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NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
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Report No.: 50-83/92-01

Licensee: University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32601

Docket No.: 50-83 License No.: R-56

Facility Name: University of Florida Training Reactor

Inspection Conducted: February 24-28, 1992

Inspector: C Bassett 3/17/92
C. H. Bassett Date Signed

Approved By: E J McAlpine 3/17/92
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 involved the biennial review of the University of Florida's Class II Operations. The onsite inspection included review of radiation protection program activities including radiation controls, environmental monitoring and surveillance, emergency planning, and transportation. The inspection also entailed a review of operational aspects of the licensee's program including organization and staffing, logs and records, procedures, experiments, surveillances, and training.

Results:

The licensee's staffing and current organizational structure met Technical Specification (TS) requirements and were adequate to implement the licensee's radiation protection and operational programs. The radiation protection and operational programs were adequate to ensure the safety of the facility personnel as well as that of the general public. The licensee has not made any shipments of radioactive material since the last inspection. The training program appeared to be current.

Strengths in the radiation protection program were noted in the areas of management involvement in facility operations, low facility radioactive contamination levels, and low radiation dose received by personnel. Strengths in the operational area included thorough and complete documentation of activities in operations and maintenance log books, and in test, experiment, and surveillance records. Analysis and evaluation of the measurements and results of required surveillance tests met or exceeded regulatory requirements.

No program weaknesses were noted. Two non-cited violations (NCVs) were identified during this inspection. These NCVs were for: 1) failure to follow procedures for checking control blade interlocks prior to reactor restart when the daily checkout is omitted as allowed in TS 4.2.2(7) (Paragraph 9.a), and 2) failure to adhere to surveillance requirements to check whether a loss of pump power on secondary deep well cooling would cause a reactor trip (Paragraph 9.b)

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*D. Munroe, Radiation Control Officer, Environmental Health and Safety (EHS) Division
*M. Ohanian, Chairman, Reactor Safety Review Subcommittee
R. Piciullo, Acting Reactor Manager, University of Florida Training Reactor (UFTR)
*J. Tulenko, Chairman, Nuclear Engineering Sciences Department
*W. Vernon, Facility Director, UFTR

Other licensee employees contacted included operators, Radiation Control technicians (RC techs), and office personnel.

*Attended exit interview

2. Organization and Staffing (40750)

Technical Specifications (TSs) 6.2.1, 6.2.2, and 6.2.3 detail organizational structure and management responsibility for safe operation of the UFTR facility.

The inspector reviewed and discussed with cognizant licensee personnel the current staffing associated with operating the UFTR and providing radiation protection coverage for daily work. There have been no changes in the organization as outlined in the TS since the last inspection. However, a different person is occupying the position of Acting Reactor Manager. The person filling this position is doing so on a "consultant-type" basis which means that he does not actively operate the reactor but reviews documents, gives training if needed, and provides an over-check of the reactor operations in general.

In the operational area, the licensee has two part-time senior reactor operators (SROs) and one part-time Reactor Operator (RO), as well as the Director of Nuclear Facilities who is an SRO. These individuals operate the reactor as required, perform the required surveillances and most of the maintenance, and complete the associated records. Currently, this provides sufficient coverage and support during operation of the reactor for experiments, training, and reactor sharing projects.

Concerning the radiation protection program, the operators complete certain weekly contamination surveys and provide limited job coverage. However, the majority of radiation protection coverage is provided by two RC technicians who

work for the Radiation Control Officer (RCO) in the University of Florida's EHS Division. These individuals perform monthly and quarterly radiation level and contamination surveys in the restricted and unrestricted areas of the facility and ensure that adequate dosimetry is available for use. They also perform other environmental monitoring functions for the facility including preparation of liquid radioactive waste tank releases. In addition, they calibrate certain radiation protection equipment used in the UFTR cell and provide job coverage for non-routine and unusual jobs such as fuel movement and maintenance activities.

During the inspection and tours of the facility, the inspector noted that the current staffing level, composed of both UFTR and EHS Division personnel, appeared adequate to safely conduct the operational and radiation protection activities at the facility.

3. Reactor Safety Review Subcommittee (40750)

a. Minutes

TS 6.2.5 requires that the Reactor Safety Review Subcommittee (RSRS) conduct quarterly meetings at intervals not to exceed four months.

The inspector reviewed the minutes of the RSRS meetings conducted from February 15, 1990 through December 19, 1991. During that time period, the RSRS and Executive RSRS met approximately 19 times, thus exceeding the TS requirement. Items reviewed included unscheduled shutdowns of the reactor, 10 CFR 50.59 safety reviews, facility status and operating reports, possible TS violations, revisions to Standard Operating Procedures (SOPs), the high enriched uranium (HEU) to low enriched uranium (LEU) fuel conversion program and progress, experiment proposals, security plan changes, emergency plan changes, unusual events, the facility annual report, and NRC inspection reports.

b. Audits

TS 6.2.5 also requires an independent review and audit of safety aspects of reactor facility operations to advise management of adverse trends. The TS requires that the review and audit functions be performed by the RSRS.

