UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report No.: 70-1151/94-03

Licensee: Westinghouse Electric Corporation
Commercial Nuclear Fuel Division (CNFD)
Columbia, SC 29250

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

Facility Name: Westinghouse Electric Corporation

Inspection Conducted: May 2-6, 1994

Inspector: E. D. Testa 6/1/94
E. D. Testa, Senior Radiation Specialist Date Signed

Inspector: Elizabeth B. Pharr 6/1/94
E. B. Pharr, Radiation Specialist Date Signed

Inspector: R. P. Carrion 1 JUNE '94
R. P. Carrion, Radiation Specialist Date Signed

Approved by: E. J. McAlpine 6/2/94
E. J. McAlpine, Chief Date Signed
Radiation Safety Projects Section
Nuclear Materials Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, unannounced inspection of the licensee's radiation protection (RP) program involved review of health physics (HP) activities including radiation protection procedures; instruments and equipment; external and internal exposure controls; posting, labeling, and control of radioactive materials; and surveys and monitoring. The licensee's radiological environmental monitoring program and shipping program were also reviewed. In addition, follow-up actions related to previously identified inspection findings were reviewed.

Results:

The licensee's radiological protection program activities appeared adequate to protect the health and safety of plant workers. Routine internal and external exposure programs were implemented with all personnel exposures less than

10 CFR Part 20 limits. The licensee had maintained an effective radiological environmental monitoring program in place to monitor radiological effluents due to plant operations. Previously-identified program weaknesses in the preparation, packaging, and shipping of radioactive materials had been satisfactorily addressed. However, one Non-Cited Violation (NCV) was identified, NCV 70-1151/94-03-01: Failure to adequately review documentation regarding the accuracy of Fuel Assembly Shipping Containers (Paragraph 2.e).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. Fischer, Senior Engineer, Regulatory Engineering
*S. Gantt, Senior Engineer, Regulatory Engineering
*W. Goodwin, Manager, Regulatory Affairs
*J. Heath, Manager, Regulatory Operations
*G. La Bruyere, Manager, Conversion Services
*R. Likes, Regulatory Engineer
*S. McDonald, Manager, Technical Services
*J. Purcell, Manager, Traffic
*E. Reitler, Manager, Regulatory Engineering
*B. Smith, Maintenance
*P. Stroud, Security and Services
*W. Ward, Manager, Uranium Recycle and Recovery Services (URRS)
*R. Williams, Technical Coordinator, Regulatory Affairs

Other licensee employees contacted during this inspection included engineers, operators, technicians, and administrative personnel.

*Attended exit interview conducted May 6, 1994

Acronyms and Initialisms used throughout this report are listed in the last paragraph.

2. Previously-Identified Inspector Follow-up Items (IFIs) (92701)

The following previously-identified issues were reviewed and discussed with cognizant licensee representatives:

a. (Closed) IFI 70-1151/93-04-03: Review the wording regarding the emergency telephone number information used on the shipping papers (Bill of Lading) for both waste and materials shipments with regard to the requirements of 49 CFR 172.604.

The inspector reviewed the licensee's action to address this issue. The licensee had revised the Bill of Lading (Licensee Form 43378A) in November 1993 for all Hazardous Materials Shipments to clearly differentiate between the "EMERGENCY RESPONSE CONTACT" number and the Westinghouse technical assistance telephone number, which previously had been listed as the "EMERGENCY CONTACT NUMBER," also. The revision reduced the potential for confusion during an emergency situation and the inspector determined that it satisfied the requirements of 49 CFR 172.604. Therefore, the inspector closed IFI 70-1151/93-04-03.

b. (Closed) IFI 70-1151/93-05-02: Questionable health physics (HP) practices while handling potentially contaminated tools in the uranium hexafluoride (UF_6) gas cylinder recertification area and tools in the shop maintenance area.

The inspector reviewed the licensee analysis of the handling of potentially contaminated tools in the UF_6 gas cylinder recertification area and tools in the shop maintenance area and the improvements implemented in those areas and determined that the licensee's corrective actions were appropriate. The licensee was informed that this item would be considered closed.

c. (Open) IFI 70-1151/93-09-01: Compare analytical results for gross alpha, gross beta, and isotopic uranium of a liquid waste sample collected on October 29, 1993.

