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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

Report No. 50-160/80-01

Licensee: Georgia Institute of Technology
225 North Avenue
Atlanta, GA 30332

Facility Name: Georgia Institute of Technology Research Reactor (GTRR)

Docket No. 50-160

License No. R-97

Inspector: C. Julian — 3/21/80
C. Julian — Date Signed

Approved by: C M Upright — 3/21/80
C. M. Upright, Acting Section Chief, RONS Branch — Date Signed

Inspection Dates: February 19-22, 1980

SUMMARY

Areas Inspected

This routine, unannounced inspection involved 29 inspector-hours on site in the areas of Nuclear Safeguards Committee activities, log and record review, surveillance, experiments, and a facility tour.

Results

Of the 5 areas inspected, no items of noncompliance or deviations were identified in 1 area; 9 items of noncompliance were found in 4 areas (Infraction: Failure to complete NSC audit, see para. 5), (Infraction: Failure to properly review experiments, see para. 6), (Infraction: Failure to provide QA review of experiments, see para. 6), (Infraction: Failure to perform monthly ECCS surveillance, see para. 7), (Infraction: Failure to promptly report abnormal occurrence, see para. 7), (Infraction: Failure to perform weekly surveillance on primary system pH, see para. 7), (Infraction: Startup of reactor with Kanne chamber inoperable, see para. 8), (Infraction: Operation in natural convection mode without high power scram set down to 1.1kw, see para. 8), (Deficiency: Late submittal of annual report, see para. 8).

DETAILS

1. Persons Contacted

Licensee Employees

*L. E. Weaver, Director, Nuclear Engineering
M. V. Davis, Director, Nuclear Research Center
*R. S. Kirkland, Reactor Supervisor
R. Boyd, Radiological Safety Officer
L. D. McDowell, Reactor Shift Supervisor

NRC

*H. C. Dance, NRC, RONS Section Chief

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on February 22, 1980, with those persons indicated in Paragraph 1 above. The licensee representatives acknowledged the items of noncompliance. Each item was discussed in some detail as described in the following paragraphs. Licensee representatives made commitments to resolve each of the items discussed below.

3. Licensee Action on Previous Inspection Findings

a. Noncompliances

(Closed) Infraction (78-03-02): Missed the June 1978 monthly shim Safety Rod Drop surveillance. The inspector determined that monthly rod drop surveillances were conducted between 10/4/78 and 2/5/80.

(Closed) Infraction (78-05-01): Failure to perform radioisotope analysis biweekly on charcoal cartridge samples on facility effluent. The inspector determined from record review that this test was performed adequately biweekly during 1979.

(Open) Deficiency (78-05-02): Failure to perform annual measurements of the shim-safety blade reactivity worths and shutdown margin during 1978. Time did not permit an adequate review of this item for close out. The licensee produced rod worth curves dated 8/30/79 indicating that the test was performed in a timely manner. This matter will be reviewed further during a future inspection.

b. Unresolved Items

(Closed) Unresolved Item (78-03-04) Nuclear Safeguards Committee Audit incomplete as of 12/1/78. This item number is closed and the failure to complete the audit by 2/22/80 is an item of noncompliance (80-01-01) as described in paragraph 5 below.

(Open) Unresolved Item (78-03-05): Facility drawings do not reflect recent modifications. The licensee is in the process of redrawing for clarification several of the facility drawings. Time did not permit an in-depth review of this item for close-out. This matter will be reviewed further during a later inspection.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve noncompliance or deviations. A new unresolved item identified during this inspection is discussed in paragraph 7.