The inspector reviewed the last two audits conducted by the RSRS for the calendar years 1989 and 1990. The audits covered the facility emergency plan, fire protection system records, the security plan, special nuclear material records, the requalification training program, health physics records, TS surveillance requirements, documentation of experiments, correspondence/commitments made to the NRC, the Quality Assurance program, and a review of maintenance records, procurement, and process control documents. The audits did not identify any serious deficiencies but some problems were noted. The licensee addressed these problems by initiating corrective actions for each item. The inspector also reviewed the actions taken by the licensee to correct the problem areas noted by the RSRS. From this review, the inspector determined that the RSRS was providing adequate oversight of the UFTR operations and that management was committed to and involved in proper operation of the facility and maintaining an adequate radiation protection program.

c. Safety Evaluations

TS 6.2.5(3)(a) requires that the RSRS review proposed changes in equipment, systems, tests, experiments, or procedures and determine that the changes do not involve an unreviewed safety question.

The inspector reviewed selected 10 CFR 50.59 safety evaluations that had been performed during 1990 and 1991 and that had been reviewed by the RSRS. Seven evaluations had been conducted in 1990 and 10 were done in 1991. The inspector determined that the evaluations had been performed in accordance with the UFTR procedure, O.4, 10 CFR 50.59 Evaluation and Determination, Rev. 2, dated July 1991. The evaluations appeared to be adequate and were performed when required. No unresolved safety questions were identified.

4. Radiation Control (40750)

a. Training

10 CFR 19.12 requires the licensee to instruct all individuals working in or frequenting any portion of the restricted area in health physics protection problems associated with exposure to radioactive material or radiation, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed, applicable provisions of

Commission regulations, individuals' responsibilities and the availability of radiation exposure reports which workers may request pursuant to 10 CFR 19.13.

The inspector discussed the training provided to those individuals who provide the radiation protection coverage for daily operation of the UFTR facility. Applicable radiation protection training is given to the operators during their initial qualification training or biennial requalification. Initial and subsequent annual training is provided to all the RC personnel who may work in the reactor cell by one of the qualified RC technicians in the EHS Division.

The inspector reviewed the training records of the operators and selected personnel authorized to use the laboratories in the reactor area. The training records were complete and subjects outlined as having been presented appeared to be appropriate and adequate for radiation protection and control.

b. Posting and Labeling

10 CFR 19.11 requires each licensee to conspicuously post current copies of (1) 10 CFR Parts 19 and 20; (2) the license; (3) the operating procedures; and (4) Form NRC-3, in sufficient places to permit individuals engaged in licensed activity to observe them on the way to and from any licensed activity location. If posting of the documents specified in (1), (2), and (3) is not practicable, the licensee may post a notice which describes the documents and states where they may be examined.

All routine entries into the UFTR restricted area are made through the reactor control room. During tours of the facility, the inspector noted that the applicable documents and/or references to their location were posted at the entrance to the control room. The posted documentation indicated that copies of the license and procedures were maintained in the control room and in the Facility Director's office.

10 CFR 20.203 specifies the requirements for posting radiation areas, high radiation areas, and labeling containers of radioactive materials.

During tours of the facility, the inspector noted that entrances into the restricted area were posted as required and that containers of radioactive material were labeled. One door, leading to the outside of the building from the reactor cell, was not posted on the

outside. Although this was not a normal access to the reactor cell and the actual radiation area existed inside the door, the licensee agreed to post a radiation area sign on the door to give anyone on the outside of the building an indication of what to expect if they had to enter through that door.

c. Restricted Area Surveys

10 CFR 20.201(b) requires the licensee to make or cause to be made such surveys as (1) may be necessary for the licensee to comply with regulations in this part and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

TS 3.9.2(2,(a) requires weekly measurements of surface contamination in the restricted area.

TS 3.9.2(2)(b) requires airborne particulate contamination to be measured using a high volume air sampler during the weekly checkout.

TS 3.9.2(3)(a) requires surveys measuring the radiation doses in the restricted area to be conducted quarterly, at intervals not to exceed four months, and at any time a change in the normal radiation levels is noticed or expected.

Changes to the following procedures outlining radiological surveys to be conducted in and around the UFTR restricted area were reviewed by the inspector:

- UFTR Radiological Procedure D.1, UFTR Radiation Protection and Control, Rev. 4, dated August 29, 1991.

- UFTR Radiological Procedure D.2, Radiation Work Permits, Rev. 10, dated March 1987, with Temporary Change Notice (TCN) dated October 1989, TCN dated April 1990, and TCN dated December 1990.

- UFTR Radiological Procedure D.4, Removing Irradiated Samples From UFTR Experimental Ports, Rev. 5, dated October 1989.

