U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	70-1113
License No.:	SNM-1097
Report No.:	70-1113/96-11
Licensee:	General Electric Company
Facility:	Nuclear Energy Production
Location:	Wilmington, North Carolina
Dates:	October 14 - 18, 1996
Inspector:	G. L. Troup Sr. Fuel Facility Inspector
Approved by:	E. J. McAlpine, Chief Fuel Facilities Branch Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

General Electric Nuclear Energy Production
NRC Inspection Report 70-1113/96-11

This routine inspection was focused on operations, functional testing, facility changes, status of the new Dry Conversion Facility (DCF) and review of events reported to the NRC. The inspection was focused on the safe operation of the facility.

Plant Operations

- The licensee has completed the modification of Line 5 in accordance with procedural requirements for change control, nuclear safety analysis and functional testing. Controls have implemented for safe operation of the system.

- The licensee had implemented an effective program to control the keys for Active Engineered Controls (AECs), but noted that while the requirement for key control was specified in a Nuclear Safety Requirements/Release (NSR/R), a memo, there was no procedure which specified how the program was to be implemented.

- Declaring the criticality alarm inoperable system based on the failure of the Public Address (PA) system was a conservative but reasonable approach.

- The action to up-date the drawings of the alarm system and place it in the configuration control system is a positive effort.

- Providing technicians performing Nuclear Criticality Safety (NCS) measurements with the out-of-specification conditions for tests for prompt notification of cognizant personnel strengthened the process.

- The bulging of the sump was not adequately addressed when first identified in 1987 or properly reviewed again when identified in 1992.

Management Organization and Control

- Persons appointed to positions described in the license application met the educational and experience requirements. Other persons were qualified for the position.

Maintenance/ Surveillance

- The fixed neutron absorbers were properly evaluated with acceptable results. Test procedures will be revised and approved based on the new techniques.

- New power sifters were installed in the grounding system of outside criticality monitors.

DCF Project

- The major process components of the process systems have been installed. Supporting piping and instrumentation systems have yet to be installed.
- Resolution of identified deficiencies in the process control system software has not been officially confirmed.
- Staffing for the DCF is behind schedule. Completion of classroom training and readiness for testing will have to be satisfactorily completed.

Within the scope of the inspection, one non-cited violation (NCV) and one new Inspector Followup Item (IFI) were identified.

Attachments:

Partial List of Persons Contacted
Inspection Procedures Used
List of Items Opened, Closed and Discussed
List of Acronyms

REPORT DETAILS

Summary of Plant Status

This report covers a one week period. During the period, fuel production operations were running normally. Powder production was shut down for about two days during the period due to a problem with the water supply to the process systems.

Construction activities for the new powder production facility (DCF) were progressing.

No other NRC inspections occurred during the period.

I. Safety Operations

03 Plant Operations (88020)

03.02 Facility Modifications and Configuration Controls

a. Inspection Scope

The inspector reviewed the documentation and modifications associated with up-grading Line 5 to process HiE materials from the Uranium Conversion (UCON) skid.

b. Observations and Findings

Various plant systems are qualified by Nuclear Safety to process uranium with a nominal maximum enrichment of 4% ("LoE") while others are qualified to process uranium with a nominal maximum enrichment of 5% ("HiE"). Line 5 consists of a defluorinator and associated equipment for processing ammonium diuranate produced by processing uranyl nitrate from Uranium Recovery in the UCON skid and producing Uranium Dioxide (UO_2) powder. Uranium Recovery and UCON were qualified for HiE but the Line 5 system was qualified only for LoE. A project was initiated to up-grade Line 5 to handle HiE material. A change request had been approved to accomplish the up-grade.

The inspector reviewed the documentation for the up-grade of Line 5 and inspected (walked down) various portions of the modifications.

The process description and safety description were incorporated into Technical Report No. 3.10.1, HiE UCON Process, Revision (Rev.) 1, dated September, 1996. New AECs were documented in Technical Report No. ADU-AEC-1, Chemical Area AECs, Rev. 0. The inspector selected 10 AECs from the list and compared the described function with the Technical Report and the Criticality Safety Analysis (CSA). Descriptions and functions were all consistent. The inspector also reviewed the associated Functional Test Instructions (FTIs) and determined that the tests confirmed

proper operation of the controls The inspector reviewed the completed FTI reports and determined that controls performed as required.