As referenced in Paragraph 3.a of IR 70-1151/93-09, licensee representatives and NRC inspectors collected and split a liquid sample from the Waste Water Treatment Facility (WWTF), downstream from the composite sampler, to verify the licensee's ability to accurately detect, identify, quantify concentrations of gross alpha, gross beta, and isotopic uranium (as required by Section 2.2.7.1 of the License Application). The licensee sent its sample to a contract laboratory for analysis and the NRC inspectors sent their sample to a DOE laboratory for analysis. Attachment 1 provides a comparison of the licensee's results to the NRC's results for the sample. Attachment 2 provides the criteria for assessing the agreement between the analytical results. As indicated in Attachment 1, the licensee's isotopic uranium results compared favorably with the NRC results. However, the results for gross alpha and gross beta did not compare favorably. Further review of this issue will be conducted during a future inspection. Therefore, IFI 70-1151/93-09-01 remains open.

d. (Closed) VIO 70-1151/93-09-02: Failure to meet DOT shipping paper documentation criteria in accordance with 49 CFR 172.200.

This violation was the result of several examples of infractions on the shipping papers, as referenced in Inspection Report (IR) 70-1151/93-09, Paragraph 9.a, including 49 CFR 172.201(c), 49 CFR 172.201(d), 49 CFR 172.203(c)(2), and 49 CFR 172.203(d)(vi). Actions taken by the licensee to correct the identified problems and to preclude their recurrence included:

- A mid-December review of all shipping documents generated since IR 70-1151/93-09 to verify compliance with all applicable requirements.

- A review of applicable regulations pertaining to shipping documents was held on December 16, 1993 with all personnel of the Traffic Group responsible for that activity.

- The Traffic Group initiated a monthly Management Audit of all Hazardous Material shipping documentation to assure compliance with regulatory requirements. The audit frequency would remain monthly until such time as it was

deemed to be unnecessary. Thereafter, the audit frequency would be reduced to a quarterly basis.

The inspector reviewed licensee shipping documentation packages for Low Level Radioactive Waste (LLRW) shipments, including CAO-8769, CAO-8924, CAO-9043, and CAO-9118; fissile material shipments, including CAO-7538, CAO-7545, CAO-7561, CAO-7563, CAO-7568, and CAO-7570; and empty packages previously used to transport fissile material, including CAO-8421, CAO-8659, CAO-8916, and CAO-8917. All of the referenced shipments had been made since the completion of Inspection 70-1151/93-09, in October 1993. The inspector especially noted the items identified in the violation and found the shipping documentation to be in compliance with all requirements for each shipment.

The inspector concluded that the licensee had taken appropriate corrective actions to remedy the weaknesses of its radioactive shipment documentation packages, as identified by the violation. Therefore, VIO 70-1151/93-09-02 is closed.

e. (Closed) URI 70-1151/93-09-05: Review adequacy of current controls regarding the issuance and accuracy of USA/9239/AF packaging Quality Control (QC) documentation.

Paragraph 9.e of IR 70-1151/93-09 discussed the referenced URI, which concerned a checklist used by QC personnel to verify the license plates of Fuel Assembly Shipping Containers. The licensee was in the midst of a program to modify Fuel Assembly Shipping Containers from Rod Control Cluster (RCC) to Modified Control Cluster (MCC) configurations. Upon completion of the modification, a new license plate with a USA/9239/AF designation was to replace the former license plate, which had a USA/5450/AF designation. Checking for a license plate was part of a check list used by the QC Group as part of its inspection of the containers before releasing them for use. The check list contained only the original RCC container designation of USA/5450/AF. This issue was found late during Inspection 70-1151/93-09 and there was insufficient time or information available for the inspector to determine if the licensee was in violation of the requirements.

10 CFR 71.113 requires that the licensee establish measures to control the issuance of documents such as instructions, procedures, and drawings, including changes, which prescribe all activities affecting quality. It further requires that the established measures must assure that documents, including changes, are reviewed for adequacy, approved for release by authorized personnel, and distributed and used at the location where the prescribed activity is performed.

Since Inspection 70-1151/93-09, the licensee had reviewed and revised the Fuel Assembly Shipping Container Inspection Checklist, Form CF-75B-002, to Rev. 5, effective on December 23, 1993, to include both license plate designations.