5. Nuclear Safeguards Committee Audit

The inspector reviewed all available meeting minutes for the Nuclear Safeguards Committee (NSC) from 9/7/78 through 2/1/80. Membership and meeting frequency appeared to meet the technical specification requirements. Technical specification 6.2.e(5) requires that the NSC shall audit reactor operations and reactor operational records for compliance with internal rules, procedures, and regulations and with licensed provisions including technical specifications. Minutes show that on 9/7/78 four members were assigned areas of reactor operation to audit to be completed by 11/1/78. During an inspection on 12/1/78, an NRC inspector noted that the four audit reports had not been completed and left the matter as an unresolved item 78-03-04. During this inspection it was determined that this audit was still incomplete as of 2/22/80. Failure to complete this audit in a timely fashion is an item of noncompliance (80-01-01).

Although technical specification 6.2.e(5) does not specify an audit frequency, the inspector stated at the exit interview that at least an annual audit is accepted industry practice. By letter dated May 9, 1978, the licensee stated that an audit of their AGN-201 reactor operations will be done semiannually. Thus an annual audit of the GTRR is appropriate.

Of the four audit areas assigned only one appears to have been completed. On 1/3/79, R. A. Karam addressed a memo to the NSC containing the results of his audit of experiments conducted at the facility during 1978. NSC minutes contained no record that the committee acknowledged this audit or addressed the problems and concerns of potential safety significance presented in the 1/3/79 memo. The inspector stated that the NSC should document the results of such audits and any proposed corrective actions.

6. Experiments

The inspector reviewed records of experiments conducted during 1979. Technical specification 6.3.a.(1) states that no experiment shall be performed without review and approval by the NSC and that repetitive experiments with common safety considerations may be reviewed and approved as a class.

This specification is implemented at the GTRR by procedure 3101 "Operation of Experimental Facilities" approved 9/7/78. The procedure defines a "minor" experiment which requires only the approval of GTRR management and the Office of Radiological Safety and states that all experiments outside the definition of minor experiments, i.e., major experiments, will "require Reactor Safeguards Committee review". Thus major experiments require review and approval of the NSC. A part of this definition of minor experiment is stated as "any irradiation of non-fissionable, non-explosive materials which will not evolve hazardous gases". Contrary to these requirements, records indicate that the following three experiments were approved and run as minor but contained fissionable material.

Experiment 79-17, irradiated 2/20/79 in H-16 pneumatic tube contained 1mg Uranium. Experiment 79-51, irradiated 8/8/79 in H-15 pneumatic tube, was approved for up to 1mg of depleted UO_2, powdered, dry or in water suspension. Experiment 79-55, irradiated 9/12/79 in H-15, was approved for up to 1mg. of fuel pellet, 80% ThO_2 and 20% UO_2 (depleted). The irradiation of these three experiments, which do not meet the procedure 3101 definition of a minor experiment, without prior review and approval of the NSC as required by technical specification 6.3.a(1) is an item of noncompliance. (80-01-02)

NSC minutes show that the only experiment reviewed by the committee between 9/7/78 and 2/1/80 was a radiation-enhanced laser experiment sponsored by the University of Florida. The inspector expressed concern whether or not each experiment receives adequate evaluation by the GTRR management, prior to approval and implementation, to insure that it meets the definition of a minor experiment and does not require NSC approval. Files of experiment records typically contain no supporting analysis of estimations of expected radioactivity production, anticipated reactivity effect, anticipated heat generation, or adequacy of encapsulation. There is insufficient evidence that experiments are receiving proper review as required by Procedure 3101. During the exit interview, however, the Reactor Supervisor stated that he felt current review practices are adequate. Technical specification 6.3.e requires a Quality Assurance Program covering the design, fabrication and testing of experiments. Licensee representatives stated that procedure 3101 constitutes the required QA program. Procedure 3101 contains no requirement for an independent review of the design, fabrication, and testing of experiments and does not constitute a QA program. Failure to provide a QA review of experiments prior to implementation is an item of noncompliance (80-01-03).

