June 7, 2000

Dr. Bernard W. Wehring
Nuclear Engineering Teaching Laboratory
10100 Burnet Road
University of Texas at Austin
Austin, TX 78758

SUBJECT: NRC INSPECTION REPORT NO. 50-602/99-202

Dear Dr. Wehring:

This letter refers to the inspection conducted on December 3, December 6 through 9, December 14 through 17, 1999, February 9 through 10, and 25, 2000, at the University of Texas research reactor facility and follow-up that ended on June 2, 2000. This inspection of your facility was on a reported increase in hydrogen and oxygen gases in the reflector. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or violations of NRC requirements were identified. No response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room.

Should you have any questions concerning this inspection, please contact Mr. Marvin Mendonca at 301-415-1128.

Sincerely,

/RA/

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-602
License No.: R-129

Enclosure: NRC Inspection Report No. 50-602/99-202

cc w/enclosure:
Please see next page

cc:

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

Junaid Razvi
General Atomic/Sorrento Electonics
10240 Flanders Ct.
San Diego, CA 92121

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No:	50-602
License No:	R-129
Report No:	50-602/99-202
Licensee:	University of Texas
Facility:	Nuclear Engineering Teaching Laboratory
Location:	J. J. Pickle Research Campus Austin, Texas
Dates:	December 3, December 6 through 9, December 14 through 17, 1999, February 9 through 10, and 25, and follow-up that ended on June 2, 2000
Inspectors:	Alexander Adams, Jr., NRR Stephan Holmes, NRR Larry Ricketson, Region IV Marvin Mendonca, NRR
Approved by:	Ledyard B. Marsh, Chief Events Assessment, Generic Communications, and Non-Power Reactors Branch Division of Regulatory Improvement Programs Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

This special inspection was announced. It included onsite review of various aspects of the licensee's programs concerning a December 2, 1999, report from the University of Texas at Austin. The report was on an increased concentration of hydrogen and oxygen gases in the reflector assembly. Licensee programs were directed toward the protection of public health and safety and met NRC requirements. The inspectors identified no safety concerns or violations of regulatory requirements.

REPORT DETAILS

Summary of Facility Status and Background

The licensee's 1.1 megawatt non-power reactor (NPR) was shut down on October 28, 1999. On December 2, 1999, the University of Texas at Austin reported apparent increased concentrations of hydrogen and oxygen gases in the reflector. The licensee resolved this issue before resuming operations.

This reflector is an aluminum canister that contains graphite surrounding the core. The reflector design has an indented raceway in the top for the Rotary Specimen Rack (RSR or the Lazy-Susan) experimental facility. The licensee observed binding of the RSR drive shaft in late October 1999. An approximate ½ inch upward movement of the RSR caused this binding of the shaft. From visual inspections and measurements the licensee found that the reflector top was about 0.5 inches closer to the reactor bridge than when installed. The licensee also found that an RSR hold-down clamp was not engaged. Marks on the drive shaft verified this displacement of the RSR that corresponded approximately to the 0.5 inch vertical displacement observed by the licensee.

The licensee attempted to remove a pneumatic transfer tube from the outer G-ring and noted that removing it was difficult. They removed the transfer tube and visual inspection found a bulge or distortion of the inner reflector wall. The licensee attempted to unload all graphite elements from the outer G ring (no fuel was in the G ring) and found they could not readily remove four graphite elements. They were eventually able to remove these elements but one graphite element was slightly bent at mid-element from the reflector bulging. The licensee now observed that four walls of the reflector were bulging inward approximately 0.25 inches. The licensee informed General Atomics, the reactor vendor, and the Reactor Safety Committee. On November 3, 1999, the licensee informed the NRC project manager of the reflector bulging. At this time, they did not identify the existence of the increased hydrogen and oxygen concentrations.

In November, the licensee unloaded the entire core to in-pool storage for visual inspection and ultrasonic testing of the reflector. Ultrasonic testing showed no discernable water level in the reflector. The licensee videotaped the inspections to record the bulges.

