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OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

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Licensee: Westinghouse Electric Corporation

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Columbia, SC 29250

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Enclosure 2

EXECUTIVE SUMMARY

WESTINGHOUSE ELECTRIC CORPORATION
NRC INSPECTION REPORT
70-1151/96-204

1.0 Inspection Summary

Areas Inspected

NRC performed a routine, unannounced criticality safety inspection of the Westinghouse Electric Corporation Columbia Fuel Fabrication Facility (CFFF) in Columbia, SC on December 16 - 20, 1996. The inspection was conducted using staff from NRC Headquarters and a contractor. The focus of this inspection was on the criticality safety program at Westinghouse and selected areas of the plant that either had recent, updated Criticality Safety Evaluations (CSEs), had undergone recent modifications, or were of special criticality safety interest. Performance auditing and the process for screening occurrences for NRC Bulletin 91-01 reportability were also reviewed.

Major programmatic portions of the nuclear criticality safety (NCS) program which were reviewed at CFFF included:

- Nuclear Criticality Safety Function
- Plant Activities
- Nuclear Criticality Safety Inspections, Audits, and Investigations
- Criticality Alarm Monitoring Systems

Results

- The Criticality Safety Analyses (CSAs) for several key processes had been performed in accordance with plant procedures and license conditions. These analyses adequately considered a range of accident scenarios and identified controls to reduce the likelihood of these accidents (Detail 2.b).

- Criticality safety limits and controls identified in CSAs were adequately implemented in the plant. Good operational control was established for material handling and transfer in the powder preparation area. However, the licensee needs to ensure that the moisture sample analyses for the bulk blender are truly independent (Detail 3.b).

- The formal monthly audit did not review procedural adequacy and ongoing operations (Detail 4.b.1).

- No written policy outlined the purpose and objectives of the facility management self-assessment program (Detail 4.b.2).

- Items entered into the performance based reporting system are not adequately summarized and trended (Detail 4.b.3).

- Process review inspections and audits were not documented or conducted in accordance with written procedures (Detail 4.b.4)

- Guidance had not been developed for reporting potential criticality safety violations to the Nuclear Criticality Safety Function for evaluation (Detail 4.b.7).

- Screening of problems and infractions for 91-01 reportability is adequate once an issue is brought to the attention of the appropriate licensee staff (Detail 4.b.7).

- The CFFF compliance inspection program lacked formality in the closure of non-compliances identified during self-inspections (Detail 4.b.7).

- The criticality accident alarm system is well designed, functional, and adequate for the CFFF plant (Detail 5.b).

DETAILS

2.0 Nuclear Criticality Safety Function

a. Scope

Inspectors reviewed the qualifications and staffing levels for the NCS function to verify that adequate, qualified staff are available to perform the responsibilities in Part 1 of the license application.

The inspectors reviewed selected portions of the criticality safety evaluations (CSEs) and CSAs for several processes to verify that the analyses had been performed in accordance with plant procedures and license conditions and that the analyses adequately considered a range of accident scenarios.

b. Observations

CFFF NCS staff consisted of three NCS engineers and one NCS technician in the Regulatory Affairs organization. All the NCS staff had extensive training and experience with criticality safety issues. The NCS group had previously been supervised by a senior NCS engineer who recently retired and will not be replaced. Due to the departure of their manager and the elimination of the position, the NCS staff reports directly to the safety manager.

The inspectors selected several portions of the plant for detailed review of the technical analyses demonstrating criticality safety. Systems selected included the calciner portion of the Ammonium Diuranate (ADU) Conversion Line, the ADU Bulk Powder Blending System, and the Uranium Recovery and Recycle Services (URRS) Incinerator. Each set of documentation was first reviewed to verify that the analyses had been performed in accordance with plant procedures and license conditions. Each of the analyses had been prepared or updated within the last year and conformed to the plant guidelines on preparation of CSEs and CSAs. Other than minor administrative oversights, no technical problems were identified.