Two uranium monitors have been installed in the system to measure the uranium concentration in the solution and maintain a safe mass in designated tanks. The inspector reviewed the test and calibration records for the monitors and also discussed the modifications made to the sample chamber for uranium concentration measurement.

Using the flow diagram in the Technical Report and the AEC list, the inspector walked down the system and visually confirmed that the equipment had been installed and the flow path was as shown. The inspector also observed that acid flush and drain valves on the monitors were locked in the "closed" position so that positive operator action is required to perform that operation.

c. Conclusions

The licensee has completed the modification of Line 5 in accordance with procedural requirements for change control, nuclear safety analysis, and functional testing. Controls have implemented for safe operation of the system.

03.03 Implementation of Process Safety Controls

a. Inspection Scope

The inspection consisted of a review of the licensee's program for the control of keys and locks which are used to implement positive control of AECs.

b. Observations and Findings

A number of NSR/Rs contain the requirement that valves or equipment be locked and the keys be controlled by Radiation Protection (RP). In Uranium Recovery Unit (URU) and on Line 5, examples are the acid flush valves for uranium monitors. Another example is the lock installed on the timer chamber on pellet presses. The timer require that pellets be removed in a specified period or the press shuts down.

The inspector asked several operators in production areas how to obtain the keys for various locks installed on pieces of equipment designated as AECs. The response in each case was that only the Shift Technical Resource (STR) could obtain the key and unlock the equipment. The inspector discussed the situation with STRs, Area Coordinators (ACs), and RP personnel as to how the keys were controlled. In each case, the individual stated that the STR could obtain the key from the radiation protection office after signing out the key, and unlock the equipment for work, then lock

it again and return the key to the RP office. The STR logs the key in and RP signs the log that the key was returned. In many cases, one key will open several locks in a particular process area, because the locks must be opened to accomplish a particular system alignment. The inspector concluded that this is an acceptable practice so long as control is maintained over the keys.

The inspector also discussed the situation with Nuclear Safety personnel who described the same procedure for obtaining the key. They also discussed the situation for auditing the control of the keys to maintain control. Certain keys can only be obtained by Nuclear Safety personnel or by designated maintenance personnel.

During discussion of the key control program, licensee personnel informed the inspector of a condition which had been identified during an internal audit. Locks had been obtained from stores which were "keyed same" such that the keys with any lock in a carton would open all of the locks in the carton. This case was documented in Unusual Incident Report (UIR) Chemical Product Line (ChPL) 9659. A number of locks were replaced and the procurement policy was changed to permit establishment of control over keys for locks installed on AECs.

c. Conclusions

The inspector determined that the licensee had implemented an effective program to control the keys for AECs, but noted that while the requirement for key control was specified in a NSR/R, a memo, there was no procedure which specified how the program was to be implemented. Licensee personnel acknowledged this comment and stated that the key control program would be formalized in a procedure, such as a Nuclear Safety Instruction (NSI).

03.07 Other Operational Issues

a. Inspection Scope

The inspector reviewed two events which had been reported to the NRC since the last inspection. The inspection included a review of the circumstances of the event and the corrective actions taken. Events reviewed were: (1) inoperable criticality warning system horns (NRC Event Number (EN) 30853), and (2) loss of geometry control in a slab tank (NRC EN 31113).

b. Observations and Findings

(1) Inoperable horns

Numerous horns are located throughout the plant areas which serve both the PA voice system and the criticality alarm system. On August 8, 1996, three of the horns were

determined to be inoperable when a message was announced over the PA system. Operations involving Special Nuclear Material (SNM) were suspended, including movement of material, and personnel were subsequently removed from the affected areas. Subsequent testing showed that three additional horns were inoperable due to the failure of amplifiers in the circuitry. As these horns are part of the criticality alarm system, the licensee declared the system inoperable and reported the condition under the requirement of 10 CFR 70.50(b)(2) when accident mitigation equipment is required and fails, even though the criticality alarm system was checked to determine if the horns responded. The required 30-day written report was submitted on September 4, 1996.