The licensee concluded that the swelling was due to a pressure buildup within the reflector from unknown origin. They verified the bulges were uniform and were in locations with no graphite immediately behind the distorted plates, so that the bulges were not due to graphite expansion. Further visual inspection identified occasional bubbles from the same location around the upper grid plate. The licensee noted bubbles in the past attributed to gas evolution during reactor operations in and around the core. The licensee took a videotape of the gas bubbles and collected these large (roughly a few inches in size) bubbles in a flask.

An independent laboratory analyzed the gas sample. Analysis showed that the collected gas was 64 percent hydrogen, 30 percent oxygen and 5 percent nitrogen by volume. The sample also showed parts per million levels of CO_2, CO, and methane. A University of Texas lab provided qualitative verification of these results, i.e., elevated levels of hydrogen and oxygen, using mass spectrometry analysis. The licensee consulted with Sandia National Lab on the radiolytic decomposition and composition of the gases. By removing the RSR, the licensee found a pinhole leak in a weld of the reflector. The bubble size was small (in the millimeter range) and the rate of gas release was about 30 milliliters per hour. During the inspection the licensee took more samples of the gas.

Analysis of the subsequent, small bubble samples showed a reduction in the hydrogen and oxygen percentage to about 13 percent hydrogen and 24 percent oxygen. This sample showed about 61 percent nitrogen with parts per million of total hydrocarbons, CO, methane, and CO_2. The licensee believed that the small bubbles were interacting with air dissolved in the pool water, because of their large surface area as opposed to the large bubbles. They believe the large bubble analysis was the correct one (this was also conservative).

A third large bubble sample taken with the RSR installed showed a composition of about 55 percent hydrogen, 20 percent oxygen and about 13 percent nitrogen. Small bubbles that leaked out the reflector formed large bubbles on the bottom of the rotary specimen rack. The large bubbles would then break free and be collected on their way to the surface of the pool. Without the RSR installed, the small bubbles come directly from the leak point up to the collection point.

Subsequently, the licensee took another sample near the reflector to eliminate the potential interaction with pool water on transit to the surface. The results of this sample analysis showed gas percentages similar to the very first sample. The licensee estimated about 20 milliliters per hour release rate, which had decreased from 30 milliliters per hour. Also, the licensee concluded that the internal pressure in the reflector was decreasing since the bubbles were coalescing more before escaping the reflector surface.

By letter dated January 20, 2000, the licensee provided another report on this issue. The licensee consulted the Organization of Test, Research and Training Reactors and the National Institute of Standards and Technology on this report. They now hypothesized that the combination of radiolytic decomposition and electrolysis of water caused the gas buildup. The subsequent safety analysis of February 29, 2000, (as amended on March 31) suggested the licensee would continue to evaluate the cause of the gas buildup. The licensee showed that a mixture of hydrogen and oxygen at the ratios and concentrations measured in the bubbles could be combustible under certain conditions. Further, the licensee said that analyses according to 10 CFR 50.59 showed they could vent the gas.

The licensee considered the reflector in a stable condition, and evaluated the potential ignition of the gas mixture. They consulted with National Aeronautics and Space Administration personnel and concluded that the mixture could be combustible. The licensee also evaluated the potential energy release of the potential combustion. They consulted with Sandia National Laboratory and Southwest Research on the energy release potential.

The licensee concluded that potential damage to the reactor would be within the bounds assumed in previously analyzed accidents. This assumption was based on three factors: (1) estimates of the potential energy release of the gas mixtures, (2) the robust biological shield structure, and (3) the limited radiological inventory of material. Specifically, the licensee found no credible potential for damage to the fuel because of the fuel structure and location. The licensee removed the fuel and the cobalt source from the pool before working on the reflector. Therefore, the radiological consequences of any event in the pool would be essentially zero. Further, analysis of potential fuel handling accident releases were considered to bound potential fission product or activation product releases. However, the licensee analyzed the condition if all water were lost from the pool. In that condition, the radiation shine from the fuel (if it were present in the pool) would be less than previously analyzed in the safety analysis report. Therefore, any potential release of radioactivity would be within the acceptable limits of previously analyzed accidents and not exceed 10 CFR Part 20 limits.

By safety analysis dated February 29, 2000, as amended on March 31, 2000, the licensee concluded they could safely operate the reactor with the reflector in the flooded condition. The licensee plans to continue to evaluate the reflector condition and characteristics.

