



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, SW, SUITE 23T85  
ATLANTA, GEORGIA 30303-8931

March 16, 2006

EA-04-096  
NMED No. 040169

Mr. M. Fecteau, Manager  
Columbia Plant  
Westinghouse Electric Company  
Commercial Nuclear Fuel Division  
Drawer R  
Columbia, SC 29250

SUBJECT: NRC INSPECTION REPORT NO. 70-1151/2005-09

Dear Mr. Fecteau:

The U.S. Nuclear Regulatory Commission (NRC) conducted an announced, regional initiative inspection February 13-17, 2006, at your Columbia, South Carolina facility. The enclosed report presents the results of this inspection. The purpose of this inspection was to evaluate the readiness of Westinghouse to proceed with the operation of your redesigned incinerator. Areas reviewed included maintenance and surveillance, operations, operator training, nuclear criticality safety, and management organization and controls. This review was performed to determine whether the incinerator, including items relied on for safety, was adequately constructed and tested, met regulatory and licensing requirements, and provided reasonable assurance of worker and public health, safety, and security. At the conclusion of the inspections, the findings were discussed with those members of your staff at an exit meeting held on February 17, 2006.

This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspection consisted of process walk downs; selective examinations of relevant procedures and records; examinations of safety-related structures, systems, equipment and components; interviews with plant personnel; and observations of plant conditions and activities in progress. Throughout the inspection, observations were discussed with your managers and staff. No violations of regulatory requirements were identified during this inspection.

The approval for startup of the incinerator will be based on Westinghouse's demonstration, to the NRC, that outstanding items are completed. These outstanding items include completion of the procedure for operation of the Fitzmill, operator training on the Fitzmill, and documentation (including the criticality safety evaluation and sketch) and modifications to the incinerator scrubber blowdown flow path. The NRC has concluded that, when these items are completed, Westinghouse will be ready to proceed with the startup and operation of the incinerator.

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

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

Sincerely,

***/RA/ T. Decker acting for***

Douglas M. Collins, Director  
Division of Fuel Facility Inspection

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

Enclosure: NRC Inspection Report

cc w/encl:  
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M. Fecteau

3

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**\*see previous concurrence**

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**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket No: 70-1151

License No.: SNM-1107

Report No.: 70-1151/2005-007

Licensee: Westinghouse Electric Company

Location: Columbia, SC

Inspection Dates: February 13-17, 2006

Inspectors: Deborah Seymour, Sr. Fuel Facility Inspector  
Manuel Crespo, Fuel Facility Inspector  
Dennis Morey, Sr. Criticality Safety Inspector

Approved: Jay Henson, Chief  
Fuel Facility Inspection Branch 2  
Division of Fuel Facility Inspection

Enclosure

## EXECUTIVE SUMMARY

### Commercial Nuclear Fuel Division NRC Inspection Report 70-1151/2005-009

This announced, regional initiative inspection focused on the evaluation of Westinghouse's operational readiness for the refurbished incinerator. This report covers inspection efforts by two regional fuel facility inspectors and a headquarters criticality safety fuel facility inspector, and includes the on-site inspection effort from February 13 through 17, 2006, and review of design and equipment installation during previous scheduled inspections. Areas reviewed included nuclear criticality safety, maintenance and surveillance, operations, operator training, fire protection, chemical safety, and management organization and controls. The inspection was conducted through process walk downs; selective examinations of relevant procedures and records; examinations of safety-related structures, systems, equipment and components; interviews with plant personnel; and observations of plant conditions and activities in progress.

Based upon the results of this inspection, the inspectors concluded that the incinerator, including items relied on for safety, was adequately constructed and tested, met regulatory and licensing requirements, and provided reasonable assurance of worker and public health, safety, and security. The inspectors did not identify any issues to delay startup and operation of the incinerator. The licensee stated they would complete outstanding items prior to the incinerator startup.

#### **Conclusions:**

No criticality safety or operational safety concerns were identified relative to startup of the new incinerator, incinerator off-gas, and ash handling systems (Section 4).