During the current inspection, the inspector reviewed the issue and determined that the licensee had been in violation of 10 CFR 71.113 in that the check list had not been updated to include both license plate designations, the original USA/5450/AF designation as well as the new USA/9239/AF designation. Therefore, an inadequate check list was being used for the inspection, indicating that the required review for adequacy had not been done. The inspector reviewed the revised check list to verify that both license plate designations were listed and found them to be so.

The inspector concluded that, as a result of the low safety significance of the issue and the prompt corrective action taken by the licensee, the violation for failure to meet 10 CFR 71.113 requirements met the criteria specified in Section VII.B of the Enforcement Policy and would not be cited (NCV 70-1151/94-03-01).

3. Procedure Review (83822)

The inspector reviewed selected procedures which were revised as part of the licensee's implementation of revised 10 CFR Part 20 on January 1, 1994. The inspector found that several lower tier procedures still contained references to old 10 CFR Part 20 terminology; however the licensee had a program underway to find and correct the problem. Reviewed procedures appeared to meet the intent of the revised 10 CFR Part 20 requirements.

No violations or deviations were identified.

4. Training and Qualifications (83822)

10 CFR 19.12 requires, in part, that the licensee instruct all individuals working in or frequenting any portion of a restricted area in the health protection aspects associated with exposure to radioactive material or radiation; in precautions or procedures to minimize exposure; in the purpose and function of protection devices employed; in the applicable provisions of the Commission regulations; in the individuals' responsibilities; and in the availability of radiation exposure data.

The inspector reviewed and discussed with licensee representatives their program for providing Radiation Protection (RP) training to plant employees. The inspector noted that all employees involved with work activities within the licensee's radioactive materials areas were required to complete an initial orientation training, refresher training within six months of the initial orientation, and then biennial refresher training. During discussions with licensee representatives the inspector noted that a designated individual from the Regulatory Engineering group provided orientation training and the initial refresher training, within six months of the orientation, to all new employees. The Regulatory Engineering representative also provided training to visitors to a degree that was commensurate with their work

assignments while at the facility. These training needs were determined on a case-by-case basis. The biennial refresher training was administered by area training supervisors, with the training text, videos, and examination provided by the Regulatory Engineering group. The inspector noted that the Regulatory Engineering group made themselves available to the training supervisors and facility workers to answer any questions regarding the training material.

The inspector further noted that the initial orientation training did not require the workers to complete an examination. Instead, personnel were presented refresher training after six months of performing their work assignments. At this time they were required to complete an examination with at least 70 percent correct. Workers attending the biennial refresher training were also required to complete an examination with 70 percent correct. Individuals not successfully completing the examination were restricted from working with radioactive materials until they could demonstrate an adequate understanding of the training material by successfully completing the exam.

The inspector also noted that neither the orientation nor refresher training, nor the associated examination, had yet been updated to include the revised 10 CFR Part 20 terminology and exposure limits. All new employees and visitors presented the training prior to the revisions were provided a handout which thoroughly discussed the changes to the regulations, to include terminology changes, and new exposure limits and monitoring criteria. Also presented in the handout were the expected effects the revisions would have on facility operations. Permanent employees had also recently been provided this information regarding the 10 CFR Part 20 revisions as a required reading. The inspector verified that the training handout regarding 10 CFR Part 20 revisions was appropriate to inform the workers of the regulatory changes.

The inspector reviewed training material and associated videos and noted that the material thoroughly discussed radiological protection, criticality safety, emergency response, and industrial safety. The inspector also reviewed the examination and noted that it was adequate to ensure the workers' knowledge of key training objectives. Additionally, the inspector reviewed training records for selected licensee employees performing work activities involving the use or handling of radioactive materials, and noted that they had been provided an appropriate level of training. For those records reviewed all RP training was current, to include successful completion of the examination. The inspector informed licensee representatives that the RP training program was appropriate for the level of work performed by the workers and provided indepth and comprehensive training to facility workers.

No violations or deviations were identified.

5. External Exposure Control (83822)

10 CFR 20.1201(a) requires each licensee to control the occupational dose to individual adults, except for planned special exposures under 10 CFR 20.1206, to the following dose limits:

(1) An annual limit, which is more limiting of: (i) the total effective dose equivalent (TEDE) being equal to 5 rems: or (ii) the sum of the deep-dose equivalent and the committed dose equivalent to any organ or tissue other than the lens of the eye being equal to 50 rems.