7. Surveillance

The inspector examined records of the results of various surveillance tests required by the technical specifications conducted during the period 12/1/78 to 2/1/80. The following inadequacies were observed.

a. ECCS Flow Surveillance

Technical specification 4.5.a requires a monthly flow test of the emergency core cooling system (ECCS). Console log entries and ECCS surveillance records show that the ECCS system was observed to generate

less than the minimum required flow during a test on 10/9/79. Flow was observed to vary depending on the manner of opening of the manual core spray isolation valve. Official surveillance records show that the ECCS flow test was not performed again until 12/5/79, thus it appears that the surveillance was not performed during the month of November 1979. Failure to perform the test monthly as required by technical specification 4.5.a is an item of noncompliance (80-01-04).

A reactor operator who performed the test on 10/9/79 was on leave during the inspection and not available for interview. The Reactor Supervisor stated that he contacted the reactor operator by phone and learned that the suspected problem of inadequate ECCS flow caused by inconsistent operating characteristics of the manual core spray isolation valve had not been resolved. The Reactor Supervisor stated that he previously understood that the problem had been corrected on 10/9/79. Thus at the completion of this inspection, there remains a question if the ECCS system is capable of delivering consistently the required minimum flow to the core. The Reactor Supervisor stated at the exit interview that a further investigaion will be conducted to resolve the question. Technical specification 3.7.a states that the reactor shall not be operated at power levels above one megawatt unless the ECCS system is operable. The inspector stated at the exit interview that to avoid a possible violation of the technical specifications, it would be prudent of the licensee not to exceed a reactor power of one megawatt until any and all questions of ECCS operability are resolved. The inspector also stated at the exit interview that records show that the reactor was operated at 5 megawatts on 11/27/79. This operation above 1 megawatt with the ECCS system having failed to meet its last surveillance of 10/9/79 and in questionable operability is a potential item of noncompliance. The inspector stated that this matter will remain unresolved pending NRC review of the results of the licensees further investigations. (Unresolved item 80-01-05).

The inspector further stated at the exit interview that this potential failure of the ECCS system should have been recognized and evaluated on 10/9/79 as to reportability. Technical specification 6.7.b requires reporting within 24 hours to the NRC regional office any "abnormal occurrence" as defined by the technical specifications. Specification 1.14(c) defines one type of "abnormal occurrance" as "A safety system component malfunction or other component or system malfunction which could, or threatens to, render the safety system or the engineered safeguard systems incapable of performing their intended safety functions". A malfunction of the manual core spray block valve that could prevent the ECCS system from delivering the minimum required flow to the core is clearly a potential malfunction of an engineered safeguards system. Failure to report this incident as required by the technical specification is an item of noncompliance (80-01-06).

A major cause of the failure to promptly recognize and resolve this potential problem appears to be that there is currently no independent second review of the results of surveillance tests. The Reactor

Supervisor stated that a program will be established to insure a second review of surveillance tests by a person of at least the level of plant knowledge of a senior reactor operator. The inspector stated that this commitment will be reviewed during a future inspection. (Inspector followup item 80-01-07).

b. Primary Coolant pH Surveillance

Technical specification 3.6.a states that the reactor shall not be made critical unless the primary coolant pH is between 4.5 and 7.5. Technical specification 4.4.a requires that the pH of the primary coolant shall be measured weekly. The Reactor Supervisor stated that this weekly surveillance is not done because there is no installed in-line pH probe and when a sample of the D_2O primary coolant is drawn,the pH measured by a laboratory meter continually changes due to CO_2 absorption so a definitive pH value cannot be obtained. The inspector stated that if a licensee feels it is impossible to meet a technical specification requirement and that such a requirement is unimportant to safe reactor operation he should request a change to the technical specifications. Until such changes is granted, the technical specification must be met. Thus, failure to perform this weekly measurement of the pH of the primary coolant is an item of noncompliance (80-01-08).

c. Primary Coolant Radionuclide Surveillance

Technical specification 4.4.c calls for a monthly radionuclide analysis. The inspector noted that this analysis is a strictly qualitative one and questioned whether a quantitative analysis should be done. The Reactor Supervisor stated that they felt that the present analysis method of just identifying the isotopes present in the sample was sufficient. The inspector stated that this matter would be referred to the NRC staff for consideration and would be addressed in a future inspection. (Inspector followup item 80-01-09).