Also, by letter dated May 10, 2000, the licensee withdrew the reportable occurrence notification. The licensee found that they did not violate the limits on experimental materials of Technical Specification 3.4.2.c.

1. Verification of Initial Conditions (IP 69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- the facility conditions
- licensee plans, and
- reports to state officials

b. Observations and Findings

On December 3, 1999, the NRC's Region IV office dispatched an inspector to the facility. The inspector verified that the facility licensee had: (1) controlled access to the facility, and (2) removed power to all bridge components except the pool water level and the radiation monitors. The Region IV inspector also confirmed the licensee's plan to continue to evaluate the issue and take no major corrective action until they acceptably evaluated the conditions. NRC Region IV personnel confirmed that the licensee's Radiation Safety Officer informed the State of Texas, Department of Health, Bureau for Radiation Control staff.

c. Conclusions

The facility condition and licensee activities were stable as described by the licensee in their reports to the NRC and to the State of Texas.

2. Physical Observations (IP 69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- the facility physical changes
- gas sampling system

b. Observations and Findings

During the inspection from December 6 through 9, an inspector from the Office of Nuclear Reactor Regulation (NRR) verified the displacement of the top of the reflector. From the licensee's videotape and observation of the reflector, the bulges were confirmed to be approximately 0.25 to 0.50 inches, the same as estimated by the licensee. The inspector observed a videotape of the bubbles with an installed RSR. This confirmed that the bubbles were of the type that occasionally occurs in pool-type research reactors during operations or work. The inspector also observed the collection device for the bubbles and determined that it was collecting bubbles from the reflector to provide a representative sample.

The inspector observed videotape of the bubble release without the RSR. This confirmed that the bubbles coalesced as observed by the licensee.

c. Conclusions

The dimensional changes in the facility were consistent with the reported condition, and the licensee monitored the gases from the reflector.

3. Estimate of Gas Quantities and Potential Energy (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- the reflector configuration
- estimates of potential hydrogen and oxygen gas conditions

b. Observations and Findings

First, the licensee estimated the free volume in the reflector as about 41 liters. The licensee used a computerized assisted drawing (CAD) program to make an estimate of the graphite volume in the reflector. The licensee then used drawings and estimates of the observed bulges in the canister as previously discussed to estimate the volume of the canister. Simple subtraction found the free volume to be approximately 41 liters. An NRR inspector independently estimated this volume from drawings of the reflector and verified it was acceptable.

The licensee then estimated the pressure to cause the observed bulges in the reflector plates. The bulges were about 0.25 to 0.50 inches on five of the six inner 0.25 inch thick plates of the reflector. The licensee measured a maximum reflector corner deflection of about 0.25 to 0.50 inches. They observed no other distortions of the canister. The licensee again used a CAD program with stress evaluation capabilities to estimate internal pressure. The licensee estimated that the displacement would result from about 200 pounds force per square inch differential pressure between the reflector and pool water. The inspector independently evaluated that this could be about the mean estimate of internal canister pressure to result in the observed deflection.

Based on the concentration of gases and their previously discussed estimates of the free volume and the pressure, the licensee calculated the mass of hydrogen and oxygen gases. The licensee also estimated the combustion potential of these gases. The inspector reviewed the mass calculation. “Guidelines for Permanent BWR Hydrogen Water Chemistry Installations - 1987 Revision,” EPRI NP-5283-SR-A, September 1987, page 2 was used to the estimate combustion potential. The inspector found the licensee’s estimates were reasonable and that the licensee was conservatively considering the full spectrum of potential conditions.

c. Conclusions

The licensee was conservatively estimating the amounts and combustion potential of gases in the reflector.

4. Operating Experience (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- operating logs and experience

b. Observations and Findings

The inspector reviewed operating logs since the last inspection. The inspector determined that the gas accumulation in the reflector was not apparent from operating conditions as indicated in the operating logs.

Interviews with reactor personnel found that they observed a mismatch in nuclear instrumentation indications. Before discovery of the increased hydrogen and oxygen condition, the licensee planned to investigate this mismatch at the end of October 1999. This nuclear instrumentation mismatch may have been associated with the reflector problem. The mismatch between nuclear instrument indications was a small amount of the difference (approximately 5 percent). Also, the conservatism of redundant and diverse instrumentation to ensure monitoring of nuclear conditions was considered. Considering these points, the licensee’s evaluation of the difference in nuclear instrumentation readings was timely and conservative.