(2) The annual limits to the lens of the eye, to the skin, and to the extremities, which are: (i) an eye dose equivalent of 15 rems; and (ii) a shallow-dose equivalent of 50 rems to the skin or to any extremity.

10 CFR 20.1502(a) requires each licensee to monitor occupational exposure to radiation and to supply and require the use of individual monitoring devices for adults likely to receive an annual dose in excess of 10 percent of the limits in 20.1201(a).

The inspector reviewed selected licensee procedures which established responsibilities and methods used to monitor and control external occupational radiation exposure. The inspector verified that the procedures had been or were in the process of being updated to include revised 10 CFR Part 20 terminology, dose limits, and monitoring criteria.

The inspector noted that in accordance with licensee procedures, the licensee provided beta/gamma monitoring dosimetry to all workers which were likely to exceed ten percent of the regulatory exposure limit. Depending on job function and other pertinent factors some dosimeters were processed monthly while most were routinely processed quarterly. During review of 1993 exposure data, the inspector noted that the maximum whole body exposures were usually assigned to personnel working in the Final Bundle Assembly areas, while the maximum skin exposures were routinely assigned to workers performing QC inspections for fuel pellets. The inspector also noted that individuals prone to receiving extremity dose, routinely pellet manufacturers and pellet QC inspectors, were provided with extremity dosimetry. The inspector noted that the worker with the maximum 1993 extremity exposure was a pellet QC inspector, who was assigned 37.2 rem.

The inspector further reviewed 1993 exposure data and noted that the licensee issued dosimetry to 613 individuals, with 505 receiving measurable exposures. The inspector noted that 205 of those individuals receiving measurable exposures received whole body doses of less than 100 millirem (mrem). 278 workers received doses between 100 and 500 mrem, 21 workers received between 500 and 2000 mrem, while only one individual exceeded a whole body dose of 2000 mrem for the year. The inspector noted that this maximally exposed individual received

2986 mrem during the year. The inspector further noted that the individual received 2828 mrem of his total annual exposure during the fourth quarter. The licensee felt that the elevated fourth quarter dosimeter reading was an anomaly since the worker was routinely associated with chemical conversion activities where whole body exposures normally were minimal. Additionally, during the previous nine years the individual had averaged an annual whole body exposure of 330 mrem. However, since such an anomaly could not be fully explained, the licensee therefore assigned the individual the recorded exposure for the period. The inspector verified that since the individual exceeded the 1993 quarterly exposure limit of 1250 mrem, the licensee, in accordance with regulatory requirements, had a completed NRC Form-4 for the individual with an adequate lifetime exposure remaining. The inspector also reviewed 1994 exposure records for selected individuals who were assigned dosimetry which was processed monthly. The inspector noted that the licensee's dosimetry vendor was appropriately reporting deep, shallow, and lens of the eye doses at the required density thicknesses.

The inspector noted that the licensee appeared to be appropriately providing monitoring equipment and controlling exposures to plant personnel. Reviews and investigations, as applicable, of workers' exposures were thorough, with the licensee appropriately assigning individual exposures. The inspector informed licensee representatives that their current external exposure monitoring programs were appropriate to evaluate workers' exposures and to verify compliance with applicable license and 10 CFR Part 20 requirements.

No violations or deviations were identified.

6. Internal Exposure Control (83822)

10 CFR 20.1204 states that for purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee, when required to monitor internal exposure, shall take suitable and timely measurements of concentrations of radioactive materials in air, quantities of radionuclides in the body, quantities of radionuclides excreted from the body, or combinations of these measurements. When specific information on the behavior of the material in an individual is known that information may be used to calculate the Committed Effective Dose Equivalent (CEDE).

10 CFR 20.1502(b) requires each licensee to monitor the occupational intake of radioactive material by and assess the committed effective dose equivalent to:

(1) Adults likely to receive, in one year, an intake in excess of 10 percent of the applicable Annual Limit on Intake (ALI) in Table 1, Columns 1 and 2 of Appendix B to 10 CFR 20.1001-20.2401; and

(2) Minors and declared pregnant women likely to receive, in one year, a committed effective dose equivalent in excess of 0.05 rem.