The licensee's maintenance and surveillance records adequately demonstrated the effectiveness of the maintenance program. The incinerator's safety significant interlocks were appropriately implemented. Functional verifications of the safety interlocks adequately tested the safety setpoints (Section 5).

The configuration change control program was appropriately implemented for the incinerator rebuild project and the incinerator modifications were properly reviewed, approved, and documented (Section 5).

The incinerator operators were trained to perform their job functions, deal with the hazards of the workplace, and respond to emergencies. The incinerator operator training was considered to be a strength (Section 5).

The incinerator operators were knowledgeable of the appropriate fire emergency response actions. No issues were noted in fire protection (Section 5).

The incinerator and its ancillary systems were appropriately included in the Environmental Health and Safety informal and formal audit programs (Section 5).

The licensee's equipment integrity program, including pipe integrity, was considered a program strength (Section 5).

The licensee's investigation of the quarantine tank isolation event was timely and appropriate. The resulting modification of the incinerator scrubber blowdown flow path will delay startup of the incinerator to May 2006 (Section 6).

Attachment:

List of Persons Contacted

Inspection Procedures Used

List of Items Opened, Closed, Discussed

List of Acronyms Used

## REPORT DETAILS

### **1. Summary of Plant Status**

Routine operations were ongoing at the time of this inspection, except for the conversion area, which was shut down (see Section 7 for details).

### **2. A Brief Description of the Incinerator System**

The basic concepts for the licensee's previous incinerator and rebuilt/refurbished incinerator are similar. The licensee's rebuilt incinerator is a standard industrial incinerator. The licensee will use the incinerator to reduce uranium-contaminated process waste volume and facilitate uranium recovery from the waste. The licensee collects burnable waste in drums, which are assayed to establish uranium mass content. The collected waste is removed from the drums and placed into the incinerator lower combustion chamber under mass control. At various times during and after a "burn campaign" and cool-down period, the ash is raked from the lower combustion chamber and transported by a conveyor belt to a Fitzmill grinder. After grinding, the ash is collected in poly packs for uranium recovery.

### **3. A Brief Description of the Previous Nuclear Criticality Event Involving the Incinerator**

On March 5, 2004, the licensee reported an event to the NRC concerning operation of the incinerator off-gas system outside the approved safety basis. The problem was discovered during a technical review of a proposed procedure change. A licensee nuclear criticality safety (NCS) engineer reviewed data from samples of ash deposits in the incinerator off-gas system and determined that the ash deposited at various locations in the system exceeded the 21.6 weight percent uranium concentration assumed to be bounding for incinerator ash. Incinerator operations were immediately halted pending investigation and the NRC was notified. Subsequently, the licensee performed a complete clean-out of the incinerator and analyzed the removed material for uranium content. This analysis determined that the mass of ash removed exceeded expectations for deposition in the system and that uranium content of the removed ash exceeded the bounding assumption for uranium concentration. The NRC concluded that prompt and appropriate action was taken by the licensee to shutdown operation of the incinerator pending investigation and resolution of the problem. Please see Inspection Report 70-1151/2004-001 for additional details about this event and the licensee's follow up actions. As noted above, the licensee's incinerator was shut down in March 2004. After the March 2004, event, the licensee agreed to not incinerate trash contaminated with special nuclear material until operations were approved by the NRC.

Subsequent to this event, the licensee rebuilt and refurbished the incinerator. Most components were redesigned and rebuilt as favorable geometry components. The remaining non-favorable geometry components are the waste feed chamber, the two combustion chambers, ash drop chute, and ash conveyor discharge chute.