The documentation for each system was also reviewed to determine the adequacy to which certain accident scenarios had been addressed. Each of the systems had safety analyses that identified a range of accident scenarios, presented fault trees for these scenarios, and presented the "defense elements" or controls that ensured an adequate margin of safety. In general, this portion of the safety documentation was excellent and presented a full range of potential accident scenarios and the controls that would be expected to reduce the likelihood of these scenarios to very low levels.

Review of the accident portions of the CSEs for ADU Bulk Powder Blending and for the URRS Incinerator also indicated that a full range of accident scenarios had been considered and controls identified.

c. Conclusions

NCS staffing levels and staff qualifications were adequate to perform the license requirements.

The inspectors found that the criticality safety analyses for several key processes had been performed in accordance with plant procedures and license conditions. These analyses adequately considered a range of accident scenarios and identified controls to reduce the likelihood of these accidents.

3.0 Plant Activities

a. Scope

Inspectors toured selected portions of the plant to verify that safety related controls were being implemented. Inspectors performed reviews of the Integral Fuel Burnable Absorber (IFBA) area and Analytical Laboratory Services/Chemistry Laboratory area. A system walkdown of the Bulk Blender area was conducted to verify that the licensee exercised adequate moderation control for the bulk blender.

The inspectors reviewed the criticality safety limits and controls identified in selected CSEs and walked down the systems to verify that the controls had been adequately implemented in the plant.

b. Observations

Section 6.2.3, Table of Plant Systems & Parametric Controls, defines the criticality safety basis for the bulk blender as moderation. The bulk blender is the component with the greatest mass of uranium oxide in a single unfavorable geometry vessel within the facility. The inspectors walked down the material flowpath from the calciner output to the bulk blender with plant operators responsible for running the process. Discussions and observation of work in progress indicated that the licensee had established multiple controls to ensure that dry powder is not transferred from the favorable geometry polypacks into the unfavorable geometry bulk blender by the operators until the results of two independent moisture analyses are obtained from the laboratory. Those controls included the use of computer bar codes to track each individual container and cart, as well as the individual making the transfers. The operators interviewed clearly understood how each control was to be implemented.

Section 6.2.1, General Control Program Practices, states that the Double Contingency Principle will be the basis for design and operation of

processes within CFFF, "As such, process designs will incorporate sufficient margins of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible." Independent sampling of moisture content is the double contingency control in the bulk blender operation. The inspectors walked down the sample flowpath from the calciner through the laboratory analysis to verify the independence of moisture sampling analysis.

Section 6.2.4 (c), Moderation, states that "Two independent controls/ measurements or the analysis of two independent samples will be utilized to document this compliance. The system for collecting, preparing, analyzing, and posting of results pertaining to sample evaluation will be designed to ensure the results obtained are independent." A composite sample is pulled by operations and a second sample is pulled by Quality Control (QC). Discussions with the laboratory technicians indicated that two different moisture analyzers were used, the analyzers were properly calibrated, and the sample results were entered into the computer system which controlled the release of the computer bar coded containers. The technician indicated that there was no administrative prohibition against running the two independent samples at the same time, nor was there a second check to ensure that the data was correctly entered into the computer.

The inspectors noted that the laboratory practice did not appear to ensure the independent posting of sample results. Discussions with the Nuclear Criticality Safety function indicated that they had not been aware of the possible lack of independent posting of sample results, as past practices involved the pulling of the composite sample on one shift and the QC sample on the following shift. Each sample had been promptly analyzed on the shift that it was pulled by a different technician. However, recent changes to the operation of the area has speeded up the material throughput such that both samples are now obtained within a short time of each other on the same shift. The licensee indicated that the current laboratory practice would be evaluated to ensure compliance with the intent of the independent measurement criteria. This is **Inspector Follow-up Item 96-204-01**.

c. Conclusions

The inspectors found that the criticality safety limits and controls identified in CSAs were adequately implemented in the plant.