The inspector reviewed selected licensee procedures which established responsibilities and methods used to control, monitor, and evaluate internal occupational radiation exposure. The inspector verified that the procedures had been appropriately updated to include revised 10 CFR Part 20 terminology and dose limits. The inspector also reviewed the licensee's programs for evaluating and controlling internal exposures to include air sampling, lung counting, urinalysis, and respiratory protection to verify implementation of the revised procedural requirements in accordance with new 10 CFR Part 20 requirements.

a. Air Sampling Program

The inspector reviewed the May 3, 1994 Airborne Reduction Team (ART) 1994 Air Sample Data. The data shows an awareness of air sample locations and points out areas which have improved and those areas needing additional attention. Plots of averages 1994 year to date provide a historical record of trends. The January 5, 1994 ART 1993 Air Sample Data showed that all plant department averages were less than or equal to 7.6 percent of the Maximum Permissible Concentration (MPC) for 1993.

No violations or deviations were identified.

b. Invivo Analysis Program

The inspector reviewed the energy calibration data for the invivo counter. Procedure ROB-04-011, Revision (Rev.) 1, dated November 7, 1991, Step 4.1, requires that the invivo counter be calibrated semi-annually. The inspector reviewed the last two semiannual calibrations and did not find any areas of concern.

The inspector discussed with licensee representatives changes made in their lung counting program as a result of revised and reduced limits on internal exposures, in accordance with 10 CFR Part 20. At the time of the inspection the minimum detectable limit (MDL) for the lung counter was approximately 82 micrograms of uranium-235 (μg U-235). The inspector also reviewed the invivo crosschecks performed at the Nuclear Fuel Services (NFS) facility in Erwin, TN on November 30, 1993. The individuals were kept out of the contaminated area of the plant for two days prior to their evaluation. The employees were counted at the licensees facility the morning before the NFS counts. The results indicate general agreement between the two facilities' results for three of the four individuals counted. The fourth individual's count appeared to be biased high (W-132.0 μg U-235 vs NFS-55.8 μg U-235). Possible factors contributing to this difference as stated by the licensee include participant physiology, detector and system electronics, and statistics. The inspector did not find any areas of concern.

No violations or deviations were identified.

c. Exposure Evaluation

The inspector reviewed the Exposure Evaluation of Unusual Incident #200 which occurred on January 19, 1994. An Ammonium Diuranate (ADU) Conversion operator was involved in a uranium solution ingestion incident while checking a plugged line between a pump and a filter press. As a result of the event and the contamination, the operator was restricted from working in the Chemical Area of the plant for seven days. Accumulated 48-hour urine and all fecal voids over a period of five days were collected. The first urine sample submitted was screened by plant medical staff for albumin (proteins). The result of this screening was negative. The relatively low urine sample results (30-66 disintegrations per minute per liter (dpm/l)) when compared to fecal results showed a classic ingestion retention and excretion characterization. The licensee performed dose estimates based on ICRP 30 methodology and the use of intake retention fractions as described in Regulatory Guide 8.9, Acceptable Concepts, Models Equations, and Assumptions for a Bioassay Program, and NUREG/CR-4884, Interpretation of Bioassay Measurements. The licensee also used reference man physiology and a one micron (um) activity median aerodynamic diameter (AMAD) particle size distribution. The licensee's estimated exposure from the event was recorded as 0.676 rem Committed Effective Dose Equivalent (CEDE) and 3.38 rem Committed Dose Equivalent (CDE), which was below regulatory limits.

No violations or deviations were identified.

d. Respiratory Protection

10 CFR 20.1703(a)(3) requires that if the licensee uses respiratory protection equipment to limit intakes pursuant to 10 CFR 20.1702, the licensee will implement and maintain a respiratory protective program that includes: air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate exposures; surveys and bioassays to evaluate the actual exposures; written procedures to select, fit, maintain, and test respirators; written procedures regarding supervision and training of personnel and issuance of records; monitoring; recordkeeping; and determination by a physician prior to initial fitting of respirators, and at least every 12 months thereafter, that the individual user is physically able to use respiratory protective equipment.