- UFTR Radiological Procedure D.5, UFTR Reactor Waste Shipments: Preparations and Transfer, Rev. 1, dated February 1992 (not yet approved).

- UFTR Radiological Procedure D.6, Control of UFTR Radioactive Material Transfers, Rev. 0, dated December 1988 with TCN dated March 1989.

The inspector reviewed selected UFTR restricted area weekly and quarterly radiological survey results conducted from January 1990 to February 1992. Surface contamination within the restricted area was found to be low. Survey data indicated that beta-gamma contamination levels were generally maintained below 100 disintegrations per minute per one hundred square centimeters (dpm/100 cm^2). Anytime surface contamination levels above that figure were encountered, the area or item was immediately decontaminated or the item was bagged and stored in a storage area.

Airborne particulate radioactive material levels were also low. Survey data indicated that airborne particulate beta-gamma activity concentrations varied generally from 1.0 E-13 to 1.5 E-12 microCuries per milliliter (uCi/ml).

Radiation survey results in the UFTR cell indicated general area levels from 1 to 8 milliRoentgens per hour (mR/hr) around the reactor and from 10 to 50 mR/hr on top of the reactor at 100% power. The survey results also indicated the existence of "hot spots" (as measured at twelve inches from reactor shielding or shielded beam ports) with radiation levels from 7.5 to 53 mR/hr.

d. External Exposure Reviews

10 CFR 20.101 delineates the quarterly radiation exposure limits to the whole body, the skin of the whole body, and the extremities for individuals in restricted areas.

The inspector reviewed the exposure records of persons working in or frequenting the UFTR facility from January 1, 1990, through December 31, 1991. Personnel exposure measurements were obtained using film badges and thermoluminescent dosimeters (TLDs) provided by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor. Vendor specifications reported a detection limit of 10 millirem (mrem) for the dosimetry provided to the licensee. The highest reported dose for 1990 was 130 mrem and was assigned to a reactor operator. The highest reported dose for 1991 was 110 mrem which was also assigned to a reactor operator. The exposure resulted from activities

associated with neutron radiography, experiments, and maintenance activities. All other cumulative annual doses assigned to personnel working in or frequenting the UFTR facility for either year were less than 100 mrem per individual for the period.

e. Continuous Air Monitoring

TS 3.4.4 requires the reactor cell environment to be monitored by at least one air particulate monitor, capable of audibly warning personnel of radioactive particulate airborne contamination in the cell atmosphere.

During a previous inspection, the inspector had reviewed the operations logs of the licensee which detailed that the air particulate detector (APD) or continuous air monitor in the reactor cell was checked to verify that it was operational prior to reactor startup. The inspector had also reviewed the quarterly calibration log for the APD and had determined that the calibrations were being performed. When asked about the APD alarm set point and detection capabilities however, the licensee had indicated that the APD was set to alarm at 30,000 counts per minute (cpm) but that that number could not be related to any Maximum Permissible Concentration in air (MPCa). The licensee had agreed that a new/different APD or continuous air monitor with greater sensitivity would improve the radiation protection program of the facility and provide a current indication of any airborne activity present.

During this inspection, the inspector noted that the licensee had obtained a new APD for use in the reactor cell. Although the APD was not operational at the time of the inspection, the licensee indicated that progress was being made on its installation and that it would give a better indication of the air activity in the cell. The new APD was designed to subtract out the effects of radon and only give the results of any other airborne activity present.

5. Environmental Protection Program (40750)

a. Effluents

10 CFR 20.303 details liquid effluent release limits to the sanitary sewerage system.

TS 3.4.5 requires liquid waste from the radioactive liquid waste holding tanks to be sampled and the activity to be measured, with the results to be within limits specified in 10 CFR 20, Appendix B, Table 1, Column 2, before release to the sanitary sewer.

The inspector reviewed the data from the ten reported discharges that had been made from the facility from September 1, 1989 through August 31, 1991. During th period from September 1, 1989 to August 31, 1990, the total average radionuclide concentrations in the liquid released from the facility's holdup tanks ranged from 4.66 E-9 to 1.18 E-8 uCi/ml. During this same period, approximately 320,000 liters of liquid were released containing approximately 1.511 uCi of gross beta activity. These data reflect a reduction in the amount of radioactivity discharged compared to the previous year.

Although the final figures were not available for the period from September 1, 1990 through August 31, 1991, the data appeared to indicate a further reduction in the quantity of liquid and activity released.

TS 4.2.4(2) requires that the Argon-41 (Ar-41) concentration in stack effluents be measured semiannually at intervals not to exceed eight months.

TS 3.4.2 requires the average Ar-41 concentration averaged over a consecutive 30-day period to be less than 4.0 E-8 uCi/ml.

Through discussions with licensee representatives and review of release data, the inspector determined that calculation of the licensee's total releases and average monthly concentrations are based upon semiannual Ar-41 release concentration measurements made at equilibrium full power (100 Kw) conditions. During the period from September 1, 1989 to August 31, 1990, average monthly concentrations of gaseous releases from the facility ranged from 0.383 E-9 to 5.066 E-9 uCi/ml. For this same reporting period, the total amount of Ar-41 released from the stack was approximately 113.865 Ci.