Interviews with reactor personnel also found that they made minor adjustments to the RSR drive shaft since initial operation in 1992 (less than 1/4 inch overall). These adjustments were considered routine maintenance. The inspector concluded that the small amount of adjustment overall would not have been reasonably considered to show a problem with the RSR and the bulging of the reflector.

c. Conclusions

Operating records showed no indication that could be reasonably used to identify the reflector bulging issue.

5. Quality Assurance (QA) Records (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- reflector supplier quality assurance records for the reflector
- licensee quality assurance records for the reflector

b. Observations and Findings

The inspector reviewed the quality assurance records from the reflector supplier. The records raised several questions. First, justification to omit a leak test on a bottom subassembly was not apparent from the records. The licensee and inspector discussed this with the reflector supplier, General Atomics. The supplier said that the lower assembly was tested on the final leak test as documented by a separate checkoff. A related question was that a certificate of compliance for the top subassembly leak test was in the records but none for the whole assembly leak test. The supplier said they generally did not get these certificates of compliance and that they would check with the testing organization to see if it were available. They said they would discuss this issue with the licensee. Subsequently, the supplier confirmed to the licensee that the certificate was not available. The supplier's QA records did show that the leak rate test was checked off as done. The inspector raised a second question because the supplier faxed the records and it was not clear from the faxed copy if they verified the qualifications of the welder. The supplier showed that they verified the welder's qualifications. Subsequent documentation in the QA records supported this. The inspector asked about the repairs of one of eight welds. The documents showed weld repair and acceptance after porosity indication on nondestructive examination. The supplier's specifications require repair and retest of such indications. The records showed the supplier's specification. This nondestructive examination and subsequent repair were consistent with industry practice.

From licensee records and discussions with licensee personnel, the inspector determined that they examined the reflector for defects on receipt. Licensee personnel found an apparent "shadow" that they recorded and photographed. It was not in the location of the apparent leak. The licensee and manufacturer representative were aware of the indication and accepted the component. The records also showed that the licensee observed the component regularly during storage.

c. Conclusions

The inspectors identified no violations of NRC requirements.

6. Fuel and Cobalt Storage for Work on the Reflector (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- licensee plans for storage of fuel and cobalt
- fuel storage pits design

b. Observations and Findings

Before working on the reflector, the licensee committed to move all fuel from the pool. They moved the fuel to the fuel storage pits in the floor of the reactor room. The licensee fabricated additional storage racks for the fuel storage pits to hold all fuel elements and cobalt source material at the facility. They designed the fuel storage pits to prevent criticality and to cool the fuel. The inspector verified that General Atomics certified this design for two racks of nineteen elements each stacked vertically under water to have a $k_{eff} < 0.8$.

From drawings, General Atomics documentation and physical observations, the inspector found that the fuel storage pits were far from the reflector. The distance was at least 16 feet horizontally from and 20 feet below the reflector. The pits were steel pipes surrounded by concrete and soil. The direct line of sight to the fuel storage pit from the reflector location would be through the pool floor or the biological shield. The pool floor was about 4 feet of reinforced concrete and the biological shield was at least 6 feet thick of high density concrete. The minimum concrete wall thickness between the reflector and fuel or the cobalt will be at least 4 feet. The fuel storage pits concrete/steel structure and the construction aggregate and soil materials were additional material between the fuel and reflector.

c. Conclusions

The proposed storage of the fuel and cobalt source in the fuel storage pits was conservative.

7. Movement of Graphite Elements (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- movement of graphite elements from the fuel storage pits to radioactive materials containers

b. Observations and Findings

In preparation to move the fuel to the fuel storage pits, the licensee began moving graphite elements from the fuel storage pits to storage containers on December 9, 1999. The inspector observed portions of this activity. They conducted the activity after establishing acceptable radiation controls. Licensee personnel used the crane to move the cover to the storage pits acceptably. The health physicist monitored radiation conditions during the evolution. Licensee personnel documented and verified locations from the fuel storage pits and to marked radioactive materials containers, radiation dose, and identification number of graphite elements. They observed As Low As Reasonably Achievable (ALARA) practices since graphite elements with higher radiation fields were placed in locations farther from licensee personnel.

c. Conclusions

The licensee acceptably conducted movements of the graphite elements from the fuel storage pits to radioactive material containers. Further, licensee activities were in accordance with ALARA principles.