The licensee has established good operational control over material handling and transfer in the powder preparation area. However, the licensee needs to ensure that the moisture sample analyses for the bulk blender are truly independent.

4.0 Nuclear Criticality Safety Inspections, Audits, and Investigations

a. Scope

The inspectors reviewed the various licensee inspection, audit and self-assessment programs defined in the license application to verify that the specific license conditions have been effectively implemented.

Inspectors participated in a monthly compliance inspection, reviewed documentation, and interviewed CFFF staff to verify the facility program for assuring compliance with NCS requirements.

Inspectors reviewed the facility "Redbooks" to verify that criticality safety violations are identified, reported, reviewed, and tracked to completion and that such violations are appropriately screened for reportability in accordance with the requirements of NRC Bulletin 91-01.

b. Observations

1. Monthly Audits

Section 3.6.1, Performance-Based Internal Inspections and Audits, Subsection (6), Formal Audits, states that "Cognizant Regulatory Function Engineers conduct monthly formal audits of regulatory program performance. The auditors will have the technical capability, and will be formally directed by Regulatory Compliance management, to find process upsets and procedural inadequacies beyond those surfaced by simple paperwork reviews." Discussions with cognizant licensee engineers responsible for conducting the audits indicated that RA-102, Regulatory Compliance Inspections, provided implementation guidance for meeting this license requirement, and that a monthly audit had been scheduled for the week of the inspection.

The inspectors accompanied the licensee engineer on the monthly audit to observe how it was conducted in the field. The audit involved a total of about 3-4 hours of the auditor's time in the field. During a monthly

inspection of the IFBA Archive Pellet storage room observed by NRC inspectors, CFFF inspectors found two storage drums in which the uranium weight storage limit had been slightly exceeded (about 10 grams). The non-compliance was immediately corrected by removing material from the two affected drums and placing it in other drums. The drum weight limit was conservative so that no safety margin was approached. In all, the audit mainly involved a review of the material condition of the plant and verification that posted requirements were met.

Subsequent inspector review of RA-102 determined that the procedure did not address the requirement for conducting formal audits to find process upsets and procedural inadequacies beyond those surfaced by simple paperwork reviews. Discussions with the Regulatory Affairs Advisory Engineer indicated that the licensee developed Section 3.6.1.b of the application based on what they believed the current monthly audit practices were when the application was originally submitted in the early 1990s. The licensee further noted that the monthly audits had been effective in identifying problems in the field that would not normally be identified through paper reviews. However, the inspector noted that RA-102 did not require, and the December audit did not look at, the topics of procedural adequacy and ongoing process operations. This is **Violation 96-204-02**.

2. Self-Assessments

Section 3.6.2, Facility Management Self-Assessment, states that "The Plant Manager will document CFFF policy on the purpose and objectives of self-assessment to Component Managers, including aggressive demand for quality assessment performance." At the start of the inspection, the inspectors requested the Regulatory Component to produce a copy of the policy. By the end of the inspection, the Regulatory Component representative indicated that it could not be found. However, the licensee did indicate that such a letter had been issued by a previous plant manager in the early 1990s, but it could no longer be located. Notwithstanding the existence of such a letter, the inspectors noted that the license requirement addressing the self-assessment program had been issued in November 1995 and included a number of commitments that may not have been in existence at that time. The failure to have a documented policy outlining the purpose and objectives of the facility management self-assessment program is **Violation 96-204-03**.

3. Trend Analysis

Section 3.6.2 also states that "On a semi-annual basis the following parameters will be summarized and trended by the Regulatory Component: A summary of items documented in the performance-based reporting process; ...The summaries and trends will be formally reviewed by the RCC [Regulatory Compliance Committee]..." The inspectors were informed by representatives from the Regulatory Component that the "Redbook" entries documented the referenced performance-based reports. A review of the RCC minutes for 1996 indicated that the only documented trending of Redbook reports concerned the total number of reports (111) broken down by general area: ADU Conversion, URRS, IFBA and Maintenance. No trending was documented for emerging problems, declining performance areas, or root cause analysis. Further, no guidance had been developed to specify how this license condition was to be met. The failure of the Regulatory Component to adequately summarize and trend items documented in the performance-based reporting process and the failure of the RCC to adequately review the summaries and trends, is **Violation 96-204-04**.

