

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-54/87-01

Docket No. 50-54

License No. R-81

Licensee: Cintichem, Inc.
P. O. Box 324
Tuxedo, New York 10987

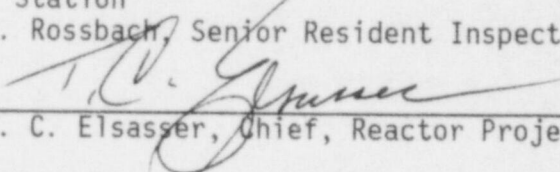
Facility Name: Sterling Forest Research Reactor

Inspection At: Tuxedo, New York

Inspection Conducted: January 20-23, 1987

Inspectors: D. Haverkamp, Project Engineer, Reactor Projects Section 3C
H. Eichenholz, Senior Resident Inspector, Yankee Nuclear Power
Station
L. Rossbach, Senior Resident Inspector, Indian Point Unit 2

Approved by:


T. C. Elsasser, Chief, Reactor Projects Section 3C

5/1/87
Date

Inspection Summary:

Areas Inspected: Routine, unannounced inspection by one region-based and two resident inspectors (64 hours) of licensee action on previous inspection findings, facility operations, maintenance activities, research reactor surveillance, and research reactor experiments.

Results: No violations or safety concerns were identified by the NRC inspectors. However, one licensee-identified violation regarding the failure to perform control rod surveillance testing at the required frequency was reviewed. No notice of violation was issued for that violation, as a result of the satisfactory corrective and preventive actions taken by the licensee, and as permitted by 10 CFR 2, Appendix C (Details paragraph 6.c). As a separate matter, the inspectors determined that the administrative controls program for maintenance and surveillance activities should be reviewed for conformance with regulatory guides and standards for research and test reactors. Appropriate measures should be established if necessary to achieve conformance with applicable requirements in these areas (Details paragraphs 5 and 6).

DETAILS

1. Persons Contacted

During the course of this inspection, the following personnel were interviewed:

- T. English, Assistant Chief Reactor Operator
- J. Franzen, Nuclear Project Engineer
- *C. Konnerth, Manager, Site Operations
- S. Lupinski, Chief Reactor Operator
- *J. McGovern, Plant Manager
- R. Racino, Instrument Technician
- *W. Ruzicka, Nuclear Operations Manager
- R. Strack, Reactor Supervisor
- *L. Thelin, Radiation Safety Officer

In addition, the inspectors held discussions with various licensed operating personnel during facility tours and observations of facility operations.

*Present at exit interview on January 23, 1987.

2. Plant Tours

The inspectors met with the plant manager upon arrival on site to discuss the scope and purpose of the inspection. A tour of the facility was conducted immediately thereafter in company with the nuclear operations manager. Subsequently, additional tours of the facility were conducted throughout the inspection period in company with licensee personnel. During these tours the inspectors observed the general condition of pumps and piping systems, including pool water filters and demineralizers, electrical systems, radiation and air monitoring systems, ventilation equipment, fire fighting and safety equipment, plant housekeeping and storage of radioactive materials, as well as the arrangement of experimental equipment. The inspectors noted the general condition of facility spaces was clean and orderly. No unsatisfactory conditions were noted, except with regard to proper posting controls for a high radiation area (Details paragraph 5).

3. Licensee Actions on Previous Inspection Findings

(Closed) Violation 64/86-02-01: Reactor startup without at least one door of the double airlock doors fully closed. The licensee's response to this item, as described in their letter dated January 9, 1987, provided a detailed discussion of this matter. That response included discussions of the summary of the event, the initial Cintichem review, the 1986 Cintichem review and corrective actions. Licensee operations management met with the operators to discuss the original inspection findings. Operators were instructed that the reactor should not be started unless one door of the double Peele doors was closed and the gasket inflated. The reactor restart checklist now specifically requires both Peele doors to be closed with the gasket inflated. The licensee's response also stated that if future operator questions should arise

concerning non-normal containment conditions prior to a startup, the startup should not commence without specific approval of the reactor supervisor or Level II management. The written response was to be discussed with operators during the next monthly operations meeting.

In addition, a new procedures manual form (AD-08, "Request for Evaluation of Abnormal Operating Condition or Problem") has been instituted. This form will be used as a vehicle to insure that questions are fully discussed and that feedback is provided. The inspector verified that satisfactory corrective actions have been taken, or scheduled, and had no further questions regarding this item.