The investigation revealed that in addition to the amplifier failure, three horns were found to be defective or clogged with foreign material. One amplifier was replaced, one repaired and the three horns were replaced. The original incident report, UIR 9649 ChPL, indicated the need for a formal investigation.

The investigation revealed that the schematic drawings for the system was not current. There were horns wired into parts of the system which were under different management teams. There was also a question about the ability to hear horns in adjacent areas if a horn was not functioning. The corrective actions included testing the horns for audibility in adjacent, updating and controlling the system drawings and changing the emergency response procedures to address the loss of horn audibility. These corrective actions are scheduled for completion by January, 1997. IFI 96-11-01 is opened to follow-up on the long term corrective actions.

(2) Loss of geometry control

During the plant shutdown period, various tanks were measured using ultrasound techniques to determine if internal dimensions conformed to NCS requirements as specified in the NSR/R. Test results for the URU Exhaust Scrubber Sump (T-965) showed a bowing or bulging at the bottom, with the dimensions of 4.59 inches up to 4.86 inches, compared to the NCS limit of 4.45 inches. Once this condition was evaluated by Nuclear Safety, it was identified as a loss of geometry control and reported to the NRC in accordance with NRC Bulletin 91-01.

Temporary measures were taken to push the sump walls back to the required dimension and retain that condition. A review of sampling records of the sump showed that the concentration of uranium in the liquid in the sump was

significantly lower than the NCS limit. The limit is 16,000 parts per million (ppm) while the highest sample result in the last thirty months was 0.7 ppm.

The licensee's investigation revealed that when the sump was initially installed in 1987 and filled with water, the sides bulged due to inadequate design (thin walls with no external support). The resolution was the installation two rows of constraints to pull the upper half in and hold it. The dimensions of the resulting space apparently were not documented nor was the dimension of the bottom of the tank checked. In 1992, the sump dimension was measured with ultrasound techniques and shown to exceed the 4.45 inch requirement in several locations but no record could be found that this had been evaluated by Nuclear Safety.

The CSA for the sump was calculated for the actual dimensions of the sump as shown to be safe for up to a five inch dimension. The original CSA had been based on an infinite length rather than the actual length. Even though the CSA determined that the bulges were acceptable, it was decided to maintain the original dimensional requirement. Additional constraints will be installed in the sump to maintain the dimensions. [Record note - this was accomplished by October 30.]

Part I, Chapter 4, Section 4.2.4.3 of the license application states that when criticality control is directly dependent on the integrity of a structure used to retain the geometric form of a fissile material accumulation, the structure shall be designed with an adequate strength factor to assure against failure under foreseeable loads or accident conditions. The design of the sump was inadequate in that it bulged and deformed under normal operating loads and thus did not meet the license criterion or the criterion of NSR/R 02.01.06. While the inadequate design is a violation, the operating conditions were such (all inputs to the exhaust ventilation system had been previously processed resulting in uranium concentrations significantly below the limit) that this is of minor significance and is being treated as an NCV consistent with Section IV of the NRC Enforcement Policy (NCV 96-11-02).

In reviewing the licensee's files on this condition, the inspector noted that over a month passed between the time that the measurements were made (August 28) and the report was evaluated by Nuclear Safety (October 7). The technicians were told which tanks and sumps to measure but were not given an action limit or "go-no go" limit which would require an immediate notification if the measurement exceeded the limit. Consequently, there was nothing which caused any concern until the report was reviewed during the

course of normal work. Licensee representatives acknowledged this comment and stated that in the future, the technicians would be provided with a limit and directed to report immediately if the limit was exceeded.

c. Conclusions

Declaring the criticality alarm system inoperable based on the failure of the PA system was a conservative but reasonable approach.

The action to up-date the drawings of the alarm system and place it in the configuration control system is a positive effort.

Providing technicians performing NCS measurements with the out-of-specification conditions for tests for prompt notification of cognizant personnel strengthened the process.

The bulging of the sump was not adequately addressed when first identified in 1987 or properly reviewed again when identified in 1992.

One IFI and one NCV were identified.

