

January 10, 2011

Mr. David J. Precht, Plant Manager  
Westinghouse Electric Company  
Commercial Nuclear Fuel Division  
P.O. Drawer R  
Columbia, SC 29250

SUBJECT: INSPECTION REPORT NO. 70-1151/2010-204

Dear Mr. Precht:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine and announced criticality safety inspection at your facility in Columbia, South Carolina, from December 13-17, 2010. The purpose of the inspection was to determine whether activities involving licensed material were conducted safely and in accordance with NRC requirements. Observations and findings were discussed with your staff throughout the inspection and during an exit meeting held on December 17, 2010.

The inspection, which is described in the enclosure, focused on the most hazardous activities and plant conditions; the most important controls relied on for safety and their analytical basis; and the principal management measures for ensuring controls are available and reliable to perform their functions relied on for safety. The inspection consisted of analytical basis review, selective review of related procedures and records, examinations of relevant nuclear criticality safety (NCS)-related equipment, interviews with NCS engineers and plant personnel, and facility walkdowns to observe plant conditions and activities related to safety basis assumptions and related NCS controls.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be made publicly available in the public electronic reading room of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/ADAMS.html>.

If you have any questions concerning this report, please contact Dennis Morey, of my staff, at 301-492-3112 or via email to [dennis.morey@nrc.gov](mailto:dennis.morey@nrc.gov).

Sincerely,

**/RA/**

Patricia Silva, Chief  
Technical Support Branch  
Special Projects and Technical  
Support Directorate  
Division of Fuel Cycle Safety  
and Safeguards,  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 70-1151  
License No. SNM-1107

Enclosures: Inspection Report 70-1151/2010-204

cc w/enclosures:  
Mr. Marc Rosser  
Westinghouse Electric Company

cc w/o enclosures:  
Aaron A. Gantt, Chief  
Bureau of Radiological Health  
South Carolina Department of Health  
and Environmental Control

If you have any questions concerning this report, please contact Dennis Morey, of my staff, at 301-492-3112 or via email to [dennis.morey@nrc.gov](mailto:dennis.morey@nrc.gov).

Sincerely,

**/RA/**

Patricia Silva, Chief  
Technical Support Branch  
Special Projects and Technical  
Support Directorate  
Division of Fuel Cycle Safety  
and Safeguards,  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 70-1151  
License No. SNM-1107

Enclosures: Inspection Report 70-1151/2010-204

cc w/enclosures:  
Mr. Marc Rosser  
Westinghouse Electric Company

cc w/o enclosures:  
Aaron A. Gantt, Chief  
Bureau of Radiological Health  
South Carolina Department of Health  
and Environmental Control

**DISTRIBUTION:**

FCSS r/f                      JCalle, RII                      CRyder, FMB                      KMcCallie, RII  
RGibson, RII

**ML103620694**

<i>INDICATE IN BOX: "E"=COPY W/ATT/ENCL; "C"=COPY W/O ATT/ENCL; "N"=NO COPY</i>				
<b>OFFICE</b>	FCSS/TSB	FCSS/TSB	FCSS/TSB	FCSS/TSB
<b>NAME</b>	DMorey	ASotomayor-Rivera	PJenifer	PSilva
<b>DATE</b>	1/3/11	1/3/11	1/4/11	1/10/11

**OFFICIAL RECORD COPY**

**U. S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS**

Docket No.: 70-1151

License No.: SNM-1107

Report No.: 70-1151/2010-204

Licensee: Westinghouse Electric Company

Location: Columbia, South Carolina

Inspection Dates: December 13-17, 2010

Inspectors: Dennis Morey, Senior Criticality Safety Inspector  
Alexis Sotomayor-Rivera, Criticality Safety Inspector

Approved by: Patricia Silva, Chief  
Technical Support Branch  
Special Projects and Technical  
Support Directorate  
Division of Fuel Cycle Safety  
and Safeguards,  
Office of Nuclear Material Safety  
and Safeguards