Final figures were not available for gaseous releases for the period from September 1, 1990 through August 31, 1991. However, based on the measurement of the stack samples taken in January 1992, the average monthly concentration of gaseous releases from the licensee's stack for January 1992 was 1.81 E-9 uCi/ml.

Total Ar-41 activity released for January was approximately 6.8 Ci. These numbers are consistent with those of past reporting periods and past analyses.

b. Environmental Monitoring with TLDs and Film Badges

TS 3.9.2(1) requires monthly environmental radioactivity surveillance outside the restricted area to be conducted by measuring the gamma doses at selected fixed locations surrounding the UFTR facility.

Environmental radiation exposure as a result of UFTR operations was considered minimal. The total yearly exposure reported during the period from September 1, 1989 through August 31, 1990, ranged from less than 10 to 150 mrem as measured by film badge and from less than 10 to 60 mrem as measured by TLD. These results were somewhat higher than previous years. However, an evaluation performed by the licensee indicated that the months in which the film badges and/or TLDs received the "highest" exposure were generally not the months of highest UFTR energy generation. The licensee concluded that the recorded exposures were probably close to background.

Again the final figures for the period from September 1, 1990 through August 31, 1991 were not available. However, the data indicated that the exposures for the period were very similar to those recorded in past years and somewhat lower than those of the previous reporting year.

c. Environmental/Unrestricted Area Surveys

TS 3.9.2(3)(b) requires quarterly radiation exposure surveys to be conducted in unrestricted areas surrounding the UFTR complex.

The inspector reviewed the quarterly radiation level surveys conducted from January 1990 through February 1992, in the unrestricted areas surrounding the UFTR facility. Areas immediately outside the reactor cell had radiation levels between 0.1 and 0.3 mR/hr. Radiation surveys outside the UFTR building indicated levels ranging from 10 to 75 microRoentgen per hour (uR/hr). No problem areas were noted.

d. Environmental Reports

TS 6.6.1(5) requires the licensee to issue a routine annual report covering the activities of the reactor facility during the previous calendar year which ends August 31 for the UFTR. The annual report is to include a summary of the nature and amount of radioactive effluents released or discharged to the environment, the environmental surveys performed outside the facility, and exposures received by facility personnel and visitors where exposures are greater than 25 percent of the allowable limit.

The inspector verified that the annual report for the period from September 1, 1989 to August 31, 1990, had been compiled and issued as required. The annual report for the period from September 1, 1990 through August 31, 1991, had not been completed as of the date of the inspection. The inspector reviewed the most recent issue. The report was found to be in compliance with the applicable TS requirements.

6. Emergency Planning (40750)

a. Procedures

The inspector reviewed the following licensee's emergency preparedness procedures:

- UFTR Operating Procedure B.1, Radiological Emergencies, Rev. 4, dated December 1988, with TCN dated October 1989,

- UFTR Operating Procedure B.2, Emergency Procedure - Fire, Rev. 8, dated May 1985, with TCN dated October 1989,

- UFTR Operating Procedure B.3 (this procedure had been superseded by another), and

- UFTR Operating Procedure B.4, Emergency Procedure - Flood, Rev. 1, dated April 1983, with TCN dated October 1989.

The procedures appeared to be adequate and outlined the actions to be taken in case of the particular emergency described.

b. Emergency Drills

TS 4.2.6(3) requires that evacuation drills for facility personnel be conducted quarterly, at intervals not to exceed 4 months, to ensure that facility personnel are familiar with the emergency plan.

The inspector reviewed the licensee's surveillance file, Q-3, Quarterly Radiological Emergency Evacuation Drill. Eight quarterly emergency drills had been held since the last inspection. Most drill scenarios were based upon the sounding of an evacuation alarm due to removal of irradiated material from the reactor. Some scenarios involved a simulated injury to a person resulting in contamination entering the wound and requiring the person to be taken to the university hospital for treatment. However, as has been noted in past inspections, none of the drills simulated the design basis accident of a dropped fuel assembly with a contaminated injured person. The inspector suggested that the licensee should consider having a drill with the design basis accident scenario for training and to ensure proper coordination with off site agencies. The licensee indicated that they would consider the need for such a drill.

7. Transportation (40750)

10 CFR 71.5 requires each licensee who transports licensed material outside the confines of its plant or other place of use to comply with the applicable requirements of the Department of Transportation (DOT) in 49 CFR 170 through 189.

The inspector discussed the processing, storage, and shipping of radioactive material with licensee representatives. The inspector also reviewed the licensee's revised procedure for the shipment of radioactive materials as indicated in Paragraph 4.c. The licensee indicated that there had been no shipments of radioactive materials from the facility since the last inspection.