(Closed) Unresolved Item 54/86-02-02: Reactor operation with nonvisible core. As requested by the NRC Region I staff, the licensee provided a detailed explanation and assessment of this occurrence in their letter dated January 9, 1987. The inspector and regional managers have reviewed the licensee's description of the event and the technical rationale presented in the licensee's justification for operation. Based on that review, it appears that operation of the reactor with a nonvisible core, although abnormal, was not unsafe. The inspector noted that appropriate corrective measures have been taken to minimize water cloudiness following heat exchanger cleaning. Also, Cintichem management's commitment to institute measures to improve communications is considered an important step in preventing recurrence of this problem, as well as other occasions when the plant may deviate from routine operations.

The results of the licensee's revised procedure for cleaning heat exchangers, as well as the effectiveness of the improved operator/management communications will be reviewed during subsequent routine NRC inspections. The inspector had no further questions regarding this matter.

(Closed) Violation 54/86-02-03: Unauthorized access to reactor building. The licensee's corrective actions for this item were described in their letter dated January 9, 1987. Based on discussions with the licensee's Designated Controlled Area Security Officer and with selected operators, observation of access controls and review of supplemental access training provisions for new permanent employees, the inspector considered that satisfactory corrective actions were taken and had no further questions regarding this item.

4. Facility Operations

The facility is used for a variety of neutron activation and target material fission experiments. The licensee operates the reactor around-the-clock, with the exception of brief shutdowns for fuel changes normally each Thursday, using a three-shift schedule. During the inspection, the licensee operated the reactor at full rated power (5 MW) until the morning of Thursday, January 22, 1987, when the reactor was shut down for a scheduled fuel change and planned maintenance and surveillance activities. The inspectors observed the reactor shutdown, fuel change, and subsequent restart of the reactor. During the shutdown period, the inspectors observed rod drop calibrations (Details paragraph 6.a), check and adjustment of the rod No. 3 down switch, reactor

building containment testing (also see Details paragraph 6.b), and examination of the No. 5 magnet for high drop current. Both power and shutdown reactor operations were conducted professionally with proper regard for safety and regulatory considerations. The licensed operators were knowledgeable of their assigned duties and responsibilities, as well as the reasons for normal and off-normal indications and plant conditions.

The fuel change consisted of the removal of three irradiated fuel assemblies to a wall rack and their replacement with three new assemblies. The inspectors observed good control and communication by the operators during the manual handling of these assemblies. Subsequently, the spent fuel assemblies were manually transferred from the wall rack to a storage location. Operators were knowledgeable of fuel handling precautions and techniques, the fuel was carefully handled and there was good coordination during fuel handling activities. The inspectors noted that radiological control techniques were also good during the fuel handling activities. There were appropriate surveys of radiation levels around the pool area. When fuel measurements were completed, operators carefully controlled the movement of fuel handling tools and the crane hoist cable taken from the pool and they used a drip sheet to collect and retain contamination from the wet handling equipment.

The inspectors observed the operators performing portions of their preparations for reactor operation in accordance with procedure RS-07, "Shutdown Checklist." The inspectors also witnessed the reactor startup during the afternoon of January 22, 1987. No inadequacies were identified, except as discussed in Details paragraphs 6.a and 6.b.

5. Maintenance Activities

The licensee's 1985 operating report dated March 26, 1986, lists 27 commercial power failures as the leading cause of reactor trips. Therefore, during this inspection period, the inspector reviewed maintenance activities related to emergency power availability. Preventive maintenance was performed on the emergency generator as described in licensee procedure RS-43. This included an annual replacement of the generator's battery. The minimum required volume of stored gasoline was verified using procedure RS-42. The gasoline storage tank was also tested for water. No inadequacies were identified regarding emergency generator preventive maintenance.

The inspector also discussed the maintenance program with the licensee's staff. Although regularly scheduled maintenance is performed, a system for recording equipment maintenance history is not used. Such information would be useful to the licensee for trending equipment failures and indicating preventive maintenance needs. The licensee is planning to begin a system for recording maintenance history.

Further, the UCC Research Reactor administrative directive AD-01, "Procedures," dated November 1, 1980, states that its objective is to establish a procedure that assigns and defines the responsibility for the procedures that assure the safe operation and maintenance of the Union Carbide Research Reactor.