During discussions with licensee representatives and review of applicable licensee procedures, the inspector noted that all users of respiratory protective devices were required to complete Respiratory Protection Training biennially, to receive a medical status review and pulmonary function test annually, and to complete a fit-test annually. The inspector was informed that based on a recent program change individuals were currently

required to complete fit-tests annually rather than biennially, as previously required. The inspector verified that selected workers, assigned to various Radiation Work Permit (RWP) activities, had current and adequate respirator qualifications as required by RWP and procedural requirements. The inspector also toured and observed routine activities in the licensee's facility for cleaning, repairing, and inspecting respirators. The inspector verified that the filters and respirators were cleaned, surveyed for contamination, inspected for integrity, and that penetration tests were performed to ensure that respirators and filters met applicable standards for safe use. During facility tours the inspector noted that respirators were appropriately stored, sealed, and labeled for use as required by licensee procedures.

No violations or deviations were identified.

7. Surveys and Monitoring (83822)

10 CFR 20.1501(a), in part, states that each licensee shall make or cause to be made, surveys that (1) may be necessary for the licensee to comply with the regulations in this part; and (2) are reasonable under the circumstances to evaluate the extent of radiation levels; concentrations or quantities of radioactive material; and the potential radiological hazards that could be present.

The inspector toured the controlled areas of the plant several times during the inspection. The portion of the product line toured included the fuel pellet press area, the pellet storage area, the sintering furnace area, the sintered pellet storage area, the pellet grinders area, and the rod loading area. During the tours the inspector did not note any weaknesses in the licensee's program to control contamination at various locations. No excessive loose contamination and no loose pellets were observed during the tours. The inspector also toured the low level waste storage area, the cylinder recertification area, outside shop areas, and the outside warehouse and no problems were found. The inspector reviewed selected plant contamination surveys and performed a limited number of independent smears of selected plant areas to verify contamination control. Postings and labels were selectively inspected and no problems were observed.

The inspector also reviewed selected RWPs for appropriateness of the radiation protection requirements based on work scope, location, and conditions. The inspector reviewed RWPs initiated during 1994 associated with work activities for which there was not a standard operating procedure. The inspector verified that in accordance with the RWP the individuals authorized to perform the work activities had signed that they had read the RWP and understood its requirements. The inspector also verified that those authorized workers on selected RWPS had appropriate and current radiation protection and respiratory protection training. The inspector reviewed records of HP coverage during selected RWP activities and found that the workers were provided

appropriate dosimetry, protective clothing, and respiratory protection devices. As well, documentation of HP coverage, to include surveys and posting and control of the work area, appeared to be adequate to meet the RWP requirements. The inspector informed licensee representatives that their program for RWP implementation adequately addressed radiological protection concerns, and provided for proper control measures.

Additionally, the inspector reviewed selected licensee internal audits and inspections and found them to be indepth and aggressively seeking out potential weaknesses. The areas identified were being tracked and responsibilities for correction were assigned. The inspector reviewed selected items on the Regulatory Affairs Inspection Report and found the closeout timing to be reasonable.

No violations or deviations were identified.

8. Program for Maintaining Exposures As Low As Reasonably Achievable (ALARA) (83822)

10 CFR 20.1101(b) requires that each licensee use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as reasonably achievable (ALARA).

The inspector reviewed the licensee's semiannual ALARA Report for the period of July 1, to December 31, 1993, as well as minutes from ART and Mini-ALARA meetings conducted during the period from July 1993 to May 1994. The inspector noted that the ALARA Report met the licensee's requirements as specified in their License Application and applicable procedures. In general, the ALARA Report was well written and organized. The ALARA Report discussed in detail airborne concentrations and internal exposures, external exposures, total effective dose equivalents (TEDEs), effluent and environmental controls, unusual occurrences, audit results, and ALARA Program efforts during the six month period. The ALARA Report also statistically evaluated in each of the operating areas any short- or long-term trends related to radiation exposure. Based on these statistical evaluations in each of the operating areas the licensee would determine locations for improvements and corrective actions. The inspector noted that the licensee continued to utilize the ART and a Mini-ALARA program to review and track radiation exposure data, and to review trend analyses, as provided by the ALARA Report, so as to select and prioritize target locations for improvements and ensure effective corrective actions.