4. Process Reviews

Section 6.1.2, Inspections & Audits, states that "This program incorporates process, procedure, and program reviews as tools to evaluate the effectiveness of the criticality safety program. All such inspections and audits will be conducted and documented in accordance with a written procedure." It further states that "Process reviews include inspections and audits of the conduct of operations within the facility and will be conducted on an annual frequency." The inspectors requested the Regulatory Component to produce a copy of the written procedure and the documented process review. The inspectors were informed that no written procedure had been developed for the conduct of process reviews. Further, the Regulatory Component representative indicated that although no process review of the conduct of operations had been documented as such, the recent CSE upgrade should be considered as meeting the intent of this requirement. The inspector noted that even if the CSE upgrade met the intent, a process review would still have to be performed on an annual frequency. The failure to conduct and document process review inspections and audits in accordance with written procedures is **Violation 96-204-05**.

5. NCS Program Audits

Section 6.1.2 also states that "A Nuclear Criticality Safety program review will be conducted on an annual basis... All portions of the program will be reviewed at least annually." The inspectors reviewed RA-311, Nuclear Criticality Safety (NCS) Programs Review, Revision 0, which provides the implementing guidance for meeting this requirement. Section 7.4 identified the specific programs that were to be reviewed. However, the inspectors noted that there was no requirement to review the administrative practices for NCS. The inspectors requested copies of the program reviews for the last two years. The licensee representative informed the inspectors that only the program audits for 1995 were currently available, as the 1996 audits had not yet been finalized. Review of the completed NCS program review for 1996 to verify that it included the administrative aspects of the NCS program is **Unresolved Item 96-204-06**.

6. Non-routine Audits

Section 6.1.2 further states that "Nonroutine inspections and audits may be conducted at the discretion of the Nuclear Criticality Safety function or may be performed as the result of an operation upset, floor observations, or external investigations." The inspectors noted that there have been two recent industry events that involved an incinerator fire and a calciner tube failure at other facilities. Discussions with licensee personnel indicated that they were aware of both events and had formed teams to review each event for applicability to their facility. The inspectors reviewed the actions taken in regard to the events and identified no concerns.

7. Reporting and Tracking Events and Audit Findings

The facility uses a "Redbook" system to report production occurrences, safety infractions, and other items of interest. Each plant area or division maintains a red notebook which uses a special form on which any employee may report anything of interest. There is no requirement for employees to report anything other than "process upsets." CFFF staff stated that employees are free to correct violations of criticality safety requirements without reporting them. The inspectors noted that most employees were not qualified to conduct criticality safety evaluations. In addition, there was no guidance for what type of criticality safety violations should be reported to the Criticality Safety

function for evaluation. The licensee indicated that this issue would be evaluated. This is **Inspector Follow-up Item 96-204-07**.

Three selected Redbook items which involved criticality safety were reviewed to verify that they had been properly screened with respect to NRC Bulletin 91-01 requirements. In all cases CFFF staff referred to "fault trees" which showed a clear relationship between process conditions and NCS contingencies. The fault tree analysis clearly demonstrated for the selected items that no contingency had been lost.

The inspectors were informed that in addition to the "Redbook" system, non-compliances observed by licensee inspectors were entered into a separate compliance item system. The manager responsible for the affected area is noted on the form but individual items are not assigned to a specific management representative for resolution or closure. Instead, items are tracked by the Regulatory Affairs staff but are not assigned a timetable for closure and the details of resolution may not always be known to the safety staff responsible for closing the item. No formal trending of the information gathered by this system is performed although the regulatory engineers stated that they were investigating items that they had seen repeatedly.

c. Conclusions

The scope of the formal monthly audit conducted in December 1996 did not meet the requirement of License Section 3.6.1.b to include reviews of procedural adequacy and ongoing operations.