Enclosure

## EXECUTIVE SUMMARY

### Westinghouse Electric Company NRC Inspection Report 70-1151/2010-204

#### Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of the Westinghouse Electric Company (WEC) LLC, Columbia, South Carolina (SC) facility from December 13-17, 2010. The inspection included an on-site review of the licensee's NCS program, NCS evaluations, NCS audits, and recent NCS-related events, the criticality accident alarm system (CAAS), and open items. The inspection focused on risk-significant fissile material processing activities and areas including ammonium diuranate (ADU) conversion, uranium dioxide (UO<sub>2</sub>) powder handling and pelletizing, fuel manufacturing including Erbia and integral fuel burnable absorber (IFBA) fuel manufacturing, uranium recovery, the incinerator, uranium hexafluoride (UF<sub>6</sub>) cylinder wash, and UF<sub>6</sub> cylinder recertification.

#### Results

- No safety concerns were identified regarding the licensee's NCS program.
- No safety concerns were identified regarding the licensee's NCS audits.
- During review of licensee event response, an unresolved item was identified regarding development of corrective actions for the simultaneous failure of multiple exterior roof criticality alarm horns.
- No other safety concerns were identified regarding licensee event review and follow-up.
- No safety concerns were identified during a review of the licensee's CAAS.
- No safety concerns were identified during plant walkdowns.

## REPORT DETAILS

### 1.0 Summary of Plant Status

WEC manufactures light water reactor fuel at its Columbia, SC, facility. During the inspection, the plant operated normally.

### 2.0 NCS Program (IP 88015, IP 88016)

#### a. Inspection Scope

The inspectors reviewed selected criticality safety evaluations (CSE) generated or revised since the last inspection to determine the adequacy of the analytical basis for facility operations. The inspectors reviewed selected aspects of the following documents:

- CN [Change Notice]-CRI-10-5, "Solvent Extraction Area," Revision 0, dated July 2010
- CSE-01-F, "Conversion Decon Room Dry Filter Housing and Torit," Revision 5, dated October 2010
- CSE-01-O, "Pellet Inspection Hood Ventilation," Revision 2, dated October 2010
- CSE-01-V, "Rod Repair Torit Ventilation," Revision 1, dated October 2010
- CSE-01-X, "ERBIA Pellet Conveyor Ventilation," Revision 2, dated October 2009
- CSE-04-D, "URRS [uranium recycle and recovery system] Dirty Dissolver Centrifuge," Revision 0, dated October 2010
- CSE-04-E, "URRS 706 Oxidation Oven and Hood," Revision 2, dated October 2010
- CSE-07-A, "Solvent Extraction System," Revision 6, dated July 2010
- CSE-07-A, "Solvent Extraction System," Revision 5, dated December 2009
- CSE-13-B, "Decontamination/Cutting Room and Filter Cleaning Hood," Revision 3, dated August 2010
- CSE-14-A, "Integrated Fuel Burnable Absorber [IFBA] Area," Revision 6, dated July 2010
- CSE-14-C, "Miscellaneous Operations in the Integrated Fuel Burnable Absorber [IFBA] Area," Revision 4, dated August 2010
- CSE-21-C, "Rod Storage and Handling," Revision 7, dated September 2010
- CSE-99-C, "Oxidation Oven and Hood," Revision 3, dated October 2010
- CSE-99-I, "16 KWU (Atom) Testing in the Product Engineering (PE) Development Laboratory," Revision 0, dated June 2010
- DWG [drawing] 339F03P103, "Decon Room Ventilation System Dust Collector DC-1427," Revision C1, dated June 2, 2009
- DWG 339F01EL05, "Chemical Conversion Room Electrical Schematics," Revision 3, dated September 18, 2009
- DWG 339A01LS02, "Decon Room Ventilation Loop Sheet for Switches LSH-1427A," Revision 2, dated September 18, 2009

b. Observations and Findings

The inspectors observed that, with the exception noted in Section 4.0, NCS evaluations were prepared by qualified NCS engineers and that independent reviews of the evaluations were completed by other qualified NCS engineers, and limits on controlled parameters were established and maintained. The inspectors determined that NCS controls for equipment and processes assured the safety of the operations.

c. Conclusions

No safety concerns were identified regarding the licensee's NCS program.