**4. Operator Training/Retraining (Inspection Procedure (IP) 88010)**  
**Headquarters Nuclear Criticality Safety Program (IP 88015)**  
**Regional Nuclear Criticality Safety Inspection Program (IP 88020)**

**a. Scope and Observations**

The inspectors reviewed operator training, NCS analyses for the incinerator and ventilation, incinerator and ventilation operating procedures, and selected NCS-related items relied on for safety (IROFS) to determine the readiness of the licensee incinerator for restart. The inspectors performed equipment walkdowns, interviewed NCS and process engineers and process operators and reviewed selected aspects of the following documents:

- CSE-13-A, "Criticality Safety Evaluation (CSE) for Incinerator System," Revision 1, dated January 18, 2006; and Revision 2, dated February 27, 2006
- CSE-1-A, "Incinerator Filter Housings," Revision 0, dated January 11, 2006
- Implementation Checklist for CSE-13-A, "CSE for Incinerator System," dated February 10, 2006
- Implementation Checklist for CSE-1-A, "Incinerator Filter Housings," dated February 10, 2006
- COP-830210, "Incinerator Operation," Revision 29, dated January 18, 2006
- MCP-108104, "Changing Roof-Top (HEPA) Intermediate and Pre-filters," Revision 20, dated February 9, 2006
- RA 108-9, "Ventilation and Scrubbing Safety Significant Controls," Revision 8, dated January 31, 2006
- 836038-1, "Safety Significant Controls - URRS," Revision 25, dated January 20, 2006
- COP-836032, "Fitzmill Startup, Operation, and Shutdown," Revision 5, dated October 16, 2003
- TAF-500-1, Columbia Plant Configuration Change Control Form, "Ash Handling System for the Incinerator Upgrade," dated FEBRUARY 13, 2006
- TAF-500-1, Columbia Plant Configuration Change Control Form, "Venturi Scrubber System for the Incinerator, dated February 13, 2006
- Form No. RAF-314-1, CSE Implementation Checklist, "Incinerator Filter Housings," dated February 10, 2006
- Form No. RAF-314-1, CSE Implementation Checklist, "CSE for Incinerator System," dated February 10, 2006
- MCP-203600, "Verification of Interlock INCIN-203 (URRS-23), Revision 1, dated February 9, 2006
- TCL-83008, "URRS Incinerator Training Checklist," Revision 2, dated January 19, 2006
- SYP-219, "Equipment Integrity Program," Revision 0, dated March 24, 2005

With the exception of the incinerator combustion chambers and some framework and condensate piping, the licensee has completely replaced the incinerator system, the incinerator off-gas system, and the incinerator ash elevator with newly designed equipment. The inspectors determined that the licensee has completely restructured



the NCS analyses for the incinerator and has established an appropriate safety basis for the equipment and operation so that limited mass and safe geometry equipment provided the basis for criticality safety.

The inspectors reviewed key criticality accident sequences associated with the incinerator and noted that appropriate controls were established to prevent fissile accumulation in the equipment. The inspectors noted that NCS controls were adequately implemented through postings, operator training and operating procedures. The inspectors determined that the licensee had appropriately designated key NCS controls as IROFS. During previous inspections, the inspectors reviewed the new incinerator project through the design and equipment installation processes. No criticality safety or operational safety issues were identified relative to restart of the incinerator.

b. Conclusions

No criticality safety or operational safety concerns were identified relative to startup of the new incinerator, incinerator off-gas, and ash handling systems.

5. **Management Organization and Controls (IP 88005)**  
**Operator Training/Retraining (IP 88010)**  
**Maintenance and Surveillance Testing (IP 88025)**  
**Fire Protection (IP 88055)**  
**Site-Wide Safety Procedures (IP 88059)**

a. Scope and Observations

The inspectors reviewed the safety significant controls/interlocks implemented as part of the incinerator rebuild/refurbishment. The rebuilt/refurbished incinerator has multiple interlocks (approximately 130) to ensure safe operation. The inspectors held discussions with cognizant licensee personnel, and reviewed selected portions of applicable documents detailing the development of the controls, the verification and validation of the computer systems controlling the interlocks, and the testing of the interlocks. The inspectors noted that the interlocks were controlled by two computer systems: a Basic Process Control System and a Safety Instrumented System (SIS). The SIS implements the incinerator's safety significant controls and was a certified safety process logic controller. The inspectors concluded, based on this review, that the safety significant interlocks were appropriately implemented. Functional verifications of the safety interlocks adequately tested the safety setpoints. The inspectors also discussed the planned periodic maintenance (PM) scheduled for selected incinerator IROFS. No issues were identified.