8. Reactor Operations (40750)

a. Operational Logs and Maintenance Records Review

The operations log sheet for the period from December 1989 to January 1992, were reviewed. Log entries were complete and descriptive of the events that occurred and the actions taken by the operators. During the

review, specific attention was given to power level entries for the nuclear instruments and primary coolant temperature rise. No instances of overpower operation were identified.

The maintenance log was reviewed for the same time period, from December 1989 to January 1992. The maintenance load appeared to be the same as in past years. During 1988, a total of 53 maintenance activities were logged; during 1989, a total of 66 activities were logged; during 1990, a total of 49 maintenance activities were logged; and, during 1991, a total of 66 activities were logged as being completed. One item that had caused a great deal of maintenance activity and reactor down time in the past had been the 2-pen recorder. The 2-pen recorder was replaced with a new one in 1990 and maintenance on that item dropped to zero in 1991. The current high-maintenance systems (or at least high activity items) appear to those that have continually required such attention. These include the stack monitor and dilution fan, area radiation monitors, the shield tank, and the overhead crane. Previous problems with the safety channels appear to have been resolved. No specific problem areas were noted.

b. Surveillances

Surveillance requirements for the UFTR are stipulated in Section 4 of the facility TS. Unless otherwise specified, quarterly surveillances (Q) are to be performed at an interval not to exceed 4 months, semiannual surveillances (S) are not to exceed 8 months, annual surveillances (A) are not to exceed 14 months, and biennial surveillances (B) are not to exceed 30 months between surveillances.

The inspector reviewed the following surveillances for timeliness and completion:

* Q-1, Quarterly Check of Scram Function. During 1990, this check was performed on March 1, June 8, September 17, and December 13. During 1991, the surveillance was performed on March 4, June 10, and September 10. During 1992 to date, the surveillance was performed on January 1 and February 13. The checks appeared to be adequate and no operational problems or significant drifts were identified during these checks.

- Q-2, Calibration Check of Area and Stack Radiation Monitors. During 1990, this surveillance was performed on March 15, May 22, August 2, October 16, and November 16. During 1991, the check was performed on January 25, March 13, April 23, May 20, July 18, and October 22. The calibration checks of these monitors had to be performed more frequently than required by TS due to some minor maintenance problems with the monitors. Following maintenance on the various monitors, calibration checks were performed as required.

- Q-3, Quarterly Radiological Emergency Evacuation Drills. Drills were conducted in April, July, October, and December during 1990 and 1991. The drills appeared to be adequate to meet the intent of the requirement. (Refer to Paragraph 6.b for more information on emergency drills.)

- Q-4, Quarterly Radiation Survey Unrestricted Areas. In 1990, this surveillance was performed on January 11, June 29, September 19, and December 10; in 1991, it was performed on March 8, June 12, October 1, and November 27. In 1992, this surveillance was performed on February 18. Although there was no quarterly surveillance performed within the required 4 month interval between January 12 and June 29, 1990, this was not a safety problem. During the period from April 27 through June 29, the reactor was shutdown due to problems encountered during the biennial fuel inspection. The survey was not performed because the reactor was not operational. Prior to bringing the reactor back up to full power on June 29, radiation surveys were performed with the reactor power level at 1 Kw, 10 Kw and then at 100 Kw. No problems or abnormal radiation readings were noted during any of the surveys.

- Q-5, Quarterly Radiation Survey of the UFTR Restricted Area. In 1990, this surveillance was performed on January 11, June 29, September 19, and December 10; in 1991, it was performed on March 8, June 12, August 8, and November 21. In 1992, this surveillance was performed on February 18. No problems or abnormal radiation readings were noted during any of the surveys. (See the paragraph above for an explanation of why the surveillance was not performed within the 4 month interval between January 12 and June 29, 1990.)

- S-1, Measurement of Control Blade Drop Times. This surveillance was performed on June 12, 1990, and on February 12, April 10, and October 29 in 1991. Satisfactory results were reported in all cases and no trends of increasing or decreasing drop times were apparent. The inspector noted that the period from June 12, 1990 to February 12, 1991 was the maximum time that the licensee could have waited to perform this particular surveillance, 8 months.

- S-2, Annual Reactivity Measurements. The annual (not semiannual) surveillance of reactivity measurements was performed in March and June of 1990 and in July of 1991. There appeared to be good consistency between blade worth distributions from measurement to measurement.

- S-4, Measurement of Argon-41 Stack Concentration. Measurements were conducted on January 1 and July 12 in 1990, on January 30 and June 18 in 1991, and on January 2, 1992. The results of the measurements performed during 1990, 1991, and 1992 were in general agreement and provided the licensee with sufficient information to calculate the amount of gaseous Ar-41 released.

- S-5, Blade Controlled Insertion Time Measurement. This surveillance was performed on June 12, 1990, and on February 12, April 10, and October 29 in 1991. The results for these measurements were satisfactory and demonstrated good correlation with previous time measurements.