[The facility was previously owned by Union Carbide Corporation (UCC) and hence this former facility name remains throughout most of the facility procedures.] Directive AD-01 describes a procedures manual for maintenance; however, there were not in fact any specific administrative control or implementation procedures for corrective maintenance. Similarly, directive RM-01, "The Regulations Manual," dated May 1, 1980, states that its objective is to assure that every operator has a ready source of information covering basic requirements for safe operation and maintenance. But the manual does not provide specific provisions for the control of maintenance activities that may impact on safe plant operation such as control of removal of equipment from service, control of actual maintenance activities, or test of equipment upon completion of maintenance. The inspector noted the generally simplistic design of the facility as compared to a power reactor facility, and specifically the relatively few structures, systems and components needed to assure safe facility operation. Nevertheless, some minimum standards and control for the review and conduct of corrective maintenance activities seem appropriate. The licensee committed to reviewing regulatory guides and standards applicable to research and test reactors and to develop a better-controlled maintenance program. The adequacy of the licensee's controls for the performance of the maintenance activities is considered an Unresolved Item (54/87-01-01).

6. Research Reactor Surveillance

The inspector conducted a review of selected areas of the licensee's surveillance program to verify program adequacy to ensure that it is being performed in accordance with Technical Specification (TS) requirements. The inspector observed tests and parts of tests to assess performance in accordance with approved procedures, TSs, test results (if completed), and deficiency review and resolution. The following tests were reviewed:

- RS-33, Control Rod Calibration
- RS-36, Evacuation Test
- RS-07, Reactor Shutdown Checklist
- RS-38, Emergency Generator Load Test
- RS-49, Evacuation Horn Test

Based upon a review of the licensee's activities in this area, the inspector noted the following:

- a. The inspector witnessed the conduct of surveillance test RS-33 for control rods Nos. 3 and 5. This test provides for a determination of control rod worth using a rod drop method. The procedure was implemented as written except for logging in the rod gang position. In addition, the inspector determined that (1) there are no established acceptance criteria; and (2) the procedure does not provide for the test results

to be checked for errors, or reviewed and accepted, by any designated licensee personnel. Licensee actions are warranted to resolve these deficiencies. Based upon a review of past RS-33 test results, the inspector noted many instances of the operators failing to complete the information for rod gang position. This inspection finding indicates that a lack of proper attention to detail is being exhibited by operators and nuclear operation supervisors involved with the test activity.

The inspector discussed the use of the RS-33 surveillance test results with the nuclear operations department supervisors, and was shown a hand-made Rod Worth History summary sheet that covered the subject testing activities from 1976 through 1986. The 1976 data reflected the determination of rod worth for the control rods using a reactivity-period test method (also known as rod bump method), which is performed by surveillance test RS-45, Rod Calibration. Technical Specification 4.2(1) requires that at least once annually, or whenever operation requires a re-evaluation of core physics parameters, the licensee will determine reactivity worth of each control rod using either method. The licensee's regulations manual procedure RM-09, dated September 1, 1980, Reactor Components, provides guidance on when and which method is to be used. However, the inspector found this guidance confusing, in that actions were specified for test results that had 10% deviations from current calibrations as well as from original rod calibrations. It was not clear if the guidance was referring to the 1976 rod bump calibration data or the most recently run rod drop calibration data. The lack of clear acceptance criteria in procedures RS-33 and RS-45 has contributed to the confusion on this subject.

In addition to the above concerns, the inspector learned that the Shutdown Margin (SDM) determination, which is one of the reactivity surveillance tests required by TS 4.2(1), uses the SDM data obtained from the 1976 rod bump test (RS-45). The licensee provided the inspector with the January 22, 1987 Fuel Reload and Work Sheet, which specifies the gang rod worth as 9.35% and the No. 2 control rod worth as 2.65% (i.e., the highest worth rod). However, those values were taken from the 1976 reactivity worth determinations. This work sheet is used for determining the excess SDM that exists for a given core. The licensee's practices in arriving at a SDM determination are of concern to the NRC because (1) the use of the 1976 data could provide for an over estimation of excess SDM and (2) a written procedure that controls the method for determination of the SDM does not exist. TS 6.3, Procedures, requires that written procedures shall be established for surveillance tests and calibrations required by the TSs. The adequacy of the licensee's controls for the performance of reactivity surveillances is considered an Unresolved Item (54/87-01-02).