8. Fuel Movement (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- fuel movement procedures and activities

b. Observations and Findings

The inspector reviewed the procedure for movement of fuel. The procedure provided a controlled manipulation sequence with qualified personnel and acceptable equipment. The procedure also required radiation controls and monitoring, and documentation and verification of proper conduct of the fuel movements. The inspector reviewed the latest fuel movement records from November 1999. The completed records followed the fuel movement procedure. The reactor supervisor had prepared a supplementary map of fuel locations in the current storage positions to help in identification of fuel more recently irradiated. Additionally, discussions with licensee personnel confirmed that the licensee previously moved fuel from the fuel storage pits acceptably.

On December 14, 1999, the licensee prepared fuel storage pits for receipt of fuel. The licensee found that to ensure visual control and thus meet their ALARA principles that the fuel storage pits should be dry. The licensee included radiation monitoring considerations for the movement of the fuel.

On December 15, 1999, the licensee did dry runs with an element without fuel but with the same design as their fuel elements. These dry runs further verified the licensee's process to move fuel elements. On December 16, 1999, the licensee commenced moving fuel to the fuel storage pits from the pool. They conducted the activity in a controlled, deliberate manner and following the applicable procedure. The licensee established radiological controls and monitoring. This included standard hand-held gamma monitors, and a rate alarming and dose integrating dosimeter. The licensee moved the lower dose fuel first to reduce doses. To reduce radiation while they loaded the top level rack, the licensee added water to a level above the lower rack in the fuel storage pits when that rack was loaded. After the top rack was loaded, the licensee filled the pits with water, inserted the hole plug and secured the storage pit by licensee procedures. Records of fuel locations were kept. The licensee moved the fuel to positions that reduced the potential for more fuel movements than necessary. Specifically, elements that the licensee may not require for reactor operations were placed in specified fuel storage pits.

c. Conclusions

Movement of the fuel elements from the pool storage to the fuel storage pits was in accordance with procedures and established radiological controls and ALARA practices.

9. Safety Significance (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- safety analyses and evaluations

b. Observations and Findings

The inspectors concluded that the reactor with its fuel and cobalt unloaded from the pool was not a radiological concern. The reactor was shut down since late October. The licensee had disassembled the reactor core and placed the fuel in storage. With the fuel and cobalt source out of the pool, only activation products and minor contamination would remain in and around the pool. No work of any type was underway or planned on the reactor, in the pool or the surrounding area that could affect the significant radioactive components or materials. The licensee conducted the previous operations of the reactor and the RSR without apparent damage to the core or safety components. The licensee safely moved fuel from the core to storage in the pool and subsequently from there to the fuel storage pits. Inspectors observed no apparent damage to the core or safety systems. As previously stated, powered electrical components on the bridge above the pool were limited. Further, ventilation was controlling the reactor building atmosphere. The reflector was under more than twenty feet of water. These factors ensure the radiological safety of the public, personnel, and the environment under any credible conditions.

The licensee identified the existence of the gases in a timely manner. The inspector found no indications that they could have reasonably identified the issue earlier. The licensee took conservative actions to ensure the radiological health and safety of the public, facility personnel, and the environment as discussed previously in this report. The licensee reported exceeding the Technical Specification 3.4.2.c limit (25 milligrams for irradiation of explosives in the reactor) on December 2, 1999. By letter dated May 10, 2000, the licensee withdrew that report. Technical Specification 3.4.2.c is for “experiment materials.” Since the gases were not experimental materials, the specification does not apply.

c. Conclusions

The inspector concluded that the radiological consequences of any potential radiological condition would be well within the calculated values of analyzed accidents and 10 CFR Part 20 limits.

10. Reduction in Gas Concentrations in the Reflector (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- licensee plans for reducing gas levels in the reflector
- initial venting of the reflector

b. Observations and Findings

Once the licensee removed the fuel and cobalt from the pool, the licensee devised a method to reduce the concentrations of hydrogen and oxygen gases in the reflector. The licensee consulted various laboratories and organizations to develop the most effective way to do this. The Nuclear Reactor Committee reviewed the process.