- A-2, UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance. The NI calibration check and the heat balance was performed on April 6, 1990, and on April 4, 1991. There was no significant change in instrument readings between surveillances and the results were satisfactory. Following a previous inspection, the licensee had indicated that they would review the need and methods for recalibrating the flow instrument used for this surveillance. The inspector determined that this had not been done but the licensee indicated that they would perform such a review and install a recalibrated flow instrument, if needed, during the conversion to the use of low enriched uranium (LEU) fuel.

- A-3, Annual Measurement of UFTR Temperature Coefficient of Reactivity. This measurement was performed on November 5, 1990, and on November 26, 1991. The results appeared to be satisfactory and no problems were noted.

- B-1, Biennial Check to Assure Negative UFTR Void Coefficient of Reactivity. The satisfactory check was performed on March 15, 1991 as required. During a previous test, rapid closing of a gas pressure valve led to an unstable indication of water level and a reactor trip. The trip report recommended adding a caution to the operating procedure to secure gas pressure more slowly. The inspector reviewed the procedure and verified that the caution step had been added.

- B-2, Biennial Inspection of Incore Reactor Fuel Elements. This inspection was performed from May 7 through June 8, 1990. During this inspection, small "blisters" were noted on one of fuel elements. Through extensive evaluation of this problem and after consulting with various people, including Argonne National Laboratory personnel, the licensee concluded that the phenomenon was not routinely representative of the potential for thermal hydraulic problem or failed fuel. A 10 CFR 50.59 safety evaluation was also performed which included the following items:

  1) previous fuel handling operations shifted the bundle with the deformations from a "hot" location in the core (in 1985),

  2) there were not safety concerns from thermal hydraulic considerations in this occurrence,

  3) no fuel element failure had been detected through the routine UFTR surveillance program,

  4) the TS require periodic (biennial) inspection of fuel elements to find fuel element problems; the detection of the occurrence occurred through the proper surveillance action, and

  5) the Safety Analysis Report addresses the Maximum Credible Accident as complete removal of cladding from one fuel plate - the "blister" effect was within that envelope of analysis.

The conclusion was that this phenomenon was not a safety issue and did not represent the potential for an unreviewed safety question. Even though this conclusion was reached, the licensee subsequently removed the fuel element from the reactor and another element was put is its place. No problems have been noted to date.

c. Experiments

TS 6.4 requires that experiments be reviewed and approved as outlined in TS 3.5 to ensure compliance with the requirements of the license, the TS, and applicable regulations.

The inspector reviewed selected experiments conducted in 1990 and 1991. A total of 47 experiments were conducted in 1990 and 37 were conducted in 1991. All those conducted in 1990 were either Class I or Class II experiments which meant that they were routine or that the experiments needed to be documented for each new group of experimenters but posed no hazards to the reactor, personnel, or the public.

Of the 37 experiments conducted in 1991, all but one were Class I or Class II experiments. The one experiment that was a Class III experiment, which indicated that it could pose significant questions regarding safety to the reactor, personnel, or the public, was reviewed by the inspector. It involved a series of temperature dependent plasma kinetics measurements (using a helium and uranium hexafluoride gas mixture) to be carried out in the reactor using a multi-probe ionization chamber system developed by the experimenters.

This experiment was closely reviewed by the RSRS and approval was given to only use helium-3 gas at low pressure in the detector to obtain the desired measurements. This changed the classification of the experiment to a Class II experiment (a similar experiment had been conducted in the past with helium-3 gas used in the detector) and reduced the likelihood of other problems as well. A 50.59 evaluation was also performed on this Class II experiment and no problems were identified.

d. Operation of the Reactor

The inspector observed an SRO perform a daily check of the reactor and then operate the reactor. The check out and operation were performed in accordance with the

appropriate Standard Operating Procedures (SOPs). The inspector also reviewed the following operating procedures:

- UFTR SOP-A.1, Pre-operational Checks, Rev. 14, dated December 1988, with TCNs dated October 1989, April 1990, January 1991, and July 1991.

- UFTR SOP-A.2, Reactor Startup, Rev. 12, dated May 1987, with TCNs dated June 1988, November 1990, and July 1991.

- UFTR SOP-A.3, Reactor Operation At Power, Rev. 11, dated May 1987, with TCNs dated June 1988, May 1989, and July 1991.

- UFTR SOP-A.4, Reactor Shutdown, Rev. 11, dated October 1989.

The inspector noted that the SRO used the SOPs during these operations and followed them as written. No problems were noted during this observation period.

9. Unusual Events, Abnormal Occurrences, and Reactor Trips (40750)

The inspector reviewed four events which had been reported to NRC Region II by the licensee. The events are as follows:

a. Failure to Check Control Blade Interlocks Per SOP-A.2.

TS 6.3 requires that the facility be operated and maintained in accordance with approved written procedures.