05 Management Organization and Controls (88005)

05.01 Organizational Structure

a. Inspection Scope

The inspector reviewed changes in the organization since the last inspection, especially as they apply to positions described in the license application.

b. Observations and Findings

The former General Manager, Nuclear Fuel moved to a new position reporting to the Vice President and General Manager, General Electric - Nuclear Energy (GE-NE). The former President, Reuter-Stokes was appointed General Manager, Nuclear Fuel.

The former Manager, Environmental Health and Safety (EH&S) was appointed to a position in a different part of GE. The Manager, GE-NE Quality is acting in the Manager, EH&S on a temporary basis pending selection of a replacement.

On October 18, 1996, a new Manager, Nuclear Safety was appointed. This individual had been acting in that position. At the same time, a functional manager for the radiation safety function was appointed, who will report to the Manager, Nuclear Safety. The inspector determined that the Manager, Nuclear Safety meets the qualifications for the criticality safety function and the

functional manager meets the qualifications for the radiation safety function as specified in Part I, Chapter 2, Section 2.5.3 of the license application. The license application permits division of the functional area management.

c. Conclusions

Persons appointed to positions described in the license application met the educational and experience requirements. Other persons were qualified for the position.

IV. Facility Support

F1 Maintenance/Surveillance (88025)

F1.06 Surveillance Testing

a. Inspection Scope

The inspector reviewed the licensee's actions to comply with the license requirement to verify the integrity of fixed neutron absorbers on a periodic schedule. The replacement of power suppresors in the grounding system of criticality monitors was also verified.

b. Observations and Findings

Part I, Chapter 4, Section 4.2.4.4.1 of the license application requires that the integrity of fixed neutron absorber systems must be verified on a periodic schedule. The licensee has determined that a two year cycle is appropriate for the neutron absorber panels associated with tanks in URU and Chemical Conversion. This requirement is specified in the applicable NSR/Rs.

Testing of the fixed neutron absorber systems (poison panels) was performed during the shutdown period in August-September. A contractor had performed the last test and their approved procedure was available. Some changes were necessary because some of the poison panels had been repositioned during structural changes in the external supports and the neutron source used had was stronger than that specified by the contractor. These changes were marked in the procedure as field changes. The licensee also increased the number of standards checks for the source and detector in the field, which made the measurements more reliable than the vendor's method. A licensee representative informed the inspector that these changes would be incorporated into the procedure and approved as a revision.

The final test report was still being prepared during the inspection. The inspector discussed the results and reviewed some of the field data for different tanks. The licensee's test results determined that the effectiveness of the panels had not decreased and all met the minimum safety specifications.

Several of the criticality monitors installed in outside areas had experienced power surges resulting in false alarms during electrical storms (IR 70-1113/96-08, Paragraph 1.2). A review of the system had identified that the surge suppressors ("power sifters") exceeded the vendor's recommended lifetime. During the shutdown period, new power sifters were installed in the six outside units. The inspector reviewed the records in the Maintenance Planning and Control database and verified that new batteries had been installed and the power sifters replaced.

c. Conclusions

The fixed neutron absorbers were properly evaluated with acceptable results. Test procedures will be revised and approved based on the new techniques.

New power sifters were installed in the grounding system of outside criticality monitors.

V. Special Topics

T1 DCF Project (88020)

T1.01 Facility Construction

a. Inspection Scope

The inspector reviewed the installation of process equipment and reviewed the status of the roof construction for the DCF.

b. Observations and Findings

Using the system description in Technical Report S14.1320, Process Description and Design Basis, and various P&IDs, the inspector walked down each process line and confirmed that all major pieces of equipment for the powder production process from the vaporizers (including cold traps) through the homogenizers were installed. Much of the inter-connecting piping and service piping and associated instrumentation had not been installed as yet.

The DCF is designed as a "moderation restricted" facility. As such, the roof of the facility has a significant role in preventing the intrusion of moderating material (water) into the facility. The installation of the roof components through the first (outer) roof membrane had previously been inspected. The final stages of the roof installation is the installation of the

edge seal and trim. The inspector observed that the edge seal and trim had not been installed. Licensee representatives stated that the schedule for the final sealing had not yet been finalized but would be about two months away. Final inspection of the roof seal will be delayed.