The inspectors observed two meetings of the Nuclear Reactor Committee subcommittee. Dr. Klein said that they asked the Organization of Test, Research and Training Reactors for assistance. This resulted in the participation of the individuals from NIST (Dr. Weiss and Dr. Brand) at the facility and the first observed meeting. The design of equipment to vent the reflector and the process for venting was presented. Questions and concerns by the committee members and participants were addressed. The meeting addressed the 10 CFR 50.59 requirements. The subcommittee was informed of the results of the tests on the exact drilling process. This testing resulted in modifications to the equipment and procedures for venting. At the second observed meeting on February 25, 2000, the Committee approved the modified process and related 10 CFR 50.59 evaluation.

The inspector observed the licensee drilling a hole through the reflector top plate under the pool water on February 25, 2000, following approved procedures. The equipment performed as designed allowing the licensee to control the flow of gas out of the reflector. The gas pressure inside the reflector was about 8.27 kilopascals (120 pounds force per square inch). The licensee controlled the drilling by procedures to limit heating, friction, electrical, and dynamic conditions. The licensee conducted drilling on a similar aluminum plate in air. They found temperature rises in the bit and material that could be held comfortably by hand (estimated at less than about 50°C (120°F)). The licensee also conducted “dry runs” to establish the ability to drill under the same configuration as observed on the reflector (i.e., dimensional, angles, drill speed, and reflector pressure). The licensee also required ground circuits to dissipate potential electrical charges including static charges from equipment. The licensee also limited the size of the drilling components to reduce the potential release rate and associated dynamic effects, e.g., potential static charge due to gas flow. The licensee minimized loose items and collected drilling debris through a vacuum system. The licensee also pointed out that they grounded the reflector through the support structure to dissipate potential static charges. The licensee also isolated selected beam ports (4 out of the 5) to the extent reasonably possible to reduce the risk of water loss through potentially damaged beam ports. The licensee taped the large truck door so that they would contain any radiological spill in the reactor building. The licensee video taped the dry runs and the actual drilling. The inspector observed selected portions of the configuration, testing and video tape of the dry runs.

c. Conclusions

The licensee resolved this issue consistent with their internal review of safety issues.

11. Reflector Condition after Venting Gases (69001)

a. Inspection Scope

The inspector reviewed selected aspects of:

- licensee safety analysis on the reflector

b. Observations and Findings

The inspector reviewed the February 29, 2000, (amended on March 31, 2000) safety analysis. The analysis considered the condition of the reflector after they vented the gas and flooded the reflector to address potential safety issues. The licensee described the reflector condition to be added to the "UT-TRIGA Safety Analysis Report."

The safety analysis considered the dimensional changes in the reflector. Based on the dimensions, the license established controls on fuel and neutron source position. Further, the licensee plans to check dimensions to monitor reflector condition.

The licensee estimated small reactivity, thermal-hydraulic and structural effects of the reflector after they vented and flooded it. The licensee estimated a small change in experimental flux conditions with the flooded reflector. Therefore, the licensee can predict changes in associated radioactivity characteristics. From discussions with the licensee, observations and measurements to date showed the changes were as predicted.

The licensee's restart plans and effort reviewed maintenance and surveillance requirements. Restart plans followed the general steps of the original facility startup program with changes for the experience gained in core loads and reactivity conditions. The licensee plans to continue to monitor and evaluate the reflector condition.

c. Conclusions

The licensee's analysis was acceptable.

12. Exit Interview

The inspector summarized the inspection scope and results during the inspection and finally on June 2, 2000, with members of licensee management. The University of Texas through interactions with the inspectors during this inspection informed the NRC staff of their plans to address the issue. The licensee provided the NRC staff their schedule for resolution of this issue. The inspector described the areas inspected and discussed the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

University of Texas Personnel

Dale Klein, Vice Chancellor for Special Engineering Programs
Bernard Wehring, Director, Nuclear Engineering Teaching Laboratory
Sheldon Landsberger, Professor
Sean O'Kelly, Associate Director, Nuclear Engineering Teaching Laboratory
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