UFTR SOP-A.2, Reactor Startup, Rev 12, dated May 1987, requires in Paragraph 4.4.6 that the control blade interlocks be checked prior to the restart when the daily checkout is omitted as allowed under TS 4.2.2(7).

TS 4.2.2(6) requires that the reactor shall not be started unless (a) the weekly checkout has been satisfactorily completed within 7 days prior to startup, (b) a daily checkout is satisfactorily completed within 8 hours prior to startup, and (c) no known condition exists that would prevent successful completion of a weekly or daily checkout.

TS 4.2.2(7) states that the limitations stipulated under Paragraph 4.2.2(6) (a) and (b) can be deleted if a reactor startup is made within 6 hours of a normal reactor shutdown on any one calendar day.

On October 2, 1990, a daily checkout was performed at about 8:30 a.m. The reactor was then run several times during the day and was shutdown at about 3:30 p.m. Shortly after 5:00 p.m. the reactor was started up for an extra series of operations lab exercises for an RO trainee and a reactor operations lab student. Prior to the startup after 5:00 p.m., the control blade withdrawal interlocks were checked as required by SOP-A.2, Paragraph 4.4.6. However, the control blade interlocks were not checked following shutdown for successive rapid restarts that were begun at about 5:30, 6:00, and 6:30 p.m. Although TS requirements on the restarts were met in all four startups which occurred after 5:00 p.m., the last three startups failed to meet the additional requirement in UFTR SOP-A.2 that required that the control blade interlocks be checked prior to the restart when the daily checkout is omitted as allowed in TS 4.2.2(7).

Following this event, the facility director noted the potential problem and reported it to the NRC on October 25, 1990. The licensee investigated the event and determined that there was no compromise to reactor safety and no danger posed to personnel from receiving excessive radiation doses. The problem was determined to be administrative in nature and the procedure was subsequently changed to eliminate the requirement that the blade interlock checks be performed prior to every startup after the 8 hour limit on the daily checkout is exceeded. Even though this was considered to be an administrative problem, all operators were given retraining on the requirements for performing daily checkouts under UFTR SOP-A.2.

Following a review of this event, the inspector determined that this was a violation of the TS 6.3 requirement for operating in accordance with written procedures. However, the inspector indicated that this violation will not be subject to enforcement action because the licensee's efforts in identifying and correcting the violation meet the criteria specified in Section V.G. of the Enforcement Policy (NCV 50-83/92-01-01).

b. Failure to Perform Required Surveillance of a Limiting Safety System Setting (LSSS) on Loss of Secondary Coolant Pump Power

TS 3.2.2(2) requires that tests for (reactor) operability shall be made in accordance with Table 3.2. Table 3.2 requires that loss of secondary coolant well pump power be tested quarterly, at an interval not to exceed 4 months.

Following SRO licensing examinations which were administered on October 2, 1991, the NRC licensed examiner questioned whether a loss of pump power on secondary deep well cooling would cause a reactor trip as required by TS. The question was raised by the examiner because the SRO candidates seemed to be less than knowledgeable on this point. Because the question could not be readily answered, the licensee performed an evaluation of the surveillance they had been conducting to comply with this requirement. They wanted to verify whether the loss of secondary coolant well pump power caused a trip and whether it had been tested at the required quarterly intervals.

It was determined that the daily checkout of the reactor was the only regular check on the secondary cooling trip where the loss of flow/loss of pump power were checked as one check. However, the trip checks on the primary coolant system involved separate LOW FLOW and Loss of Primary Coolant Pump Power on the quarterly scram surveillance. Therefore, it was decided to implement separate checks on the secondary cooling system also to insure that the most restrictive interpretation of the TS surveillance requirements were met. (When a test was performed, on October 7, 1991, it was determined that removing power to the secondary pump while maintaining secondary flow above the trip point did cause a trip just as low flow caused a trip.)

The event was evaluated by the RSRS and the committee decided that the event should be reported to the NRC. The licensee reported this event to the NRC on October 3, 1991, even though the feeling of the UFTR staff was that the intent of the TS to check both trips was considered to be met by the check of the secondary coolant low flow trip on the daily checkouts. The UFTR staff felt that the one check was valid since a loss of pump power necessarily gives a loss of flow as well.

Subsequently the licensee changed the surveillance data sheet for the Q-1 Quarterly Scram Checks to delineate using the city water to bypass the LOW FLOW secondary trip (or if city water does not exceed the trip point, the LOW FLOW trip will be bypassed by electrical shunt) to test the trip on loss of secondary pump power.