**3.0 NCS Inspections, Audits, and Investigations (IP 88015)**

a. Inspection Scope

The inspectors reviewed the licensee's audit procedure. The licensee provided to the inspectors with fifteen (15) NCS Facility Walkthrough Assessments (FWA) reports for the 3<sup>rd</sup> Quarterly period and sixteen (16) NCS FWA reports for the 4<sup>th</sup> Quarterly period. The inspectors reviewed selected aspects of the following documents:

- RA-316, "NCS Facility Walkthrough Assessments," Revision 2, dated May 22, 2008
- NCS FWA 3<sup>rd</sup> Quarterly Period Assessment Areas
  - ADU Rods
  - Misc LLRW [low level radioactive waste] – Shredder, Compactor, Liquid Honing, Ultrasonic Cleaner, Filters Disassembly, Waste Staging, Shipping, Seal, and Cylinder Wash.
  - HEPA Filter House System
  - PWR Product Test Engineering Laboratory
- NCS FWA 4<sup>th</sup> Quarterly Period Assessment Areas
  - Final Assembly
  - Safe Geometry Dissolver/Fluoride Stripping/706 Hood
  - Conversion Scrap Cage
  - Erbium Miscellaneous Operations
  - Torits

b. Observations and Findings

The inspectors spoke with the licensee's NCS staff and determined that the licensee's NCS inspections, called "Facility Walkthrough Assessments (FWA)," were conducted in accordance with written procedures. The information provided by the licensee's NCS staff was mainly on how they interviewed operators to verify understanding of controls.

c. Conclusions

No safety concerns were identified regarding the licensee's NCS audits.

#### 4.0 Nuclear Criticality Safety Event Review and Follow-up (IP 88015, 88016, 88017)

##### a. Inspection Scope

The inspectors reviewed the licensee's response to internally-reported events. The inspectors reviewed the progress of investigations and interviewed the licensee's staff regarding immediate and long-term corrective actions. The inspectors reviewed selected aspects of the following internally reported events:

- Redbook Entry #16227, "Criticality Alarm Horn Operability," dated September 23, 2010
- Redbook Entry #16237, "Criticality Alarm System Roof Horn Loop 6," dated September 30 2010
- Redbook Entry #16263, "Criticality Alarm Signal Problem," dated October 20, 2010
- Redbook Entry #16292, "ADU Cart Without Holes," dated November 9, 2010
- Redbook Entry #16306, "UN Bulk Tank not Recirculating as Required by SSC [safety-significant control]," dated November 24, 2010

##### b. Observations and Findings

The inspectors reviewed selected licensee internally-reported events including 11 criticality safety-related events and a sampling of events that were not criticality safety-related. The inspectors selected five criticality safety-related events for more detailed review. The inspectors observed that internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned. The inspectors noted that one of the licensee internally-reported events identified that approximately half of the exterior criticality alarm horns covering the facility roof were found to be out-of-service following a periodic test. The inspectors determined that the procedure for periodic testing of criticality alarms relied on voluntary reporting of out-of-service horns by plant staff. The inspectors asked if corrective actions included any changes to the procedure for periodic testing of alarms since plant staff was not routinely on the roof during alarm testing which may have led to so many horns failing before their absence was noted. The licensee indicated verbally that a new preventive maintenance procedure for the criticality alarm test was being developed which was not yet recorded as a corrective action. Development of adequate corrective actions for the simultaneous failure of multiple exterior roof criticality alarm horns will be tracked as **Unresolved Item (URI) 70-1151/2010-204-01**. The inspectors note that the out-of service horns had been repaired and there was no immediate safety concern.

##### c. Conclusions

An unresolved item was identified regarding development of corrective actions for the simultaneous failure of multiple exterior roof criticality alarm horns. No other safety concerns were identified regarding licensee event review and follow-up.



## **5.0 Criticality Alarm System (IP 88017)**

### a. Inspection Scope

The inspectors reviewed documentation of criticality accident alarm detector coverage, interviewed engineering and maintenance staff, and performed facility walkdowns to determine the adequacy of the licensee criticality alarm system.

