977, 10979, 11852, 14472, 11355, 11358, 13840, 11565, 11596, 12033, 14472, 14682, 14686, 14839

I12950, 12525, 12524, 12478, 12133, 11362, 11289, 10233, 9573, 12749

P29807, 28429, 29834, 28818, 28664, 28533, 22021

**Safety Related Equipment Functional Tests**

N301XINPIPE1A02  
N301XINPIPE1A04  
N301XXOUTERPIPE  
N301XXXXDI1D01

**Process and Instrumentation Drawings Reviewed**

301-F0260-D, Room Air Exhaust Ventilation  
301-F0257-D, Main Scrubber, Scrubber SM01  
301-F0256-D, NOx Pre-scrubber System, Stages 2 and 3

**IROFS and Setpoint Calculations**

CDG – 01, 02, 03, 07, 08, 10, 11, 12, 13, 14, 17, 23, 28, 30, 31, 32, 33, 34, 35, 37, 40, 41, 42, 44  
CDL – 04/05.035, 06.035  
CDLSR – 03, 05, 06, 07  
CDLSR.007  
CDHT – 06, 07, 09, 10  
CDPS – 01, 02  
CDPV – 08, 09, 10, 11, 15, 18, 19, 20, 21, 22, 23, 27, 33, 34, 35, 44, 47, 48, 49, 50, 51, 52  
CDS1 – 24, 25, 26, 27, 28, 29, 30, 31, 38, 39, 40, 41  
CDS3 – 08, 09, 16, 17, 18, 19, 20, 24, 25, 26, 27, 28, 29, 30  
CDTD – 07, 08, 09, 10, 11, 14, 16, 21, 23, 24  
CDVT – 01, 02, 06, 08, 11, 12, 14, 16, 18, 19, 20, 21  
FIRE – 02, 28

**4. LIST OF ACRONYMS**

AEGL	Acute Exposure Guideline Level
AIT	Augmented Inspection Team
BCS	Bowl Cleaning Station
BLEU	Blended Low Enriched Uranium
BPF	BLEU Preparation Facility
CAL	Confirmatory Action Letter
CAP	Corrective Action Program
CARB	Corrective Action Review Board
CCB	Configuration Control Board
CFR	<i>Code of Federal Regulations</i>
DFFI	Division of Fuel Facility Inspection
ECR	Enterprise Change Request
HF	Hydrofluoric Acid



IAC	Internal Authorized Change
IROFS	Items Relied On For Safety
ISA	Integrated Safety Analysis
MAA	Material Access Area
MRA	Management Readiness Assessment
NaF	Sodium Fluoride
NFS	Nuclear Fuel Services
NO <sub>x</sub>	Nitrogen Compound Gas
NRC	Nuclear Regulatory Commission
ORR	Operational Readiness Review
PIRCS	Problem Identification, Resolution, and Correction System
RCA	Root Cause Analysis
Rev.	Revision
SEW	Senior Engineering Watch
SME	Subject Matter Expert
SMO	Senior Management Observation
SOP	Standard Operating Procedure
SRE	Safety Related Equipment
UF <sub>4</sub>	Uranium Tetrafluoride
UF <sub>6</sub>	Uranium Hexafluoride
UO <sub>2</sub> F <sub>2</sub>	Uranyl Fluoride
VP	Vice President