- b. Prior to the performance of the RS-36 evacuation test on January 22, 1987, the inspector reviewed the procedure, and noted that the test does not verify that the emergency exhaust fan flow rate is less than 200 cfm during the conduct of the test. The TS Limiting Condition for Operation

(LCO) 3.5.3(1), Confinement, specifies as a condition of operability, that the fan is capable of sustaining a negative reactor building pressure of at least 0.01 in. wg at an exhaust flow rate of not greater than 200 cfm. TS Surveillance Requirement 4.5.3, Confinement, requires that the operability of the evacuation alarm and containment isolation system shall be tested, and negative pressure verified semi-annually. The inspector brought this condition to the attention of licensee representatives, who acknowledged the inspector's comments and concerns. Although they indicated that an emergency exhaust fan damper is set at a marked position, which is a verification step in the process equipment check list procedure RS-02 performed by an operator prior to a startup of the reactor, the inspector informed them that an actual flow verification would be appropriate.

On January 22, 1987, the inspector witnessed the licensee employing an Alnor Thermo-Anemometer device during the conduct of the test that verified the exhaust flow rate to be within the TS LCO limits. The licensee agreed to incorporate the verification of exhaust fan flow rate into the RS-36 procedure. The inspector had no further questions on the issue of verification of exhaust fan flow rate.

The inspector discovered as a result of reviewing the RS-36 surveillance activity that there is an apparent lack of operability verifications for all automatic and manual actuation devices that initiate the evacuation sequence. This sequence consists of an alarm, closure of damper valves in the confinement building ventilation system and hold-up tank vent, and the starting of the emergency exhaust fan. The automatic initiation sequence is provided by either one of the two excursion monitors (also known as bridge monitors) and any one of the three installed manual evacuation switches. Only one channel of each is specified as the minimum number required to be operable in TS Table 3.3, which is required by TS LCO 3.4, Radiation Monitoring System. The inspector noted that TS 3.5, Engineered Safety Features (ESF) refers in its subsection 3.5.1, Excursion Monitor, to see Section 3.3.5 for the applicable specification. However, this is incorrect as the reference should be to Section 3.4. Therefore, the inspector considered that the manual and automatic initiating channels are part of the ESF.

In addition to the above concern, the surveillance requirement in TS 4.5, ESF, stipulates in Section 4.5.3(2) that the operability of the evacuation alarm and containment isolation system shall be tested semi-annually. Surveillance test procedure RS-36 specifies to initiate the sequence from a bridge monitor, but does not specify which one, or require the logging of which one was used. Also, the procedure does not require testing to assure that all required, or potentially considered TS initiation channels, are verified operable. The licensee was informed that it was not necessary to repeat the entire RS-36 test for each channel. The licensee is required to demonstrate operable the design features that fulfill the TS required equipment functions. The licensee has agreed to incorporate appropriate channel testing into RS-36, so that the next

semi-annual performance of the test will demonstrate the required level of operability. In addition, the licensee indicated that it was their intent to apply the above channel operability considerations in other surveillance test that demonstrate system operability. The licensee should initiate a licensing action to resolve the apparent incorrect TS reference described above.

During the inspector's review of this test, he noted that on January 27, 1985, the licensee installed a Honeywell pressure control indicator that was adjusted to maintain the desired containment building's negative pressure. The building's pressure values during the conduct of the test were also taken from this instrument for logging in the RS-36 test data sheet. The inspector determined that there were no completed records or procedures that would demonstrate that this instrument was ever calibrated from its installation date to the current time. This observation raised an issue involving to what extent the licensee has established controls and practices that document and assure the dependability of equipment (i.e., gauges, instruments, and testing devices) which are used to inspect and verify operability of required equipment and systems. It appears that the licensee has an informal program for their controls on measuring and test equipment.

With respect to the above concern, the licensee was questioned about their knowledge of applicable regulatory guides or industry standards that would provide applicable guidance to a research and test reactor program for appropriate controls on measuring and test equipment. At the time of the inspection they were unaware of applicable guidance pertaining to this issue. The licensee in response to inspector concerns in this area, agreed to review and evaluate applicable industry standards and/or regulatory guides, and take corrective actions if warranted, to insure their program is in conformance with acceptable practices. Subsequent to the end of the inspection, the licensee in its letter to NRC:Region I on January 26, 1987, specified that they are reviewing ANSI Standard 15.8, Quality Assurance Program Requirements for Research Reactors, for guidance on the subject. This item remains unresolved pending the NRC's review of licensee actions pertaining to the acceptability of their established controls for measuring and test equipment (50-54/87-01-03).