Practices and Procedures (P/P) 120-15 requires that a formal design review be conducted for new process control systems. The process control system for the DCF was programmed by a contractor for the primary supplier. The design review by licensee personnel identified problems with the control of AECs and interlocks in that the computer system is able to be changed without the formal change control system required by the licensee. The resolution of this situation has not yet been defined.

c. Conclusion

The major process components of the process systems have been installed. Supporting piping and instrumentation systems have yet to be installed.

Resolution of identified deficiencies in the process control system software has not been officially confirmed.

T1.02 Staffing and Training

a. Inspection Scope

The inspector reviewed the status of staffing the DCF for operation and the status of training of the staff.

b. Observations and Findings

The original plan for designating the staff for the DCF was to be completed by September. However, a number of personnel issues delayed the selection of the staff. During the inspection period, offers were made to applicants to staff the DCF.

Training for the staff has been delayed by the identification and selection of the operating staff. Training will begin about December 1. This is due to the need to select and train personnel to replace persons selected for the DCF. The completion of classroom and on-the-job training required to support functional testing is still being scheduled.

c. Conclusions

Staffing for the DCF is behind schedule. Completion of classroom training and readiness for testing will have to be satisfactorily completed.

VI. Management Meetings

M1 Exit Interview Summary

On October 18, 1996, the inspection scope and findings were summarized with licensee representatives. The inspector discussed in detail the areas inspected, the findings and concerns which had been identified. There were no dissenting comments expressed by licensee representatives.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

*M. Chilton, Manager, Joint Conversion Project
*T. Flaherty, Start-up Manager, JCP
*R. Foleck, Sr. Licensing Specialist
*T. Hauser, Manager, GE-NE Quality and Acting Manager, EH&S
*R. Keenan, Manager, Site Security & Emergency Preparedness
*J. Kline, Manager, Chemical Product Line
D. Landry, Leader, Technology Team
*S. Murray, Team Leader, Chemical Conversion
*L. Paulson, Manager, Nuclear Safety Engineering
*L. Quintana, Manager, Fuel Fabrication Product Line
*R. Reda, Manager, Fuels and Facility Licensing
*G. Smith, Team Leader, Fuel Manufacturing Operation (FMO) Maintenance Support
C. Tarrer, Team Leader, Configuration Management & Integrated Safety Analysis (ISA)
*K. Theriault, Team Leader, URU
*C. Vaughan, Program Manager, Dry Conversion Product (DCP) EH&S and Regulatory
*C. Williams, Team Leader, Waste Treatment
*P. Winslow, Manager, Material Control and Accountability (MC&A)

* Attended exit interview on October 18, 1996.

INSPECTION PROCEDURES USED

IP 88005	Management Organization and Control
IP 88020	Operations Review
IP 88025	Maintenance/ Surveillance Testing

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

Item Number	Type	Description and Discussion
96-11-01	IFI	Follow-up on long term corrective actions for criticality system warning horns
96-11-02	NCV	Lack of structural integrity to maintain a nuclear safety limit

Closed

None

Discussed

None

LIST OF ACRONYMS

AC	Area Coordinator
AEC	Active Engineered Control
CFR	Code of Federal Regulations
ChPL	Chemical Product Line
CSA	Criticality Safety Analysis
DCF	Dry Conversion Facility
DCP	Dry Conversion Project
EH&S	Environmental, Health & Safety
EN	Event Number
FMO	Fuel Manufacturing Operation
FTI	Functional Test Instruction
GE-NE	General Electric- Nuclear Energy
IFI	Inspector Follow-up Item
IP	Inspection Procedure
ISA	Integrated Safety Analysis
MC&A	Material Control & Accountability
NCS	Nuclear Criticality Safety
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
NSI	Nuclear Safety Instruction
NSR/R	Nuclear Safety Requirements/Release
PA	Public Address
PPM	Parts Per Million
P/P	Practices & Procedures
Rev.	Revision
RP	Radiation Protection
SNM	Special Nuclear Material
STR	Shift Technical Resource
UCON	Uranium Conversion
UIR	Unusual Incident Report
UO_2	Uranium Dioxide
URU	Uranium Recovery Unit