Following a review of this event, the inspector determined that this was a violation of the TS 3.2.2 requirement for performing required surveillances. However, this violation will not cited because the criteria specified in Section V.A. of the Enforcement Policy were satisfied (NCV 50-83/92-01-02).

c. Unscheduled Reactor Trip on Loss of Secondary Cooling Flow

Following a reactor startup at 12:10 p.m. on November 18, 1991, an unscheduled reactor trip occurred at about 12:30 p.m. due to the secondary cooling water flow dropping below the 8 gallons per minute (gpm) minimum as required by the LSSS. Previously the secondary city water had been valved back to assure higher temperatures to allow the UFTR staff to conduct a required safety surveillance. A daily checkout had been completed with both the UFTR well water and the city water supplying the secondary cooling. The secondary cooling water logic had been placed in the city water mode of operation and had been tested satisfactorily, signifying that city water flow was above 8 gpm. When reactor power was brought above one Kw (the point where the secondary water LSSS protective function begins to function), the reactor tripped automatically. After conferring with the UFTR staff and the RSRS, the licensee notified the NRC.

The licensee conducted an evaluation of the event and determined that the cause of the trip was that the city water flow rate dropped below the 8 gpm setpoint and caused a trip on low flow. In normal city water secondary cooling operation, the only indications of flow were the 60 gpm light and the SEC PRESS scram light on the reactor console. When city water flow was between 8 and 60 gpm, there was no indication of the correct flow, only yes or no on 8 gpm. A fluctuation in the city water pressure caused the flow rate to drop below the 8 gpm setpoint.

After reviewing this event, the inspector determined that it was not a violation of TS requirements.

d. Safety Channel No. 2 Circuit Failure

After the second startup of the day was begun at 1:40 p.m. on November 25, 1991, and after 32 minutes of operation at full power, the Safety Channel No. 2 meter was noted to have ceased functioning and to have pegged downscale. Because the operators in the control room determined that this event represented loss of Safety Channel No. 2 trip capabilities, an unscheduled reactor shutdown was initiated at 2:32 p.m. During the shutdown, with the reactor power at about 10 kW (some 20 seconds after commencing the shutdown), the Safety Channel No. 2 meter was noted to return to a normal reading.

The licensee performed an evaluation of the event and removed the Safety Channel No. 2 meter circuit from service. Because of the pegged downscale nature of the channel failure, the fault was isolated to the Safety Channel No. 2 meter circuit which contains two amplifiers. It was initially thought that one of the amplifiers had failed and had possibly caused the event. During extended bench testing and checks of the meter circuit assembly, an intermittent fault in the fine adjust potentiometer of the circuit was isolated. Although it was not the cause of the problem, the licensee decided to replace both the coarse and the fine gain potentiometers. Sealed potentiometers were used to provide better resistance to environmentally-drive degradation. (The change was made after a 10 CFR 50.59 evaluation was made.)

Extensive additional analysis and checks were performed on the meter and related circuits. Subsequently, the Safety Channel No. 2 amplifier card was reseated and further checks were performed. Since oxidation/corrosion on contacts had occasionally been a problem with the instrumentation in the reactor console and since the meter circuit intermittent-type failure could have been caused by such oxidation of contacts, the licensee determined that the cleaning of the contacts by reseating the Safety Channel No. 2 amplifier card had corrected the fault. No further repair or maintenance was deemed necessary.

On November 25, 1991, the RSRS Executive Committee met to review the occurrence and the corrective actions that had been taken in response. Based on the extensive circuit checks, the nature of the failure indicating the probable cause to be failure in the

meter circuit, and the corrective actions taken in cleaning the meter circuit, the committee agreed that the UFTR staff could resume reactor operations. The reactor was restarted with an extra operator in the control room observing the safety channel for a period following reaching power.

After reviewing this event, the inspector determined that it was not a violation of TS requirements.

10. Followup on Information Notices (92717)

The inspector determined that the licensee was receiving all of the NRC Information Notices (INs) and that they were being reviewed for applicability and distributed to the appropriate personnel.

11. Exit Interview (30703)

The inspection scope and findings were summarized on February 28, 1992, with those persons indicated in Paragraph 1. The inspector discussed and detailed the findings for each area reviewed. Dissenting comments were not received from the licensee.

The licensee's staffing and current organizational structure met TS requirements and were adequate to implement the licensee's radiation protection and operational programs. The radiation protection and operational programs were adequate to ensure the safety of the facility personnel as well as that of the general public. The training program appeared to be current. The licensee had not made any shipments of radioactive material since the last inspection but had revised the procedure used to make such shipments.

Strengths in the radiation protection program were noted in the areas of management involvement in facility operations, low facility radioactive contamination levels, and low radiation dose received by personnel. Strengths in the operational area included thorough and complete documentation of activities in operations and maintenance log books, and in test, experiment, and surveillance records. Analysis and evaluation of the measurements and results of required surveillance tests met or exceeded regulatory requirements.

Two NCVs were identified.

Item Number	Description and Reference
50-83/92-01-01	NCV - Failure to follow procedures for checking control blade

	interlocks prior to the reactor restart when the daily checkout is omitted as allowed in TS 4.2.2(7) (Paragraph 9.a).
50-83/92-01-02	NCV - Failure to adhere to TS surveillance requirements to check whether a loss of pump power on secondary deep well cooling would cause a reactor trip (Paragraph 9.b)