The licensee did not have a written policy documenting the purpose and objectives of the facility management self-assessment program.

The Regulatory Component did not adequately summarize and trend items documented in the performance-based reporting process and the RCC did not adequately review the summaries and trends, in that emerging problems, areas of declining performance and root cause analysis was not considered.

Process review inspections and audits were not conducted and documented in accordance with a written procedure in that no written procedures had been developed and/or implemented.

Guidance had not been developed for reporting potential criticality safety violations to the Nuclear Criticality Safety Function for evaluation.

Screening of problems and infractions for 91-01 reportability is adequate once an issue is brought to the attention of the appropriate licensee staff.

The CFFF compliance inspection program lacked formality in the closure of non-compliances identified during self-inspections.

5.0 Criticality Alarm Monitoring System

a. Scope

Inspectors reviewed the criticality alarm monitoring system for adequacy of coverage, functionality, and access to control equipment. Inspectors visited selected detector locations, reviewed supporting documentation and interviewed maintenance staff.

b. Observations

The criticality alarm system consists of an NMC Model GA-6M system which the facility procured and installed using licensee employees. The system relay circuits have been modified by the licensee to improve response time. Installation of alarm monitor locations was based on the previous license requirement that detectors be placed within 120 feet of each other. The new license calls for the ANSI/ANS 8.3 placement requirement which is based on the detector trip point. The trip point at CFFF is 15 mrem/hr and gives approximately a sixfold increase in the required radius of coverage. Criticality alarm coverage at the facility exceeds the license requirements.

The alarm calibration controls are locked inside an equipment box at each detector location. Access to the box is controlled by maintenance technicians who are responsible for performing source checks and calibration. Alarms will latch at the high and low trip points and must then be manually reset by maintenance personnel. A continuous check of system operability is performed by the system and reads out at the main guard station. Alarm annunciators are checked each week on all shifts and the detectors are source checked every six months.

c. Conclusions

The criticality accident alarm system is well designed, functional, and adequate for the CFFF plant.

FOLLOW-UP ON OPEN ITEMS

70-1151/96-202-02 (IFI) - Procedure RA-300, which included requirements to update Criticality Safety Evaluations (CSE), was outdated and should be reviewed to insure that the change control system maintains the CSEs to reflect current plant configuration.

The licensee has eliminated the procedure RA-300 and replaced it with procedure RA-312 entitled "Nuclear Criticality Safety Impact Determination for Proposed System Modifications." The new procedure requires a determination of the impact on NCS when changes, modifications, or new systems are introduced. The new procedure assigns responsibilities to specific individuals and requires documentation of the determination. This item is considered closed.

MANAGEMENT MEETINGS

Exit Meeting Summary

Inspectors met with CFFF management throughout the inspection. An exit meeting was held on December 20, 1996. No classified or proprietary information was identified. The following is a partial list of exit meeting attendees:

Westinghouse Electric Corporation

Jim Fici, Columbia Plant Manager
Ed Keelen, Quality Assurance Manager
Wilbur Goodwin, Safety Manager
Bill Ward, Operations Manager
Bob Williams, Regulatory Affairs
Norman Kent, Criticality Engineer

Nuclear Regulatory Commission

William Troskoski, Inspector, NRC Headquarters
Dennis Morey, Inspector, NRC Headquarters
Sunder Bhatia, Inspector, NRC Headquarters
Douglas A. Outlaw, Consultant

LIST OF ACRONYMS USED

CFFF	Columbia Fuel Fabrication Facility
RCC	Regulatory Compliance Committee
CSEs	Criticality Safety Evaluations
NCS	Nuclear Criticality Safety
CSAs	Criticality Safety Analyses
ADU	Ammonium Diurinate
URRS	Uranium Recovery and Recycle Services
IFBA	Integral Fuel Burnable Absorber
QC	Quality Control
NMC	Nuclear Material Control
IFI	Inspector Followup Item