The inspector noted that, as identified in the ALARA Report, statistically downward trends in airborne concentrations and internal exposures have continued in many of the facility's operating areas, particularly the ADU Conversion Area, MAP, and the recovery areas. No statically significant trends were identified in urinalysis results, invivo results, nor external exposures. During 1993 four workers

exceeded a TEDE of 3.0 rem, with the maximum TEDE being 4.69 rem. Three of these individuals worked in the ADU Pellet area and one in the ADU Conversion area. Overall, licensee data indicated that the operating area with the maximum cumulative TEDE was the ADU Conversion area, followed by the ADU Pellet area. Based on 1994 exposure estimates it appeared that the maximally exposed worker during the first quarter was an operator initially working in ADU Conversion but moved to ADU Pellet, with an estimated TEDE of 1.6 rem. The inspector noted that in an effort to reduce personnel exposures the licensee was currently evaluating methods to reduce airborne concentrations in the ADU Pellet area including improving process controls and containments, upgrading and painting floors to facilitate decontamination, minimize contamination, and reduce airborne radioactivity. Additionally, the licensee had also upgraded and painted floors in the Rod Area and Recovery areas, and in an effort to reduce external/extremity exposures had installed automatic boat loaders on each of the operating pellet lines.

The inspector informed licensee representatives that their ALARA program appeared to be effective in reducing personnel exposures, and was aggressively seeking further efforts at maintaining employees' exposures ALARA.

No violations or deviations were identified.

9. Environmental Protection (88045)

Safety Demonstration 2.7 specifies the requirements for the licensee's environmental protection program, including sampling types collected, monitoring frequency, parameters analyzed, and Minimum Detectable Levels. Figures 2.7.3, 2.7.4, and 2.7.5 of the same chapter are maps showing the locations of sampling sites for the various media throughout the area.

The inspector reviewed the licensee's environmental protection program with respect to management controls, quality control, and program implementation. The program provides representative measurements of radioactivity in the highest potential exposure pathways and verification of the accuracy of the effluent monitoring program and modeling of environmental exposure pathways. Accumulation of radioactivity in the environment can thereby be measured; trends assessed, to determine whether the radioactivity resulted from plant operations; projections made of potential dose to off-site populations based on the cumulative measurements of any plant-originated radioactivity; and detection of unanticipated pathways for the transport of radionuclides through the environment. The program is designed to detect the effects, if any, of plant operation on environmental radiation levels by monitoring radiation pathways in the area surrounding the plant site. It also verifies that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Indicator sampling

stations are located where detection of the radiological effects of the plant's operation would be most likely, where the samples collected should provide a significant indication of potential dose to man, and where an adequate comparison of predicted radiological levels might be made with measured levels. Control stations are located where radiological levels are not expected to be significantly influenced by plant operation, i.e., at background locations. An environmental impact assessment of plant operation is made from the radiological measurements of the sampling stations.

The inspector reviewed Procedure No. ROP-06-006, Rev. 5, "Collection of Routine Weekly and Monthly Environmental Samples," which proceduralized the implementation of the licensee's requirements, including sampling to be performed, acidification of radiological samples upon collection, and preparation of samples for shipment. The procedure was complete and included information about equipment to be used for sampling and sample preparation, packing lists, site plans showing sampling station locations, etc.

The inspector accompanied licensee personnel during their routine weekly collection of environmental samples, as specified in the procedures and license application, to observe collection technique and to check the physical condition and operability of the sampling stations. Four air particulate samples and three water samples were collected from the sampling stations/sites visited. The inspector observed the exchange of the air particulate filters and the collection of water samples. All air sampling stations were observed to be well-maintained and located in areas free of tall weeds/vegetation which might interfere with the taking of a representative sample. There was no evidence of vandalism. The inspector noted that the calibration stickers on all of the sampling units indicated that the units were within their calibration period.

The inspector observed that the licensee personnel were knowledgeable and well-trained in sample collection, labeling, and were familiar with both the location of sampling sites and the required frequency of sample collection.

The inspector concluded that the licensee personnel were competent and conducted their activities in a professional manner. The inspector also concluded that the licensee had an effective program in place to monitor radiological effluents due to plant operations.