- c. As a result of reviewing the licensee's performance in the area of surveillance testing, the inspector learned from the licensee that the surveillance procedure RS-32, Control Rod Gauging/Guide Tube Lift Testing, which was required to be performed no later than April 28, 1986, was not completed until September 18, 1986. These calibrations were five months overdue when implemented, however, no unsatisfactory conditions were discovered. The requirement to perform these surveillance activities are contained in TS Sections 4.1 and 4.2(3).

On October 1, 1986, the reactor supervisor submitted a letter to the Nuclear Safeguards Committee (NSC) which contained (1) a description of the missed surveillance event; (2) the safety significance of the event;

and (3) corrective actions planned to preclude recurrence. This document was submitted in conformance with TS Section 6.2.3 that requires the NSC to review all violations of the TSs. At meeting No. 121 held on October 29, 1986, the NSC reviewed the October 1, 1986 letter and requested additional corrective measures for implementation. Specifically, the NSC requested that the operations department designate one person to be responsible and accountable for planning, organizing, and controlling the surveillance test program. The Chief Reactor Operator was designated to perform this task. The inspector verified that the specified corrective action was either implemented or on-schedule in accordance with the licensee's corrective action plan that required full implementation by January 31, 1987.

The above item constitutes a violation of TS Section 4.1 and 4.2(3) because the required surveillance requirements were not performed within the established time interval. This item meets the criteria of NRC Enforcement Policy, 10 CFR 2, Appendix C, Section V.A for a licensee identified item and a notice of violation will not be issued, in that: the item was identified by the licensee, it constitutes a violation at Level IV (Supplement I.D), it was not an item that the licensee could reasonably be expected to prevent by corrective action from a previous violation, and the item will be corrected including measures to prevent recurrence within a reasonable length of time. The inspector had no further questions on this item.

7. Research Reactor Experiments

The inspector reviewed selected experiments conducted by the licensee by observation of on-going activities, record review, and discussions with licensee personnel to verify that the activities were properly reviewed and approved and did not represent unreviewed safety questions, that potential hazards were identified and remedial actions specified in the experiment procedures, that reactivity effects and limits were evaluated, and that applicable TS requirements were being adhered to. The following experiments were reviewed.

-- Experiment Guide XG-02, dated July 31, 1986, Xe-124 Irradiation Procedure

Except for the following items, the inspector had no further comments as a result of reviewing the licensee's activities associated with research reactor experiments:

The inspector reviewed Experiment Guide XG-02 and determined that a well established procedure was developed specifically for the experiment and it's associated out-of-core equipment. With only one minor exception, the procedure provided proper guidance to the operator for off-normal conditions. This exception involved reduction of header gases in Step II.E whereby xenon gas is still present in the header. Although the on-shift operators demonstrated a knowledge of the various options available to them, the inspector recommended

that the options be described within the procedure. Currently, the procedure calls for contacting the Chief Xenon Technician, but this position no longer exists at the facility.

The Nuclear Operations Manager acknowledged the inspector's comments and indicated that the matter would be appropriately reviewed for necessary corrective measures. Since the out-of-core facilities used for this experiment reflect recent licensee design upgrade efforts and significant resource allocations, which is part of a self-initiated exposure reduction program for this experiment, the inspector verified that operator training was conducted and documented. The operators were found to be very knowledgeable of their assigned tasks and no inadequacies were identified in this area.

During the conduct of the experiment on January 21, 1987, the inspector reviewed area radiological postings and independently evaluated radiological conditions utilizing licensee provided dose-rate measurement instrumentation. The inspector identified the following areas of concern: (1) the experiment area was found to be improperly posted as a result of the varying nature of the radiological conditions generated by the experiment over time; (2) there appears to be a need to improve radiological controls surveys by the radiation protection department as part of evaluating new process streams that are brought on line; and (3) inadequacies exist in providing appropriate dosimetry to account for doses received to the extremities. Because of recent NRC identified deficiencies in the licensee's radiological controls program as discussed in NRC Inspection Report 70-687/86-04, and the fact that the radiation fields encountered by the inspector (i.e., streaming effects on the order of 2R/hr) were the result of the licensee's state by-product material license, the inspector provided the details of his findings to the cognizant Region I specialist inspectors and management. The inspector verified that the licensee was aware of these concerns and was aggressively pursuing appropriate corrective measures.

8. Exit Interview

The inspectors met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on January 23, 1987. The inspectors presented the scope and findings of their inspection. The licensee acknowledged the findings and indicated that corrective actions would be taken where appropriate.