### b. Observations and Findings

The inspectors reviewed the licensee criticality alarm system wiring configuration and observed in-process maintenance activities. The inspectors reviewed several alarm detector locations and also reviewed the alarm system electronic equipment at the main guard station. The inspectors reviewed a recent licensee event in which an incorrect monitoring signal had been identified at the main guard station during source checking. The licensee's criticality alarm system circuits were arranged so that a monitoring signal would be sent to the main guard station at the same time as an alarm signal was sent to horns upon alarm activation. The monitoring signals for one of the circuits were processed through a data acquisition monitor that had been incorrectly configured during initial installation to allow filtering of the monitoring signals. The problem was identified after a software upgrade of the data acquisition monitors eliminated programming that allowed the filtered signals time to settle to the correct level. This situation was a concern because the licensee relies on observation of the monitoring signal readouts during maintenance operations requiring silenced horns. The licensee had corrected the condition and completed an extent of condition review. The inspectors had no additional safety concerns regarding the licensee's corrective actions for the incorrect monitoring signal readout.

### c. Conclusions

No safety concerns were identified during a review of the licensee's CAAS.

## **6.0 Plant Operations (IP 88015, IP 88016)**

### a. Inspection Scope

The inspectors walked down portions of the facility to determine whether risk-significant fissile material operations were being conducted safely and in accordance with regulatory requirements including those addressed by newly issued or revised CSEs mentioned under Section 2.0.

### b. Observations and Findings

The inspectors performed walkdowns of operations in ADU conversion, UO<sub>2</sub> powder handling and pelletizing, vaporization, wash pit, criticality alarm detectors, URRS, fuel manufacturing including Erbia and IFBA fuel manufacturing, uranium recovery, the incinerator, UF<sub>6</sub> cylinder wash, and UF<sub>6</sub> cylinder recertification. The inspectors verified that controls identified in NCS analyses were installed or implemented and were adequate to ensure safety. The cognizant, NCS engineers were knowledgeable and

interacted regularly with operators on the process floors. The inspectors verified the adequacy of management measures for assuring the continued availability and reliability of safety-significant controls relied upon by the licensee for controlling criticality risks.

c. Conclusions

No safety concerns were identified during plant walkdowns.

**7.0 Exit Meeting**

The inspectors presented the inspection scope and results to members of the licensee's management and staff during an exit meeting on December 17, 2010. The licensee acknowledged and understood the findings as presented.

## SUPPLEMENTARY INFORMATION

### 1.0 List of Items Opened, Closed, and Discussed

#### Items Opened

**URI 70-1151/2010-204-01** Tracks development of adequate corrective actions for the simultaneous failure of multiple exterior roof criticality alarm horns.

#### Items Closed

None

#### Items Discussed

None

### 2.0 Inspection Procedures Used

IP 88015	Nuclear Criticality Safety Program
IP 88016	Nuclear Criticality Safety Evaluations and Analyses
IP 88017	Criticality Alarm Systems

### 3.0 Partial List of Persons Contacted

#### WEC

D. Precht	Plant Manager
G. Couture	EH&S
M. Rosser	EH&S Manager
C. Snyder	NCS
S. Armstrong	URRS
D. Graham	EH&S
R. Winiarski	IFBA

#### NRC

R. Gibson	Senior Fuel Facility Inspector, RII
D. Morey	Senior Criticality Safety Inspector, HQ
A. Sotomayor-Rivera	Criticality Safety Inspector, HQ

All attended the exit meeting on December 17, 2010.

#### 4.0 List of Acronyms

ADAMS	Agencywide Documents Access and Management System
ADU	ammonium diurate
CAAS	criticality accident alarm system
CN	Change Notice
CSE	criticality safety evaluation
DWG	drawing
EH&S	environment, health, and safety
FWA	Facility Walkthrough Assessments
IFBA	integral fuel burnable absorber
IP	inspection procedure
LLRW	low level radioactive waste
NCS	nuclear criticality safety
SSC	safety-significant control
UF <sub>6</sub>	uranium hexafluoride
UO <sub>2</sub>	uranium dioxide
URI	unresolved item
URRS	uranium recycle and recovery
WEC	Westinghouse Electric Company (licensee)