10. Exit Meeting (83822, 92701)

The inspector met with licensee representatives indicated in Paragraph 1 at the conclusion of the inspection on May 6, 1994. The inspector summarized the scope and findings of the inspection. Although proprietary documents and processes were reviewed during the inspection, the proprietary nature of these documents is not reflected in this report. Dissenting comments were not received from the licensee.

Item Number	Description and Reference
70-1151/94-03-01	NCV - Failure to adequately review documentation regarding the accuracy of Fuel Assembly Shipping Containers. (Paragraph 2.e.)

11. Acronyms and Initialisms

α - alpha
ADU - Ammonium Diuranate
ALARA - As Low As Reasonably Achievable
ALI - Annual Limit on Intake
AMAD - activity median aerodynamic diameter
ART - Airborne Reduction Team
ß - beta
CDE - Committed Dose Equivalent
CEDE - Committed Effective Dose Equivalent
CFR - Code of Federal Regulations
Ci - curie
CNFD - Commercial Nuclear Fuel Division
DOT - Department of Transportation
dpm - disintegrations per minute
g - gram
HP - Health Physics
ICRP - International Commission on Radiological Protection
IFI - Inspector Followup Item
IR - Inspection Report
l - liter
LLRW - Low Level Radiological Waste
μCi - microCurie (1.0E-6 Ci)
μg - microgram (1.0E-6 gram)
μm - micrometer (1.0E-6 meter)
m - meter
MCC - Modified Control Cluster
MDC - Minimum Detectable Concentration
ml - milliliter
MPC - Maximum Permissible Concentration
mrem - millirem
NCV - Non-Cited Violation
NFS - Nuclear Fuel Services, Inc.
NRC - Nuclear Regulatory Commission
QC - Quality Control
RCC - Rod Control Cluster
Rev - Revision
RP - Radiation Protection
RWP - Radiation Work Permit
TEDE - Total Effective Dose Equivalent
UF_6 - Uranium Hexafluoride
URI - Unresolved Item
URRS - Uranium Recycle and Recovery Services
VIO - Violation
WWTF - Waste Water Treatment Facility

ATTACHMENT 1

COMPARISON OF NRC AND WESTINGHOUSE ANALYTICAL RESULTS
SAMPLE COLLECTED OCTOBER 29, 1993

Type of Sample: Water (One-Liter Split Sample from the WWTF)
Units: μCi/ml

Analysis	Licensee's Value	NRC Value	Resolution	Ratio	Comparison
Gross α	5.44 E-7	(1.20 +/- 0.20)E-6	6	0.45	Disagree
Gross β	1.49 E-7	(5.50 +/- 0.70)E-7	8	0.27	Disagree
U-235	3.00 E-8	(4.30 +/- 2.20)E-8	2	0.70	Agree
U-238	1.40 E-7	(1.66 +/- 0.10)E-7	17	0.84	Agree

ATTACHMENT 2

CRITERIA FOR COMPARISONS OF ANALYTICAL MEASUREMENTS

This attachment provides criteria for the comparison of results of analytical radioactivity measurements. These criteria are based on empirical relationships which combine prior experience in comparing radioactivity emission, and the accuracy needs of this program.

In these criteria, the "Comparison Ratio Limits"[1] denoting agreement or disagreement between licensee and NRC results are variable. This variability is a function of the ratio of the NRC's analytical value relative to its associated statistical and analytical uncertainty, referred to in this program as "Resolution".[2]

For comparison purposes, a ratio between the licensee's analytical value and the NRC's analytical value is computed for each radionuclide present in a given sample. The computed ratios are then evaluated for agreement of disagreement bases on "Resolution." The corresponding values for "Resolution" and the "Comparison Ratio Limits" are listed in the Table below. Ratio values which are either above or below the "Comparison Ratio Limits" are considered to be in disagreement, while ratio values within or encompassed by the "Comparison Ratio Limits" are considered to be in agreement.

TABLE

NRC Confirmatory Measurements Acceptance Criteria
Resolution vs.Comparison Ratio Limits

Resolution	Comparison Ratio Limits for Agreement
< 4	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
> 200	0.85 - 1.18

[1]Comparison Ratio = $\frac{\text{Licensee Value}}{\text{NRC Reference Value}}$

[2]Resolution = $\frac{\text{NRC Reference Value}}{\text{Associated Uncertainty}}$