The inspectors also held discussions with cognizant licensee personnel and reviewed selected portions of the configuration change control documentation associated with the incinerator rebuild/refurbishment. The inspectors determined that the configuration change control program was appropriately implemented for the incinerator rebuild project and that the modifications were properly reviewed, approved, and documented.

The inspectors reviewed operator training on the rebuilt/refurbished incinerator. The inspectors concluded that the training was detailed, and thoroughly covered the topics needed to operate the incinerator in a safe manner. The inspectors interviewed selected incinerator operators and determined that they were very knowledgeable about incinerator operation and the logic for the safety significant controls. At the time of this inspection, the training on the Fitzmill had not been completed. This training was scheduled to be completed the week of March 13, 2006. The inspectors concluded that the incinerator operators were appropriately trained to perform their job functions, deal with the hazards of the workplace, and respond to emergencies. The inspectors did not identify any issues with operator training, and considered the incinerator operator training to be a strength.

The inspectors toured the incinerator and incinerator ventilation process areas and verified that transient combustibles were controlled to levels below that which could result in a significant fire. The inspectors also interviewed selected incinerator operators and verified that the operators were familiar with the appropriate actions to take in a fire or other unexpected event, and with general safety principles. The inspectors also noted that the operators were familiar with the emergency egress routes. The inspectors also verified that appropriate fire protection equipment was available in the area. No issues were noted in fire protection.

The inspectors also interviewed cognizant licensee personnel, and reviewed selected portions of applicable documents, and verified that licensee management had appropriately included the incinerator and ancillary systems in the Environmental Health and Safety informal and formal audit programs. No issues were identified.

The inspectors discussed the licensee's equipment integrity program with cognizant licensee personnel. This new initiative at Westinghouse was being implemented in a step-wise fashion, starting with the outside tank farm. The inspectors noted that information on applicable portions of the rebuilt incinerator was captured in the equipment integrity program. Specifically, SYF-219-1, "New Equipment Inspection Sheet," was completed for the applicable portions of the incinerator and ancillary equipment (ventilation system, etc.). The inspectors did not identify any issues in this area. The inspectors considered the equipment integrity program, including pipe integrity, to be a program strength.

b. Conclusions

The licensee's maintenance and surveillance records adequately demonstrated the effectiveness of the maintenance program. The incinerator's safety significant interlocks were appropriately implemented. Functional verifications of the safety interlocks adequately tested the safety setpoints.

The configuration change control program was appropriately implemented for the incinerator rebuild project and the incinerator modifications were properly reviewed, approved, and documented.

The incinerator operators were trained to perform their job functions, deal with the hazards of the workplace, and respond to emergencies. The incinerator operator training was considered to be a strength.

The incinerator operators were knowledgeable of the appropriate fire emergency response actions.

The incinerator and its ancillary systems were appropriately included in the Environmental Health and Safety informal and formal audit programs.

The licensee's equipment integrity program, including pipe integrity, was a program strength.

## **6. The Shutdown of Conversion Due to Incinerator Ventilation Scrubber Blowdown**

### **a. Scope and Observations**

The inspectors reviewed the licensee's actions to the inadvertent isolation of the quarantine tanks, and resulting shutdown of the conversion process, to determine if they were appropriate.

Prior to the March 2004 incinerator event, the incinerator ventilation scrubber blowdown was routed to the contaminated sump. As part of the incinerator rebuild, the incinerator ventilation scrubber blow down was rerouted to the 700-series tanks through a gamma monitor and into the quarantine tanks. The quarantine tanks are recirculated through a set of filters to collect any particulate, including insoluble uranium particulate. The chemistry of the quarantine tanks is maintained to keep the uranium in an insoluble state. Releases from quarantine tanks flow past a second gamma monitor and into the waterglass tanks. The second monitor alarms at 24 parts per million (ppm) uranium and has an interlock to stop the transfer of material out of the quarantine tanks if the alarm is actuated.