8. Log and Record Review

The inspector reviewed the console log for the period 1/17/78 through 1/15/80. The following discrepancies were found.

a. Inoperable Kanne Gas Monitor

On 1/2/79 the Kanne stack gas monitor was declared inoperable at 1312 hours. A reactor startup was begun at 1313 and the reactor operated until 1444 that day. On the following day 1/3/79 the Kanne monitor was logged as still inoperable at 0750 and the reactor was started up at 0757. Reactor operation continued and the Kanne was declared operable again at 1115 on 1/3/79. Technical specification 3.2.a requires that the reactor shall not be made critical unless the instrumentation listed in tables 3.1 and 3.2 is operable. Table 3.2 includes the Kanne chamber and provides an exception, via footnote (b), that

allows the channels to be bypassed for a period not to exceed 8 hours for test, repair or calibration. This situation was discussed with the Reactor Supervisor, who stated that their interpretation of the exception is that startups, operation and shutdowns may continue up to 8 hours of accumulated reactor operating time with one of the redundant instruments inoperable. The inspector stated at the exit interview that the exception is intended to allow steady state operation in progress to continue for up to 8 hours during test repair or calibration. The exception does not allow reactor startups without the redundant instrumentation and a reactor startup should not be made unless all the instrumentation required by technical specification tables 3.1 and 3.2 are operable. This is an item of noncompliance. (80-01-10).

A potentially similar occurrance was noted on 1/9/80 when the Kanne was logged inoperable at 1600 hours. Nine reactor startups for training were made later in that day and no definite record could be found as to when the Kanne was declared operable again. Licensee representatives recall, however, that repairs were completed before 1700 when maintenance personnel leave for the day. The first in the series of startups was begun at 1715.

b. Natural Convection Operation

Log entries indicate that on 4/5/79 and 5/24/79 the reactor was operated in the natural convection mode. Discussions with licensee representatives indicate that reactor operation in the natural convention mode is conducted typically six times a year for the purpose of Nuclear Engineering laboratory experiments. Technical specification 2.2.2 states that "the reactor thermal power safety system setting shall not exceed 1.1 kW when operating in the natural convection mode". Contrary to this requirement, discussions with the Reactor Supervisor confirm that the nuclear instrumentation scram setpoints are not lowered to 1 1 kilowatts during natural convection operation but are left at their normal full power setting. This is an item of noncompliance. (80-01-11).

The Reactor Supervisor stated in the exit interview that the necessity for lowering the nuclear instrumenation scram point during natural convection operation had not been previously recognized. He stated also that the matter will be evaluated further by their staff.

c. Annual Report

Technical specification 6.7.a requires that an annual report covering the previous years operations shall be submitted to the NRC regional office by March 1 of each year. The report covering operations during 1978 was dated by the licensee March 7, 1979 and received by Region II on March 9, 1979. Although a minor matter, this is a failure to meet a technical specification requirement and is an item of noncompliance. (80-01-12).

9. Facility Tour

The inspector toured the facility with the Reactor Supervisor and observed a reactor startup. Facility operations were discussed with several members of the staff. During reactor operation at full power, the licensee has previously experienced water leakage from the thermal shield cooling system. The Reactor Supervisor stated that leaking coils have been identified and isolated. NSC correspondence shows that in their analysis, adequate cooling capacity remains for operations with the isolated coils.

During the tour the inspector observed two short (about 2 inches) wires connected on one end only to contacts on the K2 and K3 relays. These relays are part of the scram system. The licensee representatives could not readily identify the reason for these wires being connected to the relay contacts, but they stated that these are not jumper wires and play no part in surveillance or maintenance work. The Reactor Supervisor stated that they will investigate further to determine the origin and use of these wires and eliminate them if they are unnecessary. This matter will be pursued during a future inspection. (Inspector followup item 80-01-13).

No deviations or items of noncompliance were identified in this area.