Prior to this inspection, as a way to fine tune the incinerator controls, train operators, and to "scrub" the procedures, the licensee operated the rebuilt incinerator with trash that was not contaminated with special nuclear material. During the week of February 6, after performing numerous clean burns, the incinerator ventilation scrubber blowdown reached the quarantine tanks. The pH of the scrubber solution changed the water chemistry of the quarantine tanks, dissolving the uranium trapped by the filters and putting it in solution. The soluble uranium exceeded the 24 ppm uranium needed to alarm the monitor, and terminated releases from the quarantine tanks. As a result, the quarantine tanks filled (they are also used as part of the conversion process) and could not be emptied, shutting down conversion. The inspectors noted that the scrubber blowdown did not actuate the alarm on the monitors located between the 700 tanks and the quarantine tanks, indicating low levels or no uranium in the blowdown, as expected, since the licensee was burning clean trash.

The licensee investigated the uranium monitor alarms, determined the cause, and immediately shut down the incinerator until another flow path for the scrubber blowdown could be determined. Ultimately, as a temporary solution to the full quarantine tanks, after appropriate implementation of the configuration control program, the licensee rerouted the material through preexisting pipes to waste treatment for processing, allowing conversion to restart.

At the time this inspection ended, the licensee was preparing to perform a hazardous waste operations analysis for the incinerator ventilation scrubber blowdown and determine another method for processing this effluent. This re-analysis, combined with implementation of the configuration control program, changes to the criticality safety analyses, and the implementation of the final modification, will delay the restart of the incinerator until early-May, 2006.

b. Conclusions

The licensee's investigation of the quarantine tank isolation event was timely and appropriate. The modification of the incinerator scrubber blowdown flow path will delay startup of the incinerator to May 2006.

7. Exit Interview

The inspection scope and results were summarized on February 17, 2006, with the licensee. The inspectors described the areas inspected and discussed in detail the inspection results. Although proprietary documents and processes were occasionally reviewed during this inspection, proprietary information is not included in this report. Dissenting comments were not received from the licensee.

## ATTACHMENT

### **1. LIST OF PERSONS CONTACTED**

#### Licensee

C. Aguilar, Manager, Uranium Recycle and Recovery System  
M. Fecteau, Columbia Plant Manager  
R. Fischer, Environmental, Health and Safety Engineer  
J. Goodwin, Plant Systems Engineer  
D. Graham, Criticality Technician, Environmental, Health, Safety  
J. Heath, Manager, Environmental, Health and Safety Engineering  
S. McDonald, Manager, Environmental, Health and Safety  
C. Synder, Nuclear Criticality Safety  
R. Winarski, Nuclear Criticality Safety Engineering Manager

Other licensee employees contacted included engineers, technicians, production staff, security and office personnel

### **2. INSPECTION PROCEDURES**

IP 88005	Management Organization and Controls
IP 88010	Operator Training/Retraining
IP 88015	Headquarters Nuclear Criticality Safety Program
IP 88020	Regional Nuclear Criticality Safety Inspection Program
IP 88025	Maintenance and Surveillance Testing
IP 88055	Fire Protection
IP 88059	Site-Wide Safety Procedures

### **3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

None

### **4. LIST OF ACRONYMS USED**

ADAMS	Agency-wide Document Access and Management System
CFR	Code of Federal Regulations
CSE	Criticality Safety Evaluation
IP	Inspection Procedure
IROFS	Item Relied on for Safety
NCS	Nuclear Criticality Safety
NRC	Nuclear Regulatory Commission
PM	Periodic Maintenance
ppm	Parts per Million
SNM	Special Nuclear Material